Project Manual

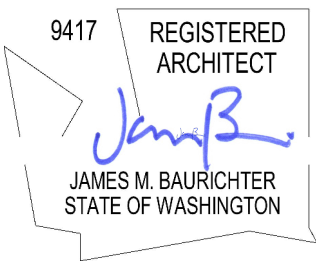
Kitsap County

Department of Emergency Management Tenant Improvement

BID # KC 2023-038

July 7, 2023

BID SET



B A U ARC · 1230 Bay Street Ste. 110 · Port Orchard, WA 98366 · 206.406.0522 · jim@bauarc.com

000110 - TABLE OF CONTENTS

END OF SECTION 000110

SECTION 000115

LIST OF DRAWING SHEETS

1.01 LIST OF DRAWING SHEETS

KITSAP COUNTY
Department of Emergency Management

GENERAL

A0.00	TITLE / NOTES / ABBV.
A0.01	CODE / LIFE SAFETY

CIVIL

C1	EXISTING CONDITIONS / DEMO PLAN
C2	PARKING PLAN
C3	STORM CLEANOUT CONDITIONS
C4	WATER AND SEWER
C5	DETAILS
C6	DETAILS

LANDSCAPE

L1	LANDSCAPE PLAN

ARCHITECTURAL

A1.01	SITE PLANS
A1.02	FLOOR PLAN - EXISTING / DEMO
A1.03	RCP – EXISTING / DEMO
A1.04	ARCHITECTURAL SLAB PLAN
A1.05	FLOOR PLAN
A1.06	FLOOR PLAN – DIMENSIONS / WALL TYPES
A1.07	FLOOR FINISH / RM SIGNAGE PLAN
A1.08	REFLECTED CEILING PLAN
A1.09	ROOF PLAN
A2.01	BLDG. ELEV. DEMO / WALL INFILL
A2.02	BUILDING ELEVATIONS
A3.01	BUILDING SECTIONS
A3.02	BUILDING / WALL SECTIONS
A3.03	WALL SECTIONS
A4.01	ENLARGED PLANS
A4.02	ENLARGED PLANS / INT ELEVATIONS
A4.03	INTERIOR ELEVATIONS
A4.04	INTERIOR ELEVATIONS
A5.00	SITE DETAILS
A5.01	SITE DETAILS
A5.02	EXTERIOR DETAILS
A5.03	EXTERIOR DETAILS
A5.04	EXTERIOR DETAILS
A5.05	EXTERIOR DETAILS
A5.06	INTERIOR DETAILS
A5.07	INTERIOR DETAILS
A6.00	DOOR / WINDOW SCHEDULES
A6.01	ASSEMBLY SCHEDULES

STRUCTURAL

S1	STRUCTURAL NOTES

S2	FOUNDATION PLAN
S2.1	FOOTING DETAILS
S3	STRUCTURAL FLOOR PLAN
S3.1	STRUCTURAL DETAILS
S4	ROOF FRAMING PLAN
S4.1	STRUCTURAL DETAILS

MECHANICAL

M0.01	MECHANICAL LEGEND
MD1.01	PLUMBING DEMOLITION PLAN
MD1.02	MECHANICAL DEMOLITION PLAN
M1.01	PLUMBING FIRST FLOOR PLAN
M1.02	PLUMBING UNDERGROUND PLAN
M1.03	HVAC DUCTWORK PLAN
M1.04	HVAC REFLECTED CEILING PLAN
M1.05	HVAC ROOF PLAN
M4.00	MECHANICAL SECTIONS
M5.00	MECHANICAL DETAILS
M5.01	MECHANICAL DETAILS II
M6.00	MECHANICAL SCHEDULES I
M6.01	MECHANICAL SCHEDULES II
M6.02	MECHANICAL SCHEDULES III
M7.00	MECHANICAL CONTROLS 1
M7.01	MECHANICAL CONTROLS II

ELECTRICAL

E0.01	ELECTRICAL LEGEND & NOTES
E0.02	SYSTEMS LEGEND
E0.03	FIXTURE, MECH SYSTEM, LTG CONTROLS
E1.01	OVERALL ELECTRICAL SITE PLAN
E1.02	ENLARGED SITE PLAN
E2.01	LIGHTING PLAN
E3.01	POWER PLAN
E3.02	ROOFTOP POWER PLAN
E4.01	SYSTEMS PLAN
E4.11	LEVEL 1 SYSTEMS PATHWAYS PLAN
E4.21	ENLARGED SYSTEMS PLANS
E5.01	ELECTRICAL ONE-LINE DIAGRAM
E5.02	PANEL SCHEDULES
E5.03	PANEL SCHEDULES
E6.01	ELECTRICAL DETAILS
E6.02	ELECTRICAL DETAILS
E6.03	ELECTRICAL DETAILS
E7.01	SECURITY DETAILS

FIRE ALARM

FA0.01	FIRE ALARM SYSTEM LEGEND AND NOTES
FA0.02	FIRE ALARM SYSTEM RISER & SEQUENCE OF OPERATIONS MATRIX
FA1.01	FIRE ALARM SYSTEM FIRST FLOOR PLAN

FIRE PROTECTION

FX0.01	FIRE PROTECTION NOTES AND FLOOR PLAN

END OF SECTION 000115

SECTION 001113
ADVERTISEMENT FOR BIDS

KC 2023-038

Kitsap County Dept. of
Emergency Management Tenant
Improvement

Materials and/or Service Requested:

Kitsap County is soliciting, for the Kitsap County Department of Emergency Management ("KCDEM"), qualified offerors interested and able to construct the Kitsap County Dept. of Emergency Management Tenant Improvement project.

EVENT	COMPLETION DATE, TIME
Issuance of Request for Proposal	July 10, 2023
Pre-Bid Conference (nonmandatory)	July 20, 2023
Written Questions Due	July 24, 2023, by 3:00 pm
Final Addendum Issued	Before July 26, 2023, by 3:00 pm
Bid Proposal Due Date	July 31, 2023, by 3:00 pm
Notice to Proceed	On or about August 25, 2023

All communications concerning this solicitation must be directed to Kitsap County's Purchasing Program Supervisor identified above, via email only. Questions to, or communications with, other Kitsap County staff may disqualify offerors from the evaluation process.

PURCHASING PROGRAM SUPERVISOR: GLEN MCNEILL

PHONE: (360) 337-4789
EMAIL: Purchasing@co.kitsap.wa.us
www.kitsapgov.com/das/pages/online-bids.aspx

OFFERORS ARE ENCOURAGED TO READ THE ENTIRE SOLICITATION.

Bid Submittal:

Sealed bids will be received by the Kitsap County Department of Emergency Management at 8900 SW Imperial Way, Bremerton, WA 98312.

Bids shall be delivered by 3:00 pm. on Monday, July 31, 2023. **Please note:** Kitsap County Department of Emergency Management will only be open to receive hand delivered bids on Monday, July 31th from 8 am to 3 pm. Bids received after the date and hour above stated will not receive consideration. Bids must be in a sealed envelope addressed to Kitsap County Department of Emergency Management. Bidders are invited to be present at the bid opening. All Bids and Alternate(s) will be opened and read aloud.

Project Description:

The scope of work includes, but is not limited to: Complete remodel of existing metal building and adjacent wood framed office area. Construction of a new restroom and entry canopy addition. The project includes new building insulation, roofing, siding, electrical, plumbing, mechanical systems, modification of existing fire suppression system and seismic upgrades. Sitework includes new landscaping, paving, fencing, and utility related work.

Estimated construction cost: $3,500,000

Non-Mandatory Pre-Bid Walkthrough:

The non-mandatory Pre-Bid walkthrough will be on Thursday, July 20, 2023 beginning at 1 p.m. The walkthrough will be at the project site, 8900 SW Imperial Way, Bremerton, WA 98312.

Bid Documents:

Digital Bidding documents will be available on **July 10, 2023** at:

1. www.kitsapgov.com/das/pages/online-bids.aspx ; Bid number 2023-038
2. ARC – Tacoma. To download or view PDF bid documents go to www.e-arc.com/location/tacoma and click on the link to “Enter Public Planroom.” Search by Kitsap County Department of Emergency Management.”

Bid Guarantee:

Each bid must be accompanied by a certified check, cashier’s check, or bid bond in an amount not less than 5% of the base bid amount, made payable to the Owner. The successful bidder is required to furnish a Performance and Labor and Material Payment Bond for 100% of the contract amount. Such bonds shall be furnished by a State Licensed Surety Company acceptable to the owner.

The Owner reserves the right to reject any or all bids and to waive as an informality any irregularities in the bids received.

No bidder may withdraw its bid after the hour set for the receipt thereof, unless the award of the contract is delayed for a period exceeding 45 days.

Prevailing Wage:

The State of Washington prevailing wage rates are applicable for this public works project located in Kitsap County. Bidders are responsible to verify and use the most recent prevailing wage rates. The "Effective Date" for this project is the Bid Proposal due date above. The applicable prevailing wage rates may be found on the Department of Labor and Industries website located at: https://lni.wa.gov/licensing-permits/public-works-projects/prevailing-wage-rates/

A condensed version of this advertisement for bids will be published in the Seattle Daily Journal of Commerce and Kitsap Sun: July 10, 2023 through July 24, 2023.

END OF SECTION 001113

SECTION 002113
INSTRUCTONS TO BIDDERS

GENERAL

1.01 DEFINITIONS:

A. All definitions set forth in the General Conditions of the Contract for Construction or in other Contract Documents are applicable to the Bidding Documents.

B. Addenda:
   1. Addenda are written or graphic instruments issued by the Architect prior to the execution of the Contract which modify or interpret the Bidding Documents by additions, deletions, clarifications or corrections. The contents of Addenda are issued in no particular order and therefore should be carefully and completely reviewed. Addenda will be posted online at locations identified in section 001113 Advertisement for Bids.

C. Alternate Bid:
   1. An Alternate Bid (or Alternate) is an amount stated in the Bid to be added to or deducted from the amount of the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted by the Owner. Any or all Alternates may be accepted or rejected in any order.

D. Award:
   1. Award means the formal decision by the Owner notifying a Bidder with the lowest responsive bid of the Owner's acceptance of the bid and intent to enter into a contract with the Bidder.

E. Award Requirements:
   1. The "Award Requirements" include the following statutory requirements as a condition precedent to Award. The lowest responsive Bidder shall:
      a. Have a Certificate of Registration in compliance with RCW 18.27;
      b. Have a current state unified business identifier number;
      c. If applicable, have industrial insurance coverage for the Bidder's employees working in Washington as required in Title 51 RCW;
      d. Have an employment security department number as required in Title 50 RCW;
      e. Have a state excise tax registration number as required in Title 82 RCW;
      f. Not be disqualified from bidding on any public works contract under RCW 39.06.010 (unregistered or unlicensed contractors) or RCW 39.12.065(3) (prevailing wage violations); and
      g. If bidding on a public works project subject to the apprenticeship utilization requirements in RCW 39.04.320, not have been found out of compliance by the Washington state apprenticeship and training council for working apprentices out of ratio, without appropriate supervision, or outside their approved work processes as outlined in their standards of apprenticeship under RCW 49.04 for the one-year period immediately preceding the date of the Bid solicitation.

F. Base Bid:
   1. The Base Bid is the sum stated in the Bid for which the Bidder offers to perform all the Work shown and described in the Bidding Documents as a lump sum bid, to which Work may be added or deducted for sums stated in Alternate Bids, if any.

G. Bid:
   1. The Bid is a complete and properly signed Bid to do the work for the sums stipulated therein, submitted in accordance with the Bidding Documents.

H. Bidding Documents:
   1. Bidding Documents include the Advertisement for Bid, Instructions to Bidders, Bid Form, any Addenda issued prior to receipt of bids. All requirements and obligations of the Bidding

Documents are hereby incorporated by reference into the Contract Documents and are binding on the Successful Bidder upon award of the Contract

I. Contract Documents
   1. The “Contract Documents” for the Work consist of the Agreement Between Owner and Contractor, the General Conditions of the Contract (as well as any Supplemental, Special or other Conditions included in the Project Manual), the Drawings, the Specifications, and all Addenda issued prior to, and all modifications issued after, execution of the Contract.

J. Responsible Bidder
   1. To be considered “Responsible” or meet “Responsibility” requirements, a Bidder must meet the following supplemental criteria applicable to this Project to the satisfaction of the Architect and the owner.
      a. The ability, capacity, and skill to perform the Contract;
      b. The character, integrity, reputation, judgment, experience, and efficiency of the Bidder;
      c. Whether the Bidder can perform the Contract within the time specified;
      d. The previous and existing compliance by the Bidder with laws relating to the Contract;
      e. The quality of performance of previous contracts, including demonstration of successful completion of similar projects in the last three (3) years;
      f. The designated Project Manager shall have a minimum of three (3) years of successful experience in project management and scheduling of projects of similar scope and complexity;
      g. The designated Superintendent shall have a minimum of five (5) years of successful supervision of projects of similar scope and complexity;
      h. Any other qualifications required by the Contract Documents or Bidding Documents; and such other information as may be secured having a bearing on the decision to award the contract.

1.02 BIDDER'S REPRESENTATIONS:

Each Bidder by submitting his Bid represents that:

A. The bidder has read and understands the Bidding Documents and his Bid is made in accordance therewith; and Bidder agrees to be bound by the terms and requirements set forth in the Bidding and Contract Documents;

B. Bidder has visited the site, has familiarized oneself with the local conditions under which the Work is to be performed and has correlated his observations with the requirements of the proposed Contract Documents;

C. Bidder’s Bid is based upon the materials, systems and equipment required by the Bidding Documents without exception; and

D. Bidder has the capability, in all respects, and the moral and business integrity, reliability, technical ability, financial resources, plant, management, superintendence, equipment and materials which will assure effective and efficient good faith performance in full compliance with the Contract Documents and with any and all schedules and completion dates required by the Owner. The Bidder acknowledges and represents that the bidder has made allowances for normal inclement weather indigenous to the Project Site, in the bidder’s estimating, planning and scheduling of the Work. The Bidder further acknowledges that the Contract Documents are, in his opinion, appropriate and adequate for completing this project and for the construction of sound and suitable work. The Bidder hereby certifies that the Work shall be completed, in place, in full accordance with the Contract Documents, within the time limits specified.

1.03 SITE CONDITIONS AND CONDITIONS OF THE WORK:

A. Each Bidder must acquaint himself thoroughly as to the character and nature of the Work to be done and the conditions under which the work will be performed. Each Bidder furthermore must

make a careful examination of the site of the Work and inform himself fully as to the difficulties to be encountered in the performance of the Work, the facilities for delivering, storing and placing materials and equipment, existing and available services and utilities, environmental and access constraints, permit requirements and other conditions relating to construction and labor.

B. No plea of ignorance of conditions that exist or may hereafter exist on the site of the Work, or difficulties that may be encountered in the execution of the Work, as a result of failures to make necessary investigations and examinations, will be accepted as an excuse for any failure or omission on the part of the Successful Bidder to fulfill in every detail all the requirements of the Contract Documents and to complete the Work for the consideration set forth therein, or as a basis for any claim whatsoever.

C. Insofar as possible, the Successful Bidder, in carrying out his work, must employ such methods or means as will not cause interruption of or interference with the Work of the Owner or any separate Contractor.

1.04 PRE-BID CONFERENCE:

A. A Pre-Bid Conference will be conducted by the Owner in conjunction with the A/E at the time indicated in section 001113 “Advertisement for Bids” to afford Bidders the opportunity to question the Owner, and Architect.

1.05 BIDDING DOCUMENTS:

A. Bidders may obtain complete sets of the Bidding Documents at the location(s) designated in 001113 the “Advertisement for Bids.”

B. Bidders shall use complete sets of Bidding Documents in preparing Bids; neither the Owner nor the Architect shall assume any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

C. The Owner and Architect making copies of the Bidding Documents available on the above terms do so only for the purpose of obtaining Bids on the Work and do not confer a license or grant for any other use.

1.06 INTERPRETATION OR CORRECTION OF BIDDING DOCUMENTS:

A. Bidder's and Sub-Bidders shall promptly notify the Owner of any ambiguity, inconsistency or error which they may discover upon examination of the Bidding and Contract Documents or of the site and local conditions. No interpretation of the meaning of the drawings, specifications or other Contract Documents will be made to any Bidder orally.

B. Every bid period request for such interpretation shall be emailed to:

PURCHASING PROGRAM SUPERVISOR: GLEN MCNEILL
EMAIL: Purchasing@co.kitsap.wa.us

C. Every request for such interpretation to be given consideration must be received at least seven (7) days prior to the date fixed for the opening of the Bids.

D. Any and all such interpretations and any supplemental instruction will be in the form of written addenda to the Bidding Documents which, if issued, will be posted and available online at the location designated in 001113 for bid documents no later than three (5) calendar days prior to the date fixed for the opening of the Bids. The Owner will not be responsible for any other explanations or interpretations of the proposed documents. Failure of any Bidder to receive any such addendum

or interpretation shall not relieve any Bidder from any obligation under his Bid as submitted. All addenda so issued shall become a part of the Contract Documents.

E. If the Bidder (or any person bidding to Bidder and/or subsequently in contract with the Bidder, relating to the subject project) knows, or should have known, that an ambiguity, discrepancy, error, omission or conflicting statement exists in the Bidding or Contract Documents, said Bidder (or sub-bidder) has an obligation to seek a clarification thereof from the owner prior to the Bid. The Owner will welcome such a clarification request, and, if deemed necessary by the Owner or the Architect, the Architect will issue a written addendum clarifying the matter in question.

F. Each Bidder shall ascertain prior to submitting his Bid that he has received all Addenda issued, and he shall acknowledge receipt and inclusion in his Bid of all Addenda.

1.07 SUBSTITUTIONS:

A. The attention of potential bidders and other interested parties is called to the conditions set forth in Division 1, Section 012500 of the Specifications entitled “Substitution Procedures” regarding approval and product options for substitutions.

1.08 PREPARATION AND SUBMISSION OF BID FORM:

A. Bids shall be submitted utilizing the Bid Form as bound herein, or otherwise provided with the Contract Documents, and shall be complete in every respect. The total Bid amount shall be entered in words and figures in the space provided. Where applicable, the unit price of lump sum items, and their extensions, shall be entered in figures in the respective columns provided for each bid item. All entries shall be typewritten or printed in ink. The signatures of all persons shall be in longhand. Any entry of amount that appears on the face of the bid to have involved an erasure, deletion, white-out and/or substitution or other such change or alteration, shall show by them the initials of the person signing the bid and the date of the change or alteration. A failure to comply with this requirement may be cause for disqualification of the Bid.

B. For lump sum Bids, in the event of a discrepancy between the Bid amount in writing and that in figures, the written value shall govern.

C. Bids shall not contain any restatement or qualifications of work to be done, and alternate bids will not be considered unless called for. No oral, telegraphic or telephonic bids or modifications will be considered.

D. Bids shall be delivered to the Owner on or before the day and hour set for the receipt of bids, enclosed in a sealed envelope and bearing the title of the work and name of the Bidder.

E. Responsibility: The Bidder assumes full responsibility for timely delivery at the location designated for receipt of Bids.

1.09 POSSIBLE TRENCH EXCAVATION SAFETY PROVISIONS

A. To ensure that the Bidder agrees to comply with relevant trenching safety requirements of RCW 39.04.180 and RCW 49.17, the Base Bid must include the cost of any required trench safety provisions. The Bidder shall enter in the blank provided on the Bid form the dollar amount the Bidder has included in its Base Bid for any trench safety provisions for trenching that will exceed a depth of four feet. If trench excavation safety provisions do not pertain to the Project, the Bidder may enter “N.A.” or “Not Applicable” in the blank on the Bid form.

B.

1.10 BID SECURITY:

A. Purpose and Procedure: Each Bid shall be accompanied by a bid security payable to the Owner in the form required in the Bidding Documents and equal to five percent (5%) of the Base Bid. The bid security constitutes a pledge that the Bidder will enter into the Contract with the Owner in the form provided, in a timely manner, and on the terms stated in its Bid and will furnish in a timely

manner the payment and performance bonds, certificates of insurance, Contractor's Construction Schedule, and all other documents required in the Contract Documents. Should the Bidder fail or refuse to enter into the Contract or fail to furnish such documents, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as a penalty. By submitting its bid and bid security, the Bidder agrees that any forfeiture is a reasonable prediction at the time of Bid submittal of future damages to the Owner.

B. Form: The bid security shall be in the form of a certified or bank cashier's check payable to the Owner or a bid bond executed by a bonding company acceptable to the Owner and licensed in the State of Washington on the form included with the Bidding Documents or on an acceptable and equivalent form. The Attorney-in-Fact who executes the bond on behalf of the surety shall be licensed to do business in the State of Washington and shall affix to the bond a certified and current copy of his/her Power of Attorney.

C. Retaining Bid Security: The Owner will have the right to retain the Bid security of Bidders to whom an award is being considered until the earliest of either (a) the Contract has been executed, and payment and performance bonds have been furnished, or (b) the specified time has elapsed so that Bids may be withdrawn, or (c) all Bids have been rejected.

D. Return of Bid Security: Within forty-five (45) days after the Bid Date, the Owner will release or return Bid securities to Bidders whose bids are not to be further considered in awarding the Contract. Bid securities of the three apparent low Bidders will be held until the Contract has been finally executed, after which all unforfeited bid securities will be returned.

1.11 MODIFICATION OR WITHDRAWAL OF BID:

A. After Receipt Time: A Bid may not be modified, withdrawn or canceled by the Bidder during the 45-day period following the time and date designated for the receipt of Bids, and each Bidder so agrees by virtue of submitting its Bid.

B. Before Receipt Time: Prior to the time and date designated for receipt of Bids, any Bid submitted may be modified or withdrawn by notice to the party receiving Bids at the place designated for receipt of Bids. Such notice shall be in writing over the signature of the Bidder or by telegram or fax; if by telegram or fax, written confirmation over the signature of the Bidder shall be mailed and postmarked on or before the date and time set for receipt of Bids. The notice shall be worded so as not to reveal the amount of the original Bid. Email notice will not be considered. It shall be the Bidder's sole responsibility to verify that the notice has been reviewed by the Owner in time to be withdrawn before the Bid opening.

C. Resubmittal: Withdrawn Bids may be resubmitted up to the time designated for the receipt of Bids provided that they are then fully in conformance with these Instructions to Bidders.

D. Bid Security with Resubmission: Bid security shall be in an amount sufficient for the Bid as modified or resubmitted.

1.12 CONSIDERATION OF BIDS:

A. OPENING OF BIDS: Unless stated otherwise in the Advertisement or Invitation to Bid or any Addendum, the properly identified Bids received on time will be opened publicly and will be read aloud. An abstract of the Base Bids and Alternate Bids, if any, will be made available to Bidders and other interested parties.

B. REJECTION OF BIDS: The Owner shall have the right but not the obligation to reject any or all Bids for any reason or for no reason, to reject a Bid not accompanied by required Bid security or by other material or data required by the Bidding Documents, or to reject a Bid which is in any way incomplete or irregular.

1.13 ACCEPTANCE OF BID (AWARD):

A. The Contract will be awarded to the lowest responsive and responsible Bidder, whose Bid is considered to be in the best interest of the Owner.

B. The Lowest Bidder is determined by the aggregate amount of the Total Base Bid plus any Alternates selected by the Owner.

C. The purpose of the above is to enable the Owner in its opinion, to select the Bid which is in the best interest of the Owner. The ability of the low Bidder to provide the required bonds will not of itself demonstrate responsibility of the Bidder.

D. The Owner reserves the right to defer award of this Contract for a period of forty-five (45) days after the due date of the Bids. During this period of time, the Bidder shall guarantee the prices quoted in his Bid.

E. The Owner reserves the right to reject all bids and to rebid the Project for any reason deemed in its best interest. The Owner reserves the right to reject any or all bids and to waive informalities in connection therewith.

1.14 SUBCONTRACTORS:

A. Listing of Subcontractors: In accordance with RCW 39.30.060, The Subcontractor List Form A and Form B be shall be completed and submitted within the required time requirement after the bid deadline. The forms are included as part of the bid form.

B. All Subcontractors proposed for the Work must be acceptable to the Owner.

C. The Owner reserves the right to request that the proposed Subcontractors complete qualification forms and/or current financial statements prepared by a Certified Public Accountant. These forms will be similar to those required of a Bidder under the Instructions to Bidders.

1.15 BID PROTEST PROCEDURES

A. Procedure: A Bidder protesting for any reason the Bidding Documents, a bidding procedure, the Owner's objection to the Bidder or a person or entity proposed by the Bidder, including but not limited to a finding of non-responsibility, the award of the Contract or of any other aspect arising from or relating in any way to the bidding shall cause a written protest to be filed with the Owner within two (2) business days of the event giving rise to the protest and, in any event, no later than two (2) business days after the date upon which Bids are opened. (Intermediate Saturdays, Sundays, and legal holidays are not counted.) The written protest shall include the name of the protesting Bidder, a detailed description of the specific factual and legal grounds for the protest, copies of all supporting documents, and the specific relief requested. The written protest shall be a “hard” (i.e. paper) copy delivered to the Owner’s office; see drawings for Owner’s address. The protesting bidder shall also notify the Owner and Architect by email that the written protest hard copy is enroute.

B. Consideration: Upon receipt of the written protest, the Owner will consider the protest. The Owner may, within three (3) business days of the Owners’ receipt of the protest, provide any other affected Bidder(s) the opportunity to respond in writing to the protest. If the protest is not resolved by mutual agreement of the protesting Bidder and the Owner, the designee will review the issues and promptly furnish a final and binding written decision to the protesting Bidder and any other affected Bidder(s) within six (6) business days of the Owners’ receipt of the protest. (If more than one protest is filed, the Owners’ decision will be provided within six (6) business days of the Owners’ receipt of the last protest.) If no reply is received from the Owner during the six-business-day period, the protest shall be deemed rejected.

1.16 POST BID INFORMATION:

A. INFORMATION FROM APPARENT LOW BIDDER: Upon notification from the Owner to the Bidder that he has submitted the apparent lowest responsive Bid, the Bidder shall, within forty-eight (3) days, provide:
   1. A detailed breakdown of his Bid in a form acceptable to the Owner.
   2. A letter or form from the Bidder's insurance company stating that the insurance required by the Contract Documents will become effective upon execution of the Contract;
   3. A letter or form from the Bidder's surety stating that the bond(s) required by the Contract Documents will become effective upon execution of the Contract;
   4. The names of the persons or entities proposed for each of the principal portions of the Work.

B. The Bidder's failure to provide the requested detailed breakdown in the specified time may result in rejection of the Bid at the sole discretion of the Owner.

2.01 PERFORMANCE BOND AND LABOR AND MATERIAL PAYMENT BOND:

A. The Successful Bidder shall furnish a Performance and Labor and Materialmen's Payment Bond in an amount equal to one hundred percent (100%) of the Contract sum, plus sales tax, as security for the faithful performance of this Contract and also as security for the payment of all persons performing labor and furnishing materials under this Contract. The Performance and Labor and Materialmen's Payment Bonds shall be acceptable to the Owner, in accordance with Chapter 39.08, RCW the General Conditions of the Contract, and shall be delivered to the Owner not later than the date of execution of the Contract. The Surety signing the Bond shall have an A.M. Best rating of A-/VII or better, be registered with the Washington State Insurance Commissioner, and the Surety's name shall appear in the current Authorized Insurance Company list in the State of Washington published by the office of the Insurance Commissioner. Each Surety's name must also appear on the United States Treasury Department's list of authorized sureties, circular 570, as amended.

B. Time of Delivery: The Bidder shall deliver the required bonds to the Owner within seven (7) days after the notice of intent to award of the Contract and prior to commencing operations at the site.

2.02 TIME FOR COMPLETION AND LIQUIDATED DAMAGES FOR NON- COMPLETION:

A. Refer to 011000 “Summary of Work” for Substantial Completion and Final Completion dates and descriptions.

B. Refer to 011000 “Summary of Work” for Liquidated Damages.

2.03 BIDDERS REFERRED TO LAWS:

A. The attention of the Bidders is called to the provisions of all Local, State and Federal laws, regulations, ordinances and resolutions applicable to the work, as well as laws, regulations, ordinances, resolutions and permits relating to obstructing streets, maintaining signals, storing and handling of explosives, preserving safety or affecting the Bidder, or his employees or his work hereunder in his relation to the Owner or any other person. The Bidder shall obey all such laws, regulations, ordinances, permits or resolutions applicable to the Work or controlling or limiting Contractors while engaged in the prosecution of the Work under this Contract.

B. The provisions of this Contract shall be interpreted in accordance with the laws of the State of Washington and in accordance with the laws, ordinances, regulations, permits and resolutions of Kitsap County.

2.04 TAXES:

A. Contractor shall include in his Bid and pay for all applicable taxes, except only State Sales Tax and Local Sales Tax on the Contract Sum, which should be excluded in the preparation of his Bid.

2.05 FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR:

A. See Section 005200 for form to be used.

2.06 L&I FEES:

A. The State of Washington requires payment of fees for approval of "Statement of Intent to Pay Prevailing Wages" forms and "Affidavit of Wages Paid" forms. Payment of such fees is the responsibility of the Contractor.

2.07 CONFLICTS:

A. **I**n case of conflict between the provisions of these Instructions and any other Bidding Document, these Instructions shall govern. In case of conflict between the provisions of the Bidding Documents and the Contract Documents, the Contract Documents shall govern.

END OF SECTION 002113

SECTION 003100
INFORMATION AVAILABLE TO BIDDER

GENERAL

1.01 INFORMATION AVAILABLE TO BIDDERS:

A. This information is for reference purposes only and does not contain Contract Work. In the event of conflicts between these reports or existing drawings and the Contract Documents, the Contract Documents shall govern.

1.02 REPORTS

A. The following report(s) are included after this Section:
   1. Pre-Renovation Regulated Building Materials Assessment, TI Project prepared by Rose Environmental, dated April 6, 2023 (21 pages)
      a. Refer to demo plans for locations of any abatement work completed or to be completed by owner's contractor prior to the commencement of this project.

1.03 RECORD DRAWINGS

A. Record Drawings:
   1. Fire Suppression System for building 8900. A fire suppression system was installed in the building in 2021-2022. Record drawings produced by Fox Fire Prevention, Inc will be available for reference only to the successful bidder upon request and completion of a disclaimer form.

END OF SECTION 003100

Rose Environmental

6715 Greenwood Avenue North
Seattle, WA 98103

Phone: 206.679.0699
www.roseenvironmental.com

April 6, 2023

Jan Glarum
Director
Kitsap County Department of Emergency Management
911 Carver Street
Bremerton, WA 98312

Subject: Pre-Renovation Regulated Building Materials Assessment, TI Project KCDEM - 8900 Southwest Imperial Way, Bremerton, Washington

Dear Jan,

On March 21, 2023, Rose Environmental LLC conducted a regulated building materials assessment for (1) suspect asbestos-containing materials, (2) silica-containing building materials, (3) building materials that may contain polychlorinated biphenyls (PCBs), mercury, and/or chlorofluorocarbons (CFCs), and (4) building materials which may contain RCRA-8 metals, within the commercial building located at 8900 Southwest Imperial Way in Bremerton, Washington. The purpose of the inspection was to verify the presence of absence of regulated building materials which may be impacted as part of an upcoming renovation project.

ASBESTOS SAMPLING – METHODS & RESULTS

Mr. Tyler Stevens, CSP, an EPA AHERA-accredited inspector from Rose Environmental, (Asbestos Inspector Certification #187430/ Certification Expiration Date: January 19, 2024), conducted the survey. Rose Environmental collected samples of suspect asbestos-containing materials; the samples were collected full depth to the surface of the underlying substrate.

Asbestos Laboratory Analysis

The bulk samples collected were submitted under strict chain of custody procedures to NVL Laboratories in Seattle, Washington, a qualified independent laboratory for analysis. The asbestos samples were analyzed using polarized light microscopy (PLM) with dispersion staining in accordance with US EPA method 600/R-93/116 as specified in 40 CFR Chapter I (7-1-93 edition) Part 763, Subpart F, Appendix A, pages 499-504. Polarizing light microscopy quantifies asbestos concentrations at between 100% and 1% detection levels. Levels below 1% can only be stated as "trace."

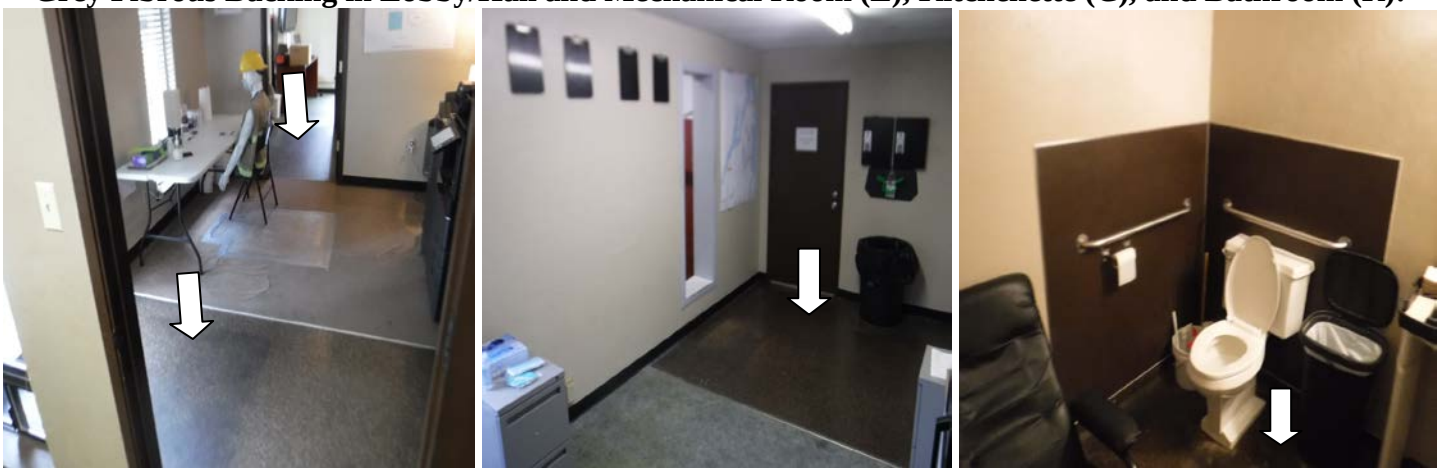
TABLE 1: ASBESTOS SAMPLING RESULTS				
Sample ID	**Material Description**	**Location**	**Asbestos Content**	**Estimated Quantity**
Asbestos Containing Materials				
DEM-A5	**Brown "stone-patterned" sheet vinyl flooring w/ Grey fibrous backing layer / Tan mastic**	**Lobby/Hall, Mechanical Room, Kitchenette Bathroom**	**29% Chrysotile Asbestos in the Grey Fibrous Backing Layer**	**~400 SF**
Non-Asbestos Containing Materials				
DEM-A1	Brown/Grey 12" x 12" VCT / Tan mastic	Conference Room	NAD	NA
DEM-A2	Black 4" VCB / Beige mastic		NAD	NA
DEM-A3	Light Brown-painted GWB system w/ Skip-trowel texture		NAD	NA
DEM-A4	White 2' x 4' pressboard suspended ceiling panel		NAD	NA
DEM-A6	Light Brown low profile carpet / Tan mastic	Copy Room Area	NAD	NA
DEM-A7	Brown laminate wall panel / Tan mastic / GWB system w/ Skip-trowel texture	Bathroom	NAD	NA
DEM-A8	Green artificial turf remnants / Black woven backing / Tan mastic on floor	Warehouse	NAD	NA
DEM-A9	Grey low profile carpet / White mastic	Warehouse South Build-out	NAD	NA
DEM-A10	Painted GWB system w/o texture	Warehouse South Build-out – Southwest Room	NAD	NA
DEM-A11	Brown 3" VCB / Tan mastic	Mechanical Room	NAD	NA
DEM-A12	Green mottled sheet vinyl w/ White fibrous backing / Tan mastic	Kitchenette "Office"	NAD	NA
DEM-A13	Brown laminate countertop backsplash / Tan mastic	Kitchenette	NAD	NA
DEM-A14	Grey 4" VCB / Mastic	North Offices	NAD	NA
DEM-A15	Painted textured GWB system		NAD	NA
DEM-A16	Blue-Grey low profile carpet / Tan mastic		NAD	NA
DEM-A17	Black asphaltic pavement	Parking Area / Driveway	NAD	NA

Note: GWB = Gypsum Wallboard VCB = vinyl cove base VCT = vinyl composition tile
NAD = No asbestos detected NA = not applicable

In summary, the survey and laboratory results revealed that:

A) Approximately 400 square feet of **Brown "stone-patterned" sheet vinyl flooring with grey fibrous backing,** as found within the Lobby/Hall, Mechanical Room, Kitchenette and Bathroom, **contained 29% chrysotile asbestos in the grey fibrous backing layer.**

Photos 1-3: Representative Photos of Brown "Stone-Patterned" Sheet Vinyl with Asbestos-Containing Grey Fibrous Backing in Lobby/Hall and Mechanical Room (L), Kitchenette (C), and Bathroom (R):



LEAD SAMPLING – METHODS & RESULTS

Rose Environmental collected a full-depth (to substrate) paint samples which might be disturbed as part of the demolition project. Bulk samples were submitted under strict chain of custody procedures to NVL Laboratories in Seattle, Washington, which is accredited by the American Industrial Hygiene Association (AIHA) Environmental Lead Accreditation Program.

TABLE 2: LEAD PAINT SAMPLING RESULTS

Sample ID	Description	Location	Lead Content (%)
DEM-L1	Beige paint on GWB	Conference Room	<0.014
DEM-L2	Tan paint on GWB	Hall/Lobby/Bathroom/etc.	<0.0047
DEM-L3	Tan paint on GWB/OSB	Warehouse South Build-out SW Room	<0.0048
DEM-L4	Blue paint on metallic walls	Warehouse Perimeter - Interior	<0.0052
DEM-L5	Green paint on metallic walls		<0.0053
DEM-L6	Black paint on OSB	Warehouse South Build-out	<0.0054
DEM-L7	White textured paint on GWB	North Office	<0.0062
DEM-L8	Grey textured paint on GWB	North Middle Office	<0.010

In summary, the survey and laboratory results revealed that none of the paint materials sampled were found to contain detectable amounts of lead.

SILICA-CONTAINING BUILDING MATERIALS

Rose Environmental observed the following materials which may be impacted during upcoming construction work which are presumed to contain respirable crystalline silica:

1. Concrete foundational subflooring, as found throughout the building.

2. Black asphaltic pavement, as found within the driveway and parking areas.

Worker (and bystander) exposure to dusts created by construction activities impacting silica-containing materials should be mitigated in accordance with L&I DOSH regulations (WAC 296-840) and good indoor air quality techniques.

MERCURY-CONTAINING FLUORESCENT LAMPS AND POLYCHLORINATED BIPHENYL LIGHT BALLASTS AND BUILDING MATERIALS

Rose Environmental conducted an inventory of installed regulated materials which may be classified as universal hazardous waste, which may be impacted as part of upcoming demolition work. These materials included mercury-containing items such as fluorescent light tubes, high-intensity discharge lighting, thermostats, and CFC-containing items such as air-conditioning units.

In summary, fluorescent tubes (in ~30 fixtures throughout the building) were found to be labeled as mercury-containing (Hg).

Where ballasts are encountered during demolition which do not have a "non-PCB" label or are not obviously manufactured after 1998, these should be assumed to contain PCBs and be tracked, removed, handled, and disposed of in an appropriate manner. All manifesting and recycling documentation are required within the project closeout documentation.

Some of the requirements which apply to mercury-containing lighting within the Universal Waste Rule for Dangerous Waste Lamps (WAC 173-303-573), include:

- Do not dispose of universal waste as general or construction debris;
- Place in closed, structurally sound, compatible containers. Cardboard containers should be used for inside storage only;
- Label containers "Waste Lamps" or "Universal Waste Lamps";
- Do not crush fluorescent light tubes on site or during transit. Track shipments of universal waste lamps with records (invoice, manifest, etc.) kept for a minimum of 3 years.
- Provide training to employees on the proper handling and emergency procedures of universal waste lamps.

CONCLUSIONS

In summary, the results of Rose Environmental's March 21, 2023 regulated materials inspection within the KCDEM property at 8900 Imperial Way Southwest, confirmed asbestos content greater than one percent in the grey fibrous backing layer of brown "stone-patterned" sheet vinyl flooring found within the Lobby/Hall, Mechanical Room, Kitchenette, and Bathroom (see above for details).

Asbestos-containing materials are required to be removed and disposed of in accordance with Washington State Regulations prior to any demolition, renovation, or remodeling that would disturb these materials. Washington State Department of Labor and Industries and PSCAA require that the abatement be performed using Certified Asbestos Workers under the direct on-site supervision of a Certified Asbestos Supervisor.

LIMITS OF SURVEY

Regulated building materials surveys are non-comprehensive by nature and subject to many limitations including those presented below. This survey is limited to only those locations sampled. Evaluation of other risks, such as toxic and hazardous substances in (or in contact with) soil and ground water, structural, electrical, mechanical, radon gas, slope stability, building settlement, moisture, or site drainage/flooding have not been included. No warranty, expressed or implied, is made.

The site visit consisted of a thorough visual walk-through of the area(s) of renovation for the purpose of viewing and/or sampling potential asbestos-containing material, lead-containing materials, silica-containing materials, RCRA-8 regulated metals, and/or polychlorinated biphenyls (PCBs). Rose Environmental is not responsible for materials which require destructive means to access, or materials which are hidden from sight, those materials hidden behind walls, or materials which cannot be found with reasonable diligence. Rose Environmental performed this survey in accordance with the generally accepted standards of care that exist in the industrial hygiene profession in Washington State at the time of this study.

It has been a pleasure assisting you with this assessment. Should you have any questions regarding this summary, feel free to contact us via phone or email.

Respectfully,

Tyler Stevens, CSP
Industrial Hygienist
Rose Environmental LLC

Reviewed by,

Martin Rose, CIH, CSP
Principal/Senior Consultant
Rose Environmental LLC

Attachments: NVL Lab Reports #2304535 (asbestos) & #23047536 (lead in paints)
Photographic Contact Sheet

March 23, 2023

Martin Rose
Rose Environmental
6715 Greenwood Ave. N
Seattle, WA 98107

RE: Bulk Asbestos Fiber Analysis; NVL Batch # 2304535.00

Client Project: 12489-KCDEM-ASB
Location: N-A

Dear Mr. Rose,

Enclosed please find test results for the 17 sample(s) submitted to our laboratory for analysis on 3/22/2023.

Examination of these samples was conducted for the presence of identifiable asbestos fibers using polarized light microscopy (PLM) with dispersion staining in accordance with **U. S. EPA 40 CFR Appendix E to Subpart E of Part 763**, Interim Method for the Determination of Asbestos in Bulk Insulation Samples and **EPA 600/R-93/116**, Method for the Determination of Asbestos in Bulk Building Materials.

For samples containing more than one separable layer of materials, the report will include findings for each layer (labeled Layer 1 and Layer 2, etc. for each individual layer). The asbestos concentration in the sample is determined by calibrated visual estimation.

For those samples with asbestos concentrations between 1 and 10 percent based on visual estimation, the EPA recommends a procedure known as point counting (NESHAPS, 40 CFR Part 61). Point counting is a statistically more accurate means of quantification for samples with low concentrations of asbestos.

The detection limit for the calibrated visual estimation is <1%, 400 point counts is 0.25% and 1000 point counts is 0.1%

Samples are archived for two weeks following analysis. Samples that are not retrieved by the client are discarded after two weeks.

Thank you for using our laboratory services. Please do not hesitate to call if there is anything further we can assist you with.

Sincerely,

Nick Ly, Technical Director

NVLAP Testing
Lab Code: 102063-0

Enc.: Sample Results

Bulk Asbestos Fibers Analysis

By Polarized Light Microscopy

Client: Rose Environmental
Address: 6715 Greenwood Ave. N
Seattle, WA 98107

Attention: Mr. Martin Rose
Project Location: N-A

Batch #: 2304535.00
Client Project #: 12489-KCDEM-ASB
Date Received: 3/22/2023
Samples Received: 17
Samples Analyzed: 17
Method: EPA/600/R-93/116

Lab ID: 23028594 **Client Sample #: DEM-A1**

Location: N-A

Layer 1 of 2	**Description:** Gray vinyl material with brown surface			
	Non-Fibrous Materials:	Other Fibrous Materials:	%	**Asbestos Type: %**
	Vinyl/Binder, Mineral grains, Debris	None Detected	ND	**None Detected ND**
Layer 2 of 2	**Description:** Clear adhesive with debris			
	Non-Fibrous Materials:	Other Fibrous Materials:	%	**Asbestos Type: %**
	Adhesive/Binder, Debris, Wood flakes	Cellulose	4%	**None Detected ND**

Lab ID: 23028595 **Client Sample #: DEM-A2**

Location: N-A

Layer 1 of 3	**Description:** Black rubbery material			
	Non-Fibrous Materials:	Other Fibrous Materials:	%	**Asbestos Type: %**
	Rubber/Binder	None Detected	ND	**None Detected ND**
Layer 2 of 3	**Description:** Pale yellow mastic with debris			
	Non-Fibrous Materials:	Other Fibrous Materials:	%	**Asbestos Type: %**
	Mastic/Binder, Debris	Cellulose	3%	**None Detected ND**
Layer 3 of 3	**Description:** White brittle material with paint & debris			
	Non-Fibrous Materials:	Other Fibrous Materials:	%	**Asbestos Type: %**
	Binder/Filler, Mineral grains, Fine grains	Cellulose	<1%	**None Detected ND**
	Paint, Debris			

Lab ID: 23028596 **Client Sample #: DEM-A3**

Location: N-A

Layer 1 of 2	**Description:** White brittle material with paint & debris			
	Non-Fibrous Materials:	Other Fibrous Materials:	%	**Asbestos Type: %**
	Binder/Filler, Mineral grains, Fine grains	Cellulose	<1%	**None Detected ND**

Sampled by: Client
Analyzed by: Kunga Woser **Date:** 03/22/2023
Reviewed by: Nick Ly **Date:** 03/23/2023

Nick Ly, Technical Director

Note: If samples are not homogeneous, then subsamples of the components were analyzed separately. All bulk samples are analyzed using both EPA 600/R-93/116 and EPA 40 CFR Appendix E to Subpart E of Part 763 with the following measurement uncertainties for the reported % Asbestos (1%=0-3%, 5%=1-9%, 10%=5-15%, 20%=10-30%, 50%=40-60%). This report relates only to the items tested. If sample was not collected by NVL personnel, then the accuracy of the results is limited by the methodology and acuity of the sample collector. This report shall not be reproduced except in full, without written approval of NVL Laboratories, Inc. It shall not be used to claim product endorsement by NVLAP or any other agency of the US Government

Bulk Asbestos Fibers Analysis

By Polarized Light Microscopy

Client: Rose Environmental
Address: 6715 Greenwood Ave. N
Seattle, WA 98107

Attention: Mr. Martin Rose
Project Location: N-A

Batch #: 2304535.00
Client Project #: 12489-KCDEM-ASB
Date Received: 3/22/2023
Samples Received: 17
Samples Analyzed: 17
Method: EPA/600/R-93/116

Paint, Debris

Layer 2 of 2 **Description:** White chalky material with paper

Non-Fibrous Materials:	Other Fibrous Materials:%	**Asbestos Type: %**
Gypsum/Binder, Fine particles, Metallic flakes	Cellulose 24%	**None Detected ND**
	Glass fibers 6%	

Lab ID: 23028597 **Client Sample #: DEM-A4**

Location: N-A

Layer 1 of 1 **Description:** Tan compressed fibrous material with paint

Non-Fibrous Materials:	Other Fibrous Materials:%	**Asbestos Type: %**
Binder/Filler, Perlite, Glass beads	Cellulose 36%	**None Detected ND**
Paint	Glass fibers 25%	

Lab ID: 23028598 **Client Sample #: DEM-A5**

Location: N-A

Layer 1 of 2 **Description:** Dark brown vinyl material with debris

Non-Fibrous Materials:	Other Fibrous Materials:%	**Asbestos Type: %**
Vinyl/Binder, Debris	None Detected ND	**None Detected ND**

Layer 2 of 2 **Description:** Gray fibrous backing with mastic

Non-Fibrous Materials:	Other Fibrous Materials:%	**Asbestos Type: %**
Binder/Filler, Fine particles, Mastic/Binder	Cellulose 28%	**Chrysotile 29%**

Lab ID: 23028599 **Client Sample #: DEM-A6**

Location: N-A

Layer 1 of 3 **Description:** Multi-colored woven fibrous material

Non-Fibrous Materials:	Other Fibrous Materials:%	**Asbestos Type: %**
Binder/Filler	Synthetic fibers 87%	**None Detected ND**

Sampled by: Client
Analyzed by: Kunga Woser **Date:** 03/22/2023
Reviewed by: Nick Ly **Date:** 03/23/2023

Nick Ly, Technical Director

Note: If samples are not homogeneous, then subsamples of the components were analyzed separately. All bulk samples are analyzed using both EPA 600/R-93/116 and EPA 40 CFR Appendix E to Subpart E of Part 763 with the following measurement uncertainties for the reported % Asbestos (1%=0-3%, 5%=1-9%, 10%=5-15%, 20%=10-30%, 50%=40-60%). This report relates only to the items tested. If sample was not collected by NVL personnel, then the accuracy of the results is limited by the methodology and acuity of the sample collector. This report shall not be reproduced except in full, without written approval of NVL Laboratories, Inc. It shall not be used to claim product endorsement by NVLAP or any other agency of the US Government

Bulk Asbestos Fibers Analysis

By Polarized Light Microscopy

Client: Rose Environmental
Address: 6715 Greenwood Ave. N
Seattle, WA 98107

Attention: Mr. Martin Rose
Project Location: N-A

Batch #: 2304535.00
Client Project #: 12489-KCDEM-ASB
Date Received: 3/22/2023
Samples Received: 17
Samples Analyzed: 17
Method: EPA/600/R-93/116

Layer 2 of 3	**Description:** Gray mastic with fibrous mesh			
	Non-Fibrous Materials:	Other Fibrous Materials:%		**Asbestos Type: %**
	Mastic/Binder	Synthetic fibers	17%	**None Detected ND**
Layer 3 of 3	**Description:** Tan woven fibrous material with debris			
	Non-Fibrous Materials:	Other Fibrous Materials:%		**Asbestos Type: %**
	Binder/Filler, Debris	Cellulose	84%	**None Detected ND**

Lab ID: 23028600 **Client Sample #: DEM-A7**

Location: N-A

Layer 1 of 3	**Description:** Tan mastic with debris			
	Non-Fibrous Materials:	Other Fibrous Materials:%		**Asbestos Type: %**
	Mastic/Binder, Debris	Cellulose	2%	**None Detected ND**
Layer 2 of 3	**Description:** White brittle material			
	Non-Fibrous Materials:	Other Fibrous Materials:%		**Asbestos Type: %**
	Binder/Filler, Mineral grains, Fine grains	Cellulose	<1%	**None Detected ND**
Layer 3 of 3	**Description:** White chalky material with paper			
	Non-Fibrous Materials:	Other Fibrous Materials:%		**Asbestos Type: %**
	Gypsum/Binder, Fine particles, Metallic flakes	Cellulose	25%	**None Detected ND**
		Glass fibers	5%	

Lab ID: 23028601 **Client Sample #: DEM-A8**

Location: N-A

Layer 1 of 2	**Description:** Black foamy material with debris			
	Non-Fibrous Materials:	Other Fibrous Materials:%		**Asbestos Type: %**
	Foamy material, Debris	Synthetic fibers	6%	**None Detected ND**

Sampled by: Client
Analyzed by: Kunga Woser **Date:** 03/22/2023
Reviewed by: Nick Ly **Date:** 03/23/2023

Nick Ly, Technical Director

Note: If samples are not homogeneous, then subsamples of the components were analyzed separately. All bulk samples are analyzed using both EPA 600/R-93/116 and EPA 40 CFR Appendix E to Subpart E of Part 763 with the following measurement uncertainties for the reported % Asbestos (1%=0-3%, 5%=1-9%, 10%=5-15%, 20%=10-30%, 50%=40-60%). This report relates only to the items tested. If sample was not collected by NVL personnel, then the accuracy of the results is limited by the methodology and acuity of the sample collector. This report shall not be reproduced except in full, without written approval of NVL Laboratories, Inc. It shall not be used to claim product endorsement by NVLAP or any other agency of the US Government

Bulk Asbestos Fibers Analysis

By Polarized Light Microscopy

Client: Rose Environmental
Address: 6715 Greenwood Ave. N
Seattle, WA 98107

Attention: Mr. Martin Rose
Project Location: N-A

Batch #: 2304535.00
Client Project #: 12489-KCDEM-ASB
Date Received: 3/22/2023
Samples Received: 17
Samples Analyzed: 17
Method: EPA/600/R-93/116

Layer 2 of 2	**Description:** Tan mastic with debris			
	Non-Fibrous Materials:	Other Fibrous Materials:%		**Asbestos Type: %**
	Mastic/Binder, Debris	Cellulose	4%	**None Detected ND**

Lab ID: 23028602 **Client Sample #: DEM-A9**
Location: N-A

Layer 1 of 2	**Description:** Multi-colored woven fibrous material			
	Non-Fibrous Materials:	Other Fibrous Materials:%		**Asbestos Type: %**
	Binder/Filler	Synthetic fibers	85%	**None Detected ND**
Layer 2 of 2	**Description:** Gray mastic with fibrous mesh			
	Non-Fibrous Materials:	Other Fibrous Materials:%		**Asbestos Type: %**
	Mastic/Binder	Synthetic fibers	16%	**None Detected ND**

Lab ID: 23028603 **Client Sample #: DEM-A10**
Location: N-A

Layer 1 of 1	**Description:** White chalky material with paper and paint			
	Non-Fibrous Materials:	Other Fibrous Materials:%		**Asbestos Type: %**
	Gypsum/Binder, Fine particles, Paint	Cellulose	26%	**None Detected ND**
		Glass fibers	3%	

Lab ID: 23028604 **Client Sample #: DEM-A11**
Location: N-A

Layer 1 of 2	**Description:** Black rubbery material with debris			
	Non-Fibrous Materials:	Other Fibrous Materials:%		**Asbestos Type: %**
	Rubber/Binder, Debris	None Detected	ND	**None Detected ND**
Layer 2 of 2	**Description:** Brown mastic with debris			
	Non-Fibrous Materials:	Other Fibrous Materials:%		**Asbestos Type: %**
	Mastic/Binder, Debris	Cellulose	2%	**None Detected ND**

Sampled by: Client
Analyzed by: Kunga Woser **Date:** 03/22/2023
Reviewed by: Nick Ly **Date:** 03/23/2023

Nick Ly, Technical Director

Note: If samples are not homogeneous, then subsamples of the components were analyzed separately. All bulk samples are analyzed using both EPA 600/R-93/116 and EPA 40 CFR Appendix E to Subpart E of Part 763 with the following measurement uncertainties for the reported % Asbestos (1%=0-3%, 5%=1-9%, 10%=5-15%, 20%=10-30%, 50%=40-60%). This report relates only to the items tested. If sample was not collected by NVL personnel, then the accuracy of the results is limited by the methodology and acuity of the sample collector. This report shall not be reproduced except in full, without written approval of NVL Laboratories, Inc. It shall not be used to claim product endorsement by NVLAP or any other agency of the US Government

Bulk Asbestos Fibers Analysis

By Polarized Light Microscopy

Client: Rose Environmental
Address: 6715 Greenwood Ave. N
Seattle, WA 98107

Attention: Mr. Martin Rose
Project Location: N-A

Batch #: 2304535.00
Client Project #: 12489-KCDEM-ASB
Date Received: 3/22/2023
Samples Received: 17
Samples Analyzed: 17
Method: EPA/600/R-93/116

Lab ID: 23028605 **Client Sample #: DEM-A12**
Location: N-A

Layer 1 of 2	**Description:** Gray vinyl material with debris			
	Non-Fibrous Materials:	Other Fibrous Materials:	%	**Asbestos Type: %**
	Vinyl/Binder, Debris	Glass fibers	4%	**None Detected ND**
Layer 2 of 2	**Description:** Tan mastic with debris			
	Non-Fibrous Materials:	Other Fibrous Materials:	%	**Asbestos Type: %**
	Mastic/Binder, Debris	Cellulose	4%	**None Detected ND**

Lab ID: 23028606 **Client Sample #: DEM-A13**
Location: N-A

Layer 1 of 2	**Description:** Tan mastic with debris			
	Non-Fibrous Materials:	Other Fibrous Materials:	%	**Asbestos Type: %**
	Mastic/Binder, Debris	Cellulose	2%	**None Detected ND**
Layer 2 of 2	**Description:** White brittle material			
	Non-Fibrous Materials:	Other Fibrous Materials:	%	**Asbestos Type: %**
	Binder/Filler, Mineral grains, Fine grains	Cellulose	2%	**None Detected ND**

Lab ID: 23028607 **Client Sample #: DEM-A14**
Location: N-A

Layer 1 of 3	**Description:** Gray rubbery material			
	Non-Fibrous Materials:	Other Fibrous Materials:	%	**Asbestos Type: %**
	Rubber/Binder	None Detected	ND	**None Detected ND**
Layer 2 of 3	**Description:** Pale yellow mastic with debris			
	Non-Fibrous Materials:	Other Fibrous Materials:	%	**Asbestos Type: %**
	Mastic/Binder, Debris	Cellulose	3%	**None Detected ND**

Sampled by: Client
Analyzed by: Kunga Woser **Date:** 03/22/2023
Reviewed by: Nick Ly **Date:** 03/23/2023

Nick Ly, Technical Director

Note: If samples are not homogeneous, then subsamples of the components were analyzed separately. All bulk samples are analyzed using both EPA 600/R-93/116 and EPA 40 CFR Appendix E to Subpart E of Part 763 with the following measurement uncertainties for the reported % Asbestos (1%=0-3%, 5%=1-9%, 10%=5-15%, 20%=10-30%, 50%=40-60%). This report relates only to the items tested. If sample was not collected by NVL personnel, then the accuracy of the results is limited by the methodology and acuity of the sample collector. This report shall not be reproduced except in full, without written approval of NVL Laboratories, Inc. It shall not be used to claim product endorsement by NVLAP or any other agency of the US Government

Bulk Asbestos Fibers Analysis

By Polarized Light Microscopy

Client: Rose Environmental
Address: 6715 Greenwood Ave. N
Seattle, WA 98107

Attention: Mr. Martin Rose
Project Location: N-A

Batch #: 2304535.00
Client Project #: 12489-KCDEM-ASB
Date Received: 3/22/2023
Samples Received: 17
Samples Analyzed: 17
Method: EPA/600/R-93/116

Layer 3 of 3	**Description:** White compacted powdery material with paint			
	Non-Fibrous Materials:	Other Fibrous Materials:	%	**Asbestos Type: %**
	Binder/Filler, Fine particles, Paint	None Detected	ND	**None Detected ND**

Lab ID: 23028608 **Client Sample #: DEM-A15**

Location: N-A

Layer 1 of 3	**Description:** White compacted powdery material with paint			
	Non-Fibrous Materials:	Other Fibrous Materials:	%	**Asbestos Type: %**
	Calcareous binder, Calcareous particles, Paint	Cellulose	2%	**None Detected ND**
Layer 2 of 3	**Description:** White compacted powdery material with paper			
	Non-Fibrous Materials:	Other Fibrous Materials:	%	**Asbestos Type: %**
	Calcareous binder, Calcareous particles	Cellulose	25%	**None Detected ND**
Layer 3 of 3	**Description:** White chalky material with paper			
	Non-Fibrous Materials:	Other Fibrous Materials:	%	**Asbestos Type: %**
	Gypsum/Binder, Fine particles, Metallic flakes	Cellulose	24%	**None Detected ND**
		Glass fibers	6%	

Lab ID: 23028609 **Client Sample #: DEM-A16**

Location: N-A

Comments: Insufficient sample amount for layer 3 thorough analysis.

Layer 1 of 3	**Description:** Multi-colored woven fibrous material			
	Non-Fibrous Materials:	Other Fibrous Materials:	%	**Asbestos Type: %**
	Binder/Filler	Synthetic fibers	88%	**None Detected ND**
Layer 2 of 3	**Description:** Gray mastic with fibrous mesh			
	Non-Fibrous Materials:	Other Fibrous Materials:	%	**Asbestos Type: %**
	Mastic/Binder	Synthetic fibers	16%	**None Detected ND**

Sampled by: Client
Analyzed by: Kunga Woser **Date:** 03/22/2023
Reviewed by: Nick Ly **Date:** 03/23/2023

Nick Ly, Technical Director

Note: If samples are not homogeneous, then subsamples of the components were analyzed separately. All bulk samples are analyzed using both EPA 600/R-93/116 and EPA 40 CFR Appendix E to Subpart E of Part 763 with the following measurement uncertainties for the reported % Asbestos (1%=0-3%, 5%=1-9%, 10%=5-15%, 20%=10-30%, 50%=40-60%). This report relates only to the items tested. If sample was not collected by NVL personnel, then the accuracy of the results is limited by the methodology and acuity of the sample collector. This report shall not be reproduced except in full, without written approval of NVL Laboratories, Inc. It shall not be used to claim product endorsement by NVLAP or any other agency of the US Government

Bulk Asbestos Fibers Analysis

By Polarized Light Microscopy

Client: Rose Environmental
Address: 6715 Greenwood Ave. N
Seattle, WA 98107

Attention: Mr. Martin Rose
Project Location: N-A

Batch #: 2304535.00
Client Project #: 12489-KCDEM-ASB
Date Received: 3/22/2023
Samples Received: 17
Samples Analyzed: 17
Method: EPA/600/R-93/116

Layer 3 of 3 **Description:** Yellow mastic (trace amount)

Non-Fibrous Materials:	Other Fibrous Materials:%	**Asbestos Type: %**
Mastic/Binder	None Detected ND	**None Detected ND**

Lab ID: 23028610 **Client Sample #: DEM-A17**

Location: N-A

Layer 1 of 1 **Description:** Black asphaltic material with debris

Non-Fibrous Materials:	Other Fibrous Materials:%	**Asbestos Type: %**
Asphalt/Binder, Asphaltic Particles, Debris Granules, Gravel, Organic debris	Cellulose 3%	**None Detected ND**

Sampled by: Client
Analyzed by: Kunga Woser **Date:** 03/22/2023
Reviewed by: Nick Ly **Date:** 03/23/2023

Nick Ly, Technical Director

Note: If samples are not homogeneous, then subsamples of the components were analyzed separately. All bulk samples are analyzed using both EPA 600/R-93/116 and EPA 40 CFR Appendix E to Subpart E of Part 763 with the following measurement uncertainties for the reported % Asbestos (1%=0-3%, 5%=1-9%, 10%=5-15%, 20%=10-30%, 50%=40-60%). This report relates only to the items tested. If sample was not collected by NVL personnel, then the accuracy of the results is limited by the methodology and acuity of the sample collector. This report shall not be reproduced except in full, without written approval of NVL Laboratories, Inc. It shall not be used to claim product endorsement by NVLAP or any other agency of the US Government

ASBESTOS LABORATORY SERVICES

Company	Rose Environmental	**NVL Batch Number**	**2304535.00**
Address	6715 Greenwood Ave. N Seattle, WA 98107	**TAT** 5 Days **AH** No **Rush TAT**	
Project Manager	Mr. Martin Rose	**Due Date** 3/29/2023 **Time** 8:00 AM	
Phone	(206) 679-0699	**Email** roseenv@gmail.com	
		Fax (206) 279-1756	

Project Name/Number: 12489-KCDEM-ASB **Project Location:** N-A

Subcategory PLM Bulk

Item Code ASB-02 EPA 600/R-93-116 Asbestos by PLM <bulk>

Total Number of Samples 17 Rush Samples

	Lab ID	Sample ID	Description	A/R
1	23028594	DEM-A1		A
2	23028595	DEM-A2		A
3	23028596	DEM-A3		A
4	23028597	DEM-A4		A
5	23028598	DEM-A5		A
6	23028599	DEM-A6		A
7	23028600	DEM-A7		A
8	23028601	DEM-A8		A
9	23028602	DEM-A9		A
10	23028603	DEM-A10		A
11	23028604	DEM-A11		A
12	23028605	DEM-A12		A
13	23028606	DEM-A13		A
14	23028607	DEM-A14		A
15	23028608	DEM-A15		A
16	23028609	DEM-A16		A
17	23028610	DEM-A17		A

	Print Name	Signature	Company	Date	Time
Sampled by	Client				
Relinquished by	Drop Box				

Office Use Only	Print Name	Signature	Company	Date	Time
Received by	Kelly AuVu		NVL	3/22/23	800
Analyzed by	Kunga Woser		NVL	3/22/23	
Results Called by					
☐ **Faxed** ☐ **Emailed**					

Special Instructions:

Date: 3/22/2023
Time: 10:14 AM
Entered By: Kelly AuVu

CHAIN of CUSTODY
SAMPLE LOG

2304535

LABORATORY • MANAGEMENT • TRAINING

Client	Rose Environmental	NVL Batch Number	
Street	6715 Greenwood Ave. N Seattle, WA 98107	Client Job Number	12489- KCDEM. ASB
		Total Samples	17
Project Manager	Mr. Martin Rose	Turn Around Time	☐ 1 Hr ☐ 6 Hrs ☐ 3 Days ☐ 10 Days ☐ 2 Hrs ☐ 1 Day ☐ 4 Days ☐ 4 Hrs ☐ 2 Days ☒ 5 Days Please call for TAT less than 24 Hrs
Project Location		Email address	roseenv@gmail.com

Phone: (206) 679-0699 **Fax:** (206) 279-1756

☐ **Asbestos Air**	☐ PCM (NIOSH 7400) ☐ TEM (NIOSH 7402) ☐ TEM (AHERA) ☐ TEM (EPA Level II) ☐ Other
☒ **Asbestos Bulk**	☒ PLM (EPA/600/R-93/116) ☐ PLM (EPA Point Count) ☐ PLM (EPA Gravimetry) ☐ TEM BULK
☐ **Mold/Fungus**	☐ Mold Air ☐ Mold Bulk ☐ **Rotometer Calibration**

METALS	**Det. Limit**	**Matrix**		**RCRA Metals** ☐ All 8		**Other Metals**
☐ Total Metals	☐ FAA (ppm)	☐ Air Filter	☐ Paint Chips in %	☐ Arsenic (As)	☐ Lead (Pb)	☐ **All 3**
☐ TCLP	☐ ICP (ppm)	☐ Drinking water	☐ Paint Chips in cm2	☐ Barium (Ba)	☐ Mercury (Hg)	☐ Copper (Cu)
☐ Cr 6	☐ GFAA (ppb)	☐ Dust/wipe (Area)	☐ Waste Water	☐ Cadmium (Cd)	☐ Selenium (Se)	☐ Nickel (Ni)
	☐ CVAA (ppb)	☐ Soil	☐ Other	☐ Chromium (Cr)	☐ Silver (Ag)	☐ Zinc (Zn)

☐ **Other Types of Analysis**	☐ Fiberglass ☐ Nuisance Dust ☐ Other (Specify) ________ ☐ Silica ☐ Respirable Dust

Condition of Package: ☐ Good ☐ Damaged (no spillage) ☐ Severe damage (spillage)

Seq. #	Lab ID	Client Sample Number	Comments (e.g Sample are, Sample Volume, etc)	A/R
1		DEM- A1		
2		A2		
3		A3		
4		A4		
5		A5		
6		A6		
7		A7		
8		A8		
9		A9		
10		A10		
11		A11		
12		A12		
13		A13		
14		A14		
15		A15		

	Print Below	Sign Below	Company	Date	Time
Sampled by	TS	[signature]	Rose Env	3/21/23	1930
Relinquished by					
Received by	Kumazen	[signature]	NVL	3/22/23	800am
Analyzed by					
Results Called by					
Results Faxed by					

Special Instructions: Unless requested in writing, all samples will be disposed of two (2) weeks after analysis.
Please composite all wall board samples

CHAIN of CUSTODY SAMPLE LOG

2304535

INDUSTRIAL HYGIENE SERVICES
LABORATORY • MANAGEMENT • TRAINING

Client Rose Environmental
Street 6715 Greenwood Ave. N
Seattle, WA 98107

Project Manager Mr. Martin Rose
Project Location

Phone: (206) 679-0699 Fax: (206) 279-1756

NVL Batch Number
Client Job Number 12489 - KCDEM - ASB
Total Samples 17
Turn Around Time ☐ 1 Hr ☐ 6 Hrs ☐ 3 Days ☐ 10 Days ☐ 2 Hrs ☐ 1 Day ☐ 4 Days ☐ 4 Hrs ☐ 2 Days ☒ 5 Days
Please call for TAT less than 24 Hrs
Email address roseenv@gmail.com

☐ Asbestos Air	☐ PCM (NIOSH 7400)	☐ TEM (NIOSH 7402)	☐ TEM (AHERA)	☐ TEM (EPA Level II)	☐ Other
☒ Asbestos Bulk	☒ PLM (EPA/600/R-93/116)	☐ PLM (EPA Point Count)	☐ PLM (EPA Gravimetry)	☐ TEM BULK	
☐ Mold/Fungus	☐ Mold Air	☐ Mold Bulk	☐ Rotometer Calibration		

METALS	Det. Limit	Matrix		RCRA Metals	☐ All 8	Other Metals
☐ Total Metals	☐ FAA (ppm)	☐ Air Filter	☐ Paint Chips in %	☐ Arsenic (As)	☐ Lead (Pb)	☐ All 3
☐ TCLP	☐ ICP (ppm)	☐ Drinking water	☐ Paint Chips in cm2	☐ Barium (Ba)	☐ Mercury (Hg)	☐ Copper (Cu)
☐ Cr 6	☐ GFAA (ppb)	☐ Dust/wipe (Area)	☐ Waste Water	☐ Cadmium (Cd)	☐ Selenium (Se)	☐ Nickel (Ni)
	☐ CVAA (ppb)	☐ Soil	☐ Other	☐ Chromium (Cr)	☐ Silver (Ag)	☐ Zinc (Zn)

☐ Other Types of Analysis ☐ Fiberglass ☐ Nuisance Dust ☐ Other (Specify) _____ ☐ Silica ☐ Respirable Dust

Condition of Package: ☐ Good ☐ Damaged (no spillage) ☐ Severe damage (spillage)

Seq. #	Lab ID	Client Sample Number	Comments (e.g Sample are, Sample Volume, etc)	A/R
1		DEM-A16		
2		A17		
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

	Print Below	Sign Below	Company	Date	Time
Sampled by	T. S		Rose Env	3/21/23	1930
Relinquished by					
Received by	Kennedy	e	hm	3/22/23	8:00
Analyzed by					
Results Called by					
Results Faxed by					

Special Instructions: Unless requested in writing, all samples will be disposed of two (2) weeks after analysis.
Please composite all wall board samples

March 28, 2023

Martin Rose
Rose Environmental
6715 Greenwood Ave. N
Seattle, WA 98107

NVL Batch # 2304536.00

RE: Total Metal Analysis
Method: EPA 7000B Lead by FAA <paint>
Item Code: FAA-02

Client Project: 12489-KCDEM-Pb
Location: N-A

Dear Mr. Rose,

NVL Labs received 8 sample(s) for the said project on 3/22/2023. Preparation of these samples was conducted following protocol outlined in EPA 3051/7000B , unless stated otherwise. Analysis of these samples was performed using analytical instruments in accordance with EPA 7000B Lead by FAA <paint>. The results are usually expressed in mg/Kg and percentage (%). Test results are not blank corrected.

For recent regulation updates pertaining to current regulatory levels or permissible exposure levels, please call your local regulatory agencies for more detail.

At NVL Labs all analyses are performed under strict guidelines of the Quality Assurance Program. This report is considered highly confidential and will not be released without your approval. Samples are archived after two weeks from the analysis date. Please feel free to contact us at 206-547-0100, in case you have any questions or concerns.

Sincerely,

Shalini Patel, Manager Metals Lab

Enc.: Sample results

Analysis Report

Total Lead (Pb)

Client: Rose Environmental
Address: 6715 Greenwood Ave. N
Seattle, WA 98107

Attention: Mr. Martin Rose
Project Location: N-A

Batch #: 2304536.00
Matrix: Paint
Method: EPA 3051/7000B
Client Project #: 12489-KCDEM-Pb
Date Received: 3/22/2023
Samples Received: 8
Samples Analyzed: 8

Lab ID	Client Sample #	Sample Weight (g)	RL in mg/Kg	Results in mg/Kg	Results in percent
23028611	DEM-L1	0.0360	140	< 140	< 0.014
23028612	DEM-L2	0.2120	47	< 47	< 0.0047
23028613	DEM-L3	0.2071	48	< 48	< 0.0048
23028614	DEM-L4	0.1941	52	< 52	< 0.0052
23028615	DEM-L5	0.1896	53	< 53	< 0.0053
23028616	DEM-L6	0.1866	54	< 54	< 0.0054
23028617	DEM-L7	0.1610	62	< 62	< 0.0062
23028618	DEM-L8	0.0969	100	< 100	< 0.010

Sampled by: Client
Analyzed by: Yasuyuki Hida
Reviewed by: Shalini Patel

Date Analyzed: 03/22/2023
Date Issued: 03/28/2023

Shalini Patel, Manager Metals Lab

mg/ Kg =Milligrams per kilogram
Percent = Milligrams per kilogram / 10000
Note : Method QC results are acceptable unless stated otherwise.
Unless otherwise indicated, the condition of all samples was acceptable at time of receipt.

RL = Reporting Limit
'<' = Below the reporting Limit

Bench Run No: 2023-0322-08
FAA-02

LEAD LABORATORY SERVICES

Company	Rose Environmental	**NVL Batch Number**	**2304536.00**
Address	6715 Greenwood Ave. N Seattle, WA 98107	**TAT** 5 Days **AH** No **Rush TAT**	
Project Manager	Mr. Martin Rose	**Due Date** 3/29/2023 **Time** 8:00 AM	
Phone	(206) 679-0699	**Email** roseenv@gmail.com	
		Fax (206) 279-1756	

Project Name/Number: 12489-KCDEM-Pb **Project Location:** N-A

Subcategory Flame AA (FAA)

Item Code FAA-02 EPA 7000B Lead by FAA <paint>

Total Number of Samples 8 Rush Samples

	Lab ID	Sample ID	Description	A/R
1	23028611	DEM-L1		A
2	23028612	DEM-L2		A
3	23028613	DEM-L3		A
4	23028614	DEM-L4		A
5	23028615	DEM-L5		A
6	23028616	DEM-L6		A
7	23028617	DEM-L7		A
8	23028618	DEM-L8		A

	Print Name	Signature	Company	Date	Time
Sampled by	Client				
Relinquished by	Drop Box				

Office Use Only	Print Name	Signature	Company	Date	Time
Received by	Kelly AuVu		NVL	3/22/23	800
Analyzed by	Yasuyuki Hida		NVL	3/22/23	
Results Called by					
☐ **Faxed** ☐ **Emailed**					

Special Instructions:

Date: 3/22/2023
Time: 10:30 AM
Entered By: Kelly AuVu

CHAIN of CUSTODY
SAMPLE LOG

2304536

Client Rose Environmental
Street 6715 Greenwood Ave. N
Seattle, WA 98107

Project Manager Mr. Martin Rose
Project Location

Phone: (206) 679-0699 **Fax:** (206) 279-1756

NVL Batch Number
Client Job Number 124891-KCDEM-Pb
Total Samples 8
Turn Around Time ☐ 1 Hr ☐ 6 Hrs ☐ 3 Days ☐ 10 Days ☐ 2 Hrs ☐ 1 Day ☐ 4 Days ☐ 4 Hrs ☐ 2 Days ☒ 5 Days
Please call for TAT less than 24 Hrs
Email address roseenv@gmail.com

☐ **Asbestos Air**	☐ PCM (NIOSH 7400) ☐ TEM (NIOSH 7402) ☐ TEM (AHERA) ☐ TEM (EPA Level II) ☐ Other
☐ **Asbestos Bulk**	☐ PLM (EPA/600/R-93/116) ☐ PLM (EPA Point Count) ☐ PLM (EPA Gravimetry) ☐ TEM BULK
☐ **Mold/Fungus**	☐ Mold Air ☐ Mold Bulk ☐ **Rotometer Calibration**

METALS	Det. Limit	Matrix		RCRA Metals		Other Metals
☒ Total Metals	☒ FAA (ppm)	☐ Air Filter	☒ Paint Chips in %	☐ Arsenic (As)	☐ All 8	☐ All 3
☐ TCLP	☐ ICP (ppm)	☐ Drinking water	☐ Paint Chips in cm2	☐ Barium (Ba)	☒ Lead (Pb)	☐ Copper (Cu)
☐ Cr 6	☐ GFAA (ppb)	☐ Dust/wipe (Area)	☐ Waste Water	☐ Cadmium (Cd)	☐ Mercury (Hg)	☐ Nickel (Ni)
	☐ CVAA (ppb)	☐ Soil	☐ Other	☐ Chromium (Cr)	☐ Selenium (Se)	☐ Zinc (Zn)
					☐ Silver (Ag)	

☐ **Other Types of Analysis** ☐ Fiberglass ☐ Silica ☐ Nuisance Dust ☐ Respirable Dust ☐ Other (Specify) ________

Condition of Package: ☐ Good ☐ Damaged (no spillage) ☐ Severe damage (spillage)

Seq. #	Lab ID	Client Sample Number	Comments (e.g Sample are, Sample Volume, etc)	A/R
1		DEM-L1		
2		L2		
3		L3		
4		L4		
5		L5		
6		L6		
7		L7		
8		L8		
9				
10				
11				
12				
13				
14				
15				

	Print Below	Sign Below	Company	Date	Time
Sampled by	T S	[signature]	Rose Env	3/21/23	1930
Relinquished by					
Received by	KevinAzlen	[signature]	NVL	3/22/23	800
Analyzed by					
Results Called by					
Results Faxed by					

Special Instructions: Unless requested in writing, all samples will be disposed of two (2) weeks after analysis.
Please composite all wall board samples


DSCF1026


DSCF1027


DSCF1028


DSCF1029


DSCF1030


DSCF1031

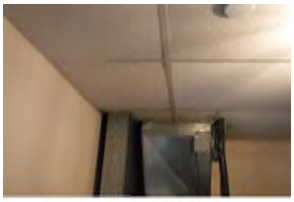

DSCF1032


DSCF1033


DSCF1034


DSCF1035


DSCF1036

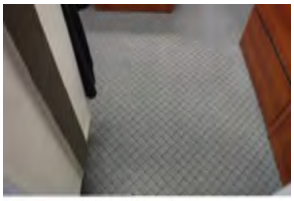

DSCF1037

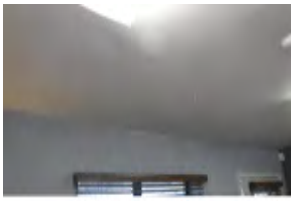

DSCF1038

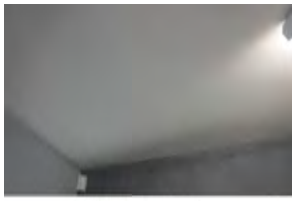

DSCF1039


DSCF1040

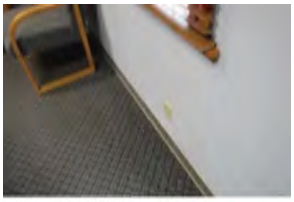

DSCF1041


DSCF1042


DSCF1043


DSCF1044


DSCF1045


DSCF1046


DSCF1047


DSCF1048


DSCF1049


DSCF1050


DSCF1051


DSCF1052


DSCF1053


DSCF1054


DSCF1055


DSCF1056


DSCF1057


DSCF1058


DSCF1059


DSCF1060

SECTION 004200
BID FORM

BID DATE: **Monday, July 31, 2023**

BID TIME: **3:00 PM**

TO: Kitsap County Department of Emergency Management

8900 SW Imperial Way

Bremerton, WA 98312

FOR: **Kitsap County Dept. of Emergency Management**

FROM (Bidder Name): _____

ADDENDA ACKNOWLEDGEMENT:

The undersigned acknowledges receipt of the following addenda: (List by number appearing on addenda).

Addendum No.	Date	Addendum No.	Date
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

BASE BID:

Having become completely familiar with the local conditions and legal requirements affecting the cost of Work at the place where Work is to be executed, and having carefully examined the site conditions as they currently exist, and having carefully examined Bidding Documents titled,

KITSAP COUNTY DEPT. OF EMERGENCY MANAGEMENT

Together with any addenda to such Bidding Documents as listed hereinafter, the undersigned hereby proposes and agrees to provide all labor, materials, equipment, transportation and other facilities and services as necessary and/or required to execute all of the Work described by the aforesaid Bidding Documents for the lump sum consideration:

I WILL CONSTRUCT THIS PROJECT FOR THE FOLLOWING PRICE:

BASE BID, **NOT INCLUDING DDC CONTROLS PRICE** (Lump sum)

_____

_____Dollars ($_____)

said amount being hereinafter referred to as the Base Bid and is exclusive of Washington State Sales Tax. All amounts shall be shown in both words and figures. In case of discrepancy, the amount shown in words will govern.

ALTERNATES:

The undersigned proposes to perform alternates for stated resulting additions to or deductions from the Base Bid. Additions and deductions shall include any modifications of work or additional work that undersigned may be required to perform by reason of the acceptance of any alternate. Alternates are described under Specification Section 012300. (Note: Include all alternates as required by Bidding Documents.)

Alternate #1A – Andover controls as provided by Schneider Electric

Add ($ _____)

_____ Dollars

Alternate #1B – Alerton controls by ATS Automation

Add ($ _____)

_____ Dollars

TRENCH EXCAVATION SAFETY PROVISION COSTS:

If the bid amount contains any work which requires excavation/trenching exceeding a depth of four feet (+48”), all costs for trench safety shall be included in the Base Bid and indicated below for adequate trench safety systems in compliance with Chapter 39.04 RCW. 49.17 RCW and WAC 296-155-650. Please note that this is not cumulative to the base, just included within. If trench excavation safety provisions do not pertain to the Project, the Bidder may enter “N.A.” or “Not Applicable” in the blank.

Trench Excavation Safety Provision Costs Included are $_____

PRINCIPAL SUBCONTRACTORS:

The undersigned agrees to submit Subcontractor Listing Form A (HVAC, Plumbing, Electrical) within one hour of bid submittal time & Subcontractor Listing Form B (Structural Steel Install, Rebar Install) within 48 hours of the bid submittal time, as applicable to the work, pursuant to RCW 39.30.060 and the Instructions to Bidders. Forms A and B have been included as part of the bid form.

STATE & LOCAL SALES TAX:

The above bids shall not include State or Local Sales Tax

OVERHEAD AND PROFIT:

The Undersigned agrees that all of the above bids include all Contractor’s overhead and profit.

ACCEPTANCE:

This offer shall be open to acceptance and is irrevocable for (45) days from Bid Date. If this Bid is accepted by the Owner within the time stated above, we will:

1. Deliver all bonds and proof of insurance coverage required by the Specifications and to execute a contract for the above-named project work and the above-stated consideration on the form required, within ten (10) calendar days of such notification.
2. Commence work under the Contract upon receipt of a written Notice to Proceed.

TIME OF COMPLETION / LIQUIDATED DAMAGES:

The undersigned agrees to Substantially Complete all Work under this Contract within the dates specified in the milestone or specific date schedule, as set forth in Section 011000 - Summary of Work. The undersigned

further agrees that the Owner may retain from the compensation otherwise due, the liquidated damage costs incurred by the Owner for each calendar day as set forth in Section 011000 – Summary of Work.

CHANGES IN WORK:

The undersigned agrees that when changes in the Work are ordered which involve extra cost over and above the Contract Sum, such Work shall proceed as required by the General Conditions and Special Conditions.

BID SECURITY:

3. Bid security in the amount of five percent (5%) of the Base Bid plus any additive alternates is attached, without endorsement. Failure to submit such security may result in the Bid being considered non-responsive.
4. The undersigned further agrees to execute the formal Contract within ten (10) days from date of Notice of Acceptance of and Intent to Award this Bid, and in case the undersigned fails or neglects to appear within the specified time to execute the Contract, and the undersigned is considered having abandoned the Contract by the Owner, the Cashier's Check or Bid Bond accompanying this Bid will be forfeited to the Owner by reason of such failure on the part of the undersigned.
5. The undersigned further agrees that the bid security may be retained by the Owner and that said bid guaranty shall remain with the Owner until the Contract has been signed and Performance Bond in a form acceptable to the Owner has been made and delivered to the Owner.
6. In submitting this Bid, it is understood that the right is reserved by the Owner to reject any or all bids and waive all informalities in connection therewith. It is agreed that this Bid may not be withdrawn for a period of forty-five (45) days from time of opening.

BIDDER INFORMATION:

Date of Submission _____

Bidder (Legal Name) _____

Mailing Address _____

Telephone _____

Contractor License Number _____

License Expiration Date _____

UBI Number _____

Federal Tax ID Number _____

Name / Title of Person Authorized to Sign _____

Signature of Person Authorized to Sign _____

Subcontractor List Form A

For HVAC, Plumbing, and Electrical

Within One Hour of the Bid Submittal Time

Email FORM A as an attachment to: jim@bauarc.com

Subject line on email shall include: Project No., Project Name, Contractor Name, Form A

In compliance with the contract documents, the following subcontractor list is submitted:

SUBCONTRACTOR LISTING – RCW 39.30.060
If the base bid and the sum of the additive alternates is one million dollars or more, the Bidder shall provide names of the subcontractors with whom the Bidder will **directly** subcontract for performance of the following work. If the Bidder intends to perform the work, the Bidder must enter its name for that category of work.

The Bidder shall not list more than one subcontractor for each category of work identified UNLESS subcontractors vary with bid alternates, in which case the Bidder must indicate which subcontractor will be used for which alternate. Substitutions are prohibited except as outlined in RCW 39.30.060.

Failure of the Bidder to submit the NAMES of such subcontractors or to name itself to perform such work shall render the Bidder's bid nonresponsive and, therefore, VOID.

Bidders who name themselves to perform the work are expected to perform the work and the Department of Enterprise Services reserves the right to reject substitution of the bidder with a subcontractor unless the bidder demonstrates a change in circumstances from the time of bid submission that is outside of the control of the bidder.

Category of Work	Alternate Bid # (if applicable)	Firm Name
1. HVAC, Base Bid	n/a	
a. HVAC, Alternate Bid		
2. Plumbing, Base Bid	n/a	
a. Plumbing, Alternate Bid		
3. Electrical, Base Bid	n/a	
a. Electrical, Alternate Bid		

Bidder may attach a separate sheet for additional alternate bid subcontractors.

Submitted By: _____

Print Name and Title of Authorized Person

STATE OF WASHINGTON
DEPARTMENT OF ENTERPRISE SERVICES
FACILITY PROFESSIONAL SERVICES

Subcontractor List Form B
For Structural Steel Installation and Rebar Installation

Within 48 Hours of Bid Submittal Time
Email FORM B as an attachment to: jim@bauarc.com

Subject line on email shall include: Project No., Project Name, Contractor Name, Form B

In compliance with the contract documents, the following subcontractor list is submitted:

SUBCONTRACTOR LISTING – RCW 39.30.060

If the base bid and the sum of the additive alternates is one million dollars or more, the Bidder shall provide names of the subcontractors with whom the Bidder will **directly** subcontract for performance of the following work. If the Bidder intends to perform the work, the Bidder must enter its name for that category of work.

The Bidder shall not list more than one subcontractor for each category of work identified UNLESS

subcontractors vary with bid alternates, in which case the Bidder must indicate which subcontractor will be

used for which alternate. Substitutions are prohibited except as outlined in RCW 39.30.060.

Failure of the Bidder to submit the NAMES of such subcontractors or to name itself to perform such work shall render the Bidder's bid nonresponsive and, therefore, VOID.

Bidders who name themselves to perform the work are expected to perform the work and the Department of Enterprise Services reserves the right to reject substitution of the bidder with a subcontractor unless the bidder demonstrates a change in circumstances from the time of bid submission that is outside of the control of the bidder.

Category of Work	Alternate Bid # (if applicable)	Firm Name
4. Structural Steel Installation, Base Bid	n/a	
a. Structural Steel Installation, Alternate Bid		
5. Rebar Installation, Base Bid	n/a	
a. Rebar Installation, Alternate Bid		

Bidder may attach a separate sheet for additional alternate bid subcontractors.

Submitted By: _____
Print Name and Title of Authorized Person

FORM OF BID BOND

KNOWN ALL BY THESE PRESENTS, that we, _____

as Principal and _____ a Corporation

duly organized and existing under the laws of the State of _____ and

authorized to do business in the State of Washington, a surety, are held and firmly bound unto Kitsap County, hereinafter called the Owner, in the full and just sum of _____

_____ Dollars ($_____),

Good and lawful money of the United States of America for the payment of which sum of money well and truly to be made, the said Principal and Surety bind themselves, their and each of their heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that if the Owner shall make any award to the Principal for:

KITSAP COUNTY DEPT. OF EMERGENCY MANAGEMENT TI

according to the terms of the proposal or bid made by the Principal therefore, and the Principal shall duly make and enter into a Contract with the Owner in accordance with the terms of said proposal or bid and award and shall give bond for the faithful performance thereof, with Surety and Sureties approved by the Owner; or if the Principal shall, in case of failure so to do, pay to the Owner the damages which the Owner may suffer by reason of such failure not exceeding the penalty of this bond, then this obligation shall be null and void; otherwise it shall be and remain in full force and effect.

Signed, Sealed and Dated this _____ day of _____, 20_____

_____
Principal

_____
By

_____
Surety

_____
By Attorney-in-Fact

END OF BID BOND

END OF SECTION 004200

SECTION 005000
CONTRACTING FORMS AND SUPPLEMENTS

PART 1 GENERAL

1.01 OWNER / CONTRACTOR AGREEMENT FORM

A. The contract is provided by the Owner and will form the agreement between the Owner and Contractor. No professional liability will be required.
   1. 05000(A) Contract
      a. Attachment A - Scope of Work
      b. Attachment B – Compensation
      c. Attachment C – Federal Contract Terms
      d. Attachment D – Certification Regarding Debarment
      e. Attachment E – Civil Rights
      f. Attachment F – Prevailing Wage Certification

B. Supplemental Forms
   1. 05000(B) Performance Bond
   2. 05000(C) Payment Bond
   3. 05000(D) Retainage Bond

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION 005000

CONTRACT NO. [Contract Number]

CONTRACT FOR GOODS AND SERVICES

AMERICAN RESCUE PLAN ACT OF 2021 (ARPA)
CORONAVIRUS STATE & LOCAL FISCAL RECOVERY FUNDS (CSLFRF)

This Goods and Services Contract ("Contract") is between Kitsap County, a Washington state political subdivision, having its principal offices at 614 Division Street, Port Orchard, Washington 98366 ("County") and [Contractor Name], a [Contractor Type], having its principal offices at [Contractor Addr] ("Contractor").

WHEREAS, the County is a recipient of certain Coronavirus Local Fiscal Recovery Funds ("ARPA Funds") which are to be disseminated and used in compliance with section 603(c) of the Social Security Act ("Act"), as added by section 9901 of the American Rescue Plan Act ("ARPA"), the U.S. Department of Treasury regulations implementing that section and the guidance issued by the U.S. Department of Treasury published in the Coronavirus State and Local Fiscal Recovery Funds Interim Final Rule: Frequently Asked Questions issued January 2022, all collectively referred to herein as "ARPA Rules".

WHEREAS, the County desires to use ARPA Funds to pay for the goods and services provided by the Contractor and the parties desire to execute this Contract to address the respective requirements of each for the receipt and use of the ARPA Funds.

In consideration of the terms and conditions of this Contract, the parties agree as follows:

SECTION 1. TERM AND EFFECTIVE DATE

1.1. The Contract will become effective on [Contract Effective Date] and terminate on [Contract End Date], unless terminated or extended. The Contract may be extended for additional consecutive terms at the mutual agreement of the parties. In no event will the Contract become effective unless and until it is approved and executed by the duly authorized representative of Kitsap County.

SECTION 2. DEFINITIONS

2.1. Contract means this Contract and any exhibits, amendments, specifications, schedule, and solicitation documents accepted by the County, and Attachments A (Scope of Work), B (Compensation), C (Federal Contract Terms), D (Certification Regarding Debarment, Suspension, Ineligibility, and Voluntary Exclusion Lower Tier Covered Transactions), E (Civil Rights Certification), F (Prevailing Wage), all of which are attached hereto and incorporated in full by reference.

2.2. Defect means a failure of a Good or Service to strictly comply with the Contract.

2.3. Goods means all products, materials, and Deliverables described in the Contract.

2.4. Deliverables means all things, materials, documents, information, and items developed by or on behalf of the Contractor or its Personnel in the course of or in connection with the

supply of the Goods and Services in any form whatsoever (including electronic form) and includes all inventions, models, drawings, plans, artwork, designs, logos, reports, advices, proposals, and records, including all things described as deliverables in the Scope of Work.

2.5. Personnel means the Contractor and its employees, subcontractors, volunteers, interns, agents, and any other person utilized by the Contractor directly or indirectly or through third parties to provide goods and/or perform any services under the Contract. The Contractor shall have and maintain complete responsibility for its Personnel. The Contractor remains liable for all acts, errors, and omissions of its Personnel as if they were the acts or omissions of the Contractor. The Contractor will remove any Personnel performing services upon a request from the County.

2.6. Services means the work to be performed and deliverables as described in the Contract.

SECTION 3. SCOPE OF WORK, COMPENSATION, AND PAYMENT

3.1. Scope of Work. The Contractor shall provide all Goods and Services as identified in Attachment A, Scope of Work, in compliance with the Contract.

3.2. Compensation. The maximum amount of compensation paid under the Contract by the County shall not exceed $[Contract Amount]. A description of the compensation is provided in Attachment B: Compensation.

3.3. Price. The price payable for the Goods and Services shall be as provided in the Contract and unless otherwise stated shall include all charges for packing, shipping, insurance, and delivery of the Goods to the location identified by the County, and any taxes, levies, duties and applicable tax. No increase in the price may be made (whether on account of increased costs of material, labor, transport or fluctuation in rates of exchange or otherwise) without the prior written consent of the County.

3.4. Invoice. The Contractor will submit one (1) invoice to the County per month for payment of Goods and Services completed to date, unless otherwise agreed. Each invoice shall identify the Goods and Services provided, dates the services were provided, and any other information requested by the County. In the event the County disputes any aspect of an invoice, the County may upon providing written notice to the Contractor, withhold or suspend payment of the disputed part of the invoice until the dispute is resolved. The Contractor shall continue to perform its obligations under this Contract in the event of such a dispute.

3.5. Payment. The County will make reasonable efforts to pay the Contractor within thirty (30) days from the date the County receives a complete and correct invoice, subject to Section 4. All funds disbursed to the Contractor by Direct Deposit via Automated Clearing House (ACH), unless agreed otherwise.

3.6. Insurance/W-9 Compliance. All payments are expressly conditioned upon the Contractor's compliance with all insurance requirements and submission of a current IRS W-9 form to the County. Payments may be suspended in full in the event of noncompliance. Payments will be released upon compliance, subject to Section 4.

3.7. Restrictions. The Contractor will only be entitled to receive payment for Goods and Services expressly authorized in the Contract, which are received during the Contract term, and accepted by the County. The Contractor acknowledges oral requests and approvals of additional services or additional compensation are prohibited and unenforceable. Advance payments are not authorized.

3.8. Certification. By signing this Contract, the parties certify that each understands that this Contract is funded in whole or part with ARPA Funds and subject to all ARPA Rules, and other laws, and requirements associated with federally funded programs now in effect and as amended, and the parties agree to comply with the same.

SECTION 4. TERMINATION

4.1. For Convenience. The County may terminate the Contract, in whole or in part, without penalty, by giving ten (10) days prior notice to the Contractor.

4.2. For Funding issues. It is expressly understood by the parties that this Contract has been negotiated and executed in anticipation of receipt of ARPA Funds by the County from the federal government, and that the terms, conditions, and sums payable under this Contract are subject to any changes or limitations which may be required by the terms of the County's agreement with the federal government and all applicable federal law, rules, and regulations. If any funding for Services is not available, withdrawn, reduced, or limited in any way, or if additional or modified conditions are placed on the funding after the Contract becomes effective, the County may: (1) accept a decreased price offered by the Contractor; (2) terminate the Contract; or (3) terminate the Contract and re-solicit the requirements.

4.3. Termination for Default. The County may immediately terminate the Contract, in whole or part, due to the Contractor's failure to comply with any Contract term or condition, or to make satisfactory progress in performing the Contract.

4.4. Procedures. Upon receipt of notice of termination, the Contractor shall stop all Goods and Services as directed in the notice and minimize further costs. All goods, materials, documents, data, and reports prepared by the Contractor under the Contract shall become the property of, and delivered to, the County on demand. A final payment will be made to the Contractor only for Goods and Services provided and accepted by the County up to the effective date of termination. No costs incurred after the effective date of termination will be paid.

SECTION 5. STANDARDS, ACCEPTANCE, RISK OF LOSS, WARRANTY

5.1. Warranties. The Contractor warrants and represents to the County as follows:

5.1.1. The Contractor has free and unencumbered title and the right to sell the Goods to the County.

5.1.2. All Goods will: i) be free from defects, and errors or omissions in design, materials, and workmanship; ii) comply in every respect with any relevant specification, industry standards, samples, drawings, and the Contract; iii) be newly

manufactured, of first quality and not end of life; iv) adequately marked, labeled, contained, and packaged to prevent damage or deterioration during transport; v) be able to be used, assembled, handled, stored, dismantled, decommissioned, and disposed of without risk to the health or safety of any person; vi) be of good and merchantable quality; and vii) of satisfactory quality and fit for the purpose for which the County has made known to the Contractor, or, where the County does not make any purpose known to the Contractor, for the purpose for which the Goods are normally used.

5.1.3. All Services will: i) be performed with due care, diligence, and skill, in a professional, efficient and safe manner, and to best industry standards; ii) be performed by appropriately qualified and experienced Personnel; iii) be fit for the ordinary purpose for which they are intended; and iv) comply with every relevant specification, industry standards, and the Contract. The Contractor shall devote such time, energy, attention, and efforts to the Services provided under this Contract in order to promptly, efficiently, and satisfactorily provide all Services.

5.1.4. The Contractor will do all acts, matters, and things that may be necessary for and incidental to the proper and efficient supply of the Goods and Services. The Contractor and its Personnel will comply with all laws and standards relating to the supply of the Goods and Services, including the County's standards, policies, procedures, and directions, and obtain all necessary licenses, consents, permits, and approvals to supply the Goods and Services. The Contractor shall keep the County informed of the progress of the Goods and Services in the manner, method, and intervals requested by the County.

5.1.5. The Contractor and its Personnel: i) are competent and have all necessary and appropriate skills, training, background, and valid qualifications to carry out the duties and responsibilities of their positions and the tasks allocated to them; ii) will behave in a professional and responsible manner at all times and perform the Services with due care and skill and in accordance with best industry practice; iii) understand and agree to the requirements of this Contract which are relevant to them; and iv) when accessing the County locations, will comply with any security, occupational health, and safety and other policies and procedures specified by the County from time to time.

5.1.6. The Contractor will ensure that the County will obtain the benefit of all warranties given by all manufacturers, subcontractors, suppliers, and other relevant third parties in relation to the Goods and Services; and that the supply, and use, of any Goods and Services does not and will not contravene any laws or infringe the rights of a third party (including any Intellectual Property Rights). During any applicable Warranty Period, the Contractor shall, at no additional charge to the County and without prejudice to any other rights or remedies of the County, repair or replace any Goods or Services that do not comply with any of the applicable warranties.

5.2. Inspection, Testing and Acceptance. Prior to delivery of any Goods, the Contractor must conduct pre-installation testing to confirm that all Goods have no apparent defects. All Goods and Services are subject to final inspection and acceptance by the County. In the

event of nonconforming Goods and/or Services, the County may elect to do any or all of the following: a) waive the non-conformance; b) stop the work immediately; c) require the Contractor to bring Goods and Services into compliance; and/or d) terminate the Contract and seek all remedies available in law and in equity. The Contractor agrees to diligently correct any work and replace any Goods and Services or make alterations necessary to meet specification requirements free of cost to the County. Inspection, testing, acceptance, or use of the Goods and Services will not affect the Contractors obligation under the warranty. All warranties shall survive inspection, testing, acceptance, and use.

5.3. Title and Risk of Loss. Title to all Goods and Services will vest in the County upon delivery to the County unless expressly agreed otherwise. Risk of loss for Goods will pass to the County when the County actually receives and accepts the Goods at the point of delivery. All work shall be performed at the Contractor's own risk, and the Contractor shall be responsible for any loss of or damage to materials, tools, or other articles used or held for use in connection with the work. All Goods failing to conform to the Contract shall be held at the Contractor's risk and may be returned to the Contractor.

5.4. Damage to County Property. The Contractor shall perform all work so that no damage to any County buildings or property results. The Contractor shall at its sole expense repair any damage caused to the satisfaction of the County. The Contractor shall take care to avoid damage to adjacent finished materials that are to remain. If finished materials are damaged, the Contractor shall at its sole expense, repair and finish in a manner which matches existing material as approved by the County.

5.5. Product Discontinuance. Should a product or model identified in the Contract be subsequently discontinued by the manufacturer, the County at its sole discretion may allow the Contractor to provide a substitute for the discontinued item. The Contractor shall request prior permission from the County to substitute a new product or model and shall provide the County with documentation from the manufacturer confirming that the product or model has been discontinued and identifying the names of the replacement product or model. All replacements shall meet or exceed all Contract specifications, be compatible with all the functions or uses of the discontinued product or model, and be at a price equal to or less than the discontinued product or model.

5.6. Guarantee. All Goods and Services shall be guaranteed for a minimum period of one (1) year from the date of acceptance by the County against defects in material and workmanship. The Contractor at its sole expense shall be responsible for the repair or replacement of any defects identified during that period, unless the defect was caused solely by misuse of the County.

SECTION 6. INDEMNIFICATION

6.1. To the fullest extent permitted by law, the Contractor shall indemnify, defend, and hold harmless Kitsap County and its elected and appointed officials, officers, employees, and agents (collectively "Indemnitees") from and against all Claims resulting from or arising out of the performance of the Contract, whether such Claims arise from the acts, errors, or omissions of the Contractor, its Personnel, third parties, or anyone directly or indirectly employed by any of them, or anyone for whose acts, errors, or omissions for which any of

them may be liable. It is the specific intent of the parties that the Indemnitees shall, in all instances except Claims arising from the sole negligence or willful misconduct of the Indemnitees, be indemnified by the Contractor from and against any and all Claims.

6.2. With regard to any Claim against any Indemnitee by any of the Contractor's Personnel, or anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the Contractor's indemnification obligation shall not be limited in any way by a limitation on the amount or type of damages, compensation, or benefits payable by or for the Contractor or the Contractor's Personnel under workers compensation acts, disability benefit acts, or other employee benefit acts. Solely for the purposes of this indemnification provision, the Contractor expressly waives its immunity under Title 51 RCW (Industrial Insurance) and acknowledges this waiver was mutually negotiated by the parties.

6.3. Claim. "Claim" means all losses, claims, suits, actions, liabilities, damages, demands, judgments, settlements, expenses, fines, or other liabilities of any kind or nature whatsoever, including without limitation, all costs including costs of Claim processing, investigation, reasonable attorneys' fees, consequential damages, and punitive damages, for any personal or bodily injury, sickness, disease, disability, or death, or loss or damage to tangible or intangible business or property, including the loss of use. Claim includes any infringement, violation, or misappropriation of copyright, patent, trademark, or other proprietary rights of any third parties.

6.4. Obligations/Notice of Claim. The County will provide the Contractor notice of the assertion of liability by a third party that may give rise to a Claim by the County against the Contractor based on the indemnity contained herein. The Contractor shall respond to the County's tender of defense of a claim in writing within fourteen (14) calendar days from the notice date and will advise the County if the Contractor accepts or denies tender of the claim. The County may in its discretion withhold all or part of any payment due the Contractor under the Contract until the Contractor responds to such notice. The Contractor shall keep the County timely and fully informed through all stages of the defense and promptly respond to and comply with the County's requests for information. The County at all times reserves the right but has no obligation to participate in the defense and settlement of any Claim. Such participation shall not constitute a waiver of the Contractor's indemnity and defense obligations under the Contract. The Contractor shall not settle or compromise any Claim in any manner that imposes any obligations upon the County without the prior written consent of the County. The Contractor shall promptly advise the County of any occurrence or information known to the Contractor that could reasonably result in a Claim against the County. The violation of any provisions of Section 6, including improper refusal to accept tender, is a material breach.

SECTION 7. INSURANCE

7.1. Minimum Insurance Required. The Contractor and its subcontractors, if any, shall procure and maintain, until all of Contract obligations have been fully discharged, including any warranty period, all insurance required in Section 7 with an insurance company duly licensed in Washington State with an A.M. Best Company ratings of not less than A-VIII and a category rating of not less than "8", with policies and forms satisfactory to the County. Use of alternative insurers requires prior written approval from the County. Coverage limits shall be at minimum the limits identified in Section 7, or the limits available under the policies maintained by the Contractor without regard to the Contract, whichever is greater.

7.2. Professional Liability. *(Check one of the following options)*:

☐ Not applicable.

☐ Not less than $1,000,000 per occurrence and $2,000,000 annual aggregate. Coverage will apply to liability for professional error, act or omission arising out of or in connection with the Contractor's Services under the Contract. The coverage shall not exclude bodily injury, property damage, or hazards related to the work rendered as part of the Contract or within the scope of the Contractor's services under the Contract, including testing, monitoring, measuring operations, or laboratory analysis where such Services are rendered under the Contract.

7.3. Commercial General Liability ("CGL"). Not less than $1,000,000 per occurrence and $2,000,000 annual aggregate. Coverage shall include personal injury, bodily injury, and property damage for premise-operations liability, products/completed operations, personal/advertising injury, contractual liability, independent contractor liability, and stop gap/employer's liability. Coverage shall not exclude or contain sub-limits less than the minimum limits required herein, without the prior written approval of the County. The certificate of insurance for the CGL policy shall expressly cover the indemnification obligations required by the Contract.

7.4. Automobile Liability. *(Check one of the following options)*:

☐ Contractor shall maintain personal automobile insurance on all vehicles used for Contract purposes as required by law.

☐ Not less than $1,000,000 per occurrence and $2,000,000 annual aggregate. Coverage shall include liability for any and all owned, hired, and non-owned vehicles. Coverage may be satisfied with an endorsement to the CGL policy.

☐ Not less than $100,000 per occurrence and $300,000 annual aggregate. If a personal automobile liability policy is used to meet this requirement, it must include a business rider and cover each vehicle to be used in the performance of the Contract. If the Contractor will use non-owned vehicles in performance of the Contact, the coverage shall include owned, hired, and non-owned automobiles.

7.5. Umbrella or Excess Liability. The Contactor may satisfy the minimum liability limits required for the CGL and Automobile Liability under an Umbrella or Excess Liability policy. There is no minimum per occurrence limit of liability under the Umbrella or Excess Liability; however, the annual aggregate limit shall not be less than the highest "Each Occurrence" limit for either CGL or Automobile Liability. The Contractor agrees to an endorsement naming the County as an additional insured as provided in Section 7, unless the Umbrella or Excess Liability provides coverage on a "Follow-Form" basis.

7.6. Workers' Compensation and Employer Liability. If applicable, the Contractor shall maintain workers' compensation insurance as required under the Title 51 RCW (Industrial Insurance), for all Contractor's Personnel eligible for such coverage. If the Contract is for over $50,000, then the Contractor shall also maintain employer liability coverage with a limit of not less than $1,000,000.

7.7. Primary, Non-Contributory Insurance/Subcontractors. The Contractor's and its subcontractors' insurance policies and additional named insured endorsements will provide primary insurance coverage and be non-contributory. Any insurance or self-insurance programs maintained or participated in by the County will be excess and not contributory to such insurance policies. All Contractor's and its subcontractors' liability insurance policies must be endorsed to show as primary coverage. The Contractor shall include all subcontractors as insureds under its policies or shall furnish separate certificates and endorsements for each subcontractor. All subcontractors shall comply with all insurance and indemnification requirements herein.

7.8. Review of Policy Provisions. Upon request, the Contractor shall provide a full and complete copy of all requested insurance policies to the County. The County reserves the right without limitation, but has no obligation to revise any insurance requirement, or to reject any insurance policies that fail to meet the requirements of the Contract. The County also has the right, but no obligation to review and reject any proposed insurer providing coverage based upon the insurer's financial condition or licensing status in Washington. The County has the right to request and review the self-insurance retention limits and deductibles, and the Contractor's most recent annual financial reports and audited financial statements, as conditions of approval. Failure to demand evidence of full compliance with the insurance requirements or failure to identify any insurance deficiency shall not relieve the Contractor from, nor be construed or deemed a waiver, of its obligation to maintain all the required insurance at all times as required herein.

7.9. Waiver of Subrogation. In consideration of the Contract award, the Contractor agrees to waive all rights of subrogation against the County, its elected and appointed officials, officers, employees, and agents. This waiver does not apply to any policy that includes a condition that expressly prohibits waiver of subrogation by the insured or that voids coverage should the Contractor enter into a waiver of subrogation on a pre-loss basis.

7.10. Additional Insured, Endorsement, and Certificate of Insurance. All required insurance coverage, other than the workers' compensation and professional liability, shall name the County, its elected and appointed officials, officers, employees, and agents, as additional insureds and be properly endorsed for the full available limits of coverage maintained by the Contractor and its subcontractors. Endorsement is not required if the Contractor is a self-insured government entity, or insured through a government risk pool authorized by Washington State.

The Certificate of Insurance and endorsement shall identify the Contract number and shall require not less than thirty (30) days' prior notice of termination, cancellation, nonrenewal, or reduction in coverage. At the time of execution, the Contractor shall provide the Certificate of Insurance, endorsement, and all insurance notices to: Risk Management Division, Kitsap County Department of Administrative Services, 614 Division Street, MS-7, Port Orchard, WA 98366.

7.11. No Limitation on Liability. The coverage limits identified herein are minimum requirements only and will not in any manner limit or qualify the liabilities or obligations of the Contractor under the Contract. All insurance policy deductibles and self-insured retentions for policies maintained under the Contract shall be paid by the Contractor. Any failure to comply with reporting provisions of the policies shall not affect coverage provided to the County, its elected and appointed officials, officers, employees, or agents. The Contractor's insurance shall apply separately to each insured against whom a claim is made or suit is brought, subject to the limits of the insurer's liability.

7.12. Claims-Made. If the Contractor's liability coverage is written as a claims-made policy, the Contractor shall purchase an extended-reporting period or "tail" coverage for a minimum of three (3) years following completion of the performance or attempted performance of the provisions of this Contract.

SECTION 8. NOTICE AND CONTRACT REPRESENTATIVES

8.1. Any notices, demands, and other communications required by the Contract will be effective if personally served upon the other party or if mailed by registered or certified mail, postage prepaid, return receipt requested, to the other party's Contract Representative at the address below. Notice may also be given by facsimile with the original to follow by regular mail. Notice will be deemed to be given three (3) days following the date of mailing, or immediately if personally served. For service by facsimile, service will be effective at the beginning of the next working day. Each party will designate a "Contract Representative", which may be changed by providing fifteen (15) days prior notice to the other party.

County's Contract Representative

Name: [County Rep Name]
Title: [County Rep Title]
Address: [County Rep Addr]
Phone: [County Rep Phone]
Email: [County Rep Email]

Contractor's Contract Representative

Name: [Contractor Rep Name]
Title: [Contractor Rep Title]
Address: [Contractor Rep Addr]
Phone: [Contractor Rep Phone]
Email: [Contractor Rep Email]

SECTION 9. AMENDMENT, SUBCONTRACT, INDEPENDENT CONTRACTOR

9.1. Amendment. No amendment or modification to the Contract will be effective without the prior written consent of the authorized representatives of the parties.

9.2. Successors and Assigns. To the extent permitted by law, the Contract is binding on the parties' respective partners, successors, assigns, executors, and legal representatives.

9.3. Assignments. Neither party shall assign or transfer, including by merger (whether that party is the surviving or disappearing entity), consolidation, dissolution, or operation of law, any right, duty, obligation, or remedy under the Contract without the prior written consent of the other.

9.4. Subcontracts. The Contractor shall provide the County a list of all subcontractors and the subcontractors' proposed responsibilities. "Subcontract" means any contract, express or implied, between the Contractor and another party or between a subcontractor and another party delegating or assigning, in whole or in part, the making or furnishing of any Good or Service for the performance of the Contract. All subcontracts shall incorporate by reference the terms and conditions of this Contract. The Contractor is solely responsible for the performance and payment of its subcontractors.

9.5. Independent Contractor. Each party under the Contract shall be for all purposes an independent contractor. Nothing contained herein will be deemed to create an association, a partnership, a joint venture, or a relationship of principal and agent, or employer and employee between the parties. Neither the Contractor nor its Personnel shall be, or be deemed to be, or act or purport to act, as an employee, agent, or representative of the County. The Contractor shall have complete responsibility and control over its Personnel. The Contractor and its Personnel shall have no County employee-type benefits of any kind whatsoever, including without limitation, insurance, pension plan, vacation pay, or sick pay, or other right or privilege afforded to County employees. The Contractor and its Personnel shall be responsible for payment of all insurance, taxes, and benefits.

SECTION 10. OWNERSHIP, CONFIDENTIAL INFORMATION, AND BREACH

10.1. Ownership. Any and all work product, deliverable, equipment, or any other materials created, prepared, constructed, assembled, made, performed, or otherwise produced by the Contractor or its Personnel for delivery to the County under this Contract are the sole property of the County, must be delivered to the County upon termination of the Contract, or final payment to the Contractor, and shall not be used or released by the Contractor without prior authorization from the County. The Contractor agrees all such property shall constitute "work made for hire" as defined by the U.S. Copyright Act of 1976, 17 U.S.C § 101, and the ownership of the copyright and any other intellectual property rights in such property shall vest in the County at the time of its creation. Ownership of the intellectual property includes the right to copyright, patent, and register, and the ability to transfer these rights. Material the Contractor uses to perform this Contract that is not created, prepared, constructed, assembled, made, performed, or otherwise produced for or paid for by the County is owned by the Contractor and is not "work made for hire" within the terms of the Contract.

10.2. Personal Identifying Information/Breach. The Contractor shall ensure all personal identifying information, financial information, and other information made available to the Contractor by, or on behalf of, the County, or acquired or developed by the Contractor in the performance of the Contract (unless publicly available) is kept confidential, secured, and protected to prevent unauthorized access. In the event of unauthorized access or other security breach, the Contractor shall immediately notify the County and at its sole expense comply with all requirements of RCW 19.255.010. Upon Contract expiration or termination all confidential information shall be returned to the County or destroyed at the County's discretion.

10.3. Medical Records. If applicable, medical records shall be maintained and preserved by the Contractor in accordance with all applicable laws, including but not limited to RCW 70.41.190, RCW 70.02.160, and standard medical records practice. Contractor shall also be responsible for the proper maintenance and disposal of such medical records.

10.4 Unauthorized Disclosure. Contractor agrees that all information, records, and data collected in connection with this Contract shall be protected from unauthorized disclosure in accordance with applicable state and federal law.

10.5 Compliance with the Health Insurance Portability and Accountability Act of 1996 (HIPAA). If applicable, Contractor shall not use protected health information created or shared under
this Contract in any manner that would constitute a violation of HIPAA or applicable regulations. Contractor shall read and maintain compliance with all HIPAA requirements at the U.S. Office of Civil Rights website: https://www.hhs.gov/hipaa/index.html.

SECTION 11. REPRESENTATIONS AND RECORDS

11.1. No Fee. The Contractor certifies it has not received, nor paid or agreed to pay another person or entity, other than a bona fide employee working exclusively for the Contractor,

any fee, commission, percentage, gift, or any other consideration contingent upon or resulting from the award or making of the Contract.

11.2. Licenses, Permits, and Taxes. The Contractor shall, at its own expense, have and maintain all licenses, registrations, permits, and approvals necessary for the performance of the Contract, including without limitation, registration with the Washington State Department of Revenue. The Contractor shall pay all fees (including licensing fees) and applicable federal, state, and local taxes.

11.3. Nondiscrimination. In the performance of this Contractor, Contractor and its Personnel shall not discriminate against any person on the basis of race, color, creed, religion, national origin, age, sex, marital status, sexual orientation, veteran status, disability, or other circumstance prohibited by federal, state, or local law, and shall comply with Americans with Disabilities Act of 1990 and Title VI of the Civil Rights Act of 1964 (Title VI) Public Law 88-352, 42 U.S.C. 2000d-1 et seq., and the Department's implementing regulations, 31 CFR part 22; Section 504 of the Rehabilitation Act of 1973 (Section 504), Public Law 93-112, as amended by Public Law 93-516, 29 U.S.C. 794; Title IX of the Education Amendments of 1972 (Title IX), 20 U.S.C. 1681 et seq., and the Department's implementing regulations, 31 CFR part 28; Age Discrimination Act of 1975, Public Law 94-135, 42 U.S.C. 6101 et seq., and the Department implementing regulations at 31 CFR part

11.4. Public Records. The Contractor agrees that the Contract and all records associated with the Contract shall be available to the County for inspection and copying by the public pursuant to the Public Records Act, Chapter 42.56 RCW ("Act"). If the County determines that records in the custody of the Contractor are needed to respond to a request under the Act, the Contractor shall make all such records promptly available to the County at no cost to the County. With the exception of the Contract, if the Contractor considers any portion of any record, electronic or hard copy, to be protected from disclosure under the Act, the Contractor shall clearly identify all specific information it claims to be confidential or proprietary. If the County receives a request under the Act to inspect or copy proprietary information that has been identified by the Contractor as protected from disclosure and the County determines that release of the information is required by the Act or otherwise appropriate, the County's sole obligation will be to make a reasonable effort to notify the Contractor of the request and the date that such protected information will be released unless the Contractor obtains a court order to enjoin disclosure pursuant to RCW 42.56.540. If the Contractor fails to timely obtain a court order enjoining disclosure, the County will release the requested information on the date specified. The County has no obligation on behalf of the Contractor to claim any exemption from disclosure under the Act. The County will not be liable to the Contractor for releasing records pursuant to the Act.

11.5. Advertising. The Contractor shall not advertise or use the name, trademark, or logo of the County, without the County's prior written consent.

11.6. Audit and Record Retention. The Contractor and its Personnel shall retain all records relating to performance of the Contract for six (6) years after completion of the Contract or longer if requested by the County. All records shall be subject to inspection and audit by the County. Upon request, the Contractor shall promptly make all records available to the County at no cost to the County.

SECTION 12. RIGHTS AND REMEDIES

12.1. Responsibility for Correction. Any defects of design, workmanship, or materials that would result in non-compliance with the Contract specification or law shall be fully corrected by the Contractor (including parts, labor, shipping or freight) without cost to the County. This includes any necessary labor to remove, repair, install, or to ship or transport any item to a point of repair and return.

12.2. Default in One Installment. The Contractor shall deliver conforming goods in each installment or lot of this Contract and may not substitute nonconforming goods. Delivery of nonconforming goods or a default of any nature, at the option of the County, shall constitute a breach of the Contract as a whole.

12.3. Failure to Perform. If the County determines the Contractor has failed to perform any material obligation of the Contract, and such failure has not been cured within ten (10) days, following notice from the County, the County may without penalty, in its discretion, withhold all monies due the Contractor until such failure is cured to the satisfaction of the County.

12.4. Right of Assurance. If the County in good faith has reason to believe the Contractor does not intend or is unable to perform, or continue performing under the Contract, the County may demand in writing that the Contractor give a written assurance of intent to perform. Should the Contractor fail to provide adequate assurance to the reasonable satisfaction of the County, by the date specified the demand, the County may terminate all or part of the Contract and pursue all other rights and remedies available at law and in equity.

12.5. Responsibility for Errors. All Goods and Services shall be provided to the satisfaction of the County and as required herein. Upon request, the Contractor shall provide any clarifications and/or explanations regarding any Goods and Services provided as required by the County, at no cost to the County. In the event of noncompliance, error or omission under the Contract, the Contractor shall, at no cost to the County, provide all necessary design drawings, estimates, and all other services the County deems necessary to rectify and correct the matter to the satisfaction of the County. The Contractor shall continue to be responsible for the accuracy of Goods and Services, even after accepted by the County and the termination or expiration of the Contract.

12.6. Remedies. All County rights and remedies under the Contract are in addition to, and shall in no way limit, any other rights and remedies that may be available to the County at law and in equity.

12.7. Right of Off-Set; Reimbursement. The County shall be entitled to offset against any sums due the Contractor and reimbursement from the Contractor for any defects, damages,

expenses, and any costs whatsoever incurred by the County due to the Contractor's nonconforming performance or failure to perform under the Contract.

12.8. Waiver. Either party's failure to insist upon the strict performance of any provision of the Contract, or to exercise any right based upon a breach thereof or the acceptance of any performance during such breach, will not constitute a waiver of any right or remedy under the Contract unless expressly so agreed in writing by an authorized representative.

12.9. The County may, upon termination of the Contract, procure on terms and in the manner that it deems appropriate, Goods and Services to replace those under the Contract. The Contractor shall be liable to the County for any and all costs, expenses, penalties, and fees incurred by the County in procuring Goods and Services in substitution for those due from the Contractor.

SECTION 13. GOVERNING LAW, DISPUTES

13.1. Governing Law; Venue. The Contract will be governed in all respects by the laws of the Washington State, both as to interpretation and performance, without regard to conflicts of law or choice of law provisions. Any action arising out of or in connection with the Contract may be instituted and maintained only in a court of competent jurisdiction in Kitsap County, Washington or as provided by RCW 36.01.050.

13.2. Disputes. Conflicts and disagreements between the parties related to the Contract will be promptly brought to the attention of the County. Any dispute relating to the quality or acceptability of performance or compensation due the Contractor will be decided by the County's Contract Representative. All decisions of the County's Contract Representative are considered final; however, nothing herein prohibits either party from seeking judicial relief.

SECTION 14. PREVAILING WAGE

14.1 To the extent applicable, Contractor shall comply with the prevailing wage requirements identified in Attachment C, which is incorporated in full by this reference

SECTION 15. GENERAL PROVISIONS

15.1. Force Majeure. Neither party shall be liable to the other or be deemed to be in breach of contract by reason of any delay in performing, or any failure to perform any of their respective obligations in relation to the Contract, if the delay or failure was due to any cause beyond said party's reasonable control including, but not limited to, any act of God, government or state action, war, fire, civil commotion, insurrection, or industrial action of third parties out of the Contractor's control.

15.2. Time of the Essence. The time of delivery of the Goods and of performance of the Services is of the essence of the Contract.

15.3. Implied Contract Terms. Each provision of law and any terms required by law to be in the Contract are made a part of the Contract as if fully stated in it.

15.4. Headings/Captions. Headings and captions are for convenience only and are not a part of the Contract and do not limit or amplify the terms and provisions hereof.

15.5. No Party the Drafter. The Contract is the product of negotiation between the parties, and no party is deemed the drafter of the Contract.

15.6. No Third-Party Beneficiary. No provision of the Contract is intended to, nor will it be construed to, create any third-party beneficiary or provide any rights or benefits to any person or entity other than the County and the Contractor.

15.7. Severability. If a court of competent jurisdiction holds any provision of the Contract to be illegal, invalid, or unenforceable, in whole or in part, the validity of the remaining provisions will not be affected, and the parties' rights and obligations will be construed and enforced as if the Contract did not contain the particular provision held to be invalid.

15.8. Precedence. The Contract documents consist of this Contract and its attachments and exhibits. In the event of a conflict between or among the Contract documents, the federal terms shall prevail.

15.9. Counterparts/Electronic Signature. The Contract may be executed in several counterparts, each of which will be deemed an original, but all of which together will constitute one and the same agreement. A facsimile, email, or other electronically delivered signatures of the parties shall be deemed to constitute original signatures and deemed to constitute duplicate originals.

15.10. Non-Exclusive Contract. The County may obtain the same or similar goods or services that are the subject of this Contract from another source or have its own employees perform the same or similar services contemplated by the Contract.

15.11. Survival. Those provisions of this Contract that by their sense and purpose should survive expiration or termination of the Contract shall so survive. Those provisions include, without limitation: Sections 5 (Standards, Acceptance, Risk of Loss, Warranty), 6 (Indemnification), 7 (Insurance), 9 (Amendment, Subcontract, and Independent Contractor), 10 (Ownership, Confidential Information and Breach), 12 (Rights and Remedies), 13 (Governing Law, Disputes), and 15 (General Provisions).

15.12. Entire Agreement. The parties acknowledge the Contract is the product of negotiation between the parties and represents the entire agreement of the parties with respect to its subject matter. All previous agreements, oral or written, are hereby revoked and superseded by the Contract.

15.13. Authorization. Each party signing below warrants to the other party, that they have the full power and authority to execute this Contract on behalf of the party for whom they sign.

Dated this ____ day of _____, 20____.

CONTRACTOR NAME

_____
Signature

_____
Print Name

_____
Title

ATTEST:

_____
DANA DANIELS, CLERK OF THE BOARD

Dated this ____ day of _____, 20____.

BOARD OF COUNTY COMMISSIONERS
KITSAP COUNTY, WASHINGTON

_____
CHARLOTTE GARRIDO, CHAIR

_____
ROBERT GELDER, COMMISSIONER

_____
KATHERINE T. WALTERS, COMMISSIONER

ATTACHMENT A
SCOPE OF WORK

Scope: As described in the project plans and project manual

Project Manual Table of Contents:

Division 04 – Masonry
Not Used

Division 05 – Metals

051200	Structural Steel Framing
054000	Cold Formed Metal Framing

Division 06

061000	Rough Carpentry
062000	Finish Carpentry
068316	Fiberglass Reinforced Paneling

Division 07 – Thermal and Moisture Protection

072100	Thermal Insulation
072700	Air / Weather Resistive Barriers
074113	Metal Roof Panels
074213	Metal Wall Panels
074623	Wood Siding
076200	Sheet Metal Flashing and Trim
077200	Roof Accessories
079200	Joint Sealants

Division 08 – Openings

081113	Hollow Metal Doors and Frames
081416	Flush Wood Doors
083100	Access Doors and Panels
083613	Sectional Doors
084313	Aluminum Framed Storefronts
085413	Fiberglass Windows
085653	Security Windows
087100	Door Hardware
087113	Automatic Door Operators
088000	Glazing
089100	Louvers

Division 09 – Finishes

090561	Common Work Results for Flooring Preparation
092115	Gypsum Board Assemblies
092216	Non-Structural Metal Framing
095100	Acoustical Ceilings
096813	Tile Carpeting
098430	Sound-Absorbing Wall Units
099113	Exterior Painting
099123	Interior Painting
099300	Staining and Transparent Finishing
099600	High Performance Coatings

Division 10 - Specialties

101419	Dimensional Letter Signage
101419	Signage
102113.17	Phenolic Toilet Compartments
102600	Wall and Door Protection
102800	Toilet, Bath, and Laundry Accessories
104400	Fire Protection Specialties
107500	Flagpoles

Division 11 - Equipment

113013 Residential Appliances

Division 12 - Equipment

122113 Horizontal Louver Blinds
123200 Manufactured Wood Casework

Division 13 – Special Construction

133421 Structural Retrofit Roof Sub-Framing System

Division 20 – Mechanical

200000 General Mechanical Requirements

Division 21 – Fire Suppression

Bidder Design – See Fire Protection Schematic Drawing Sheet

Division 22 – Plumbing

220300 Excavation & Backfill for Mechanical Underground Utilities
220513 Common Motor Requirements for Plumbing Equipment
220517 Sleeves and Sleeve Seals for Plumbing Piping
220523 General Duty Valves for Plumbing Piping
220548 Vibration and Seismic Controls for Plumbing Piping and Equipment
220553 Identification for Plumbing Piping and Equipment
220719 Plumbing Piping Insulation
221005 Plumbing Piping
221006 Plumbing Piping Specialties
223000 Plumbing Equipment
224000 Plumbing Fixtures

Division 23 – Heating, Ventilating and Air Conditioning (HVAC)

230513 Motors and Variable Drives
230529 Hangers and Supports for HVAC Piping and Equip.
230548 Vibration and Seismic Control
230553 Mechanical Identification for HVAC Piping and Equipment
230593 Air System Testing and Balancing
230713 Equipment / Ductwork Insulation
230900 Energy Management and Controls (DDC)
232500 Water Treatment (Hydronic Systems)
232300 Refrigerant Piping System
233113 Steel Ductwork
233300 HVAC Specialties
233423 Exhaust Fans
233700 Air Terminals
237200 Air-To-Air Heat Exchangers
238126 Ductless Split Systems
238143 Split Systems
238239 Electric Heaters
239000 Mechanical Demolition

Divisions 24-25 – Not Used

Division 26 – Electrical

260000 Electrical General Conditions
260005 Electrical – Existing Systems
260010 Excavation and Backfill for Electrical Underground Utilities
260519 Wires and Cables

260526	Grounding	
260532	Outlet and Pull Boxes	
260533	Raceway	
260534	Metal Clad Cable (Type MC) and Fittings	
260536	Cable Tray	
260539	Floor Outlet Devices-Flush	
260573	Electrical System Studies	
260924	Networked Low Voltage Lighting Controls	
262213	Dry Type Transformers	
262413	Switchboards	
262416	Panelboards	
262419	Motor Controllers	
262726	Switches and Receptacles	
262813	Fuses	
262816	Disconnects and Fused Switches	
263613	3-Way Manual Transfer Switch	
264300	Surge Protective Device (SPD)	
265000	Lighting	
265600	Emergency Lighting Inverter	

Division 27 – Communications

270000	Low Voltage Systems General Requirements	
270528	Pathways For Communications Systems	

Divisions 28-30 – Not Used

Division 31 – Earthwork

312200	Grading	
312316	Excavation	
312316.13	Trenching	

Division 32 – Exterior Improvements

321216	Asphalt Paving	
321313	Concrete Paving	
321713	Parking Bumpers	
321723	Pavement Markings	
323113	Chain Link Fences and Gates	
329300	Planting	See Landscape Drawing

Division 33 – Utilities

331416	Site Water Utility Distribution Piping	See Civil Drawings
333113	Site Sanitary Sewerage Gravity Piping	See Civil Drawings
334211	Stormwater Gravity Piping	
334230	Stormwater Drains	

Drawing List:

GENERAL

A0.00	TITLE / NOTES / ABBV.
A0.01	CODE / LIFE SAFETY

CIVIL

C1	EXISTING CONDITIONS / DEMO PLAN
C2	PARKING PLAN

C3	STORM CLEANOUT CONDITIONS
C4	WATER AND SEWER
C5	DETAILS
C6	DETAILS

LANDSCAPE

L1	LANDSCAPE PLAN

ARCHITECTURAL

A1.01	SITE PLANS
A1.02	FLOOR PLAN - EXISTING / DEMO
A1.03	RCP – EXISTING / DEMO
A1.04	ARCHITECTURAL SLAB PLAN
A1.05	FLOOR PLAN
A1.06	FLOOR PLAN – DIMENSIONS / WALL TYPES
A1.07	FLOOR FINISH / RM SIGNAGE PLAN
A1.08	REFLECTED CEILING PLAN
A1.09	ROOF PLAN
A2.01	BLDG. ELEV. DEMO / WALL INFILL
A2.02	BUILDING ELEVATIONS
A3.01	BUILDING SECTIONS
A3.02	BUILDING / WALL SECTIONS
A3.03	WALL SECTIONS
A4.01	ENLARGED PLANS
A4.02	ENLARGED PLANS / INT ELEVATIONS
A4.03	INTERIOR ELEVATIONS
A4.04	INTERIOR ELEVATIONS
A5.00	SITE DETAILS
A5.01	SITE DETAILS
A5.02	EXTERIOR DETAILS
A5.03	EXTERIOR DETAILS
A5.04	EXTERIOR DETAILS
A5.05	EXTERIOR DETAILS
A5.06	INTERIOR DETAILS
A5.07	INTERIOR DETAILS
A6.00	DOOR / WINDOW SCHEDULES
A6.01	ASSEMBLY SCHEDULES

STRUCTURAL

S1	STRUCTURAL NOTES
S2	FOUNDATION PLAN
S2.1	FOOTING DETAILS
S3	STRUCTURAL FLOOR PLAN
S3.1	STRUCTURAL DETAILS
S4	ROOF FRAMING PLAN
S4.1	STRUCTURAL DETAILS

MECHANICAL

M0.01	MECHANICAL LEGEND
MD1.01	PLUMBING DEMOLITION PLAN
MD1.02	MECHANICAL DEMOLITION PLAN
M1.01	PLUMBING FIRST FLOOR PLAN
M1.02	PLUMBING UNDERGROUND PLAN
M1.03	HVAC DUCTWORK PLAN
M1.04	HVAC REFLECTED CEILING PLAN
M1.05	HVAC ROOF PLAN
M4.00	MECHANICAL SECTIONS
M5.00	MECHANICAL DETAILS

M5.01	MECHANICAL DETAILS II
M6.00	MECHANICAL SCHEDULES I
M6.01	MECHANICAL SCHEDULES II
M6.02	MECHANICAL SCHEDULES III
M7.00	MECHANICAL CONTROLS 1
M7.01	MECHANICAL CONTROLS II

ELECTRICAL

E0.01	ELECTRICAL LEGEND & NOTES
E0.02	SYSTEMS LEGEND
E0.03	FIXTURE, MECH SYSTEM, LTG CONTROLS
E1.01	OVERALL ELECTRICAL SITE PLAN
E1.02	ENLARGED SITE PLAN
E2.01	LIGHTING PLAN
E3.01	POWER PLAN
E3.02	ROOFTOP POWER PLAN
E4.01	SYSTEMS PLAN
E4.11	LEVEL 1 SYSTEMS PATHWAYS PLAN
E4.21	ENLARGED SYSTEMS PLANS
E5.01	ELECTRICAL ONE-LINE DIAGRAM
E5.02	PANEL SCHEDULES
E5.03	PANEL SCHEDULES
E6.01	ELECTRICAL DETAILS
E6.02	ELECTRICAL DETAILS
E6.03	ELECTRICAL DETAILS
E7.01	SECURITY DETAILS

FIRE ALARM

FA0.01	FIRE ALARM SYSTEM LEGEND AND NOTES
FA0.02	FIRE ALARM SYSTEM RISER & SEQUENCE OF OPERATIONS MATRIX
FA1.01	FIRE ALARM SYSTEM FIRST FLOOR PLAN

FIRE PROTECTION

FX0.01	FIRE PROTECTION NOTES AND FLOOR PLAN

Schedule/Deliverables: See Project Manual

Compliance/Acceptance: Subject to Final review by Owner and Architect

Warranties: See Project Manual

Support / Maintenance: See Project Manual

ATTACHMENT B

COMPENSATION

Lump sum bid, progress payments monthly as a percentage of completion, as approved by the Owner and Engineer. Payments subject to retainage.

Contract Amount	$_____
Plus Sales Tax	$_____
Total	$_____

As revised by contract change order, as approved by the Owner and Engineer.

ATTACHMENT C

FEDERAL CONTRACT TERMS

AMERICAN RESCUE PLAN ACT OF 2021 (ARPA)
CORONAVIRUS STATE & LOCAL FISCAL RECOVERY FUNDS (CSLFRF) SUBAWARD

If applicable, the following provisions apply to the Subrecipient Agreement for receipt of ARPA Funds:

1. CONFLICT. In the event of conflict between these Federal Contract Terms and the Subrecipient Agreement, the Federal Contract Terms shall take priority.

2. COMPLIANCE. Subrecipient understands and agrees that funds provided under the Subrecipient Agreement come from a federal source and agrees to comply with all additional applicable terms.

   A. Technical Assistance. If, at any time, Subrecipient believes its capacity is compromised or Subrecipient otherwise needs any sort of assistance, it shall immediately notify the County. County will make best efforts to provide timely technical assistance to Subrecipient to bring Subrecipient into compliance.

   B. Compliance with Act. Subrecipient understands and agrees that ARPA Funds provided under the Subrecipient Agreement may only be used in compliance with section 603(c) of the Social Security Act ("Act"), as added by section 9901 of the American Rescue Plan Act ("ARPA"), the U.S. Department of Treasury's ("Treasury's") regulations implementing that section, and guidance issued by Treasury regarding the foregoing.

3. SCOPE OF ELIGIBLE EXPENDITURES. ARPA funds may only for reimbursable eligible expenditures as described in the Subrecipient Agreement, these Federal Contract Terms and Scope of Work. No ARPA Funds may be used to pay or reimburse costs for expenditures for which Subrecipient has received any other funding, whether state, federal or private in nature, for that same expense.

4. REPORTS. Subrecipient shall provide the County with additional information and documentation upon request, including completing any reports deemed necessary for the County to comply with documentation, reporting, or audit requirements

5. REMEDIES. All administrative, contractual, or other legal remedies available by law, including sanctions and penalties, are available to the parties in the event of a breach of contract.

6. UNIFORM GUIDANCE COMPLIANCE.

   A. Remedial Actions. In the event of Subrecipient's noncompliance with section 603(c) of the Act, Treasury's regulations implementing that section, guidance issued by Treasury regarding the foregoing, or any other applicable federal laws or regulations, Treasury may take available remedial actions as set forth in 2 C.F.R. 200.339.

B. Recoupment.

1. Subrecipient agrees that it is financially responsible for and will repay the County all indicated amounts following an audit exception which occurs due to Subrecipient's failure, for any reason, to comply with the terms of the Subrecipient Agreement. This duty to repay the County shall not be diminished or extinguished by the termination of the Contract.
2. In the event of a violation of section 603(c) of the Act, ARPA Funds shall be subject to recoupment by the County.
3. Any funds paid to Subrecipient (a) more than the amount to which Subrecipient is authorized to retain under the terms of the Subrecipient Agreement; (b) that are determined by the Treasury Office of Inspector General to have been misused; (c) are determined by Treasury to be subject to a repayment obligation pursuant to section 603(e) of the Act; or (d) are otherwise subject to recoupment by the County shall constitute a debt to the County.
4. Any Subrecipient debts determined to be owed the County must be paid promptly by Subrecipient. A debt is delinquent if it has not been paid by the date specified in the County's initial written demand for payment, unless other satisfactory arrangements have been made or if the County knowingly or improperly retains funds that are a debt. The County will take any actions available to it to collect such a debt.

C. Return of Unused ARPA Funds. If Subrecipient has any unspent ARPA Funds on hand as of the earlier of December 31, 2024, or the termination of the Subrecipient Agreement, Subrecipient shall return all unspent ARPA Funds to the County within ten (10) calendar days.

7. DISCLAIMER
   A. The United States expressly disclaims all responsibility or liability to Subrecipient or third persons for the actions of Subrecipient or third persons resulting in death, bodily injury, property damages, or any other losses resulting in any way from the performance of this award or any other losses resulting in any way from the performance of this grant or any contract, or subcontract under this grant.
   B. The acceptance of this grant by Subrecipient does not in any way establish an agency relationship between the United States and Subrecipient.

8. CONFLICT OF INTEREST. Subrecipient understands and agrees it must maintain and comply with a conflict-of-interest policy consistent with 2 C.F.R. § 200.318(c) and such policy is applicable to each activity funded under this award. Subrecipient and subrecipients must disclose in writing to the County or Treasury, as appropriate, any potential conflict of interest affecting the awarded funds in accordance with 2 C.F.R. § 200.112.

9. PROTECTION FOR WHISTLEBLOWERS
   A. In accordance with 41 U.S.C. § 4712, Subrecipient may not discharge, demote, or otherwise discriminate against an employee in reprisal for disclosing to any of the list of persons or entities provided below, information that the employee reasonably believes is evidence of gross mismanagement of a federal contract or grant, a gross waste of federal funds, an abuse of authority relating to a federal contract or grant, a substantial and specific danger to public health or safety, or a violation of law, rule, or regulation related to a federal contract (including the competition for or negotiation of a contract) or grant.

B. The list of persons and entities referenced in the paragraph above includes the following: (1) a member of Congress or a representative of a committee of Congress; (2) an Inspector General; (3) the Government Accountability Office; (4) a Treasury employee responsible for contract or grant oversight or management; (5) an authorized official of the Department of Justice or other law enforcement agency; (6) a court or grand jury; and (7) a management official or other employee of Subrecipient, Subrecipient, or subcontractor who has the responsibility to investigate, discover, or address misconduct.
C. Subrecipient shall inform its employees in writing of the rights and remedies provided under this section, in the predominant native language of the workforce.

10. INCREASING SEAT BELT USE IN THE UNITED STATES. Pursuant to Executive Order 13043, 62 FR 19217 (Apr. 18, 1997), Subrecipient is encouraged to adopt and enforce on-the-job seat belt policies and programs for its their employees when operating company-owned, rented or personally owned vehicles.

11. REDUCING TEXT MESSAGING WHILE DRIVING. Pursuant to Executive Order 13513, 74 FR 51225 (October 6, 2009), Subrecipient is encouraged to adopt and enforce policies that ban text messaging while driving, and to establish workplace safety policies to decrease accidents caused by distracted drivers.

12. FALSE STATEMENTS. Subrecipient understands that making false statements or claims in connection with this Subrecipient Agreement may be a violation of federal law and may result in criminal, civil, or administrative sanctions, including fines, imprisonment, civil damages and penalties, debarment from participating in federal or county awards or contracts, and/or any other remedy available by law.

13. APPLICABLE LAWS

The Subrecipient Agreement shall be governed by and construed in accordance with the laws of the State of Washington. Subrecipient agrees to comply with the requirements of section 603 of the Act, the Treasury's regulations implementing that section, and guidance issued by Treasury regarding the foregoing. Subrecipient also agrees to comply with all other applicable federal laws, regulations, and executive orders, and Subrecipient shall provide for such compliance by other parties in any agreements it enters with other parties relating to this Subrecipient Agreement. Federal regulations applicable to this grant may include, without limitation, the following:

A. Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards, 2 C.F.R. Part 200, including the following: Subpart A, Acronyms and Definitions; Subpart B, General Provisions; Subpart C, Pre-Federal Award Requirements and Contents of Federal Awards; Subpart D, Post-Federal Award Requirements; Subpart E, Cost Principles; and Subpart F, Audit Requirements.
B. Universal Identifier and System for Award Management (SAM), 2 C.F.R. Part 25, pursuant to which the award term set forth in Appendix A to 2 C.F.R. Part 25 is hereby incorporated by reference.
C. Reporting Subaward and Executive Compensation Information, 2 C.F.R. Part 170, pursuant to which the award term set forth in Appendix A to 2 C.F.R. Part 170 is hereby incorporated by reference.

D. OMB Guidelines to Agencies on Governmentwide Debarment and Suspension (Non-procurement), 2 C.F.R. Part 180, including the requirement to include a term or condition in all lower tier covered transactions (contracts and subcontracts described in 2 C.F.R. Part 180, subpart B) that the award is subject to 2 C.F.R. Part 180 and Treasury's implementing regulation at 31 C.F.R. Part 19.
E. Subrecipient Integrity and Performance Matters, pursuant to which the award term set forth in 2 C.F.R. Part 200, Appendix XII to Part 200 is hereby incorporated by reference.
F. Governmentwide Requirements for Drug-Free Workplace, 31 C.F.R. Part 20.
G. Uniform Relocation Assistance and Real Property Acquisitions Act of 1970 (42 U.S.C. §§ 4601-4655) and implementing regulations.
H. Statutes and regulations prohibiting discrimination applicable to this award include, without limitation, the following:
    1. Title VI of the Civil Rights Act of 1964 (42 U.S.C. §§ 2000d et seq.) and Treasury's Implementing regulations at 31 C.F.R. Part 22, which prohibit discrimination on the basis of race, color, or national origin under programs or activities receiving federal financial assistance;
    2. The Fair Housing Act, Title VIII of the Civil Rights Act of 1968 (42 U.S.C. §§ 3601 et seq.), which prohibits discrimination in housing based on race, color, religion, national origin, sex, familial status, or disability;
    3. Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. § 794), which prohibits discrimination based on disability under any program or activity receiving federal financial assistance;
    4. The Age Discrimination Act of 1975, as amended (42 U.S.C. §§ 6101 et seq.), and Treasury's implementing regulations at 31 C.F.R. Part 23, which prohibit discrimination based on age in programs or activities receiving federal financial assistance; and
    5. Title II of the Americans with Disabilities Act of 1990, as amended (42 U.S.C. §§ 12101 et seq.), which prohibits discrimination based on disability under programs, activities, and services provided or made available by state and local governments or instrumentalities or agencies thereto.

14. HATCH ACT. Subrecipient agrees to comply, as applicable, with requirements of the Hatch Act (5 U.S.C.§§ 1501-1508 and 7324-7328), which limits certain political activities of federal employees, as well as certain other employees who work in connection with federally funded programs. Subrecipient agrees to comply with the Prohibition on Providing Funds to the Enemy (2 C.F.R. 183).

15. EQUAL EMPLOYMENT OPPORTUNITY. During the performance of this Subrecipient Agreement, the Subrecipient agrees as follows:
Subrecipient will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, gender identity, or national origin. The Subrecipient will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, sexual orientation, gender identity, or national origin. Such action shall include, but not be limited to the following:

A. Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Subrecipient agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

B. The Subrecipient will, in all solicitations or advertisements for employees placed by or on behalf of the Subrecipient, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, or national origin.

C. The Subrecipient will not discharge or in any other manner discriminate against any employee or applicant for employment because such employee or applicant has inquired about, discussed, or disclosed the compensation of the employee or applicant or another employee or applicant. This provision shall not apply to instances in which an employee who has access to the compensation information of other employees or applicants as a part of such employee's essential job functions discloses the compensation of such other employees or applicants to individuals who do not otherwise have access to such information, unless such disclosure is in response to a formal complaint or charge, in furtherance of an investigation, proceeding, hearing, or action, including an investigation conducted by the employer, or is consistent with the Subrecipient's legal duty to furnish information.

D. The Subrecipient will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the Subrecipient's commitments under this section and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

E. The Subrecipient will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

F. The Subrecipient will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the administering agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

G. In the event of the Subrecipient's noncompliance with the nondiscrimination clauses of this Subrecipient Agreement or with any of the said rules, regulations, or orders, this Subrecipient Agreement may be canceled, terminated, or suspended in whole or in part and the Subrecipient may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

H. Subrecipient will include the portion of the sentence immediately preceding paragraph (1) and the provisions of paragraphs (1) through (8) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The Subrecipient will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance:

1. Provided, however, that in the event a Subrecipient becomes involved in, or is threatened with, litigation with a subcontractor or vendor due to direction by the administering agency, the Subrecipient may request the United States to enter such litigation to protect the interests of the United States.

2. County further agrees that it will be bound by the above equal opportunity clause with respect to its own employment practices when it participates in federally assisted construction work: *Provided,* that if the County so participating is a State or local government, the above equal opportunity clause is not applicable to any agency, instrumentality or subdivision of such government which does not participate in work on or under the Subrecipient Agreement.

3. County agrees that it will assist and cooperate actively with the administering agency and the Secretary of Labor in obtaining the compliance of Subrecipients and subcontractors with the equal opportunity clause and the rules, regulations, and relevant orders of the Secretary of Labor, that it will furnish the administering agency and the Secretary of Labor such information as they may require for the supervision of such compliance, and that it will otherwise assist the administering agency in the discharge of the agency's primary responsibility for securing compliance.

4. County further agrees that it will refrain from entering into any contract or contract modification subject to Executive Order 11246 of September 24, 1965, with a Subrecipient debarred from, or who has not demonstrated eligibility for, Government contracts and federally assisted construction contracts pursuant to the Executive Order and will carry out such sanctions and penalties for violation of the equal opportunity clause as may be imposed upon Subrecipients and subcontractors by the administering agency or the Secretary of Labor pursuant to Part II, Subpart D of the Executive Order. In addition, the County agrees that if it fails or refuses to comply with these undertakings, the administering agency may take any or all of the following actions: Cancel, terminate, or suspend in whole or in part this grant (contract, loan, insurance, guarantee); refrain from extending any further assistance to the County under the program with respect to which the failure or refund occurred until satisfactory assurance of future compliance has been received from such County; and refer the case to the Department of Justice for appropriate legal proceedings.

16. DAVIS-BACON ACT. All transactions regarding this Subrecipient Agreement shall be done in compliance with the Davis-Bacon Act (40 U.S.C. 31413144, and 3146-3148) and the requirements of 29 C.F.R. pt. 5 as may be applicable. The Subrecipient shall comply with 40 U.S.C. 3141-3144, and 3146-3148 and the requirements of 29 C.F.R. pt. 5 as applicable. Subrecipients are required to pay wages to laborers and mechanics at a rate not less than the prevailing wages specified in a wage determination made by the Secretary of Labor. Additionally, Subrecipients are required to pay wages not less than once a week.

17. COPELAND ANTI-KICKBACK ACT
    A. Subrecipient. The Subrecipient shall comply with 18 U.S.C. § 874, 40 U.S.C. § 3145, and the requirements of 29 C.F.R. pt. 3 as may be applicable, which are incorporated by reference into this Subrecipient Agreement.

    B. Subcontracts. The Subrecipient or subcontractor shall insert in any subcontracts the clause above and a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime Contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all contract clauses.

    C. Breach. A breach of the Subrecipient Agreement clauses above may be grounds for termination of the Subrecipient Agreement, and for debarment as a Subrecipient and subcontractor as provided in 29 C.F.R. § 5.12.

18. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT
    A. Overtime Requirements. As required by 29 C.F.R. § 5.5(b), no Subrecipient or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

    B. Violation; Liability for Unpaid Wages; Liquidated Damages. In the event of any violation of the clause set forth in paragraph (1) of this section the Subrecipient and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such Subrecipient and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (1) of this section, in the sum of $27 for each calendar day on which such individual was required or permitted to work more than the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (1) of this section.

    C. Withholding for Unpaid Wages and Liquidated Damages. The County shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the Subrecipient or subcontractor under any such contract or any other federal contract with the same prime Contractor, or any other federally-assisted contract subject to the Contract Work

Hours and Safety Standards Act, which is held by the same prime Contractor, such sums as may be determined to be necessary to satisfy any liabilities of such Subrecipient or subcontractor for unpaid wages and liquidated damages as provided by federal law.

D. Subcontracts. The Subrecipient or subcontractor shall insert in any subcontracts the clauses set forth in paragraphs (A) through (D) of this section and a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime Contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (A) through (D) of this section.

19. RIGHTS TO INVENTIONS. All materials produced under this Subrecipient Agreement shall be considered "works for hire" as defined by the U.S. Copyright Act and shall be owned by the County.

20. CLEAN AIR ACT AND THE FEDERAL WATER POLLUTION CONTROL ACT. Subrecipient will comply with all applicable federal environmental laws and regulations, including without limitation.

A. Clean Air Act. The Subrecipient agrees to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act, as amended, 42 U.S.C. § 7401 et seq. The Subrecipient agrees to report each violation to the County and understands and agrees that the County will, in turn, report each violation as required to assure notification to the Federal Emergency Management Agency, and the appropriate Environmental Protection Agency Regional Office. The Subrecipient agrees to include these requirements in each subcontract exceeding $150,000 financed in whole or in part with federal assistance provided by FEMA.

B. Federal Water Pollution Control Act. The Subrecipient agrees to comply with all applicable standards, orders, or regulations issued pursuant to the Federal Water Pollution Control Act, as amended, 33 U.S.C. 1251 et seq. The Subrecipient agrees to report each violation to the County and understands and agrees that the County will, in turn, report each violation as required to assure notification to the Federal Emergency Management Agency, and the appropriate Environmental Protection Agency Regional Office. The Subrecipient agrees to include these requirements in each subcontract exceeding $150,000 financed in whole or in part with federal assistance provided by FEMA.

21. DEBARMENT AND SUSPENSION. If this Subrecipient Agreement is a covered transaction for purposes of 2 C.F.R. pt. 180 and 2 C.F.R. pt. 3000, the Subrecipient is required to verify that none of the Subrecipient's principals (defined at 2 C.F.R. § 180.995) or its affiliates (defined at 2 C.F.R. § 180.905) are excluded (defined at 2 C.F.R. § 180.940) or disqualified (defined at 2 C.F.R. § 180.935). The Subrecipient must comply with 2 C.F.R. pt. 180, subpart C and 2 C.F.R. pt. 3000, subpart C, and must include a requirement to comply with these regulations in any lower tier covered transaction it enters.

This certification is a material representation of fact relied upon by the County. If it is later determined that the Subrecipient did not comply with 2 C.F.R. pt. 180, subpart C and 2 C.F.R. pt. 3000, subpart C, in addition to remedies available to the County, the federal government may pursue available remedies, including but not limited to suspension and/or debarment.

The bidder or proposer agrees to comply with the requirements of 2 C.F.R. pt. 180, subpart C and 2 C.F.R. pt. 3000, subpart C while this offer is valid and throughout the period of any contract that may arise from this offer. The bidder or proposer further agrees to include a provision requiring such compliance in its lower tier covered transactions.

22. PROCUREMENT OF RECOVERED MATERIALS. In the performance of this Subrecipient Agreement, the Subrecipient shall make maximum use of products containing recovered materials that are EPA-designated items unless the product cannot be acquired i) competitively within a timeframe providing for compliance with the contract performance schedule; ii) meeting contract performance requirements; or ii) at a reasonable price. Information about this requirement, along with the list of EPA-designated items, available at EPA's Comprehensive Procurement Guidelines web site, https://www.epa.govismm/comprehensive-procurement-guideline-cpg-program. Subrecipient also agrees to comply with all other applicable requirements of Section 6002 of the Solid Waste Disposal Act.

23. ACCESS TO RECORDS. Subrecipient agrees to provide the County, the Treasury Office of Inspector General, the Government Accountability Office, or any of their authorized representatives access to any books, documents, papers, and records of the Subrecipient which are directly pertinent to this Subrecipient Agreement for the purposes of making audits, examinations, excerpts, and transcriptions, to the extent allowed by law. The Subrecipient agrees to permit any of the foregoing parties to reproduce by any means whatsoever or to copy excerpts and transcriptions as reasonably needed. The Subrecipient agrees to provide the FEMA Administrator or his authorized representatives access to construction or other work sites pertaining to the work being completed under the Subrecipient Agreement. In compliance with the Disaster Recovery Act of 2018, the County and the Subrecipient acknowledge and agree that no language in this Subrecipient Agreement is intended to prohibit audits or internal reviews by the FEMA Administrator or the Comptroller General of the United States.

24. AMENDMENTS. The Subrecipient Agreement may only be amended upon the mutual written agreement of the parties.

25. COMPLIANCE WITH FEDERAL LAW, REGULATIONS, AND EXECUTIVE ORDERS. Subrecipient will comply with all applicable federal law, regulations, executive orders, policies, procedures, and directives.

26. NO OBLIGATION BY FEDERAL GOVERNMENT. The federal government is not a party to this Subrecipient Agreement and is not subject to any obligations or liabilities to the non-federal entity, Subrecipient, or any other party pertaining to any matter resulting from this Subrecipient Agreement.

27. PROGRAM FRAUD AND FALSE OR FRAUDULENT STATEMENTS OR RELATED ACTS. Subrecipient acknowledges that 31 U.S.C. Chap. 38 (Administrative Remedies for False Claims and Statements) applies to the Subrecipient's actions pertaining to this Subrecipient Agreement.

28. BYRD ANTI-LOBBYING AMENDMENT, 31 U.S.C. § 1352 (AS AMENDED). Subrecipients who request or receive an award for federal money shall file the required certification. Each tier certifies to the tier above that it will not and has not used federal appropriated funds to pay any

person or organization for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, officer or employee of Congress, or an employee of a Member of Congress in connection with obtaining any federal contract, grant, or any other award covered by 31 U.S.C. § 1352. Each tier shall also disclose any lobbying with non-federal funds that takes place in connection with obtaining any federal award. Such disclosures are forwarded

Required Certification. If applicable, Subrecipients must sign and submit to the non-federal entity the following certification.

APPENDIX A, 44 C.F.R. PART 18 — CERTIFICATION REGARDING LOBBYING
The undersigned certifies, to the best of his or her knowledge and belief, that:

1. No federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any federal contract, the making of any Federal grant, the making of any federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any federal contract, grant, loan, or cooperative agreement.

2. If any funds other than federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a member of congress, an officer or employee of congress, or an employee of a member of congress in connection with this federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit standard form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions, as attached.

3. The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

4. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification is subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

By signing below, Subrecipient certifies that Subrecipient has read and understood, is and will remain in compliance with the above-described obligations. Subrecipient acknowledges any intentional or negligent misrepresentation or falsification of any information submitted in conjunction with this document may subject the Subrecipient to civil and/or criminal liability and penalties, including but not limited to fines and/or imprisonment under Title 18, United States Code, Sec. 1001, et seq. and other applicable law.

CONTRACTOR

_____ _____

Signature of Authorized Representative Print Name

_____

Title of Authorized Representative

Dated this _____day of _____, 20_____.

ATTACHMENT D

CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY, AND VOLUNTARY EXCLUSION LOWER TIER COVERED TRANSACTIONS

AMERICAN RESCUE PLAN ACT OF 2021 (ARPA)
CORONAVIRUS STATE & LOCAL FISCAL RECOVERY FUNDS (CSLFRF)

This certification is required by the regulations implementing Executive Order 12549, Debarment and Suspension, 29 CFR Part 98, Section 98.510, Participant's responsibilities. The regulations were published as Part VII of the May 26, 1988, Federal Register (pages 19160-19211).

(BEFORE COMPLETING CERTIFICATION, READ THE INSTRUCTIONS ON THE NEXT PAGE WHICH ARE AN INTEGRAL PART OF THE CERTIFICATION)

1. The prospective recipient of Federal assistance funds certifies, by submission of this IFB/RFP Response, that neither it nor its principals are presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.

2. Where the prospective recipient of Federal assistance funds is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this IFB/RFP Response.

CONTRACTOR

_____ _____
Signature of Authorized Representative Print Name

_____
Title of Authorized Representative

Dated this _____day of _____, 20_____.

FEDERAL DEBARMENT CERTIFICATION FORM (CONTINUED)

1. By signing and submitting this response, the prospective recipient of Federal assistance funds is providing the certification as set out below.
2. The certification in this class is a material representation of fact upon which reliance was placed when this transaction was entered. If it is later determined that the prospective recipient of Federal assistance funds knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the Department of Labor (DOL) may pursue available remedies, including suspension and/or debarment.
3. The prospective recipient of Federal assistance funds shall provide immediate written notice to the person to which this response is submitted if at any time the prospective recipient of Federal assistance funds learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.
4. The terms "covered transaction," "debarred," "suspended," "ineligible," "lower tier covered transaction," "participant," "person," "primary covered transaction," "principal," "RFP Response," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the person to which this response is submitted for assistance in obtaining a copy of those regulations.
5. The prospective recipient of Federal assistance funds agrees by submitting this response that, should the proposed covered transaction be entered, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the DOL.
6. The prospective recipient of Federal assistance funds further agrees by submitting this response that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transactions," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.
7. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that it is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may but is not required to check the List of Parties Excluded from Procurement or Non-Procurement Programs.
8. Nothing contained in the foregoing shall be construed to require establishment of a system of records to render in good faith the certification required by this clause. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.
9. Except for transactions authorized under paragraph 5 of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the DOL may pursue available remedies, including suspension and/or debarment.

ATTACHMENT E

CIVIL RIGHTS CERTIFICATION

AMERICAN RESCUE PLAN ACT OF 2021 (ARPA)
CORONAVIRUS STATE & LOCAL FISCAL RECOVERY FUNDS (CSLFRF)

The ARPA funds provided to the grant Contractor named below ("Contractor") are available under section 603 of the Social Security Act, as added by section 9901 of the American Rescue Plan Act.

1. Contractor understands and acknowledges that:
   A. As a condition of receipt of federal financial assistance from the Department of the Treasury ("Treasury"), with monies distributed through Kitsap County, Contractor provides the assurances stated herein. The federal financial assistance may include federal grants, loans, and contracts to provide assistance to Contractor and other arrangements with the intention of providing assistance. Federal financial assistance does not encompass contracts of guarantee or insurance, regulated programs, licenses, procurement contracts by the Federal government at market value, or programs that provide direct benefits.
   B. The Civil Rights Restoration Act of 1987 provides that the provisions of the assurances apply to all operations of Contractor's programs and activities, so long as any portion of Contractor's programs or activities are federally assisted in the manner prescribed above.

2. Contractor certifies the following:
   A. Contractor ensures its current and future compliance with Title VI of the Civil Rights Act of 1964, as amended, which prohibits exclusion from participation, denial of the benefits of, or subjection to discrimination under programs and activities receiving federal financial assistance, of any person in the United States on the ground of race, color, or national origin (42 U.S.C. § 2000d et seq.), as implemented by the Treasury Title VI regulations at 31 CFR Part 22 and other pertinent executive orders such as Executive Order 13166, directives, circulars, policies, memoranda, and guidance documents.
   B. Contractor acknowledges Executive Order 13166, "Improving Access to Services for Persons with Limited English Proficiency," seeks to improve access to federally assisted programs and activities for individuals who, because of national origin, have Limited English proficiency (LEP). Contractor understands denying a person access to its programs, services, and activities because of LEP is a form of national origin discrimination prohibited under Title VI of the Civil Rights Act of 1964 and Treasury implementing regulations. Accordingly, Contractor shall take reasonable steps to comply with Treasury's directives to ensure LEP persons have meaningful access to its programs, services, and activities. Contractor understands and agrees that meaningful access may entail providing language assistance services, including oral interpretation and written translation where necessary, to ensure effective communication in such programs, services, and activities.

C. Contractor agrees to consider the need for language services for LEP persons when Contractor develops applicable budgets and conducts programs, services, and activities. As a resource, the Treasury has published its LEP guidance at 70 FR 6067. For more information on taking reasonable steps to provide meaningful access for LEP persons, please visit http://www.lep.gov.

D. Contractor acknowledges and agrees compliance with the assurances constitutes a condition of continued receipt of federal financial assistance and is binding upon Contractor and its successors, transferees, and assignees for the period in which such assistance is provided.

E. Contractor shall comply with Title VI of the Civil Rights Act of 1964, which prohibits Contractors of federal financial assistance from excluding from a program or activity, denying benefits of, or otherwise discriminating against a person based on race, color, or national origin (42 U.S.C. § 2000d et seq.), as implemented by Treasury's Title VI regulations, 31 CFR Part 22, which are herein incorporated by reference and made a part of this contract (or agreement). Title VI also includes protection to LEP persons in any program or activity receiving federal financial assistance, 42 U.S.C. § 2000d et seq., as implemented by Treasury's Title VI regulations, 31 CFR Part 22, and herein incorporated by reference and made a part of the Contract.

F. Contractor understands and agrees that if any real property or structure is provided or improved with federal financial assistance by the Treasury, Contractor, or in the case of a subsequent transfer, transferee, is obligated for the period during which the real property or structure is used for a purpose for which the federal financial assistance is extended or for another purpose involving the provision of similar services or benefits. If personal property is provided, this assurance obligates the Contractor for the period during which it retains ownership or possession of the property.

G. Contractor shall cooperate in any enforcement or compliance review activities by the Treasury of Contractor's obligations. Enforcement may include investigation, arbitration, mediation, litigation, and monitoring of any settlement agreements that may result from these actions. Contractor shall comply with information requests, on-site compliance reviews and reporting requirements.

H. Contractor shall maintain a complaint log and inform the Treasury of any complaints of discrimination on the grounds of race, color, or national origin, and limited English proficiency covered by Title VI of the Civil Rights Act of 1964 and implementing regulations and provide, upon request, a list of all such reviews or proceedings based on the complaint, pending, or completed, including outcome. Contractor must also inform the Treasury if Contractor has received no complaints under Title VI.

I. Contractor must provide documentation of an administrative agency or court findings of non-compliance of Title VI and efforts to address the non-compliance, including any voluntary compliance or other agreements between the Contractor and administrative agency that made the finding. Contractor must provide documentation of the settlement of any case or matter alleging discrimination or identify that Contractor has not been the subject of any court or administrative agency finding of discrimination.

J. The U.S. has the right to seek judicial enforcement of the terms contained herein. Nothing in this document alters or limits the federal enforcement measures that the U.S. may take to address violations of any provision contained herein or other applicable federal law.

By signing below, Contractor certifies that Contractor has read and understood, is and will remain in compliance with the above-described obligations. Contractor acknowledges any intentional or negligent misrepresentation or falsification of any information submitted in conjunction with this document may subject the Contractor to civil and/or criminal liability and penalties, including but not limited to fines and/or imprisonment under Title 18, United States Code, Sec. 1001, et seq. and other applicable law.

CONTRACTOR

_____ _____

Signature of Authorized Representative Print Name

_____

Title of Authorized Representative

Dated this _____day of _____, 20_____.

ATTACHMENT F

PREVAILING WAGE

AMERICAN RESCUE PLAN ACT OF 2021 (ARPA)
CORONAVIRUS STATE & LOCAL FISCAL RECOVERY FUNDS (CSLFRF)

PREVAILING WAGE		
☐	General	Contractor shall comply with the prevailing wage requirements of chapter 39.12 RCW and WAC 296-127, specifically including RCW 39.12.020 and WAC 296-127-023 (Building Service Maintenance), if applicable. Contractor shall pay not less than the prevailing rate of per diem wages to its employees and shall provide documentation to the County of its compliance with prevailing wage laws and regulations. A copy of such prevailing rates of wage statement shall be posted by the Contractor in a location readily visible to workers at the job site or as provided in RCW 39.12.020
	Over $2,500	For contracts greater than $2,500, a “Statement of Intent to Pay Prevailir Wages: (hereinafter “Statement of Intent”) must be submitted to ar approved by the State Department of Labor and Industries prior to beginnir work by the Contractor. If the Contract is more than $10,000, the Stateme of Intent shall include the Contractor's registration number, the prevailir wage for each classification of workers, and an estimate of the number workers in each classification. An “Affidavit of Wages Paid” must b submitted to and approved by the State Department of Labor and Industri by the Contractor prior to release of the retained percentage. Copies of thes documents shall be provided to the County prior to any payment being mac to the Contractor. The fee for each of these documents shall be paid by tl Contractor.
	$2,500 or Less	For contracts $2,500 or less, the Contractor may submit the Statement of Intent to the County directly without the approval by the Washington State Department of Labor & Industries. Upon final acceptance of the work, the Contractor will submit an “Affidavit of Wages Paid” to the County.
	Statement of Intent	The Statement of Intent and Affidavit of Wages Paid must be submitted on forms approved by the Department of Labor and Industries.

Contractors must file weekly certified payroll reports for all prevailing wage jobs (regardless of project amount) and submit them directly to L&I.

SECTION 005000(B)
PERFORMANCE BOND
TO KITSAP COUNTY, WA

Kitsap County, Washington, (County) has awarded to _____ (Principal), a contract for the construction of the project designated as Department of Emergency Management TI Project No _____, in Kitsap County, Washington (Contract), and said Principal is required to furnish a bond for performance of all obligations under the Contract. The Principal, and _____ (Surety), a corporation organized under the laws of the State of _____ and licensed to do business in the State of Washington as surety and named in the current list of "Surety Companies Acceptable in Federal Bonds" as published in the Federal Register by the Audit Staff Bureau of Accounts, U.S. Treasury Dept., are jointly and severally held and firmly bound to the County, in the sum of _____ _____US Dollars ($_____) Total Contract Amount, subject to the provisions herein.

This statutory performance bond shall become null and void, if and when the Principal, its heirs, executors, administrators, successors, or assigns shall well and faithfully perform all of the Principal's obligations under the Contract and fulfill all the terms and conditions of all duly authorized modifications, additions, and changes to said Contract that may hereafter be made, at the time and in the manner therein specified; and if such performance obligations have not been fulfilled, this bond shall remain in full force and effect.

The Surety for value received agrees that no change, extension of time, alteration or addition to the terms of the Contract, the specifications accompanying the Contract, or to the work to be performed under the Contract shall in any way affect its obligation on this bond, and waives notice of any change, extension of time, alteration or addition to the terms of the Contract or the work performed. The Surety agrees that modifications and changes to the terms and conditions of the Contract that increase the total amount to be paid the Principal shall automatically increase the obligation of the Surety on this bond and notice to Surety is not required for such increased obligation.

This bond may be executed in two (2) original counterparts and shall be signed by the parties' duly authorized officers. This bond will only be accepted if it is accompanied by a fully executed and original power of attorney for the officer executing on behalf of the surety.

PRINCIPAL	**SURETY**
_____	_____
Principal Signature	Surety Signature
_____	_____
Printed Name	Printed Name
_____	_____
Title	Title

Name, address, and telephone of local office/agent of Surety Company are:

_____

_____

END OF SECTION 005000(B)

SECTION 005000(C)
PAYMENT BOND
TO KITSAP COUNTY, WA

Kitsap County, Washington, (County) has awarded to _____ (Principal), a contract for the construction of the project designated as Department of Emergency Management TI Project, Project No. _____, in Kitsap County, Washington (Contract), and said Principal is required under the terms of that Contract to furnish a payment bond in accord with Title 39.08 Revised Code of Washington (RCW) and (where applicable) 60.28 RCW. The Principal, and _____ (Surety), a corporation organized under the laws of the State of _____ and licensed to do business in the State of Washington as surety and named in the current list of "Surety Companies Acceptable in Federal Bonds" as published in the Federal Register by the Audit Staff Bureau of Accounts, U.S. Treasury Dept., are jointly and severally held and firmly bound to the County, in the sum of _____ _____US Dollars ($_____) Total Contract Amount, subject to the provisions herein. This statutory payment bond shall become null and void, if and when the Principal, its heirs, executors, administrators, successors, or assigns shall pay all persons in accordance with RCW Titles 39.08 and 39.12 including all workers, laborers, mechanics, subcontractors, and material suppliers, and all persons who shall supply such contractor or subcontractor with provisions and supplies for the carrying on of such work; and if such payment obligations have not been fulfilled, this bond shall remain in full force and effect.

The Surety for value received agrees that no change, extension of time, alteration or addition to the terms of the Contract, the specifications accompanying the Contract, or to the work to be performed under the Contract shall in any way affect its obligation on this bond, except as provided herein, and waives notice of any change, extension of time, alteration or addition to the terms of the Contract or the work performed. The Surety agrees that modifications and changes to the terms and conditions of the Contract that increase the total amount to be paid the Principal shall automatically increase the obligation of the Surety on this bond and notice to Surety is not required for such increased obligation.

This bond may be executed in two (2) original counterparts and shall be signed by the parties' duly authorized officers. This bond will only be accepted if it is accompanied by a fully executed and original power of attorney for the officer executing on behalf of the surety.

PRINCIPAL	**SURETY**
_____	_____
Principal Signature	Surety Signature
_____	_____
Printed Name	Printed Name
_____	_____
Title	Title

Name, address, and telephone of local office/agent of Surety Company are:

_____

_____

END OF SECTION 005000(C)

SECTION 005200(D)
RETAINAGE FORM

OWNER: **Kitsap County**

PROJECT: **Kitsap County Department of Emergency Management TI**

CONTRACTOR: _____

RETAINED PERCENTAGE ON PUBLIC WORKS CONTRACTS:
RCW 60.28 as amended by (Chapter 223, laws of 1994) Regular Session allows each prime contractor on a public works contract the following options concerning the amount reserved as retainage from moneys earned by the contractor. The contractor to complete and submit this form for the above public works project.

KITSAP COUNTY DEPT. OF EMERGENCY MANAGEMENT

_____ Retained in a non-interest bearing fund by the public body until sixty days following the final acceptance of said improvement or work as completed.

_____ Deposited by the public body in an interest bearing account or escrow account in a bank, mutual savings bank, or savings and loan association designated by the contractor (on an Escrow Agreement Form acceptable to the owner), not subject to withdrawal until after the final acceptance of said improvement or work as completed, or until agreed to by both parties; PROVIDED, that interest on such account shall be paid to the contractor.

_____ The contractor may provide a bond in place of retainage, in an amount of 5% of the contract plus change orders. in a form acceptable to the public body and from an authorized surety insurer. The public body may require that the authorized surety have a minimum A.M. Best financial strength rating so long as that minimum rating does not exceed A-. The public body must comply with the provisions of RCW **48.28.010**.

_____
Signature Title

_____
Name of Firm

_____
Address

_____
Date

END OF SECTION 005200(D)

SECTION 007200
GENERAL CONDITIONS

FORM OF GENERAL CONDITIONS

1.01 GENERAL CONDITIONS

A. The AIA Document A201-2017 Edition "General Conditions of the Contract for Construction." The document is not supplied within this project manual, the Contractor will receive copies from the Owner or Architect at the time of Contract Signing.

RELATED REQUIREMENTS

2.01 SECTION 007300 - SUPPLEMENTARY CONDITIONS.

SUPPLEMENTARY CONDITIONS

3.01 REFER TO DOCUMENT 007300 - SUPPLEMENTARY CONDITIONS FOR AMENDMENTS TO THE GENERAL CONDITIONS.

END OF SECTION 007200

SECTION 007300 - SUPPLEMENTAL CONDITIONS

The following supplements modify, change, delete from, or add to the referenced "General Conditions of the Contract for Construction." Where any article of the General Conditions is Modified or any Paragraph, Subparagraph, or Clause is modified or deleted by Section 007300, the unaltered provisions of that Article, Paragraph, Subparagraph, or Clause remain in effect.

Modification to the General Conditions:

ARTICLE 1
CONTRACT DOCUMENTS

1.1.1 THE CONTRACT DOCUMENTS

Add the following 1.1.1.1 and 1.1.1.2:

1.1.1.1 In the event of a conflict or discrepancy among or in the Contract Documents, interpretation shall be governed in the following priority:

1. Contract and contract attachments
2. Any Special Conditions
3. Any Supplemental Conditions
4. General Conditions (A-201-2017)
5. Specifications
6. Drawings
7. Material and systems schedules

1.1.1.2 In the event that Work is shown on Drawings but not contained in Specifications, the Work as shown shall be provided at no change in the Contract Sum or Contract Time, according to specifications to be issued by the Architect that are consistent with and reasonably inferable from the Work shown on the Drawings.

1.1.3 THE WORK

Add the following 1.1.3.1

1.1.3.1 Where the Work requires construction that modifies or interfaces with existing structures or systems, the contractor shall take such actions as are necessary to make its Work compatible with and appropriately interface with the as-built conditions of the existing structures or systems.

1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

Add the following 1.2.4

1.2.4 If the Contractor discovers that the Specifications or Drawings fail to particularly describe the material or kind of goods to be used in any place or discovers an inconsistency or ambiguity between the Specifications, Drawings, or Project Manual or an inconsistency or ambiguity arises internally within the Specifications, Drawings, or Project Manual, then the Contractor shall make inquiry of the Architect as to what is intended and best suited. The material that a competent contractor would use in its place to produce first quality finished Work shall be considered a part of the Contract without adjustment to the Contract Sum or Contract Time. If the Contractor discovers such an inconsistency or ambiguity and fails to notify the Architect, there shall be no adjustment to the Contract Sum or Contract Time.

1.7 DIGITAL DATA USE AND TRANSMISSION

Replace 1.7 with the following:

1.7 The drawings, specifications, Instruments of Service, or any other information or documentation that the Contractor receives in digital form may contain transmission or translation errors and are issued for convenience only. The Contractor may only rely on hard copy documents and stamped .pdfs. that are part of the Contract Documents. Use of information contained in electronic files other than Contract Document PDF files is at the Contractor's risk and without liability to the Architect or the Owner. If requested, the Contractor is required to execute the Architect's electronic document release to obtain the Instruments of Service other than hard copy and PDF files.

ARTICLE 2
OWNER

2.2 EVIDENCE OF THE OWNER'S FINANCIAL ARRANGEMENTS

Delete subparagraph 2.2.1 and substitute the following:
[Not used.]

2.3 INFORMATION AND SERVICES REQUIRED OF THE OWNER

Add the following to 2.3.1:
2.3.1 The Contractor is responsible to secure and pay for licenses and all other permits, subject to Section 3.7.1

Replace 2.3.6 with the following:
2.3.6 The Contractor will be furnished free of charge PDF files of Drawings and Project Manuals for the purposes of making reproductions pursuant to Section 1.5.2.

Add the following to 2.5:
2.5 In the event that Contractor deficiencies threaten the health or safety of The Owner's staff or occupants; or the ability to maintain the security of the facility, The Owner may immediately proceed to correct such deficiencies without notice and without the ten-day cure period.

ARTICLE 3
CONTRACTOR

3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

Add the following to 3.3.1:
3.3.1 If the Contractor has any concerns, objections or reservations concerning such specific instructions, the Contractor must raise and resolve such issues with the Architect and the Owner prior to performing such specific instructions.

3.4 LABOR AND MATERIALS

Add the following to 3.4.3:
3.4.3 At no change to the Contract Sum or Contract Time, the Owner may provide written notice requiring the Contractor to remove from the Work any employee, subcontractor employee, or other person carrying out the Contract whom the Owner reasonably considers objectionable.

Add the following 3.4.4
3.4.4 PREVAILING WAGES

3.4.4.1 The Washington State Department of Labor and Industries Prevailing Wage Rates are part of the Contract.

3.4.4.2 It is the Contractor's responsibility to follow the most current edition of the Washington State Department of Labor and Industries Prevailing Wage Rates

3.4.4.3 No worker may be paid less than the prevailing minimum hourly wage rate established by the State Department of Labor and Industries. Statements of Intent to Pay Prevailing Wages and Affidavits of Wages Paid are required. The Contractor shall fully comply with all current applicable labor laws and regulations, including without limitation RWC Chapters 39.12 (Prevailing Wages); 49.28 (Hours of labor); and 49.70 (Worker Right to Know).

3.4.4.4 Contractor and its Subcontractors of all tiers shall submit certified payrolls in accordance with RCW 39.12.120.

3.4.4.5 The Owner reserves the right to perform wage rate interviews and/or require Contractor submission of certified payrolls for all Contractor and Subcontractor personnel.

3.4.4.6 Contractor shall provide Owner with copies of the Intent to Pay Prevailing Wage forms as filed with the State of Washington for the contractor's forces and for all subcontractors.

Add the following 3.4.5

3.4.5 APPRENTICESHIP

3.4.5.1 Pursuant to RCW 39.04.320, no less than fifteen percent (15%) of the Labor hours shall be performed by apprentices, unless a different amount is permitted or otherwise required by law. During the term of this Contract, the Owner may adjust the apprenticeship labor hour requirement upon its finding or determination in accordance with RCW 39.04.320.

3.4.5.2 Apprenticeship hours shall be performed by participants in training programs approved by the Washington State Apprenticeship Council.

3.6 TAXES

Change subparagraph 3.6 to read:

3.6 The Contractor shall pay all applicable State and Local Sales, Consumer, Use and other similar taxes for Work or portions thereof provided by the Contractor. The Owner shall include these taxes in his payments to the Contractor who shall pay the taxes to the proper authorities in accordance with the applicable laws and regulations governing this project. Sales tax will not be included in bid amount.

3.7 PERMITS, FEES, NOTICES, AND COMPLIANCE WITH LAWS

Delete subparagraph 3.7.1 and substitute the following:

3.7.1 The **Owner** shall secure and pay for permits and associated plan review fees that are explicitly listed as the Owner's responsibility in the Contract Documents or bidding documents. The Contractor shall secure and pay for all other permits and governmental fees, licenses and inspections necessary for proper execution of and completion of the Contract which are legally required when bids are received.

3.9 SUPERINTENDENT

Add the following to subparagraphs 3.9.3:

During the construction period should the initial superintendent fall ill, retire, be laid off or terminated employment, the Owner reserves the right to review and accept the replacement as stated above.

ARTICLE 4
ARCHITECT

4.2 ADMINISTRATION OF THE CONTRACT

Replace 4.2.1 with::

4.2.1 The Owner will administer the Owner-Contractor Agreement. The Architect will assist in providing administration of the Contract as described in the Contract Documents and will be an Owner's representative but not the Owner's agent during construction until the date the Architect issues the final Certificate for Payment and from time to time during the one-year period for correction of Work.The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents, unless otherwise modified in writing in accordance with other provisions of the Contract. The Architect is not the agent of the Owner and is not authorized to agree on behalf of the Owner to changes in the Contract Sum or Contract Time, to waive provisions of the Contract Documents, to direct the Contractor to take actions that change the Contract Sum or Contract Time except that the Owner's representative may issue Construction Change Directives in accordance with Section 7.3

ARTICLE 5
SUBCONTRACTORS

5.3 SUBCONTRACTUAL RELATIONS

Add the following new subparagraph:

5.3.1 The Contractor shall schedule, supervise and coordinate the operations of all Subcontractors. No subcontracting of any of the Work shall relieve the Contractor from its responsibility for the performance of the Work in accordance with the Contract Documents or from its responsibility for the performance of any other of its obligations under the Contract Documents.

ARTICLE 6
CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

6.2 MUTUAL RESPONSIBILITY

Add the following to paragraph:

6.2.6 If the Contractor receives items from a separate contractor or from the Owner for storage, erection or installation, the Contractor shall acknowledge receipt for items delivered, and thereafter will be held responsible for care, storage and any necessary replacement of item or items received.

At subparagraph 6.2.4, delete the word "wrongfully."

ARTICLE 7
CHANGES IN THE WORK

Add 7.1.4 as follows:

7.1.4 Before effectuating a change in the Work or in the Contract Documents, the Owner may, through a Change Order Proposal or similar document, request the Contractor to propose the amount of change in the Contract Sum, if any, and the extent of change in the Contract Time, if any, arising from the proposed change in the Work. The Contractor shall submit its responsive proposal as soon as possible and within ten days, and shall in good faith specify the components and amounts by which the Contract Sum and/or Contract Time would change. Labor, materials and equipment shall be limited to and itemized in the manner described in Section 7.5 for the Contractor and Subcontractors of any tier. If the Contractor fails to respond within this time, the Owner may withhold some or all of a progress payment otherwise due until the tardy proposal is received. If the Owner explicitly accepts the proposal in writing, the Owner and the Contractor will be immediately bound to the terms of the proposal, the change will be included promptly in a future Change Order, and the change in the Work described in the proposal shall commence expeditiously. The Owner may reject the proposal, in which case the Owner may either not effectuate the change in the Work or may order the change through a Construction Change Directive or supplemental instruction or an order for a minor change in the Work. The Owner and Architect may confer directly with Subcontractors of any tier concerning any item proposed to the Owner under this Article.

Replace 7.3.4 with the following:

7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, or if the cost is to be determined under Section 7.3.3.3, the Contractor shall provide a not-to-exceed price for the Construction Change Directive Work within fourteen days of receipt of the Construction Change Directive, and the Contractor shall keep and present, itemized in the categories of Section 7.5 and in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data.

Add 7.5 as follows:

7.5 PRICING COMPONENTS

7.5 The total cost of any Change in the Work or of any other increase or decrease in the Contract Sum, including a Claim, shall be limited to the following components:

7.5.1 Direct Labor Costs

.1 Basic wages and fringe benefits: The hourly wage (without markup or labor burden) and fringe benefits paid as established by the Washington Department of Labor and Industries or contributed to labor trust funds as itemized fringe benefits, whichever is applicable, not to exceed that specified in the applicable "Intent to Pay Prevailing Wage" for the laborers, apprentices, journeymen, and foremen performing and/or directly supervising the Change in the Work on the site. The premium portion of overtime wages is not included unless pre-approved in writing by the Owner. Costs paid or incurred for vacations, per diem, subsistence, housing, travel, bonuses, stock options, or discretionary payments to employees are not separately reimbursable. The Contractor shall provide copies of certified payrolls for itself and Subcontractors of any tier upon the Owner's request.

.2 Workers' insurances: Direct contributions to the State of Washington as industrial insurance; medical aid; and supplemental pension by class and rates established by the Washington Department of Labor and Industries.

.3 Federal insurances: Direct contributions required by the Federal Insurance Compensation Act (FICA); Federal Unemployment Tax Act (FUTA); and State Unemployment Compensation Act (SUCA).

Upon the Owner's request, the Contractor shall substantiate all claimed wage rates and shall provide a breakdown of the various components of the labor costs in a form provided or approved by the Owner.

7.5.2 Direct Material Costs: This is an itemization, including material invoice, of the quantity and cost of additional materials reasonable and necessary to perform the change in the Work. The unit cost shall be based upon the net cost after all discounts or rebates, freight costs, express charges, or special delivery costs, when applicable. No lump sum costs will be allowed except when approved in advance by the Architect and the Owner. If the Contractor is offered discounts and/or rebates based upon prompt payment, the Contractor shall offer the Owner the opportunity to take advantage of such discount and/or rebate, and if the Owner makes such a prompt payment then the Owner shall only be charged the price as reduced by the discount and/or rebate. If the Owner declines the opportunity the Contractor may keep any such discounts and/or rebates it achieves through its own prompt payment. If the Contractor does not provide the Owner the opportunity to participate then the Contractor may only charge the net costs after consideration of discounts and rebates.

7.5.3 Construction Equipment Usage Costs: This is an itemization of the actual length of time that construction equipment appropriate for the Work will be used solely on the change in the Work at the site times the applicable rental cost as established by the lower of the local prevailing rate published in The Rental Rate Blue Book by EquipmentWatch, Atlanta, Georgia (copies of which shall be provided to the Owner), as modified by the AGC/WSDOT agreement or the actual, reasonable rate paid to unrelated third parties as evidenced by rental receipts. Rates and quantities of equipment rented that exceed the local fair market rental costs shall be subject to the Owner's prior approval. Total rental charges for equipment or tools shall not exceed 75% of the fair market purchase value of the equipment or the tool. Actual, reasonable mobilization costs are permitted if the equipment is brought to the Site solely for the change in the Work. If more than one rate is applicable, the best available rate shall be utilized. The rates in effect at the time of the performance of the changed Work are the maximum rates allowable for equipment of modern design and in good working condition and include full compensation for furnishing all fuel, oil, lubrication, repairs, maintenance, and insurance to the same extent as the comparable Blue Book or fair market rate. Equipment not of modern design and/or not in good working condition shall have lower rates. Hourly, weekly, and/or monthly rates, as appropriate, shall be applied to yield the lowest total cost. When rental rates payable do not include fuel, lubrication, maintenance, and servicing, as defined as operating costs in the Blue Book, such operating costs shall be reimbursed based on actual costs. The rate for equipment necessarily standing by for future use on the changed Work shall be no more than 50% of the rate established above. If equipment is required for which a rental rate is not established by Blue Book,

an agreed rental rate shall be established for that equipment, which rate and use must be approved by the Owner prior to performing the Work.

7.5.4 Cost of change in insurance or bond premium: This is as:

.1 Contractors' liability insurance: The actual cost (expressed as a percentage submitted with the certificate of insurance provided under Section 11.1.1.2, and subject to audit) of any changes in the Contractor's liability insurance arising directly from the changed Work; and

.2 Public works bond: The actual cost (expressed as a percentage submitted with evidence of bondability under Section 11.1.2, and subject to audit) of the change in the Contractor's premium for the Contractor's statutorily required performance and payment bond arising directly from the changed Work, and any such premiums for the Changed Work on Subcontractor bonds that have been contractually required by the Owner. The Contractor is not entitled to any increased premium on any retainage bond or any Subcontractor bond not contractually required by the Owner, as such bonds are optional.

Upon request, the Contractor shall provide the Owner with supporting documentation from its insurer or surety of any associated cost incurred.

7.5.5 Subcontractor Costs: These are payments the Contractor makes to Subcontractors for changed Work performed by such Subcontractors. The Subcontractors' cost of changed Work shall be determined in the same manner as prescribed in this Section 7.5 and among other things, shall not include consultant costs, attorneys' fees or claim preparation expenses.

7.5.6 Fee: This is the allowance for all combined overhead, profit and other costs, including all office, home office and site overhead (including project manager, project engineer, other engineers, project foreman, estimator, superintendent and their vehicles and assistants), taxes (except for sales tax), employee per diem, subsistence and travel costs, warranty, safety costs, quality control/assurance, purchasing, small or hand tool (a tool that costs $500 or less and is normally furnished by the performing contractor) or expendable charges, preparation of as-built drawings, impact on unchanged Work, Claim preparation, and delay and impact costs of any kind, added to the total cost to the Owner of any Change Order, Construction Change Directive, Claim or any other claim of any kind on this Project. No Fee shall be due, however, for direct settlements by the Owner of claims of Subcontractors of any tier claims. The Fee shall be limited in all cases to the following schedule:

.1 The Contractor shall receive 12% of the cost of any materials supplied or work properly performed by the Contractor's own forces.

.2 The Contractor shall receive 8% of the amount owed (less fee) directly to a first-tier Subcontractor or supplier for materials supplied or for work properly performed by that Subcontractor or supplier.

.3 Each Subcontractor of any tier shall receive 12% of the cost of any materials properly supplied or work performed by its own forces.

.4 Each Subcontractor of any tier shall receive 8% of the amount (less fee) it properly incurs for materials supplied or work properly performed by its suppliers or subcontractors of the next lower tier.

.5 The Contractor and its Subcontractors of any tier shall receive 5% of any amounts owed to any remote, sub-tier subcontractors which are within the lines of contractual responsibility but not in privity of contract with such Contractor or Subcontractors, for Work performed by that remote, sub-tier subcontractor.

.6 The cost to which this Fee is to be applied shall be determined in accordance with Section 7.5.1 through 7.5.4.

.7 The total summed Fee of the Contractor and all Subcontractors of any tier shall not exceed 25%. None of the fee percentages authorized in this Section 7.5.6 may be compounded with any other fee percentage or percentages authorized in this Section.

If a change in the Work involves both additive and deductive items, the appropriate Fee allowed will be added to the net difference of the items. If the net difference is negative, no Fee will be added to the negative figure as a further deduction. The parties acknowledge that the fees listed in this Section 7.5.6 are substantially greater that the fees and overhead normally included in determining the Contract Sum bid; that these higher percentages are a sufficient amount to compensate the Contractor for all effects and impacts of Changes in the Work; and that the resultant overcompensation of the Contractor for some Changes compensates the Contractor for any Changes for which the Contractor believes the percentage is otherwise insufficient.

7.5.7 The cost of any changed Work or of any other increase or decrease in the Contract Sum, including a Claim, shall not include, among other things, consultant costs, attorneys' fees or Claim preparation expenses. Such items are not recoverable from the Owner.

ARTICLE 8
TIME

8.1 PROGRESS AND COMPLETION

Replace 8.1.2 with the following:

8.1.2

The date of commencement of the Work is the date established by the Owner in its conditional notice to proceed, which may not be issued until the Contractor has complied with the terms of the notice of award the Contract. Work on the site may begin when the Contractor complies with the requirements of the Conditional Notice to Proceed. Within ten days of issuance of the Conditional Notice to Proceed, the Contractor shall submit the executed contract, evidence of bondability, certificates of insurance, and all other documents required by the Contract Documents.

8.2 PROGRESS AND COMPLETION

Add the following 8.2.4 and 8.2.5:

8.2.4 The Contractor shall furnish such manpower, materials, facilities, and equipment and shall work such hours, including night shifts, overtime operations and Sundays and holidays, as may be necessary to insure the progress and completion of the Work in accordance with the approved and currently updated Progress Schedule. If work actually in place falls behind the currently updated and approved Progress Schedule and it becomes apparent from the current schedule that the Work will not be completed within the Contract Time, the Contractor agrees that he will, as necessary, take some or all of the following actions at no additional cost to the Owner, as required to substantially eliminate tardiness of Work:

1. Increase the manpower in such quantities and crafts as will substantially eliminate, in the opinion of the Owner, the backlog of Work.
2. Increase the number of working hours per shift, shifts per working day, working days per week, or the amount of equipment, or any combination of the foregoing sufficiently to substantially eliminate, in the opinion of the Owner, the backlog of Work; and
3. Reschedule activities to achieve maximum practical concurrency of accomplishment of activities.

8.2.5 The Contractor and Owner acknowledge and contemplate that delay in substantial completion and final completion will cause the Owner substantial damages which are difficult to determine precisely. To the extent the Owner is unable to beneficially occupy each of the facilities which are the subject of this Contract, the Owner is expected to experience damages and costs including but not limited to the following: Loss of use of the facility; the costs of delayed move-in and the disruption of Owner activities and schedule; and rescheduling and shift changes to paid personnel. The parties therefore agree that the following sums of liquidated damages shall be paid to the Owner (or the Owner may withhold payments otherwise due to the Contractor) in liquidation of these difficult to measure damages and/or delay costs reasonably anticipated as a result of delays beyond the dates as established in the Contract, as they may be extended by agreement of the parties by change order during the course of the project:

SUBSTANTIAL COMPLETION: For each calendar day after the date fixed for Substantial Completion and until Substantial Completion of the facilities, the Contractor shall pay the Owner the sum of **one-thousand ($1,000.00).** The Owner shall not be required to accept Substantial Completion of anything

less than the entirety of the project but shall have the option to do so. This sum is to be fixed, agreed, liquidated damages and not to be construed as in any sense a penalty.
FINAL COMPLETION: The Contractor shall pay the Owner the sum not to exceed **five-hundred ($500.00)** per calendar day for failure to achieve Final Completion within **30** days after Substantial Completion. Actual damages will be calculated on the basis of direct architectural, administrative, and other related costs attributed to the Project from the date when Final Completion should have been achieved, to the date Final Completion is actually achieved. Owner may offset these costs against any payment due to the Contractor by reduction in retainage.

8.3 DELAYS AND EXTENSIONS OF TIME

Change 8.3.3 to read:
8.3.3 Except as provided in this subparagraph, the Contractor's sole remedy for delays shall be an extension of time. Except for unreasonable delays in performance caused by the acts or omissions of the Owner, the Contractor shall not be entitled to damages, extra compensation or equitable adjustment for direct, indirect or impact damages for delay, including but not limited to cost of acceleration, home office overhead or lost profits. All claims for damages or extensions of time are subject to the requirements of Article 15. In the event the Contractor is entitled to damages from the Owner for delay, it is agreed that the Contractor's sole damages for each day of delay shall be limited to the daily liquidated damage rate provided for the Owner in subparagraph 8.2.5 above.

ARTICLE 9
PAYMENT AND COMPLETION

9.3 APPLICATIONS FOR PAYMENT
Add the following 9.3.4:
9.3.4 If authorized by the Owner, the Application for Payment may include request for payment for material delivered to the Project site and suitably stored, or for completed preparatory work. Payment may similarly be requested, subject to Owner's approval, for material stored off the Project site, provided the Contractor complies with or furnishes satisfactory evidence of the following:

1. The material will be placed in a warehouse that is structurally sound, dry, lighted and suitable for the materials to be stored;
2. The warehouse is located within a 25-mile radius of the project. Other locations may be utilized, if approved in writing, by Owner;
3. Only materials for the Project are stored within the warehouse (or a secure portion of a warehouse set aside for the Project);
4. Contractor furnishes Owner a certificate of insurance extending Contractor's insurance coverage for damage, fire, and theft to cover the full value of all materials stored, or in transit;
5. The warehouse (or secure portion thereof) is continuously under lock and key, and only Contractor's authorized personnel shall have access;
6. Owner shall at all times have the right of access in company of the Contractor;
7. Contractor and its surety assume total responsibility for the stored materials; and
8. Contractor furnishes to Owner certified lists of materials stored, bills of lading, invoices, and other information as may be required, and shall also furnish notice to owner when materials are moved from storage to the Project site.

9.3 APPLICATIONS FOR PAYMENT
Add the following 9.3.5:
9.3.5 In accordance with RCW 60.28, a sum equal to five percent (5%) of each approved Application for Payment shall be retained. After award of a Contract for public improvements, or work for which retained percentages are required to be reserved under the provision of RCW 60.28, the Owner shall require the Contractor to exercise, in writing, one of the options listed below:

.1 Retained percentages will be retained in a fund by the Owner not subject to release until sixty days following the Final Acceptance of the Work as completed and as provided in Section 9.10.6; or

.2 Deposited by the Owner in an interest-bearing account in a bank, mutual savings bank or savings and loan association and not subject to release until sixty days following Final Acceptance of the Work as completed and as provided in Section 9.10.6; or

.3 Placed in escrow with a bank or trust company and not subject to release until sixty days following the Final Acceptance of the Work as completed and as provided in Section 9.10.6.

.4 If the Contractor provides a bond in place of retainage, it shall be in an amount equal to 5% of the Contract Sum plus change orders. The minimum requirements for the bond are that it must be on a form acceptable to the Owner, with an A.M. Best rating of "A-" or better and a financial rating of no less than "VII," and signed by a surety registered by the Washington State Insurance Commissioner and on the currently authorized insurance list published by the Washington State Insurance Commissioner; additional requirements as established by the Owner may be applied.

9.5 DECISIONS TO WITHHOLD CERTIFICATION

Add the following to 9.5.1:

9.5.1 The Architect may also decide not to certify payment or, because of subsequently discovered evidence or subsequent observations, may nullify the whole or part of a Certificate for Payment previously issued, or the Owner may refuse to process an application for payment to such extent as may be necessary in the Owner's or Architect's opinion to protect the Owner from loss because of:

Add the following new subparagraphs 9.5.1.8 through 9.5.1.12:

9.5.1.8 Unsatisfactory prosecution of the Work by the Contractor, including but not limited to failure to carry out the Work in accordance with the Contract Documents.

9.5.1.9 Failure or refusal of the Contractor to fully comply with requirements in the Contract Documents for preparation and submission of scheduling of the Work and updates thereof, or failure to present statements of Intents or Affidavits pertaining to prevailing wages paid as may be required by statue.

9.5.1.10 Liquidated damages.

9.5.1.11 Failure to provide adequate security measures to protect materials stored on site for which the Contractor is seeking payment for.

9.5.1.12 Failure to provide evidence that the performance and payment bonds have been increased to equal the sum of Change Orders.

9.6 PROGRESS PAYMENTS

Add the following 9.6.9 through 9.6.14:

9.6.9 Upon Commencement of the Work and at the option of the Contractor, an escrow account may be established by the Contractor in a financial institution chosen by the Contractor and approved by the Owner.

9.6.10 The escrow agreement shall provide that the financial institution will act as escrow agent, will pay interest on funds deposited in such account in accordance with the provisions of the escrow agreement and will disburse funds from the account upon the direction of the Owner as set forth below. Compensation to the escrow agent for establishing and maintaining the escrow account shall be paid from interest accrued in the escrow account.

9.6.11 As each progress payment is made, the retainage with respect to that payment shall be deposited by the Owner in the escrow account.

9.6.12 The interest earned on funds in the account shall accrue for the benefit of the Contractor until the substantial completion date named in the Construction Contract or the expiration of any authorized extension of such date. Interest earned after such date shall accrue for the benefit of the Owner. Cost of compensation to the escrow agent paid out of interest earned shall be borne by the Contractor.

9.6.13 When the Contractor has fulfilled all of the requirements of the Contract providing for reduction of retained funds, the escrow agent shall release to the Contractor one-half of the accrued funds but none of the interest thereon. When the Work has been fully completed in a satisfactory manner and the Architect has issued a final Certificate for Payment, the escrow agent shall pay to the Contractor the full amount of funds remaining in the account, including net balance of the interest paid to the account, but less any interest that may have accrued for the benefit of the Owner, which shall be paid to the Owner.

9.6.14 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor, the escrow agent shall make payment to the Contractor as provided in Subparagraph 9.10.3

9.8 SUBSTANTIAL COMPLETION

Change 9.8.1 to read:

9.8.1 Substantial Completion is the stage in the progress of the Work (or portion thereof designated and approved by the Architect and Owner) when the construction is sufficiently complete, in accordance with the Contract Documents, so the Owner can fully occupy under necessary permits the Work (or portion thereof designated by the Owner) for the use for which it is intended. All Work other than incidental corrective or punch list work and final cleaning shall have been completed.

Change subparagraph 9.8.5 to read:

9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of the responsibilities assigned to them in such Certificate.

Add the following new subparagraph:

9.8.6 The acceptance of Substantial Completion payment shall constitute a waiver of all claims by the Contractor except those previously made in writing and identified by the Contractor as unsettled at the time of the application for payment for the Substantial Completion payment, and except for the Contract Sums due at Final Acceptance.

9.10 FINAL COMPLETION AND FINAL PAYMENT

Add the following to 9.10.1:

The Architect's final Certificate of Payment shall establish the date of Final Completion. If the Contractor notifies the Architect that the punch list items are completed and requests an inspection to determine compliance, and the Architect determines that some or all the punch list items are not completed, the Contractor shall be responsible to the Owner for all costs, including Architect's fees, for any future Architect's inspections after the first inspection to determine subsequent compliance with the punch list.

Delete from 9.10.2: Delete *"remaining"* from the first sentence.

Add the following new subparagraph:

9.10.6 The retainage will be held and applied by the Owner as a trust fund in a manner required by RCW 60.28. Release of the retainage will be processed in ordinary course of business upon the expiration of sixty days following Final Acceptance of the Work by the Owner provided that no notice of lien shall have been given as provided in RCW 60.28, that no claims have been brought to the attention of the Owner and that the Owner has no claims under this Contract; and provided further that, for state-funded projects, release of retention has been duly authorized by the State. The following items must also be obtained prior to release of retainage: pursuant to RCW 60.28, a certificate from the Department of Revenue; pursuant to RCW 50.24, a certificate from the Department of Employment Security; and appropriate information from the Department of Labor and Industries.

ARTICLE 10
PROTECTION OF PERSONS AND PROPERTY

10.2 SAFETY OF PERSONS AND PROPERTY

Add the following 10.2.9:

10.2.9 At all times until final acceptance of the Work, the Contractor shall protect from damage, weather, deterioration, theft, vandalism, and, malicious mischief all materials, equipment, tools, and other items incorporated or to be incorporated in the Work, or consumed or used in the performance of the Work, and all Work in process and completed Work.

ARTICLE 13
MISCELLANEOUS PROVISIONS

13.4 TESTS AND INSPECTIONS

Add the following new subparagraph:

13.4.7 No acceptance by the Owner of any Work shall be construed to result from any inspection, tests or failures to inspect by the Owner, the Owner's representative, the Architect or any other person. No inspection, test, failure to inspect or test, or failure to discover any defect or non conformity by the Owner, the Owner's representative, the Architect or any other person shall relieve the Contractor of its responsibility for meeting the requirements of the Contract Documents or impair the Owner's right to reject defective or nonconforming items or right to avail itself of any other remedy to which the Owner may be entitled, notwithstanding the Owner's knowledge of the defect or nonconformity, its substantially or the ease of discovery.

ARTICLE 14
TERMINATION OR SUSPENSION OF THE CONTRACT

14.2 TERMINATION BY THE OWNER FOR CAUSE

Change subparagraph 14.2.1 to read:

14.2.1 The Owner may, upon seven days' written notice to the Contractor, terminate (without prejudice to any right or remedy of the Owner) the whole or any portion of the Work for cause, including the following circumstances:

1. the Contractor fails to prosecute the Work or any portion thereof with sufficient diligence to ensure the Substantial Completion of the Work within the Contract Time;
2. the Contractor is in material default of any provision of the Contract;
3. the Contractor is adjudged bankrupt, makes a general assignment for the benefit of its creditors, or if a receiver is appointed on account of its insolvency;
4. the Contractor fails to supply a sufficient number of properly skilled workers or proper materials;
5. the Contractor fails to make prompt payment due to Subcontractors or for materials or labor;
6. the Contractor disregards laws, ordinances, rules, regulations or orders of any public authority having jurisdiction; or
7. the Contractor materially breaches any provision of the Contract Documents.

Add the following new subparagraph:

14.2.5 If the Owner terminates in whole or part the Work pursuant to paragraph 14.2, the Owner may procure, upon such terms and in such manner as it deems appropriate, supplies or services similar to those terminated, and the Contractor shall be liable to the Owner for any excess costs for such similar supplies or services. The Contractor shall continue to perform of this Contract to the extent not terminated hereunder.

ARTICLE 15
ADMINISTRATION OF THE CONTRACT

15.1 CLAIMS AND DISPUTES

Add the following new subparagraphs 15.1.8 and 15.1.9:

15.1.8 All Claims filed against Owner shall be subject to audit at any time following the filing of the Claim. Failure of Contractor, or Subcontractor of any tier, to maintain and retain sufficient records to allow Owner to verify all or a portion of the Claim or to permit Owner access to the books and records of Contractor, or Subcontractors of any tier, shall constitute a waiver of the Claim and shall bar recovery. The audit may be performed by employees of Owner or a representative of Owner. Contractor, and its Subcontractors, shall provide adequate facilities acceptable to Owner, for the audit during normal business hours. Contractor, and all Subcontractors, shall make a good faith effort to cooperate with Owner's auditors.

15.1.9 The Contract Documents and the rights of the parties herein shall be governed by the laws of the State of Washington. Venue for all dispute resolution proceedings (including, but not limited to, mediation, arbitration, and litigation) shall be in the county in which the Owner's principal place of business is located, unless otherwise specified.

END OF SECTION

SECTION 009000
WAGE RATES AND APPRENTICESHIP UTILIZATION

GENERAL

1.01 WAGE RATES

A. Contractor shall comply with the prevailing wage requirements of chapter 39.12 RCW and WAC 296-127. Specifically including RCW 39.12.020 and WAC 296-127-023 (Building Service Maintenance), if applicable. Contractor shall pay not less than the prevailing rate of per diem wages to its employees and shall provide documentation to the County of its compliance with prevailing wage laws and regulations. A copy of such prevailing rates of wage statement whall be posted by the Contractor in a location readily visible to workers at the job site or as provided in RCW 30.12.020.

B. For contracts greater than $2,500, a “Statement of intent to Pay Prevailing Wages”: (hereinafter “Statement of Intent”) must be submitted to and approved by the State Department of Labor and Industries prior to beginning work by the Contractor. If the Contract is more than $10,000, the Statement of Intent shall include the Contractor's registration number, the prevailing wage for each classification of workers, and an estimate of the number of workers in each classification. An 'Affidavit of Wages Paid' must be submitted to and approved by the State Department of Labor and Industries by the Contractor prior to release of the retained percentage. Copies of these documents shall be provided to the County prior to any payment being made to the Contractor. The fee for each of these documents shall be paid by the Contractor.

C. Contractors must file weekly payroll reports for all prevailing wage jobs (regardless of project amount) and submit them directly to L&I.

D. A list of the applicable prevailing wage rates are available at URL:
   1. https://lni.wa.gov/licensing-permits/public-works-projects/prevailing-wage-rates/

1.02 APPRENTICESHIP UTILIZATION

A. Pursuant to RCW 39.04.320, for all public works estimated to cost one million dollars or more, no less than fifteen percent (15%) of the labor hours shall be performed by apprentices. The Contractor is responsible for monitoring Project compliance.

B. Apprenticeship hours shall be performed by participants in training programs approved by the Washington State Apprenticeship Council.

C. The Owner may adjust the apprenticeship requirement as allowed in RCW 39.04.320 only if the Contractor establishes to the satisfaction of the Owner that one or more of the following reasons exists.
   1. The demonstrated lack of availability of apprentices in specific geographic areas;
   2. A disproportionately high ratio of material costs to labor hours, which does not make feasible the required minimum levels of apprentice participation;
   3. Participating contractors have demonstrated a good faith effort to comply with the requirements of RCW **39.04.300** and **39.04.310** and this section
   4. Other criteria the awarding entity deems appropriate, which are subject to review by the office of the governor.

END OF SECTION 009000

SECTION 011000
SUMMARY OF WORK

PART 1 GENERAL

1.01 PROJECT

A. Project Name: Kitsap County Emergency Management

B. Project Location: 8900 SW Imperial Way, Bremerton, WA 98312

C. Owner: Kitsap County

D. Architect: Bauarc, 1230 Bay Street, Ste 110, Port Orchard, WA 98366
   1. Contact: Jim Baurichter, jim@bauarc.com, 206-406-0522

E. The work includes, but is not limited to the following scope:
   1. Tenant improvements to the existing 8900 building.
   2. New single occupant bathroom addition and new entrance canopy.
   3. New insulation, roof, and metal siding panels entire building.
   4. New plumbing, mechanical, and electrical systems
   5. Updates to existing fire suppression and fire alarm system
   6. New water and electrical service.
   7. Associated site improvements including new fencing, pedestrian paving, and landscaping.

1.02 CONTRACT DESCRIPTION

A. Contract Type: A single prime contract based on a Stipulated Price as described in 005000 – Standard Form of Agreement.

1.03 PERMITS

A. The Owner will pay for the building, mechanical, and plumbing permits.

B. The Owner will pay for PSE electrical service design and installation fees.

C. The Contractor shall be responsible for securing and paying for any permits related to bidder design systems or other deferred submittals included in the contract documents.

D. The Contractor shall be responsible for securing and paying for any required permits related to off-site work or work in the public Right-of-Way.

E. Prior to final acceptance, the approved, signed permits shall be delivered to the owner.

1.04 PRINTING OF CONTRACT DOCUMENTS

A. The Contractor is responsible for printing copies of the contract documents as required for their use. PDF's of the permit set and a conformed set will be provided by the Architect.

B. The Contractor is responsible for printing (1) copy of the City approved permit drawing set in color to be kept on-site as required by the City of Bremerton for inspections.

1.05 WORK SEQUENCE AND SCHEDULE

A. The Contractor will be issued Notice to Proceed on or about the date listed below. A weekly construction coordination meeting will occur immediately thereafter. Site Access will be granted by KCDEM on the Notice to Proceed date listed below, to begin mobilization and construction activities provided KCDEM has received required bonds and insurance certificates.

B. **Project Schedule:**
   1. **The Contractor shall follow and incorporate in his planning of the Project this work sequence**
      a. **Anticipated Notice to Proceed: On or About 8/25/23**

b. **Substantial Completion:** **3/8/24**
c. **Final Completion:** **3/29/24**

1.06 LIQUIDATED DAMAGES

A. For each calendar day of delay beyond the dates below, the following liquidated damages amounts shall apply:
   1. $1,000.00 per day for delay in achieving Substantial Completion
   2. $500.00 per day for every day that Final Completion is delayed beyond 30 calendar days.

1.07 WORK BY OWNER

A. General:
   1. Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under separate contracts.
   2. Provide rough-in as indicated on drawings for work by owner's third party contractor if applicable.

B. Concurrent Work: Owner will award separate contracts for the following construction operations at the Project Site. These operations will be conducted simultaneously with work under this Contract.
   1. Access control including any access control related door hardware designated as OFOI in section 087100.
   2. CCTV cabling and equipment.
   3. Fiber connection to building.
   4. Data Cabling

1.08 OWNER FURNISHED, CONTRACTOR INSTALLED ITEMS

A. White Boards

B. Tack Boards

C. Projection Screens

D. Wall Mounted TV Monitors and hardware where indicated on drawings as OFCI. TV's in room 127 are OFOI.

E. Other items labeled OFCI in drawings.

1.09 OWNER USE OF THE PREMISES

A. The owner will vacate the 8900 building during construction.

B. The owner will continue to use and access two warehouse buildings on site and use the site for storage of vehicles.

C. A portion of the site well away from the area of work is leased to a third party for storage of empty POD storage units.

D. The owner will use a KCDEM owned RV parked on-site. See electrical for temp power provided to this vehicle.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION – NOT USED

END OF SECTION 011000

SECTION 012000
PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Requirements:
   1. Section 012600 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
   2. Section 013216 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.03 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.04 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
   1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:
      1) Application for Payment forms with continuation sheets.
      2) Submittal schedule.
      3) Items required to be indicated as separate activities in Contractor's construction schedule.
   2. Submit the schedule of values to Architect at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.

B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
   1. Identification: Include the following Project identification on the schedule of values:
      1) Project name and location.
      2) Name of Architect.
      3) Architect's project number.
      4) Contractor's name and address.
      5) Date of submittal.
   2. Arrange schedule of values consistent with format of AIA Document G703.
      a. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:
      b. Related Specification Section or Division.
      c. Description of the Work.
      d. Name of subcontractor.
      e. Change Orders (numbers) that affect value.
      f. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
         1) Labor.
         2) Materials.

3. Equipment.
4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Project Manual table of contents.
5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
6. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
7. Provide line item(s) for project closeout. Amount of project closeout items shall not be less than 1.25% of total construction contract amount.

1.05 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
   1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.

D. Application Preparation: Complete every entry on form. Execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
   1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
   2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
   3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
   4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.

E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
   1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
   2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
   3. Provide summary documentation for stored materials indicating the following:
      a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
      b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
      c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.

F. Transmittal: Email and signed copy of each Application for Payment to Architect and owner’s representative.

G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
   1. List of subcontractors.

2. Schedule of values.
3. Contractor's construction schedule (preliminary if not final).
4. Delete items from three subparagraphs below submitted before executing the Contract.
5. Certificates of insurance and insurance policies.
6. Performance and payment bonds.

H. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
   1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
   2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

I. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
   1. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
   2. Retain first subparagraph below if a surety is involved.
   3. AIA Document G707, "Consent of Surety to Final Payment."

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 012900

SECTION 012300
ALTERNATES

PART 1 GENERAL

1.01 GENERAL

A. The Owner reserves the right to accept any, all, or none of the alternate bid items. The determination of the lowest bona fide bid will include an evaluation of alternates to be accepted by the Owner.

B. In preparing his price for each alternate bid item, the Contractor shall include all costs necessary to provide and install complete and in operating order in accordance with Contract Documents, and as indicated in the General Requirements and General Conditions, all component parts necessary to add or deduct each alternate bid item individually.

C. Following are the descriptions of the alternate bid items; the Contractor shall indicate on the Bid Form whether each individual item is additive or deductive.

1.02 DESCRIPTION OF ALTERNATES

A. **Alternate Bid Item #1**: DDC Controls
   1. **Base Bid Item**: Do not include DDC Controls in Base Bid.
   2. **Alternate Bid Item #1A**: Furnish and install Andover controls by Schneider Electric
   3. **Alternate Bid Item #1B**: Furnish and install Alerton controls by ATS Automation

END OF SECTION 012300

SECTION 012500
SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 RELATED REQUIREMENTS SPECIFIED ELSEWHERE

A. 002113 Instructions to Bidders - Substitutions During Bidding.
B. 013000 Administrative Requirements: Coordination
C. 016000 Product Requirements: Fundamental product requirements

1.02 CONTRACTOR'S OPTIONS

A. For products specified only by reference standards, select any product meeting standards, by any manufacturer.
B. Products specified by naming one or more manufacturers: Products of manufacturers named and meeting specifications, no options or substitutions allowed.
C. Products specified by naming one or more manufacturers with a provision for substitutions: Submit a request for substitution for any manufacturer not named.
D. Products specified by "Similar To" a listed manufacturer: Products of similar quality to listed manufacturer.

1.03 SUBSTITUTIONS

A. During bidding substitution requests shall be emailed to Owner’s Purchasing Program Supervisor. The Architect will consider written requests for substitutions only when received on the form provided in Section 012500. No request will be considered unless received at least ten (10) calendar days prior to the bid date. Requests for substitutions after the bid date will only be considered if in conformance to specified Section 012500, paragraph1.06.
B. In connection with the use of any substitute item approved by the Owner and Architect, it shall be the Contractor's responsibility to see that such items meet all space requirements, and that any alterations to connecting items necessitated by use of the alternate items are properly made, at no increase in cost to the Owner.
C. Specific reference in the specifications to any article, device, product, materials, form or type of construction, etc., by name, make or catalog number, shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition.
D. In making request for substitution, Bidder/Contractor represents:

1. He has personally investigated the proposed product or method, and determined that it is equal or superior in all respects to that specified.
2. He will provide the same guarantee for substitution as for product or method specified.
3. He will coordinate installation of accepted substitution into Work, making such changes as may be required for Work to be complete in all respects at no additional cost to Owner.
4. He waives all claims for additional costs or time extensions related to substitution which consequently becomes apparent.

5. He will reimburse Owner and ARCHITECT for review or redesign services associated with the substitution and re-approval by authorities.

E. In order to allow the fullest competition, consistent with the Owner's interests, the Architect will give consideration, prior to submission of proposals, to requests for approval of products and materials competitive with and similar to those specified by proprietary name.

F. To be considered and in order to facilitate review of requests for approval of substitutions for specified products or materials, all such requests shall be made in writing on the form included as a part of this section.

G. Should any proposed product substitution require any redesign work by the Architect to accommodate the substitute product, costs for such redesign work shall be Engineer included in the Bid amount and shall be paid to the Design Consultant at the Design Consultant's usual rates for the time expended in the required redesign work.

H. Substitutions will not be considered when they are indicated or implied on shop drawings or product data submittals, if they have not been previously approved.

I. Substitution submittal procedure:

1. All substitution requests shall be accompanied with the Substitution Request Form, completely filled out. Substitution Request Forms are bound in the specifications following Section 012500. Limit each request form to one proposed substitution.
2. Submit substitution request form and supporting data.
3. Clearly indicate with red arrows on the supporting data the proposed substitution and accessories.

J. Substitution Review Procedure: Because of the number of substitution requests typically received before bidding and the coordination required to review these, the following procedures will apply:

1. Substitution requests received after the time specified in paragraph 1.05 A. will not be reviewed nor listed on addenda.
2. Substitution requests will be evaluated and the request form will be annotated in the column marked "For Use by Architect". It will then be retained in the Architect's file.
3. The Substitution Request Form and submitted data will <u>not</u> be returned to the submitter. These forms are for the Architect's in-house use only.
4. Only approved substitutions will be listed on addenda. All proposed substitutions not listed on addenda shall be considered by the submitter and the Contractor as a non-acceptable substitution and shall not be used.

1.04 ARCHITECT'S OPTIONS

A. The Architect will be sole judge of acceptability of any proposed substitution.

B. Only approved substitutions may be used on Contract Work.

C. Each request for substitution approval shall include:

1. Identity of product for which substitution is requested; include specification page and paragraph number.
2. Identity of substitution; include complete product description, drawings, photographs performance and test data, and any other information necessary for evaluation.
3. Quality comparison of proposed substitution with specified product.
4. Changes required in other work because of substitution.

5. Effect on construction progress schedule.
6. Cost comparison of proposed substitution with specified product.
7. Any required license fees or royalties.
8. Availability of local maintenance service.
9. Source of replacement materials.

1.05 DURING BIDDING PERIOD

A. No request for substitution approval will be considered unless a written request has been submitted on Substitution Request Form bound hereinafter, and has been received by Owner's Purchasing Program Supervisor at least ten (l0) calendar days prior to bid.

1.06 AFTER CONTRACT AWARD

A. Approval will be granted only when:

1. Specified product has been discontinued, or
2. Specified product has been replaced by superior product, or
3. Specified product will not fit within designated space, or
4. Specified product does not comply with governing codes or regulations, or
5. Substitution determined by the Owner to be in his best interest.

SUBSTITUTION REQUEST FORM

DURING BIDDING PERIOD
TO: Kitsap County Purchasing Office
Attn: Glen McNeill
Purchasing@co.kitsap.wa.us

AFTER CONTRACT AWARD
TO: Bauarc
Attn: Jim Baurichter
1230 Bay Street, Ste 110
Port Orchard, WA 98366
jim@bauarc.com

PROJECT NAME:
KITSAP DEPT. OF EMERGENCY MANAGEMENT TI

We hereby submit for consideration, the following product instead of specified item for above project:

Section Paragraph Specified Item

_____

Proposed Substitution:_____

Attach complete dimensional information and technical data including laboratory tests, if applicable.

Include complete information on changes to Drawings and/or specifications which proposed substitution will require for its proper installation.

Submit with request all necessary samples and substantiating data to provide equal quality, performance, and appearance to that which is specified. Clearly mark manufacturer's literature to indicate equality in performance. Differences in quality of materials and construction shall be indicated.

The undersigned states that the following paragraphs, unless modified on attachments, are correct:

1. The proposed substitutions does not affect dimensions shown on drawings.
2. The undersigned will pay for changes to the building design, including engineering design, detailing and construction costs caused by the requested substitution.
3. The proposed substitution will have no adverse affect on other trades, the construction schedule, or specified warranty requirements.
4. Maintenance and service parts will be locally available for the proposed substitution.
5. The proposed substitution will have no affect on applicable codes.
6. The manufacturer's guarantee or warranties of proposed product is equivalent to; or exceeds that of the specified product.

List of names and location of three similar projects on which product was used, date of installation, and Engineer's name and phone number.

CERTIFICATION OF EQUAL PERFORMANCE AND ASSUMPTION OF LIABILITY FOR EQUAL PERFORMANCE

UNDERSIGNED ATTESTS THAT FUNCTION AND QUALITY ARE EQUAL TO OR SUPERIOR TO SPECIFIED ITEMS.

Submitted By:

Signature Title

Firm

Address

City, State Zip

Telephone Date

Above signature must be by person having authority to legally bind his firm to the above terms.

FOR USE BY ARCHITECT OR ENGINEER:

_____Accepted _____Accepted as Noted

_____Not Accepted _____Received Too Late

By_____

Date_____

Remarks_____

END OF SECTION 012500

SECTION 012600
CONTRACT MODIFICATION PROCEDURES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

B. Section 012500 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.

C. Section 013000 "Administrative Requirements" for: Coordination

1.02 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

B. Related Requirements:

C. Changes to the Contract may involve close coordination between this Section and Section listed below.

1.03 MINOR CHANGES IN THE WORK

A. Request for Information (RFI) Clarifications not involving adjustment to the Contract Sum or the Contract Time see Section 013000.

B. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710 or similar, Architect's Supplemental Instructions (ASI).

1.04 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

B. Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.

C. Within time specified in Proposal Request or 10 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
   1. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
   2. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
   3. Include costs of labor and supervision directly attributable to the change.
   4. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
   5. Quotation Form: Use forms acceptable to Architect.

1.05 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701 or similar.

1.06 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714 or similar form. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

B. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

C. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

D. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 012600

SECTION 013000
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

B. Section 013300 “Submittals’

1.02 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
   1. General coordination procedures.
   2. Coordination drawings.
   3. Requests for Information (RFIs).
   4. Project meetings.

B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.

C. Related Requirements:
   1. Section 012600 "Contract Modification Procedures"
   2. Section 013200 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
   3. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
   4. Section 017700 "Closeout Procedures" for coordinating closeout of the Contract.

1.03 DEFINITIONS

A. RFI: Request from Owner,Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.04 INFORMATIONAL SUBMITTALS

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
   1. Name, address, and telephone number of entity performing subcontract or supplying products.
   2. Number and title of related Specification Section(s) covered by subcontract.
   3. Drawing number and detail references, as appropriate, covered by subcontract.

B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
   1. Post copies of list in project meeting room, in temporary field office,and by each temporary telephone. Keep list current at all times.

1.05 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of Contractor's construction schedule.
2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

1.06 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
b. Coordinate the addition of trade-specific information to the coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
f. Indicate required installation sequences.
g. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor

dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordination Drawing Organization: Organize coordination drawings as follows:
   1. Mechanical and Plumbing Work: Show the following:
      a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
      b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
      c. Fire-rated enclosures around ductwork.
   2. Fire-Protection System: Show the following:
      a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.
   3. Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make changes as directed and resubmit.

1.07 REQUESTS FOR INFORMATION (RFIS)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
   1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
   2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
   1. Project name.
   2. Project number.
   3. Date.
   4. Name of Contractor.
   5. Name of Architect.
   6. RFI number, numbered sequentially.
   7. RFI subject.
   8. Specification Section number and title and related paragraphs, as appropriate.
   9. Drawing number and detail references, as appropriate.
   10. Field dimensions and conditions, as appropriate.
   11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
   12. Contractor's signature.
   13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
      a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: AIA Document G716 or Architect approved standard form used by Contractor.
   1. Attachments shall be electronic files in Adobe Acrobat PDF format.

D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI.
   1. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
   2. If Architect's action on RFIs may result in a change to the Contract Time or the Contract Sum the contractor shall request issuance of a Proposal Request according to Section 012600 "Contract Modification Procedures."

a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 7 days of receipt of the RFI response.

1.08 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.
   1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
   2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
   3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.

B. Preconstruction Conference: Architect will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.
   1. Conduct the conference to review responsibilities and personnel assignments.
   2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
   3. Agenda: Discuss items of significance that could affect progress, including the following:
      a. Tentative construction schedule.
      b. Phasing.
      c. Critical work sequencing and long-lead items.
      d. Designation of key personnel and their duties.
      e. Lines of communications.
      f. Procedures for processing field decisions and Change Orders.
      g. Procedures for RFIs.
      h. Procedures for testing and inspecting.
      i. Procedures for processing Applications for Payment.
      j. Distribution of the Contract Documents.
      k. Submittal procedures.
      l. Preparation of record documents.
      m. Use of the premises and existing building.
      n. Work restrictions.
      o. Working hours.
      p. Owner's occupancy requirements.
      q. Responsibility for temporary facilities and controls.
      r. Procedures for disruptions and shutdowns.
      s. Parking availability.
      t. Office, work, and storage areas.
      u. Equipment deliveries and priorities.
      v. First aid.
      w. Security.
      x. Progress cleaning.
   4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Progress Meetings: progress meetings, conducted by the Architect will be at weekly intervals.
   1. Coordinate dates of meetings with preparation of payment requests.
   2. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these

meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.

3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
   a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
      1) Review schedule for next period.
   b. Review present and future needs of each entity present, including the following:
      1) Sequence of operations.
      2) Status of submittals.
      3) Progress cleaning.
      4) Status of correction of deficient items.
      5) Field observations.
      6) Status of RFIs.
      7) Status of proposal requests.
      8) Status of Change Orders.
      9) Documentation of information for payment requests.
4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
   a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 012900

SECTION 013206
CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.01 RELATED DOCUMENTS

1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

1. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
   a. Startup construction schedule.
   b. Contractor's construction schedule.
   c. Daily construction reports.
2. Related Requirements:
   a. Section 013300 "Submittals" for submitting schedules and reports.

1.03 INFORMATIONAL SUBMITTALS

1. Format for Submittals: Submit required submittals in the following format:
   a. Working electronic copy of schedule file, where indicated.
   b. PDF electronic file.
   c. Two paper copies for submittals.
2. Startup construction schedule.
3. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
   a. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.

1.04 COORDINATION

1. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

PRODUCTS

1.05 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

1. Time Frame: Extend schedule from date established for the Notice of Award to date of final completion.
   a. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
2. Activities: Treat each story or separate area as a separate numbered activity for each main element of the Work. Comply with the following:
   a. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
   b. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
   c. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
3. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.

4. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
   a. Unresolved issues.
   b. Unanswered Requests for Information.
   c. Rejected or unreturned submittals.
   d. Notations on returned submittals.
   e. Pending modifications affecting the Work and Contract Time.

1.06 STARTUP CONSTRUCTION SCHEDULE

1. Bar-Chart Schedule: Submit startup, horizontal, bar-chart-type construction schedule within seven days of date established for commencement of the Work.
2. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

1.07 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

1. General: Prepare network diagrams using AON (activity-on-node) format.
2. CPM Schedule: Prepare Contractor's construction schedule using a time-scaled CPM network analysis diagram for the Work.
   a. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 60 days after date established for the Notice to Proceed.
      1) Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.
   b. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule in order to coordinate with the Contract Time.
3. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.
   a. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
      1) Preparation and processing of submittals.
      2) Mobilization and demobilization.
      3) Purchase of materials.
      4) Delivery.
      5) Fabrication.
      6) Utility interruptions.
      7) Installation.
      8) Work by Owner that may affect or be affected by Contractor's activities.
      9) Testing.
      10) Punch list and final completion.
      11) Activities occurring following final completion.
   b. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
   c. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
   d. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
      1) Subnetworks on separate sheets are permissible for activities clearly off the critical path.
      2) Each activity cost shall reflect an appropriate value subject to approval by Architect.

3) Total cost assigned to activities shall equal the total Contract Sum.

4. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall project schedule.
5. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:
   a. Contractor or subcontractor and the Work or activity.
   b. Description of activity.
   c. Main events of activity.
   d. Immediate preceding and succeeding activities.
   e. Early and late start dates.
   f. Early and late finish dates.
   g. Activity duration in workdays.
   h. Total float or slack time.
   i. Average size of workforce.
   j. Dollar value of activity (coordinated with the schedule of values).
6. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
   a. Identification of activities that have changed.
   b. Changes in early and late start dates.
   c. Changes in early and late finish dates.
   d. Changes in activity durations in workdays.
   e. Changes in the critical path.
   f. Changes in total float or slack time.
   g. Changes in the Contract Time.

1.08 REPORTS

1. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
   a. List of subcontractors at Project site.
   b. Approximate count of personnel at Project site.
   c. Equipment at Project site.
   d. Material deliveries.
   e. High and low temperatures and general weather conditions, including presence of rain or snow.
   f. Accidents.
   g. Meetings and significant decisions.
   h. Unusual events (see special reports).
   i. Stoppages, delays, shortages, and losses.
   j. Orders and requests of authorities having jurisdiction.

EXECUTION

1.09 CONTRACTOR'S CONSTRUCTION SCHEDULE

1. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities.
   a. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
   b. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
   c. As the Work progresses, indicate final completion percentage for each activity.

2. Distribution: Distribute copies of approved schedule to Architect Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
   a. Post copies in Project meeting rooms and temporary field offices.
   b. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 012900

SECTION 013300
SUBMITTALS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes administrative and procedural requirements for submittals required for performance of the Work, including the following:
   1. Contractor's construction schedule.
   2. Submittal schedule.
   3. Daily construction reports.
   4. Shop drawings.
   5. Product data.
   6. Product Samples and Mock-up Installations

B. Administrative Submittals: Refer to other Division 1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to, the following:
   1. Permits
   2. Applications for payment
   3. Performance and payment bonds.
   4. Insurance certificates.
   5. List of subcontractors.

C. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Division 1 Section "Applications for Payment" specifies requirements for submittal of the Schedule of Values.
   2. Division 1 Section "Project Meetings" specifies requirements for submittal and distribution of meeting and conference minutes.
   3. Division 1 Section "Contract Closeout" specifies requirements for submittal of Project Record Documents and warranties at project closeout.
   4. General Conditions include requirements for construction schedules.

D. Methods of Sending: See 013100 Project Management for acceptable means of sending submittals.

1.03 DEFINITIONS

A. Coordination Drawings show the relationship and integration of different construction elements that require careful coordination during fabrication or installation to fit in the space provided or to function as intended.

B. Shop Drawings: Shop drawings include specially-prepared technical data for this project, including drawings, diagrams, performance curves, data sheets, schedules, templates, patterns, reports,

calculations, instructions, measurements and similar information not in standard printed form for general application to several projects.

C. Product Data: Product data includes standard printed information on materials, products and systems; not specially-prepared for this project, other than the designation of selections from among available choices printed therein.

1.04 SUBMITTAL PROCEDURES

A. General:
   1. Before submittal of shop drawings, brochures, and lists, Contractor shall carefully review same for correctness, dimensions, and technical applicability to the project Contract Document requirements. Contractor is to note his/her approval together with any notes or amendments thereto for compliance with the Contract Documents by suitable stamp, date and the signature of the Contractor or his/her representative authorized to so sign. Items submitted but not stamped and signed by the Contractor will not be reviewed by the Architect until stamped and signed as noted herein above.
   2. Submit Operation and Maintenance Manuals 10 days prior to scheduled training sessions.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.
   1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
   2. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination.
      a. The Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until all related submittals are received. Submittals requiring color selection is one example of a sample which may take longer to process.
   3. Process: To avoid the need to delay installation as a result of the time required to process submittals, allow sufficient time for submittal review, including time for re-submittals.
      a. Allow 2 weeks for initial review. Allow additional time if the Architect must delay processing to permit coordination with subsequent submittals.
      b. If an intermediate submittal is necessary, process the same as the initial submittal.
      c. Allow 1 week for reprocessing each submittal.
      d. No extension of contract Time will be authorized because of failure to transmit submittals to the Architect sufficiently in advance of the Work to permit processing.

C. Submittal Preparation: Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.
   1. Provide spaces approximately 4 by 5 inches (100 by 125 mm) each on the label or beside the title block on Shop Drawings to record the Contractor's and Owner’s review and approval markings and the action taken.
   2. Include the following information on the label for processing and recording action taken.
      a. Project name.
      b. Date.
      c. Name and address of Architect.
      d. Name and address of the Contractor.
      e. Name and address of the subcontractor.
      f. Name and address of the supplier.
      g. Name of the manufacturer.
      h. Number and title of appropriate Specification Section.
      i. Drawing number and detail references, as appropriate.

D. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from the contractor to the Owner using a transmittal form. The Owner will not accept submittals received from sources other than the Contractor.
   1. On the transmittal, record relevant information and requests for data. On the form, or separate sheet, record deviations from Contract Document requirements, including variations and limitations. Include Contractor's certification that information complies with Contract Document requirements.

E. Submittal Log:
   1. Contractor shall prepare a log of submittals and their actions
   2. Include the Submittal log with the Record Product Data at Substantial Completion

1.05 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Within 10 calendar days after the Notice to Proceed, the Contractor shall submit a construction schedule for the Work. The schedule shall be in bar-graph format, or similar format approved by the Architect and Owner. The schedule shall be time-scaled, with weekends and holidays shown. Duration shall be in workdays. No on-site activity shall be of a duration greater than fifteen workdays. Show all construction-related activities including activities such as mobilization, punch list completion and project closeout. Include activities related to procurement, delivery and installation of emergency generator.

B. Contractor shall meet with the Owner to review the construction schedule and explain the Contractor’s approach to the scheduling and sequencing of the Work. Within five days after the meeting, the Contractor shall adjust and resubmit the construction schedule to fairly incorporate comments by the Owner.

1.06 SUBMITTAL SCHEDULE

A. Coordinate the List of Subcontractors, Schedule of Values, O & M Manuals, the Products Submittals and the Contractor's Construction Schedule.
   1. Prepare the Contractor's Construction Schedule in chronological order. Provide the following information:
      a. Scheduled date for the first submittal.
      b. Related Section number.
      c. Submittal category (Shop drawings, Product Data, or Samples).
      d. Name of the subcontractor.
      e. Description of the part of the Work covered.
      f. Scheduled date for re-submittal.
      g. Scheduled date for the Owner’s final release or approval.

B. Distribution: Following response to the initial submittal, print and distribute copies to the Owner, subcontractors, and other parties required to comply with submittal dates indicated.
   1. When revisions are made, distribute to the same parties. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.

C. Schedule Updating: Revise the schedule after each meeting or activity where revisions have been recognized or made. Issue the updated schedule concurrently with the report of each meeting.

1.07 DAILY CONSTRUCTION REPORTS

A. Prepare a daily construction report recording the following information concerning events at the site, and submit duplicate copies to the Owner on a daily basis by fax or electronically:
   1. List of Contractor and subcontractors at the site.
   2. Count of personnel at the site for contractor and each subcontractor.

3. Work started, in progress and completed.
4. High and low temperatures, general weather conditions.
5. Accidents and unusual events.
6. Meetings and significant decisions.
7. Stoppages, delays, shortages, and losses.
8. Equipment on site.
9. Emergency procedures.
10. Orders and requests of governing authorities.
11. Change Orders received, implemented.
12. Equipment or system tests and startups.
13. Partial Completions, occupancies.
14. Substantial Completions authorized.
15. Number and location(s) of construction photographs taken.
16. Other significant project activities, decisions and impacts that occurred.

1.08 SHOP DRAWINGS

A. Submit newly prepared information drawn accurately to scale. Highlight, circle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not a Shop Drawing. Submitting quantities necessary for Contractor and subcontractors/suppliers, plus the quantities required for the Owner.

B. All items shown on shop drawings that do not conform to drawings and specifications shall be specifically noted as such, flagged and brought to the Architect's attention. In any case, the Architect's stamp of review shall not include approval of unauthorized changes in the Contract Documents, except where specific written approval is given.

C. Shop Drawings include fabrication and installation Drawings, setting diagrams, schedules, patterns, templates and similar Drawings. Include the following information:
   1. Dimensions.
   2. Identification of products and materials included by sheet and detail number.
   3. Compliance with specified standards.
   4. Notation of coordination requirements.
   5. 5Notation of dimensions established by field measurement.
   6. Sheet Size: Except for templates, patterns and similar full-size Drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 24 by 36 inches.
   7. Submit one print for the Architect's review. The Architect will return one print.
   8. Do not use Shop Drawings without an appropriate final stamp indicating action taken.

1.09 PRODUCT DATA

A. Collect Product Data into a single submittal for each element of construction or system. Product data includes printed information, such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams, and performance curves.
   1. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products that are not required, mark copies to indicate the applicable information. Include the following information:
      a. Manufacturer's printed recommendations.
      b. Compliance with trade association standards.
      c. Compliance with recognized testing agency standards.
      d. Application of testing agency labels and seals.
      e. Notation of dimensions verified by field measurement.
      f. Notation of coordination requirements.
   2. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.

3. Submittals: Submit enough copies such that the Architect may retain 2 sets, and so that the Contractor will have enough copies for his use and for his subcontractors and suppliers, plus the number required for the maintenance manuals. The Architect will retain two sets and will return the others marked with action taken and corrections or modifications required.
   a. Unless noncompliance with Contract Document provisions is observed, the submittal may serve as the final submittal.
4. Distribution: Furnish copies of final submittal to installers, subcontractors, suppliers, manufacturers, fabricators, and others required for performance of construction activities. Show distribution on transmittal forms.
   a. Do not proceed with installation until a copy of Product Data is in the Installer's possession.
   b. Do not permit use of unmarked copies of Product Data in connection with construction.

1.10 SAMPLES

A. Submit samples of the actual product specified to illustrate functional and aesthetic characteristics of the Product, with integral parts and attachment devices.

B. Submit samples of finishes from the full range of manufacturers standard colors, textures and patterns for Architect selection.

C. Include identification on each sample, with full Project information.

D. Submit the number of samples specified in individual specification Sections; one of which will be retained by Architect.

E. Field samples and Mock-ups:
   1. Contractor shall erect, at the Project site, at a location acceptable to the Architect.
   2. Size or area: that specified in the respective specification section.
   3. Coordinate sample submittals with interfacing work.
   4. Fabricate each field sample complete with finishes, connections, and sequencing with other products.
   5. Accepted Field Samples and Mock-ups are the arbiter of actual completed work.
   6. Accepted field samples and mock-ups remain until conclusion of Work or when allowed by the Architect.

1.11 MANUFACTURER'S INSTRUCTIONS

A. When specified in individual Sections, submit manufacturer's printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, in quantities specified for Product Data.

B. Identify conflicts between manufacturer's instructions and Contract documents.

1.12 MANUFACTURER'S CERTIFICATES

A. When specified in individual Sections, submit manufacturer's certificate to Architect for review, in quantities specified for Product Data.

B. Indicate material or Product conforms to or exceeds specified requirements. Submit supporting reference date, affidavits, and certifications as appropriate.

C. Certificate may be recent or previous test results on material or Product, but must be acceptable to Architect.

1.13 COLOR SELECTION

A. Exterior colors selected when all exterior color samples have been submitted.

B. Interior colors selected when all interior color samples have been submitted.

1.14 MISCELLANEOUS SUBMITTALS

A. Warranties: Furnish 3 copies of sample warranties, guarantees and product/workmanship bonds, which are uniquely prepared and executed for the project on materials and equipment installed and the technical provisions of the specifications. Submit final warranties in quantities as required for O & M Manuals.

B. Operation & Maintenance Data: Furnish instructions and data on materials and equipment installed in the work in accordance with requirements of the technical provisions of the specifications and assemble as Division 01 section “Warranties”.
   1. This information is the basis for the training sessions.

1.15 OWNER ACTION

A. Except for submittals for the record or for information, where action and return is required, the Architect will review each submittal, mark to indicate action taken, and return promptly.
   1. Compliance with specified characteristics is the Contractor’s responsibility.

B. Action Stamp Owner’s Response: The Owner will stamp each submittal with a uniform, action stamp, or cover sheet with action stamp. The Architect will mark the stamp appropriately to indicate the action taken, as follows:
   1. The Owner’s review stamp has indications for the following conditions:
      a. “No Exceptions Taken”: If this box is marked, the work covered by the submittal may proceed provided it complies with the requirements of the Contract Documents; acceptance of the work will depend upon compliance.
      b. “Make Corrections Noted: If this box is marked, the work covered by the submittal may proceed provided it complies with the Architect’s notations or corrections to the submittal and with the requirements of the Contract Documents; acceptance of the work will depend on that compliance.
      c. “Resubmit”: If this box is marked, do not proceed with the work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise the submittal or prepare a new submittal in accordance with the Architect’s notations and resubmit without delay.
      d. Not Reviewed: Unsolicited Submittals: The Owner will return unsolicited submittals to the sender without action.

PART 2 - PRODUCTS

PART 3 - EXECUTION

3.01 SUBMITTALS

A. General:
   1. The listing of submittals hereinafter is set forth generally as a check list for the Contractor's convenience and are general in nature.
   2. The Architect reserves the right to add to this list in case of omissions of any submittals specified in other Sections but not listed hereinafter.

B. Submittals, Within 10 Days of Notice of Intent to Award Contract:
   1. Executed Agreement.
   2. Performance and Labor & Material Payment Bonds (State of Washington Statutory Form for Public Work, RCW 39.08) with certified copy of Power of Attorney from Attorney-in-Fact Executing bonds.
   3. Certified copies of Contractor's Liability Insurance Policies
   4. List of subcontractors and major material suppliers for the Work.

C. Submittals, within 10 Days After Notice to Proceed:
   1. Construction Schedule.

2. Emergency telephone list for key personnel of Contractor and principal subcontractors.

D. Submittals, Within 15 Days After Notice to Proceed:
   1. All submittals, shop drawings and product data.
   2. Schedule of Values.
   3. Retainage Agreement (if applicable).

E. Submittals, to Precede or Accompany the First Month's Application for Payment
   1. Copies of permits.

F. Submittals, to Precede or Accompany Each Month's Payment:
   1. Application and Certification for Payment.
   2. Updated construction schedule, if any changes have been made to schedule since last submittal.

G. Submittals, Prior to Substantial Completion:
   1. Notification to Architect that work of the Project is substantially complete, including a listing of items of work to be completed or corrected.
   2. Refer to Division 01 section “Execution and Closeout Requirements” for additional submittal items required as a prerequisite to Substantial Completion.

H. Submittals, prior to Final Acceptance (Completion):
   1. See Division 01 section “Execution and Closeout Requirements”

END OF SECTION 013300

SECTION 014000
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Submittals.

B. Quality assurance.

C. References and standards.

D. Testing and inspection agencies and services.

E. Contractor's design-related professional design services.

F. Control of installation.

G. Defect Assessment.

1.02 RELATED REQUIREMENTS

A. Document 007200 - General Conditions: Inspections and approvals required by public authorities.

B. Section 016000 - Product Requirements: Requirements for material and product quality.

1.03 REFERENCE STANDARDS

A. ASTM E699 - Standard Specification for Agencies Involved in Testing, Quality Assurance, and Evaluating of Manufactured Building Components 2016.

B. IAS AC89 - Accreditation Criteria for Testing Laboratories 2021.

1.04 DEFINITIONS

A. Contractor's Professional Design Services: Design of some aspect or portion of the project by party other than the design professional of record. Provide these services as part of the Contract for Construction.
   1. Design Services Types Required:

1.05 CONTRACTOR'S DESIGN-RELATED PROFESSIONAL DESIGN SERVICES

A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.

B. Base design on performance and/or design criteria indicated in individual specification sections.

C. Scope of Contractor's Professional Design Services: Provide for the following items of work:
   1. Light Guage Steel Roof Sub-Purlin System: As described in Section 133421 “Structural Retrofit Roof Sub-Framing System”. Design to be submitted to the City of Bremerton as a deferred submittal under the overall building permit.
   2. Fire suppression system revisions. Separate permit to be obtained by contractor.
   3. Fire Alarm system modifications. Separate permit to be obtained by contractor.
   4. Other design services specified in sections of this Project Manual.

1.06 SUBMITTALS

A. See Section 013300 Submitals for submittal procedures.

B. Designer's Qualification Statement: Submit for Architect's knowledge as contract administrator, or for Owner's information.
   1. Include information for each individual professional responsible for producing, or supervising production of, design-related professional services provided by Contractor.
      a. Full name.
      b. Professional licensure information.
      c. Statement addressing extent and depth of experience specifically relevant to design of items assigned to Contractor.

C. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.
   1. Include calculations that have been used to demonstrate compliance to performance and regulatory criteria provided, and to determine design solutions.
   2. Include required product data and shop drawings.
   3. Include a statement or certification attesting that design data complies with criteria indicated, such as building codes, loads, functional, and similar engineering requirements.
   4. Include signature and seal of design professional responsible for allocated design services on calculations and drawings.

D. Test Reports: After each test/inspection, promptly submit two copies of report to Architect and to Contractor.
   1. Include:
      a. Date issued.
      b. Project title and number.
      c. Name of inspector.
      d. Date and time of sampling or inspection.
      e. Identification of product and specifications section.
      f. Location in the Project.
      g. Type of test/inspection.
      h. Date of test/inspection.
      i. Results of test/inspection.
      j. Compliance with Contract Documents.
      k. When requested by Architect, provide interpretation of results.

E. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.07 QUALITY ASSURANCE

A. Testing Agency Qualifications:
   1. Prior to start of work, submit agency name, address, and telephone number, and names of full time specialist and responsible officer.
   2. Qualification Statement: Provide documentation showing testing laboratory is accredited under IAS AC89.

B. Designer Qualifications: Where professional engineering design services and design data submittals are specifically required of Contractor by Contract Documents, provide services of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

1.08 REFERENCES AND STANDARDS

A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Comply with reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.

C. Obtain copies of standards where required by product specification sections.

D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.

E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.

F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from Contract Documents by mention or inference otherwise in any reference document.

1.09 TESTING AND INSPECTION AGENCIES AND SERVICES

A. Owner will employ and pay for services of an independent testing agency to perform specified building code related testing and inspection (IBC).

B. Contractor will employ and pay for services of an independent testing agency to perform required inspections related to energy code (WSEC).

C. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

PART 3 EXECUTION

2.01 CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.

D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Have work performed by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

2.02 TESTING AND INSPECTION

A. Testing Agency Duties:
   1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
   2. Perform specified sampling and testing of products in accordance with specified standards.
   3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
   4. Promptly notify Architect and Contractor of observed irregularities or non-compliance of Work or products.
   5. Perform additional tests and inspections required by Architect.
   6. Submit reports of all tests/inspections specified.

B. Limits on Testing/Inspection Agency Authority:
   1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
   2. Agency may not approve or accept any portion of the Work.
   3. Agency may not assume any duties of Contractor.
   4. Agency has no authority to stop the Work.

C. Contractor Responsibilities:
   1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
   2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
   3. Provide incidental labor and facilities:
      a. To provide access to Work to be tested/inspected.
      b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
      c. To facilitate tests/inspections.

d. To provide storage and curing of test samples.

4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

D. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.

E. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

2.03 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not complying with specified requirements.

END OF SECTION 014000

SECTION 015000
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary utilities.

B. Temporary sanitary facilities.

C. Temporary Controls: Barriers, enclosures, and fencing.

D. Security requirements.

E. Vehicular access and parking.

F. Waste removal facilities and services.

G. Field offices.

1.02 RELATED REQUIREMENTS

A. Section 015100 - Temporary Utilities.

B. Section 015500 - Vehicular Access and Parking.

1.03 TEMPORARY UTILITIES - SEE SECTION 015100

A. Owner will provide the following:
   1. Electrical power and metering, consisting of connection to existing facilities.
   2. Water supply, consisting of connection to existing facilities.

1.04 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.

B. Maintain daily in clean and sanitary condition.

1.05 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.

C. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.06 FENCING

A. Provide 6 foot high fence around construction site; equip with vehicular and pedestrian gates with locks.

1.07 SECURITY

A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.

1.08 VEHICULAR ACCESS AND PARKING

A. Coordinate access and haul routes with governing authorities and Owner.

B. Provide and maintain access to fire hydrants, free of obstructions.

C. Provide means of removing mud from vehicle wheels before entering streets.

D. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

1.09 WASTE REMOVAL

A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.

B. Provide containers with lids. Remove trash from site periodically.

C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.

D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.10 FIELD OFFICES

A. Office: Weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture, drawing rack, and drawing display table.

B. Provide space for Project meetings, with table and chairs to accommodate 6 persons.

C. Locate offices a minimum distance of 30 feet from existing and new structures.

1.11 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.

B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.

C. Clean and repair damage caused by installation or use of temporary work.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 015000

SECTION 015100
TEMPORARY UTILITIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary Utilities: Provision of electricity, lighting, heat, ventilation, and water.

1.02 RELATED REQUIREMENTS

A. Section 015000 - Temporary Facilities and Controls:

1.03 REFERENCE STANDARDS

A. 29 CFR 1926 - Safety and Health Regulations for Construction Current Edition.

1.04 TEMPORARY ELECTRICITY

A. Cost: By Owner.

B. Connect to Owner's existing power service.
   1. Do not disrupt Owner's need for continuous service.

C. Provide temporary electric feeder from existing building electrical service at location as directed.

D. Provide temporary power as shown on Electrical Drawings for KCDEM RV plug-in during construction.

E. Permanent convenience receptacles may be utilized during construction.

F. Provide adequate distribution equipment, wiring, and outlets to provide single phase branch circuits for power and lighting.

1.05 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

A. Provide and maintain LED or compact fluorescent lighting as suitable for the application for construction operations in accordance with requirements of 29 CFR 1926 and authorities having jurisdiction.

B. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.

C. Maintain lighting and provide routine repairs.

1.06 TEMPORARY HEATING

A. Provide heating devices and heat as needed to maintain specified conditions for construction operations.

B. Maintain minimum ambient temperature of 50 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.

1.07 TEMPORARY VENTILATION

1.08 TEMPORARY WATER SERVICE

A. Cost of Water Used: By Owner.

B. Extend branch piping with outlets located so water is available by hoses with threaded connections. Provide temporary pipe insulation to prevent freezing.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 015100

SECTION 016000
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General product requirements.

B. Re-use of existing products.

C. Transportation, handling, storage and protection.

D. Product option requirements.

E. Substitution limitations.

F. Procedures for Owner-supplied products.

G. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

A. Section 010000 - Summary: Identification of Owner-supplied products.

B. Section 012500 - Substitution Procedures: **Substitutions** made during procurement and/or construction phases.

C. Section 014000 - Quality Requirements: Product quality monitoring.

1.03 SUBMITTALS

A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
   1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by Contract Documents.

2.02 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by Contract Documents.

B. See Section 014000 - Quality Requirements, for additional source quality control requirements.

C. Use of products having any of the following characteristics is not permitted:
   1. Made using or containing CFC's or HCFC's.
   2. Containing lead, cadmium, or asbestos.

D. Where other criteria are met, Contractor shall give preference to products that:
   1. If used on interior, have lower emissions, as defined in Section 016116.
   2. If wet-applied, have lower VOC content, as defined in Section 016116.

2.03 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

2.04 MAINTENANCE MATERIALS

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.

B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

A. See Section 012500 - Substitution Procedures.

3.02 OWNER-SUPPLIED PRODUCTS

A. Owner's Responsibilities:
   1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
   2. Arrange and pay for product delivery to site.
   3. On delivery, inspect products jointly with Contractor.
   4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
   5. Arrange for manufacturers' warranties, inspections, and service.

B. Contractor's Responsibilities:
   1. Review Owner reviewed shop drawings, product data, and samples.
   2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
   3. Handle, store, install and finish products.
   4. Repair or replace items damaged after receipt.

3.03 TRANSPORTATION AND HANDLING

A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.

B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.

C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

D. Transport and handle products in accordance with manufacturer's instructions.

E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.

H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.04 STORAGE AND PROTECTION

A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 017419.

B. Store and protect products in accordance with manufacturers' instructions.

C. Store with seals and labels intact and legible.

D. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.

E. For exterior storage of fabricated products, place on sloped supports above ground.

F. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

G. Comply with manufacturer's warranty conditions, if any.

H. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

I. Prevent contact with material that may cause corrosion, discoloration, or staining.

J. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

K. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION 016000

SECTION 017000
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.

B. Requirements for alterations work, including selective demolition.

C. Cutting and patching.

D. Surveying for laying out the work.

E. Cleaning and protection.

F. Starting of systems and equipment.

G. Demonstration and instruction of Owner personnel.

H. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.

I. General requirements for maintenance service.

1.02 RELATED REQUIREMENTS

A. Section 011000 - Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.

B. Section 014000 - Quality Requirements: Testing and inspection procedures.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
   1. On request, submit documentation verifying accuracy of survey work.
   2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in compliance with Contract Documents.
   3. Submit surveys and survey logs for the project record.

C. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
   1. Structural integrity of any element of Project.
   2. Integrity of weather exposed or moisture resistant element.
   3. Efficiency, maintenance, or safety of any operational element.
   4. Visual qualities of sight exposed elements.
   5. Work of Owner or separate Contractor.

1.04 QUALIFICATIONS

A. For demolition work, employ a firm specializing in the type of work required.

B. For surveying work, employ a land surveyor registered in the State in which the Project is located and acceptable to Architect. Submit evidence of surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate. Employ only individual(s) trained and experienced in collecting and recording accurate data relevant to ongoing construction activities,

1.05 PROJECT CONDITIONS

A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

B. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

C. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
   1. Minimize amount of bare soil exposed at one time.

D. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.06 COORDINATION

A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

B. Notify affected utility companies and comply with their requirements.

C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

F. Coordinate completion and clean-up of work of separate sections.

G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

E. Verify that utility services are available, of the correct characteristics, and in the correct locations.

F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 LAYING OUT THE WORK

A. Verify locations of survey control points prior to starting work.

B. Promptly notify Architect of any discrepancies discovered.

C. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

D. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

E. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.

F. Utilize recognized engineering survey practices.

G. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
   1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations
   2. Grid or axis for structures.
   3. Building foundation, column locations, ground floor elevations.

H. Periodically verify layouts by same means.

I. Maintain a complete and accurate log of control and survey work as it progresses.

3.04 GENERAL INSTALLATION REQUIREMENTS

A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.05 ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
   1. Verify that construction and utility arrangements are as indicated.
   2. Report discrepancies to Architect before disturbing existing installation.
   3. Beginning of alterations work constitutes acceptance of existing conditions.

B. Remove existing work as indicated and as required to accomplish new work.
   1. Remove items indicated on drawings.
   2. Relocate items indicated on drawings.
   3. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
   4. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.

C. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, andTelecommunications): Remove, relocate, and extend existing systems to accommodate new construction.

1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
    a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
    b. Provide temporary connections as required to maintain existing systems in service.
4. Verify that abandoned services serve only abandoned facilities.
5. Remove abandoned pipe, ducts, conduits, and equipment , including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.

D. Protect existing work to remain.
1. Prevent movement of structure; provide shoring and bracing if necessary.
2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
3. Repair adjacent construction and finishes damaged during removal work.

E. Adapt existing work to fit new work: Make as neat and smooth transition as possible.

F. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.

G. Refinish existing surfaces as indicated:
1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.

H. Clean existing systems and equipment.

I. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.

J. Do not begin new construction in alterations areas before demolition is complete.

K. Comply with all other applicable requirements of this section.

3.06 CUTTING AND PATCHING

A. Whenever possible, execute the work by methods that avoid cutting or patching.

B. See Alterations article above for additional requirements.

C. Perform whatever cutting and patching is necessary to:
1. Complete the work.
2. Fit products together to integrate with other work.
3. Provide openings for penetration of mechanical, electrical, and other services.
4. Match work that has been cut to adjacent work.
5. Repair areas adjacent to cuts to required condition.
6. Repair new work damaged by subsequent work.
7. Remove samples of installed work for testing when requested.
8. Remove and replace defective and non-complying work.

D. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.

E. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

F. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

G. Restore work with new products in accordance with requirements of Contract Documents.

H. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 078400, to full thickness of the penetrated element.

J. Patching:
   1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
   2. Match color, texture, and appearance.
   3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.07 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.08 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

G. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.09 SYSTEM STARTUP

A. Coordinate schedule for start-up of various equipment and systems.

B. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.

C. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

D. Verify that wiring and support components for equipment are complete and tested.

E. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.

F. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.10 DEMONSTRATION AND INSTRUCTION

A. Demonstrate operation and maintenance of products to Owner's personnel two weeks prior to date of Substantial Completion.

B. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time, at equipment location.

C. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

D. Provide a qualified person who is knowledgeable about the Project to perform demonstration and instruction of Owner's personnel.

E. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.

F. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

3.11 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.12 FINAL CLEANING

A. Use cleaning materials that are nonhazardous.

B. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

C. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.

D. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

E. Clean filters of operating equipment.

F. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, drainage systems.

G. Clean site; sweep paved areas, rake clean landscaped surfaces.

H. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.13 CLOSEOUT PROCEDURES

A. Make submittals that are required by governing or other authorities.
   1. Provide copies to Architect and Owner.

B. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.

C. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.

D. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.

E. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.

F. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.

G. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.

H. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

3.14 MAINTENANCE

A. Provide service and maintenance of components indicated in specification sections.

B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.

C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.

D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.

E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION 017000

SECTION 017419
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

A. Owner requires that this project generate the least amount of trash and waste possible.

B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.

C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.

D. Required Recycling, Salvage, and Reuse: The following may not be disposed of in landfills or by incineration:
   1. Aluminum and plastic beverage containers.
   2. Corrugated cardboard.
   3. Wood pallets.
   4. Clean dimensional wood.
   5. Metals, including packaging banding, metal studs, sheet metal, structural steel, piping, reinforcing bars, door frames, and other items made of steel, iron, galvanized steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.

E. Contractor Reporting Responsibilities: Submit periodic Waste Disposal Reports; report landfill disposal, incineration, recycling, salvage, and reuse regardless of to whom the cost or savings accrues; use the same units of measure on required reports.

F. Methods of trash/waste disposal that are not acceptable are:
   1. Burning on the project site.
   2. Burying on the project site.
   3. Dumping or burying on other property, public or private.
   4. Other illegal dumping or burying.

G. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.02 RELATED REQUIREMENTS

A. Section 013000 - Administrative Requirements: Additional requirements for project meetings, reports, submittal procedures, and project documentation.

B. Section 015000 - Temporary Facilities and Controls: Additional requirements related to trash/waste collection and removal facilities and services.

C. Section 016000 - Product Requirements: Waste prevention requirements related to delivery, storage, and handling.

D. Section 017000 - Execution and Closeout Requirements: Trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

1.03 DEFINITIONS

A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.

B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.

C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.

D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.

E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.

F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.

G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.

H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

I. Return: To give back reusable items or unused products to vendors for credit.

J. Reuse: To reuse a construction waste material in some manner on the project site.

K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.

L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.

M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.

N. Toxic: Poisonous to humans either immediately or after a long period of exposure.

O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.

P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.
   1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.
   2. Submit Report on a form acceptable to Owner.
   3. Landfill Disposal: Include the following information:
      a. Identification of material.
      b. Amount, in tons or cubic yards, of trash/waste material from the project disposed of in landfills.
      c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
      d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
   4. Incinerator Disposal: Include the following information:
      a. Identification of material.
      b. Amount, in tons or cubic yards, of trash/waste material from the project delivered to incinerators.
      c. State the identity of incinerators, total amount of fees paid to incinerator, and total disposal cost.
      d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
   5. Recycled and Salvaged Materials: Include the following information for each:
      a. Identification of material, including those retrieved by installer for use on other projects.
      b. Amount, in tons or cubic yards, date removed from the project site, and receiving party.
      c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
      d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
      e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.
   6. Material Reused on Project: Include the following information for each:

a. Identification of material and how it was used in the project.
b. Amount, in tons or cubic yards.
c. Include weight tickets as evidence of quantity.

7. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

PART 3 EXECUTION

2.01 WASTE MANAGEMENT PROCEDURES

A. See Section 013000 for additional requirements for project meetings, reports, submittal procedures, and project documentation.

B. See Section 015000 for additional requirements related to trash/waste collection and removal facilities and services.

C. See Section 016000 for waste prevention requirements related to delivery, storage, and handling.

D. See Section 017000 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

2.02 WASTE MANAGEMENT PLAN IMPLEMENTATION

A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.

B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner, and Architect.

C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.

D. Meetings: Discuss trash/waste management goals and issues at project meetings.
1. Prebid meeting.
2. Preconstruction meeting.
3. Regular job-site meetings.

E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
1. Provide containers as required.
2. Provide adequate space for pick-up and delivery and convenience to subcontractors.
3. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.

F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.

G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.

H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.

I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION 017419

SECTION 024100
SELECTIVE DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Building demolition .

B. Selective demolition of built site elements.

C. Selective demolition of building elements for alteration purposes.

D. Abandonment and removal of existing utilities and utility structures.

1.02 RELATED REQUIREMENTS

A. Section 003100 - Available Project Information: Existing building survey conducted by Owner; information about known hazardous materials.

B. Section 011000 - Summary: Limitations on Contractor's use of site and premises.

C. Section 011000 - Summary: Description of items to be salvaged or removed for re-use by Contractor.

D. Section 015000 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.

E. Section 016000 - Product Requirements: Handling and storage of items removed for salvage and relocation.

F. Section 017000 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.

G. Section 017419 - Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.

H. Section 028400 - Polychlorinate Biphenyl (PCB) Remediation: Removal of equipment containing substances regulated under the Federal Toxic Substances Control Act (TSCA), including but not limited to PCB- and mercury-containing equipment.

1.03 DEFINITIONS

A. Demolition: Dismantle, raze, destroy or wreck any building or structure or any part thereof.

B. Remove: Detach or dismantle items from existing construction and dispose of them off site, unless items are indicated to be salvaged or reinstalled.

C. Remove and Salvage: Detach or dismantle items from existing construction in a manner to prevent damage. Clean, package, label and deliver salvaged items to Owner in ready-for-reuse condition.

D. Remove and Reinstall: Detach or dismantle items from existing construction in a manner to prevent damage. Clean and prepare for reuse and reinstall where indicated.

E. Existing to Remain: Designation for existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

1.04 REFERENCE STANDARDS

A. 29 CFR 1926 - Safety and Health Regulations for Construction Current Edition.

B. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations 2022, with Errata (2021).

1.05 QUALITY ASSURANCE

A. Demolition Firm Qualifications: Company specializing in the type of work required.
   1. Minimum of 3 years of documented experience.

PART 3 EXECUTION

2.01 DEMOLITION

A. Remove paving and curbs required to accomplish new work.

B. Remove fences and gates.

C. Remove other items indicated, for salvage, relocation, and recycling.

2.02 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
   1. Obtain required permits.
   2. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
   3. Provide, erect, and maintain temporary barriers and security devices.
   4. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
   5. Do not close or obstruct roadways or sidewalks without permits from authority having jurisdiction.
   6. Conduct operations to minimize obstruction of public and private entrances and exits. Do not obstruct required exits at any time. Protect persons using entrances and exits from removal operations.
   7. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon, or limit access to their property.

B. Do not begin removal until receipt of notification to proceed from Owner.

C. Protect existing structures and other elements to remain in place and not removed.
   1. Provide bracing and shoring.
   2. Prevent movement or settlement of adjacent structures.
   3. Stop work immediately if adjacent structures appear to be in danger.

D. Hazardous Materials:
   1. If hazardous materials are discovered during removal operations, stop work and notify Architect and Owner; hazardous materials include regulated asbestos containing materials, lead, PCBs, and mercury.
   2. Hazardous Materials: Comply with 29 CFR 1926 and state and local regulations.

E. Perform demolition in a manner that maximizes salvage and recycling of materials.
   1. Dismantle existing construction and separate materials.
   2. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.

F. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.

2.03 EXISTING UTILITIES

A. Coordinate work with utility companies. Notify utilities before starting work, comply with their requirements, and obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.

E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.

F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

2.04 SELECTIVE DEMOLITION FOR ALTERATIONS

A. Existing construction and utilities indicated on drawings are based on casual field observation and existing record documents only.
   1. Verify construction and utility arrangements are as indicated.
   2. Report discrepancies to Architect before disturbing existing installation.
   3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.

B. Remove existing work as indicated and required to accomplish new work.
   1. Remove items indicated on drawings.

C. Services including, but not limited to, HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications: Remove existing systems and equipment as indicated.
   1. Maintain existing active systems to remain in operation, and maintain access to equipment and operational components.
   2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
   3. Verify that abandoned services serve only abandoned facilities before removal.
   4. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings. Remove back to source of supply where possible, otherwise cap stub and tag with identification.

D. Protect existing work to remain.
   1. Prevent movement of structure. Provide shoring and bracing as required.
   2. Perform cutting to accomplish removal work neatly and as specified for cutting new work.
   3. Repair adjacent construction and finishes damaged during removal work.
   4. Patch to match new work.

2.05 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site.

B. Remove materials not to be reused on site; comply with requirements of Section 017419 - Waste Management.

C. Leave site in clean condition, ready for subsequent work.

D. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION 024100

SECTION 028400
POLYCHLORINATE BIPHENYL (PCB) REMEDIATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Furnish labor, materials, services, and equipment necessary for complete removal and disposal of the following demolition debris in accordance with federal, state, and local regulations:
   1. PCB-containing electrical equipment, including transformers, capacitors, and switches.
   2. PCB- and DEHP-containing lighting ballasts.
   3. Mercury-containing lamps and tubes, including fluorescent lamps, high intensity discharge (HID), arc lamps, ultra-violet, high pressure sodium, mercury vapor, ignitron tubes, neon, and incandescent.

B. Perform PCB removal and disposal work in accordance with 40 CFR 761 and the requirements specified herein.

1.02 RELATED REQUIREMENTS

A. Section 003100 Information Available to Bidders: For Pre-Renovation Regulated Building Materials Assessment

B. Division 26 - Selective Demolition for Electrical.

1.03 DEFINITIONS

A. Toxic Substances: PCBs, mercury, and other substances regulated under the U.S. Federal Toxic Substances Control Act (TSCA); substances covered by this specification are identified under SECTION INCLUDES.

B. Leak: Leak or leaking means any instance of a toxic substance present on any portion of the external surface of an item of equipment or container.

1.04 REFERENCE STANDARDS

A. 29 CFR 1910.132-138 - Personal Protective Equipment Current Edition.

B. 29 CFR 1910.145 - Accident Prevention Signs and Tags Current Edition.

C. 40 CFR 273 - Standards For Universal Waste Management current edition.

D. 40 CFR 761 - Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution In Commerce, And Use Prohibitions current edition.

E. 49 CFR 178 - Specifications for Packaging current edition.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures, except that all submittals are to be made to Owner, not to Architect.

B. Spill notification and documentation:
   1. Certification of Decontamination for PCB Spill.
   2. Post-cleanup sampling data, if required.

C. Transporter and disposal documentation.

PART 2 PRODUCTS

2.01 EQUIPMENT

A. Special Clothing (PPE): Work clothes shall consist of personal protective equipment (PPE) as required by 29 CFR 1910.132-138; including, but not limited to, the following:
   1. Disposable coveralls.
   2. Gloves (Disposable rubber gloves may be worn under these).
   3. Disposable foot covers (polyethylene).
   4. Chemical safety goggles.
   5. Half mask cartridge respirator.

B. Special Clothing for Owner's Personnel Required to Enter Control Areas: Provide PPE same as specified for workers.

C. PCB Spill Kit: Include the following items, in at least the quantity indicated:
   1. Disposable Gloves (Polyethylene): 6 Pairs.
   2. Gloves With A High Degree Of Impermeability To PCB: 6 Pairs
   3. Disposable Coveralls With Permeation Resistance To PCB: 4 Each.
   4. Chemical Safety Goggles: 2 Each.
   5. Disposable Foot Covers (Polyethylene): 6 Pairs.
   6. PCB Caution Sign: "PCB Spill--Authorized Personnel Only": 2 Each.
   7. Banner Guard Or Equivalent Banner Material: 100 feet (30 m).
   8. Absorbent Material.
   9. Blue Polyethylene Waste Bags: 5 Bags.
   10. Cloth Backed Tape: 5 Each.
   11. Area Access Logs, Blank: 1 Roll.
   12. Brattice Cloth 6 by 6 feet (2 by 2 m): 10 Each.
   13. Rags: 1 Piece.
   14. Ball Point Pens: 20 Each.
   15. Herculite, 4 by 4 feet (1.5 by 1.5 m): 2 Each.
   16. Herculite, 8 by 8 feet (3 by 3 m): 1 Each.
   17. Blank Metal Signs And Grease Pencils.
   18. Waste Containers: 55 gallon (208 Liters): 2 Each.
   19. Drum (May Be Used As Container For Kit): 1 Each.

D. PCB Caution Labels: Comply with 40 CFR 761, Subpart C.
   1. Affix labels to PCB waste containers and PCB-contaminated items not stored in containers.
   2. Provide label with sufficient print size to be clearly legible, with bold print on contrasting background, displaying the following: "CAUTION: Contains PCBs (Polychlorinated Biphenyls)."

E. Caution Signs: Comply with 29 CFR 1910.145.
   1. Provide signs at approaches to Control Areas.
   2. Locate signs at such a distance that personnel may read the sign and take the necessary precautions before entering the control area.

F. Storage Containers for PCBs: Comply with 49 CFR 178.
   1. Liquid PCBs: Department of Transportation (DOT) Specification 17E containers.
   2. Non-Liquid PCB Mixtures, Articles, and Equipment: DOT Specification 5, 5B, or 17C containers with removable heads.

G. Storage Containers for Mercury-Containing Lamps: Appropriate DOT containers (original transport boxes or equivalent).

PART 3 EXECUTION

3.01 PREPARATION

A. Control Area: Isolate Control Area by physical boundaries to prevent unauthorized entry of personnel; do not permit food, drink, or smoking materials in areas where toxic substances are handled or stored.

3.02 WORK PROCEDURE - PCBS

A. Permissible Exposure Limits (PEL): PEL for PCBs is 3.1 E-08 pounds per cubic foot (0.5 mg/cu m) on an 8-hour time weighted average basis.

B. Work Operations: Ensure that work operations and processes involving PCB or PCB-contaminated materials are conducted in accordance with 40 CFR 761 and the applicable requirements of this section, including but not limited to:
   1. Obtaining advance approval of PCB storage sites.
   2. Notifying Owner prior to commencing the operation.

3. Reporting leaks and spills to Owner.
4. Cleaning up spills.
5. Maintaining access log of employees working in Control Area and providing copy to Owner upon completion of the operation.
6. Inspecting PCB and PCB-contaminated items and waste containers for leaks and forwarding copies of inspection reports to Owner.
7. Maintaining the specified spill kit.
8. Maintaining inspection, inventory and spill records.

C. Perform PCB removal as described in PCB Removal Work Plan; handle PCBs so that no skin contact occurs.

D. Personnel Protection: Require workers to wear and use PPE, as recommended by the Industrial Hygienist, upon entering PCB control area. If PPE is not required by the CIH, so state in PCB Removal Work Plan.

E. Footwear: Keep work footwear inside work area until completion of removal operations.

F. Hazards:
1. Do not expose PCBs to open flames or other high temperature sources since toxic decomposition by-products may be produced.
2. Do not heat or handle PCBs to temperatures of 135 degrees F (55 degrees C) or higher without Owner's concurrence.

G. Package, mark, transport, and dispose of PCBs as required by regulations.

H. Control Area: Allow only personnel certified as having received specified training into the control area.

I. No Smoking: Smoking is not permitted within 50 feet (15 m) of control area; provide "No Smoking" signs as directed by Owner.

J. Confined Spaces: Wherever feasible, do not carry out PCB handling operations in confined spaces having limited means of egress and inadequate cross ventilation.

K. Exhaust Ventilation: If used, discharge exhaust ventilation for PCB operations to outside and away from personnel.

L. Solvent Cleaning: Clean contaminated tools, containers, etc., after use by rinsing three times with appropriate solvent or by wiping down three times with solvent wetted rag; suggested solvents are Stoddard solvent and hexane.

M. Drip Pans: Place drip pans under portable PCB transformers and rectifiers in use or stored for use; provide pans with containment volume of at least one and one-half times internal volume of PCBs that would drain into pan.

N. Evacuation Procedures: Establish written procedures for evacuation of injured workers; do not delay aid for a seriously injured worker for reasons of decontamination.

3.03 PCB-CONTAINING EQUIPMENT EXCEPT BALLASTS

A. Draining of Liquid PCB: Drain equipment items of free flowing liquid prior to transportation.
1. Place the drained liquids in specified containers, filled with not more than 50 gallons (190 liters) of oil.
2. Do not mix different concentrations in the same container.
3. Containers must have a 2 inch (50 mm) ullage space from the top of the container.
4. After draining add absorbent material to absorb oil residue remaining.

B. If equipment cannot be drained, place it in storage container of the type specified.

C. Markings: Apply specified PCB Caution Labels to containers and drained PCB-contaminated electrical equipment.
1. Apply date drained to transformer using stencil or grease pencil.
2. Containers: Stencil on the following:
a. PCB content in parts per million (ppm).

b. Date container filled.
c. Serial number of transformer liquid came from.

3.04 BALLASTS

A. As ballasts are removed from lighting fixtures, inspect label on ballast.
   1. Ballasts Without "No PCB" Label: Assume to contain PCBs; containerize and dispose of as specified.
   2. Ballasts With "No PCB" Label: If there are less than 1600 total to be removed from project, dispose of them as normal demolition debris.

B. More Than 1600 "No PCB" Labeled Ballasts: Determine whether the "No PCB" labeled ballasts contain diethylhexyl phthalate (DEHP) either by testing or by checking with ballast manufacturer indicated on the label.
   1. Submit testing results and/or written confirmation from manufacturer to Owner.
   2. If the ballasts do not contain DEHP, dispose of them as normal demolition debris.
   3. If they do contain DEHP, dispose of them as as specified for PCBs.
   4. As basis of contract assume ballasts with "No PCB" labels do not contain DEHP.
   5. If 1600 or more DEHP ballasts are disposed of in a 24 hour period, notify the National Response Team at 800-424-8802.

3.05 MERCURY-CONTAINING LIGHTING LAMPS

A. Lighting Lamps: Remove lighting tubes/lamps from lighting fixtures and carefully place, unbroken, into containers.
   1. In the event a lighting tube/lamp breaks, sweep up pieces and contents and place waste in double plastic taped bags and dispose of as Universal Waste as specified in 40 CFR 273.

B. Deliver unbroken, boxed, lamps to Owner at location directed.

3.06 PCB SPILL CLEANUP REQUIREMENTS

A. Immediately report to Owner all PCB spills on the ground or in the water, PCB spills in drip pans, and PCB leaks.

B. Control Area: Rope off area around edges of PCB leaks and spills and post "PCB Spill Authorized Personnel Only" caution sign. Immediately transfer leaking items to drip pan or other container.

C. Cleanup: Comply with 40 CFR 761, Subpart G.
   1. Initiate cleanup of spills as soon as possible, but no later than 48 hours of its discovery.
   2. Require personnel to wear specified PPE, unless determined not required by CIH.
   3. If misting, elevated temperatures, or open flames are present, or if spill is situated in a confined space, notify Owner.
   4. Mop up liquid with rags or other conventional absorbent.
   5. Treat spent absorbent as solid PCB waste.

D. Records and Certification: Document cleanup with records of decontamination in accordance with 40 CFR 761, Section 125, Requirements for PCB Spill Cleanup; provide certification of decontamination.

E. Sampling: Perform post cleanup sampling as required by 40 CFR 761, Section 130, Sampling Requirements.

F. Do not remove boundaries of PCB control area until site is determined satisfactorily clean by Owner.

3.07 TEMPORARY STORAGE PRIOR TO DISPOSAL

A. Storage Site: Obtain Owner's approval in advance of areas, spaces, rooms, and buildings used to store toxic substances prior to disposal off-site; storage sites must comply with the following criteria without exception:
   1. Adequate roof and walls to prevent rainwater from reaching stored toxic substances.
   2. Adequate floor that has continuous curbing with minimum 6 inch (50 mm) high curb, with containment volume equal to at least two times internal volume of largest toxic substance

article or container stored therein or 25 percent of total internal volume of all toxic substance containing equipment or containers stored therein, whichever is greater.
3. No drain valves, floor drains, expansion joints, sewer lines, or other openings that would permit liquids to flow from curbed area.
4. Floors and curbing constructed of continuous smooth and impervious materials, such as Portland cement, concrete, or steel, to prevent or minimize penetrations of toxic substances.
5. Not located at a site that is below the 100-year flood water elevation.
6. Posted with specified Caution Sign.

B. Store PCBs, PCB articles, and PCB-contaminated items in specified containers.
1. Label waste containers with the following:
a. "Solid (or Liquid) Waste Polychlorinated Biphenyls."
b. Specified PCB Caution Label.
c. Date item was placed in storage and name of generator.
2. Label PCB articles and PCB-contaminated items with the following:
a. Specified PCB Caution Label.
b. Date item was placed in storage and name of generator.

C. Label mercury-containing lamp waste in accordance with 40 CFR 273. Affix labels to all lighting waste containers.

3.08 CLEANING

A. Clean up and containerize wastes daily.

B. Maintain surfaces of Control Areas free of accumulations of toxic substances. Restrict spread of dust and debris; keep waste from being distributed over work area.

C. Do not remove Control Area boundaries or warning signs prior to Owner's approval.

D. Reclean areas showing residual toxic substances.

3.09 DISPOSAL BY CONTRACTOR

A. Comply with disposal requirements and procedures specified in 40 CFR 761 and _____; deliver toxic substance waste to a disposal facility having required permits.
1. Do not accept toxic substance waste unless it is accompanied by a manifest signed by Owner.
2. Before transporting toxic substance waste, sign and date manifest acknowledging acceptance of the waste from Owner.
3. Return a signed copy to Owner before leaving project site.
4. Ensure that manifest accompanies waste at all times.
5. Submit transporter certification of notification to EPA of their toxic substance waste activities.

B. Payment will not be made until Certificate of Disposal has been furnished to Owner.

C. Certificate of Disposal: Submit to Owner within 30 days of date that disposal of waste identified on manifest was completed; include on the certificate:
1. The identity of disposal facility, by name, address, and EPA identification number.
2. The identity of waste affected by Certificate of Disposal including reference to manifest number for the shipment.
3. Statement certifying the fact of disposal of the identified waste, including date(s) of disposal, and identifying disposal process used.
4. Certification as defined in 40 CFR 761, Section 3.

END OF SECTION 028400

SECTION 033000
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete formwork.

B. Floors and slabs on grade.

C. Concrete foundations and anchor bolts for pre-engineered building.

D. Concrete reinforcement.

E. Joint devices associated with concrete work.

F. Miscellaneous concrete elements, including equipment pads, equipment pits, light pole bases, flagpole bases, thrust blocks, and manholes.

G. Concrete curing.

1.02 RELATED REQUIREMENTS

A. Section 033511 - Concrete Floor Finishes: Densifiers, hardeners, applied coatings, and polishing.

B. Section 079200 - Joint Sealants: Products and installation for sealants and joint fillers for saw cut joints and isolation joints in slabs.

C. Section 321313 - Concrete Paving: Sidewalks, curbs and gutters.

1.03 REFERENCE STANDARDS

A. ACI CODE-318 - Building Code Requirements for Structural Concrete and Commentary 2019 (Reapproved 2022).

B. ACI PRC-211.1 - Selecting Proportions for Normal-Density and High Density-Concrete - Guide 2022.

C. ACI PRC-302.1 - Guide to Concrete Floor and Slab Construction 2015.

D. ACI PRC-304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete 2000 (Reapproved 2009).

E. ACI PRC-305 - Guide to Hot Weather Concreting 2020.

F. ACI PRC-306 - Guide to Cold Weather Concreting 2016.

G. ACI PRC-308 - Guide to External Curing of Concrete 2016.

H. ACI SPEC-301 - Specifications for Concrete Construction 2020.

I. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement 2022.

J. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete 2022.

K. ASTM C33/C33M - Standard Specification for Concrete Aggregates 2018.

L. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens 2021.

M. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete 2022a.

N. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50 mm] Cube Specimens) 2021.

O. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete 2020.

P. ASTM C150/C150M - Standard Specification for Portland Cement 2022.

Q. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete 2020.

R. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete 2019, with Editorial Revision (2022).

S. ASTM C618 - Standard Specification for Coal Ash and Raw or Calcined Natural Pozzolan for Use in Concrete 2023, with Editorial Revision.

T. ASTM C685/C685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing 2017.

U. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete 2018.

V. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types) 2018.

W. ASTM E1155 - Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers 2020.

X. ASTM E1155M - Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers (Metric) 2014.

Y. ASTM E1643 - Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs 2018a.

Z. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs 2017.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
   1. For curing compounds, provide data on method of removal in the event of incompatibility with floor covering adhesives.

C. Mix Design: Submit proposed concrete mix design.
   1. Indicate proposed mix design complies with requirements of ACI SPEC-301, Section 4 - Concrete Mixtures.
   2. Indicate proposed mix design complies with requirements of ACI CODE-318, Chapter 5 - Concrete Quality, Mixing and Placing.

D. Samples: Submit samples of underslab vapor retarder to be used.

E. Test Reports: Submit report for each test or series of tests specified.

1.05 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI SPEC-301 and ACI CODE-318.

B. Follow recommendations of ACI PRC-305 when concreting during hot weather.

C. Follow recommendations of ACI PRC-306 when concreting during cold weather.

PART 2 PRODUCTS

2.01 FORMWORK

A. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.
   1. Form Facing for Exposed Finish Concrete: Contractor's choice of materials that will provide smooth, stain-free final appearance.
   2. Form Coating: Release agent that will not adversely affect concrete or interfere with application of coatings.
   3. Form Ties: Cone snap type that will leave no metal within 1-1/2 inches (38 mm) of concrete surface.

2.02 REINFORCEMENT MATERIALS

A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi) (420 MPa).
   1. Type: Deformed billet-steel bars.

B. Steel Welded Wire Reinforcement (WWR): Galvanized, plain type, ASTM A1064/A1064M.

1. WWR Style: 4 x 8-W6 x W10 (102 x 203-MW39 x MW65).

C. Reinforcement Accessories:
1. Tie Wire: Annealed, minimum 16 gauge, 0.0508 inch (1.29 mm).
2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
3. Provide stainless steel, galvanized, plastic, or plastic coated steel components for placement within 1-1/2 inches (38 mm) of weathering surfaces.

2.03 CONCRETE MATERIALS

A. Cement: ASTM C150/C150M, Type I - Normal Portland type.
1. Acquire cement for entire project from same source.

B. Fine and Coarse Aggregates: ASTM C33/C33M.

C. Fly Ash: ASTM C618, Class C or F.

D. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

2.04 ADMIXTURES

A. Admixtures: The use of admixtures shall be the sole responsibility of the Contractor. When more that one admixture is used in the mix, furnish satisfactory evidence to the Architect that the admixtures to be used are compatible in combination with the cement and aggregates. Provide only one brand of each type of admixture. Accelerating admixtures shall not be used unless approved by the Architect.

B. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.

2.05 ACCESSORY MATERIALS

A. Underslab Vapor Retarder:
1. Sheet Material: ASTM E1745, Class A; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. Single-ply polyethylene is prohibited.
2. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations.
3. Products:
a. ISI Building Products; Viper VaporCheck II 15-mil (Class A): www.isibp.com/#sle.
b. Stego Industries, LLC: Stego Wrap, 15 mils: www.stegoindustries.com/#sle.
c. W. R. Meadows, Inc; PERMINATOR Class A - 15 mils (0.38 mm): www.wrmeadows.com/#sle.

B. Non-Shrink Cementitious Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
1. Minimum Compressive Strength at 48 Hours, ASTM C109/C109M: 2,000 pounds per square inch (13.7 MPa).
2. Minimum Compressive Strength at 28 Days, ASTM C109/C109M: 7,000 pounds per square inch (48 MPa).
3. Flowable Products:
a. L&M Construction Chemicals, Inc, a subsidiary of Laticrete International, Inc; DURAGROUT: www.laticrete.com/our-products/concrete-construction-chemicals/#sle.
b. SpecChem, LLC; SpecRock: www.specchemllc.com/#sle.
c. W. R. Meadows, Inc; Speed-E-Roc: www.wrmeadows.com/#sle.
d. Substitutions: See Section 016000 - Product Requirements.
4. Low-Slump, Dry Pack Products:
a. L&M Construction Chemicals, Inc, a subsidiary of Laticrete International, Inc; Duragrout: www.lmcc.com/#sle.
b. SpecChem, LLC; SC Multipurpose Grout: www.specchemllc.com/#sle.
c. W. R. Meadows, Inc; PAC-IT: www.wrmeadows.com/#sle.
1. Substitutions: See Section 012500 – Substitution Procedures

C. Non-Shrink Epoxy Grout: Moisture-insensitive, two-part; consisting of epoxy resin, non-metallic aggregate, and activator.
   1. Products:
      a. Dayton Superior Corporation; _____: www.daytonsuperior.com/#sle.
      b. SpecChem, LLC; SpecPoxy Grout: www.specchemllc.com/#sle.
      c. W. R. Meadows, Inc; REZI-WELD 3/2: www.wrmeadows.com/#sle.
   2. Substitutions: See Section 012500 – Substitution Procedures

2.06 BONDING AND JOINTING PRODUCTS

A. Slab Isolation Joint Filler: 1/2 inch (13 mm) thick, height equal to slab thickness, with removable top section that will form 1/2 inch (13 mm) deep sealant pocket after removal.
   1. Material: ASTM D1751, cellulose fiber.
   2. Products:
      a. W. R. Meadows, Inc; Fiber Expansion Joint Filler with Snap-Cap: www.wrmeadows.com/#sle.
   3. Substitutions: See Section 012500 – Substitution Procedures

B. Slab Contraction Joint Device: Preformed linear strip intended for pressing into wet concrete to provide straight route for shrinkage cracking.

C. Slab Construction Joint Devices: Combination keyed joint form and screed, galvanized steel, with rectangular or round knockout holes for conduit or rebar to pass through joint form at 6 inches (150 mm) on center; ribbed steel stakes for setting.

2.07 CURING MATERIALS

A. Curing Compound, Naturally Dissipating: Clear, water-based, liquid membrane-forming compound; complying with ASTM C309.

2.08 CONCRETE MIX DESIGN

A. Proportioning Normal Weight Concrete: Comply with ACI PRC-211.1 recommendations.

B. Admixtures: Add acceptable admixtures as recommended in ACI PRC-211.1 and at rates recommended or required by manufacturer.

C. Normal Weight Concrete:
   1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: See Structural Drawing Notes
   2. Water-Cement Ratio: Maximum 40 percent by weight.
   3. Maximum Aggregate Size: 5/8 inch (16 mm).

2.09 MIXING

A. On Project Site: Mix in drum type batch mixer, complying with ASTM C685/C685M. Mix each batch not less than 1-1/2 minutes and not more than 5 minutes.

B. Transit Mixers: Comply with ASTM C94/C94M.

C. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.02 PREPARATION

A. Formwork: Comply with requirements of ACI SPEC-301. Design and fabricate forms to support all applied loads until concrete is cured and for easy removal without damage to concrete.

B. Verify that forms are clean and free of rust before applying release agent.

C. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.

D. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

E. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. Comply with ASTM E1643. Lap joints minimum 6 inches (150 mm). Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor retarder before covering.
   1. Vapor Retarder Over Granular Fill: Install compactible granular fill before placing vapor retarder as indicated on drawings. Do not use sand.

3.03 INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS

A. Comply with requirements of ACI SPEC-301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.

B. Install welded wire reinforcement in maximum possible lengths, and offset end laps in both directions. Splice laps with tie wire.

3.04 PLACING CONCRETE

A. Place concrete in accordance with ACI PRC-304.

B. Place concrete for floor slabs in accordance with ACI PRC-302.1.

C. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.

D. Place concrete continuously without construction (cold) joints wherever possible; where construction joints are necessary, before next placement prepare joint surface by removing laitance and exposing the sand and sound surface mortar, by sandblasting or high-pressure water jetting.

E. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

3.05 SLAB JOINTING

A. Locate joints as indicated on drawings.

B. Anchor joint fillers and devices to prevent movement during concrete placement.

C. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.

D. Saw Cut Contraction Joints: Saw cut joints before concrete begins to cool, within 4 to 12 hours after placing; use 3/16 inch (5 mm) thick blade and cut at least 1 inch (25 mm) deep but not less than one quarter (1/4) the depth of the slab.

E. Contraction Joint Devices: Use preformed joint device, with top set flush with top of slab.

F. Construction Joints: Where not otherwise indicated, use metal combination screed and key form, with removable top section for joint sealant.

3.06 FLOOR FLATNESS AND LEVELNESS TOLERANCES

A. Minimum F(F) Floor Flatness and F(L) Floor Levelness Values:
   1. Exposed to View and Foot Traffic: F(F) of 20; F(L) of 15, on-grade only.
   2. Under Thick-Bed Tile: F(F) of 20; F(L) of 15, on-grade only.
   3. Under Carpeting: F(F) of 25; F(L) of 20, on-grade only.
   4. Under Thin Resilient Flooring and Thinset Tile: F(F) of 35; F(L) of 25, on-grade only.

B. Measure F(F) Floor Flatness and F(L) Floor Levelness in accordance with ASTM E1155 (ASTM E1155M), within 48 hours after slab installation; report both composite overall values and local values for each measured section.

C. Correct the slab surface if composite overall value is less than specified and if local value is less than two-thirds of specified value or less than F(F) 13/F(L) 10.

D. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.07 CONCRETE FINISHING

A. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch (6 mm) or more in height.

B. Concrete Slabs: Finish to requirements of ACI PRC-302.1 and as follows:
   1. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI PRC-302.1; thin floor coverings include carpeting, resilient flooring, seamless flooring, resinous matrix terrazzo, thin set quarry tile, and thin set ceramic tile.
   2. Decorative Exposed Surfaces: Trowel as described in ACI PRC-302.1; take measures necessary to avoid black-burnish marks; decorative exposed surfaces include surfaces to be stained or dyed, pigmented concrete, surfaces to receive liquid hardeners, surfaces to receive dry-shake hardeners, surfaces to be polished, and all other exposed slab surfaces.

C. Concrete Polishing: See Section 033511.

3.08 CURING AND PROTECTION

A. Comply with requirements of ACI PRC-308. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

C. Surfaces Not in Contact with Forms:
   1. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water ponding, water-saturated sand, water-fog spray, or saturated burlap.
   2. Final Curing: Begin after initial curing but before surface is dry.

3.09 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 014000 - Quality Requirements.

B. Provide free access to concrete operations at project site and cooperate with appointed firm.

C. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.

D. Compressive Strength Tests: ASTM C39/C39M, for each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cubic yards (76 cu m) or less of each class of concrete placed.

E. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.

F. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

3.10 DEFECTIVE CONCRETE

A. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances or specified requirements.

B. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

C. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect for each individual area.

3.11 PROTECTION

A. Do not permit traffic over unprotected concrete floor surface until fully cured.

END OF SECTION 033000

SECTION 033511
CONCRETE FLOOR FINISHES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface treatments for concrete floors and slabs.

B. Liquid densifiers and hardeners.

C. Polished concrete.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Finishing of concrete surface to tolerance; floating, troweling, and similar operations; curing.

B. Section 033000 - Cast-in-Place Concrete: Curing compounds that also function as sealers.

1.03 SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Product Data: Manufacturer's published data on each finishing product, including information on compatibility of different products and limitations.

C. Product Data: Manufacturer's published data and installation instructions for concrete polishing system and finishing products, including manufacturer's installation instructions, information on compatibility of different products, and limitations.

D. Maintenance Data: Provide data on maintenance and renewal of applied finishes.

E. Warranty Documentation: Manufacturer warranty; ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 FIELD CONDITIONS

A. Maintain light level equivalent to a minimum 200 W light source at 8 feet (2.5 m) above the floor surface over each 20 foot (6 m) square area of floor being finished.

B. Do not finish floors until interior heating system is operational.

C. Maintain ambient temperature of 50 degrees F (10 degrees C) minimum.

1.05 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Correct defective work within a two-year period commencing on the Date of Substantial Completion.

PART 2 PRODUCTS

2.01 CONCRETE FLOOR FINISH APPLICATIONS

A. Unless otherwise indicated, all concrete floors are to be finished using liquid densifier/hardener.

B. Polished Finish:
   1. Use at following locations: See Floor Finish Plan.

2.02 DENSIFIERS AND HARDENERS

A. Liquid Densifier and Hardener: Penetrating chemical compound that reacts with concrete, filling the pores, hardening, and dustproofing.

2.03 POLISHED CONCRETE SYSTEM

A. Polished Concrete System: Materials, equipment, and procedures designed and furnished by a single manufacturer to produce dense polished concrete of the specified sheen.
   1. Acceptable Systems:
      a. Curecrete Distribution, Inc; RetroPlate: www.curecrete.com/#sle.

b. PROSOCO, Inc; Consolideck Polished Concrete System: www.prosoco.com/consolideck/#sle.
c. Advanced Floor Products Inc; RetroPlate 99 www.retroplatesystem.com.
d. Substitutions: See Section 012500 – Substitution Procedures

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that floor surfaces are acceptable to receive the work of this section.

B. Verify that flaws in concrete have been patched and joints filled with methods and materials suitable for further finishes.

3.02 GENERAL

A. Apply materials in accordance with manufacturer's instructions.

3.03 COATING APPLICATION

A. Verify that surface is free of previous coatings, sealers, curing compounds, water repellents, laitance, efflorescence, fats, oils, grease, wax, soluble salts, residues from cleaning agents, and other impediments to adhesion.

B. Protect adjacent non-coated areas from drips, overflow, and overspray; immediately remove excess material.

C. Apply coatings in accordance with manufacturer's instructions, matching approved mock-ups for color, special effects, sealing and workmanship.

3.04 CONCRETE POLISHING

A. Execute using materials, equipment, and procedures specified by manufacturer, using manufacturer approved installer.
   1. Semi-Gloss Finish: Reflecting overhead and side images from 35 to 45 feet (10 to 14 meters) away.

B. Protect finished surface as required and as recommended by manufacturer of polishing system.

END OF SECTION 033511

SECTION 035400
CAST UNDERLAYMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Liquid-applied self-leveling floor underlayment.
   1. Use gypsum-based type at Raised Floor Areas without ramp.
   2. Use cementitious type at See Architectural Slab Plan.

1.02 REFERENCE STANDARDS

A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in.Cube Specimens) 2021.

B. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete 2018.

C. ASTM C348 - Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars 2021.

D. ASTM C472 - Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters, and Gypsum Concrete 2020.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2023.

1.03 SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Product Data: Provide manufacturer's data sheets documenting physical characteristics and product limitations of underlayment materials. Include information on surface preparation, environmental limitations, and installation instructions.

C. Manufacturer's Instructions.

1.04 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing the work of this section, and approved by manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Keep dry and protect from direct sun exposure, freezing, and ambient temperature greater than 105 degrees F (41 degrees C).

1.06 FIELD CONDITIONS

A. Do not install underlayment until floor penetrations and peripheral work are complete.

B. Maintain minimum ambient temperatures of 50 degrees F (10 degrees C) 24 hours before, during and 72 hours after installation of underlayment.

C. During the curing process, ventilate spaces to remove excess moisture.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Gypsum Underlayment:
   1. ARDEX Engineered Cements; ARDEX K 22 F with ARDEX P51 Primer: www.ardexamericas.com/#sle.
   2. Maxxon Corporation; Commercial EZ Crete: www.maxxon.com/#sle.
   3. SILPRO Corporation; Silflo SG: www.silpro.com/#sle.

B. Cementitious Underlayment:
   1. ARDEX Engineered Cements; ARDEX V 1200 with ARDEX P51 Primer: www.ardexamericas.com/#sle.

2. LATICRETE International, Inc; LATICRETE DRYTEK Skimcoat with DRYTEK LEVELEX Primer: www.laticrete.com/#sle.
3. LATICRETE International, Inc; LATICRETE NXT Skim: www.laticrete.com/#sle.
4. Maxxon Corporation; Maxxon Commercial Level EZ: www.maxxon.com/#sle.
5. SILPRO Corporation; Skim Pro: www.silpro.com/#sle.
6. Substitutions: See Section 012500 Substitution Procedures.

2.02 MATERIALS

A. Gypsum-Based Underlayment: Gypsum based mix, that when mixed with water in accordance with manufacturer's directions will produce self-leveling underlayment with the following properties:
   1. Compressive Strength: Minimum 2500 pounds per square inch (17.24 MPa), tested per ASTM C472.
   2. Density: Maximum 115 pounds per cubic foot (1842 kg/cu m).
   3. Final Set Time: 1 to 2 hours, maximum.
   4. Thickness: 3/4 inch (19 mm) to maximum 3 inch (_____ mm).
   5. Surface Burning Characteristics: Flame spread/Smoke developed index of 0/0 in accordance with ASTM E84.

B. Cementitious Underlayment: Blended cement mix, that when mixed with water in accordance with manufacturer's directions will produce self-leveling underlayment with the following properties:
   1. Compressive Strength: Minimum 4000 pounds per square inch (27.6 MPa) after 28 days, tested per ASTM C109/C109M.
   2. Flexural Strength: Minimum 1000 psi (6.9 MPa) after 28 days, tested per ASTM C348.
   3. Density: 125 pounds per cubic foot (2002 kg/cu m), nominal.
   4. Final Set Time: 1-1/2 to 2 hours, maximum.
   5. Thickness: Capable of thicknesses from feather edge to maximum 3-1/2 inch (89 mm).
   6. Surface Burning Characteristics: Flame spread/Smoke developed index of 0/0 in accordance with ASTM E84.

C. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to underlayment mix materials.

D. Primer: Manufacturer's recommended type.

E. Joint and Crack Filler: Latex based filler, as recommended by manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are clean, dry, unfrozen, do not contain petroleum byproducts, or other compounds detrimental to underlayment material bond to substrate.

3.02 PREPARATION

A. Remove substrate surface irregularities. Fill voids and deck joints with filler. Finish smooth.

B. Vacuum clean surfaces.

C. Prime substrate in accordance with manufacturer's instructions. Allow to dry.

D. Close floor openings.

3.03 APPLICATION

A. Install underlayment in accordance with manufacturer's instructions.

B. Place to indicated thickness, with top surface level to 1/8 inch in 10 ft (1:1000).

3.04 PROTECTION

A. Protect against direct sunlight, heat, and wind; prevent rapid drying to avoid shrinkage and cracking.

B. Do not permit traffic over unprotected floor underlayment surfaces.

END OF SECTION 035400

SECTION 051200
STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Structural steel framing members.

B. Structural steel support members and struts.

C. Grouting under base plates.

1.02 RELATED REQUIREMENTS

A. See Section 099600 – High Performance Coatings for finishing exterior exposed steel

1.03 REFERENCE STANDARDS

A. AISC (MAN) - Steel Construction Manual 2017.

B. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges 2022.

C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2019.

D. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2023.

E. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength 2021.

F. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes 2021a.

G. ASTM A529/A529M - Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality 2019.

H. ASTM A992/A992M - Standard Specification for Structural Steel Shapes 2022.

I. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength 2022.

J. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification 2021.

K. AWS D1.1/D1.1M - Structural Welding Code - Steel 2020, with Errata (2022).

1.04 SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Shop Drawings:
   1. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.
   2. Connections not detailed.

C. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

1.05 QUALITY ASSURANCE

A. Fabricate structural steel members in accordance with AISC (MAN) "Steel Construction Manual."

B. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and no more than 12 months before start of scheduled welding work.

PART 2 PRODUCTS

2.01 MATERIALS

A. Steel Angles and Plates: See Structural Drawing Notes

B. Steel Shapes: See Structural Drawing Notes

C. Cold-Formed Structural Tubing: See Structural Drawing Notes

D. Structural Bolts and Nuts: See Structural Drawing Notes

E. Tension Control Bolts: See Structural Drawing Notes

F. Welding Materials: See Structural Drawing Notes

2.02 FABRICATION

A. Shop fabricate to greatest extent possible.

B. Fabricate connections for bolt, nut, and washer connectors.

2.03 FINISH

A. Shop prime structural steel members. Do not prime surfaces that will be fireproofed, field welded, in contact with concrete, or high strength bolted.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that conditions are appropriate for erection of structural steel and that the work may properly proceed.

3.02 ERECTION

A. Erect structural steel in compliance with AISC 303.

B. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

C. Grout solidly between column plates and bearing surfaces, complying with manufacturer's instructions for nonshrink grout. Trowel grouted surfaces smooth, splaying neatly to 45 degrees.

3.03 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch (6 mm) per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch (6 mm).

END OF SECTION 051200

SECTION 054000
COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Formed steel stud exterior wall and interior wall framing.

B. Exterior wall sheathing.

C. Formed steel joist and purlin framing and bridging.

1.02 RELATED REQUIREMENTS

A. Section 072100 - Thermal Insulation: Insulation within framing members.

B. Section 076200 - Sheet Metal Flashing and Trim: Head and sill flashings.

C. Section 079200 - Joint Sealants.

D. Section 092116 - Gypsum Board Assemblies: Gypsum-based sheathing and non-structural metal framing.

E. Section 095100 - Acoustical Ceilings: Ceiling suspension system.

1.03 REFERENCE STANDARDS

A. AISI S240 - North American Standard for Cold-Formed Steel Structural Framing 2015, with Errata (2020).

B. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members 2015.

C. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories 2020.

1.04 SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Product Data: Provide data on cold-formed steel structural members; include material descriptions and base steel thickness.

C. Steel Framing Industry Association (SFIA) Certification:
   1. Submit documentation that metal studs and connectors used on project meet or exceed requirements of International Building Code.
   2. Submit current documentation of contractor accreditation and installer certification. Keep copies of each on-site during and after installation, and present upon request.

1.05 QUALITY ASSURANCE

A. See Section 014000 - Quality Requirements for additional requirements.

B. SFIA Code Compliance Certification Program: www.CFsteel.org/#sle: Use metal studs and connectors certified for compliance with International Building Code.

C. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, and with minimum three years of documented experience.

D. Professional Contractor and Truss Fabricator Qualifications: SFIA-accredited contractor and fabricator: www.CFsteel.org/#sle.

E. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience and approved by manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Structural Framing:
   1. CEMCO; www.cemcosteel.com/#sle.

2. ClarkDietrich; www.clarkdietrich.com/#sle.
3. Jaimes Industries; www.jaimesind.com/#sle.
4. MarinoWARE; www.marinoware.com/#sle.
5. SCAFCO Corporation; www.scafco.com/#sle.
6. Steel Construction Systems; www.steelconsystems.com/#sle.
7. The Steel Network, Inc; www.SteelNetwork.com/#sle.
8. Substitutions: See Section 012500 – Substitution Procedures

B. Connectors:
1. Same manufacturer as metal framing.
2. Simpson Strong-Tie; www.strongtie.com/#sle.
3. Substitutions: See Section 012500 – Substitution Procedures

2.02 PERFORMANCE REQUIREMENTS

2.03 MATERIALS

A. Steel Sheet: ASTM A1003/A1003M, subject to the ductility limitations indicated in AISI S240.

2.04 STRUCTURAL FRAMING COMPONENTS

A. Wall Studs and Track Sections: AISI S240; c-shaped studs and u-shaped track sections in stud-matching nominal width and compatible height.
1. Structural Grade: See structural Drawings.

2.05 CONNECTIONS

2.06 SHEATHING

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

B. Verify field measurements and adjust installation as required.

3.02 PREPARATION

A. Structural Wall Foundations: For gaps between wall bottom track and top of foundation 1/4 inch (6.4 mm) or greater, level substrate with loadbearing shims or grout between track and foundation.

3.03 INSTALLATION - GENERAL

A. Install structural members and connections in compliance with ASTM C1007.

3.04 INSTALLATION OF STUDS

A. Install wall studs plumb and level.

B. Construct corners using minimum of three studs. Install double studs at wall openings, door and window jambs.

C. Install load-bearing studs full length in one piece. Splicing of studs is not permitted.

D. Coordinate placement of insulation in multiple stud spaces made inaccessible after erection.

E. Install intermediate studs above and below openings to align with wall stud spacing.

F. Install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.

3.05 INSTALLATION OF JOISTS AND PURLINS

A. Install framing components in accordance with manufacturer's instructions.

B. Make provisions for erection stresses. Provide temporary alignment and bracing.

C. Locate joist end bearing directly over load-bearing studs or provide load distribution on top of stud track.

3.06 INSTALLATION OF WALL SHEATHING

A. Install wall sheathing with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using self-tapping screws.

END OF SECTION 054000

SECTION 061000
ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. At existing wood framing locations (Walls south of Grid C)
   1. Structural dimension lumber framing.
   2. Nonstructural dimension lumber framing.
   3. Blocking
   4. Rough opening framing for doors, windows, and roof openings.
   5. Sheathing.
   6. Preservative treated wood materials.
   7. Concealed wood blocking, nailers, and supports.

B. Communications and electrical room mounting boards.

C. New roof sheathing at New Canopy and new addition.

1.02 RELATED REQUIREMENTS

A. Section 035400 - Cast Underlayment.

B. Section 076200 - Sheet Metal Flashing and Trim: Sill flashings.

1.03 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2023.

B. PS 1 - Structural Plywood 2019.

C. PS 2 - Performance Standard for Wood Structural Panels 2018.

D. PS 20 - American Softwood Lumber Standard 2021.

1.04 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
   1. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.
   2. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at www.alsc.org, and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

A. Sizes: Nominal sizes as indicated on drawings, S4S.

B. Moisture Content: S-dry or MC19.

C. Stud Framing (2 by 2 through 2 by 6 (50 by 50 mm through 50 by 150 mm)):
   1. Species: Allowed under referenced grading rules.
   2. Grade: No. 2.

D. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
   1. Lumber: S4S, No. 2 or Standard Grade.
   2. Boards: Standard or No. 3.

2.03 CONSTRUCTION PANELS

A. Roof Sheathing: PS 2 type, rated Structural I Sheathing.
   1. Bond Classification: Exterior.
   2. Span Rating: 60.
   3. Performance Category: 3/4 PERF CAT.

B. Wall Sheathing: Plywood, PS 1, Grade C-D, Exposure I.

C. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch (19 mm) thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

PART 3 EXECUTION

3.01 PREPARATION

A. Install sill gasket under sill plate of framed walls bearing on foundations; puncture gasket cleanly to fit tightly around protruding anchor bolts.

3.02 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

3.03 FRAMING INSTALLATION

A. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength or result in unacceptable appearance of exposed members.

B. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.

C. Install structural members full length without splices unless otherwise specifically detailed.

D. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes and AWC (WFCM) Wood Frame Construction Manual.

E. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists; use metal joist hangers unless otherwise detailed.

F. Frame wall openings with two or more studs at each jamb; support headers on cripple studs.

3.04 BLOCKING, NAILERS, AND SUPPORTS

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

B. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.

C. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

D. Provide the following specific nonstructural framing and blocking:
   1. Cabinets and shelf supports.
   2. Wall brackets.
   3. Handrails.
   4. Grab bars.
   5. Towel and bath accessories.
   6. Wall-mounted door stops.
   7. Chalkboards and marker boards.
   8. Wall paneling and trim.

9. Wall mounted TV or Computer monitors.
10. Joints of rigid wall coverings that occur between studs.

3.05 INSTALLATION OF CONSTRUCTION PANELS

A. Roof Sheathing: Secure panels with long dimension perpendicular to framing members, with ends staggered and over firm bearing.
   1. Screw panels to framing; staples are not permitted.

B. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using nails, screws, or staples.

C. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches (610 mm) on center on all edges and into studs in field of board.
   1. Install adjacent boards without gaps.

END OF SECTION 061000

SECTION 062000
FINISH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Finish carpentry items.

B. Hardware and attachment accessories.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Support framing, grounds, and concealed blocking.

B. Section 081416 - Flush Wood Doors.

C. Section 099300 - Staining and Transparent Finishing: Staining and transparent finishing of finish carpentry items.

D. Section 123000 - Manufactured Casework

1.03 REFERENCE STANDARDS

A. PS 1 - Structural Plywood 2019.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with plumbing rough-in, electrical rough-in, installation of associated and adjacent components.

1.05 SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Product Data:
   1. Provide manufacturer's product data, storage and handling instructions for factory-fabricated units.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store finish carpentry items under cover, elevated above grade, and in a dry, well-ventilated area not exposed to heat or sunlight.

B. Protect from moisture damage.

C. Handle materials and products to prevent damage to edges, ends, or surfaces.

PART 2 PRODUCTS

2.01 FINISH CARPENTRY ITEMS

A. Exterior Woodwork Items:
   1. Soffits: Cedar as specified on drawings Prepare for transparent finish

B. Interior Woodwork Items:
   1. Window Sills: MDF; prepare for paint finish.
   2. Cased Opening: Clear Cedar: prepare for transparent finish
   3. Cedar Wood Siding as specified on drawings: Prepare for transparent finish.
   4. Chair Rail: Prepare for paint finish
   5. Acoustical Panel wood base rail: Prepare for paint finish

2.02 SHEET MATERIALS

A. Softwood Plywood, Not Exposed to View: Any face species, medium density fiberboard core; PS 1 Grade A-B, glue type as recommended for application.

2.03 FASTENINGS

A. Fasteners: Of size and type to suit application; galvanized steel finish in concealed locations and stainless steel finish in exposed locations.

B. Fasteners for Exterior Applications: Stainless steel; length required to penetrate wood substrate 1-1/2 inch minimum.

2.04 FABRICATION

A. Shop assemble work for delivery to site, permitting passage through building openings.

B. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.02 INSTALLATION

A. Set and secure materials and components in place, plumb and level.

B. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

3.03 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch.

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

END OF SECTION 062000

SECTION 068316
FIBERGLASS REINFORCED PANELING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fiberglass reinforced plastic panels.

B. Trim.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

A. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber 2021.

B. ASTM D5319 - Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels 2022.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2023.

D. FDA Food Code - Chapter 6 - Physical Facilities Current Edition.

E. ISO 846 - Plastics - Evaluation of the Action of Microorganisms 2019.

F. ISO 2812-1 - Paints and Varnishes -- Determination of Resistance to Liquids -- Part 1: Immersion in Liquids Other than Water 2017.

1.04 SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Samples: Submit two samples 6" inch (x 6" mm) in size illustrating material and surface design of panels.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fiberglass Reinforced Plastic Panels:
   1. Crane Composites, Inc; www.cranecomposites.com/#sle.
   2. Marlite, Inc; www.marlite.com/#sle.
   3. Nudo Products, Inc; www.nudo.com/#sle.
   4. Panolam Industries International, Inc; www.panolam.com/#sle.
   5. Substitutions: See Section 012500 – Substitution Procedures

2.02 PANEL SYSTEMS

A. Wall Panels:
   1. Panel Size: 4 by 8 feet (1.2 by 2.4 m).
   2. Panel Thickness: 0.10 inch (2.5 mm).
   3. Surface Design: Smooth.
   4. Color: White.
   5. Attachment Method: Adhesive only, with trim and sealant in joints.

2.03 MATERIALS

A. Panels: Fiberglass reinforced plastic (FRP), complying with ASTM D5319.
   1. Surface Burning Characteristics: Maximum flame spread index of 25 and smoke developed index of 450; when system tested in accordance with ASTM E84.
   2. Surface Characteristics and Cleanability: Provide products that are smooth, durable, and easily cleanable, in compliance with FDA Food Code, Chapter 6 - Physical Facilities.
   3. Chemical Cleanability: Excellent chemical resistance to common cleaners and detergents when tested in accordance with ISO 2812-1.

B. Trim: Vinyl; color coordinating with panel.

C. Adhesive: Type recommended by panel manufacturer.

D. Sealant: Type recommended by panel manufacturer; white.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions and substrate flatness before starting work.

B. Verify that substrate conditions are ready to receive the work of this section.

3.02 INSTALLATION - WALLS

A. Install panels in accordance with manufacturer's instructions.

B. Cut and drill panels with carbide tipped saw blades, drill bits, or snips.

C. Apply adhesive to the back side of the panel using trowel as recommended by adhesive manufacturer.

D. Apply panels to wall with seams plumb and pattern aligned with adjoining panels.

E. Install panels with manufacturer's recommended gap for panel field and corner joints.

F. Place trim on panel before fastening edges, as required.

G. Fill channels in trim with sealant before attaching to panel.

H. Install trim with adhesive and screws or nails, as required.

I. Seal gaps at floor, ceiling, and between panels with applicable sealant to prevent moisture intrusion.

J. Remove excess sealant after paneling is installed and prior to curing.

END OF SECTION 068316

SECTION 072100
THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. XPS Board insulation at underside of floor slabs

B. Polyurethane foam-plastic board insulation at roof and exterior girt framed walls

C. Unfaced Glass Fiber Batt insulation in wall construction.

D. Unfaced Glass Fiber Batt insulation in wall and roof construction.

E. Acoustical Batt insulation in interior wall and ceiling construction.

F. Unfaced Glass Fiber Batt insulation for filling metal door frames.

G. Sill Sealer below new and infilled exterior wall sill plates.

1.02 RELATED REQUIREMENTS

A. Section 072700 - Air Barriers: Separate air barrier materials.

1.03 REFERENCE STANDARDS

A. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method 2022.

B. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation 2022.

C. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications 2013 (Reapproved 2019).

D. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation 2022.

E. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing 2017.

F. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension 2016 (Reapproved 2021).

G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2023.

H. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 °C 2022.

1.04 SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

C. Manufacturer's Installation Instructions: Include information on installation techniques.

1.05 FIELD CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. Insulation Under Concrete Slabs: Extruded polystyrene (XPS) board.

B. Insulation in Metal Framed Walls: Glass Fiber Batt insulation with no vapor retarder.

C. Insulation in Wood Framed Walls: Glass Fiber Batt insulation with no vapor retarder.

D. Insulation Above Lay-In Acoustical Ceilings: Glass Fiber Batt insulation with no vapor retarder.

E. Insulation Over Roof Deck: Polyurethane foam-plastic board insulation

F. Insulation outside of girt framed steel walls: Polyurethane foam-plastic board insulation

G. Insulation in hollow metal frames: Glass Fiber insulation

H. Insulation in perimeter cracks and crevices the exterior wall: Spray Foam Insulation

I. Insulation in specified interior sound walls and layed on interior ACT ceilings: Glass Fiber Acoustical Batt insulation

2.02 FOAM BOARD INSULATION MATERIALS

A. Polyurethane foam-plastic board insulation.
   1. Manufacturer's standard proprietary composite rigid polyurethane-core board with integral factory-applied exterior and interior fiber-reinforced polypropylene scrim facings, with factory-applied tape tab system for integral vapor-retarding air barrier membrane. Edge condition as recommended by manufacturer.
   2. Basis-of-Design Product:
      a. Subject to compliance with requirements, provide Pacific Insulation Products, R-Seal Board insulation.
      b. Substitutions: See Section016000-Product Requirements.
   3. Performance Requirements - Board Insulation Core
      a. 20-psi (138-kPa) minimum compressive strength when tested in accordance with ASTM D1621.
      b. Density to be between 2.0 and 2.5 lb. per cubic ft. when tested in accordance with ASTM D1622.
      c. Maximum vapor permeance of 2.27-perm at 1-inch (25.4-mm) thickness when tested in accordance with ASTM E96.
      d. Maximum air permeance of 0.004 cubic ft. per minute per sq. ft. under a pressure differential of 0.3 inch wg (75 Pa) when tested in accordance with ASTM E2178.
      e. R7.5 minimum stable R-value at 1-inch (25.4-mm) thickness when tested in accordance with ASTM C518.
      f. 87 percent closed cell core when tested in accordance with ASTM D2856.
      g. Minimum self-ignition temperature of 932 deg F (500 deg C) when tested in accordance with ASTM D1929.
      h. Mold-resistant (no growth) when tested in accordance with ASTM C665 and ASTM C1338.
      i. Board insulation to be left exposed to the interior of the building without an additional thermal barrier.
   4. Performance - Integral Air Barrier Facing
      a. Light Reflectance (LR) to be not less than 85 percent when tested in accordance with ASTM C523.
      b. Bursting Strength to be not less than 120 psi (827 kPa) when tested in accordance with ASTM D774.
      c. Tensile Strength to be not less than 195 lb./inch width (MD) and not less than 150 lb./inch width (XD) when tested in accordance with ASTM C1136.
      d. Vapor Permeance to be not less than 0.09-perm when tested in accordance with ASTM E96.
      e. Remain flexible with no delamination when tested at low temperature of minus 40 deg F (minus 40 deg C) and high temperature of 240 deg F (115 deg C) when tested in accordance with ASTM D1790.
      f. Highly resistant to solvents and chemicals when tested in accordance with ASTM D543.
      g. Excellent resistance to environmental stress cracking when tested in accordance with ASTM D1693.
      h. Mold-resistant (no growth) when tested in accordance with ASTM C1338.
   5. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches (305 mm) and wider in width.
   6. Air Barrier Tape: Pressure-sensitive tape of type recommended by board insulation manufacturer for sealing joints and penetrations in integral air barrier facing.

B. Extruded Polystyrene (XPS) Board Insulation: Comply with ASTM C578 with either natural skin or cut cell surfaces.
   1. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
   2. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
   3. Type and Thermal Resistance, R-value (RSI-value): Type IV, 5.0 (0.88), minimum, per 1 inch (25.4 mm) thickness at 75 degrees F (24 degrees C) mean temperature.
   4. Products:
      a. DuPont de Nemours, Inc; Styrofoam Brand: building.dupont.com/#sle.
      b. Kingspan Insulation LLC; GreenGuard XPS Type IV, 25 psi: www.kingspan.com/#sle.
      c. Owens Corning Corporation; FOAMULAR Extruded Polystyrene (XPS) Insulation: www.ocbuildingspec.com/#sle.
      d. Substitutions: See Section 016000 - Product Requirements.

2.03 MINERAL FIBER BLANKET INSULATION MATERIALS (THERMAL AND SOU

A. Flexible Glass Fiber Blanket Thermal Insulation: Preformed insulation, complying with ASTM C665; friction fit.
   1. Flame Spread Index: 75 or less, when tested in accordance with ASTM E84.
   2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
   3. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
   4. Products:
      a. CertainTeed Corporation; www.certainteed.com/#sle.
      b. Johns Manville; www.jm.com/#sle.
      c. Owens Corning Corporation; EcoTouch PINK FIBERGLAS Insulation: www.ocbuildingspec.com/#sle.
   5. Substitutions: See Section 012500 – Substitution Procedures

2.04 SPRAY APPLIED FOAM INSULATION

A. Spray foam insulation for filling cavities, cracks and crevices and where indicated:
   1. Air permeability - ASTM E283: .0049 L/Sq. meter @ 75{a fpr 5.25"
   2. Thermal Resistance - ASTM C518: R13 min. per 3 ½”
   3. Water Vapor transmission - ASTM E96: 16 perms @ 3” thick
   4. Manufacturers:
      a. Dupont; www.dupont.com.
         1) FROTH-PAK Low GWP.
   5. Substitutions: See Section 012500 – Substitution Procedures

2.05 ACCESSORIES

A. Sheet Vapor Retarder: See Section 072600.

B. Interior Vapor Retarder: Modified polyethylene/polyacrylate (PE/PA) film reinforced with polyethylene terephthalate (PET) fibers, 12 mil, 0.012 inch (0.30 mm) thick.
   1. Width: 4.9 feet (1.5 m).
   2. Products:
      a. SIGA Cover Inc; SIGA-Majrex 200: www.siga.swiss/global_en/#sle.
      b. Certainteed; Membrain Smart vapor Retarder.
      c. Substitutions: See Section 016000 - Product Requirements.

C. Tape: Reinforced polyethylene film with acrylic pressure sensitive adhesive.
   1. Application: Sealing of interior circular penetrations, such as pipes or cables.
   2. Width: Are required for application.
   3. Products:

D. Self-Adhered Transition Flashing: Multipurpose, self-adhered flashing with modified butyl adhesive, polyester fiber top sheet, and polypropylene interlayer.
   1. Application: Primerless adhesion for use as through-wall flashings and wall transitions to roof and below-grade systems.

2. Thickness: 45 mil, 0.045 inch (1.14 mm), nominal.
3. Size: 6 inches (152 mm) wide, in rolls 75 feet (23 m) long.
4. Tensile Strength: Greater than 1,300 psi (8963 kPa) complying with ASTM D412 test method.
5. Products:
   a. DuPont de Nemours, Inc; DuraGard CM Transition Flashing: building.dupont.com/#sle.
6. Substitutions: See Section 012500 – Substitution Procedures

E. Flashing Tape: Special reinforced film with high performance adhesive.
1. Application: Window and door opening flashing tape.
2. Width: As required for application.
3. Primer: Tape manufacturer's recommended product.
4. Products:
   a. Protecto Wrap Company; Protecto Super Stick Building Tape: www.protectowrap.com/#sle.
   b. Protecto Wrap Company; Protecto Seal 45 Butyl: www.protectowrap.com/#sle.
   c. Protecto Wrap Company; Protecto Seal PW 100/40: www.protectowrap.com/#sle.
   d. Protecto Wrap Company; Protecto BT20XL Butyl: www.protectowrap.com/#sle.
   e. Protecto Wrap Company; Protecto BT25XL: www.protectowrap.com/#sle.
   f. Rmax Inc; R-SEAL 6000: www.rmax.com/#sle.
5. Substitutions: See Section 012500 – Substitution Procedures

F. Sill Plate Sealer: Closed-cell foam tape with rubberized adhesive membrane; bridges gap between foundation structure and sill plate or skirt board.
1. Width: 3-1/2 inches (89 mm).
2. Ultraviolet (UV) and Weathering Resistance: Approved in writing by manufacturer for up to 30 days of weather exposure.
3. Products:
   a. Protecto Wrap Company; Triple Guard Energy Sill Sealer: www.protectowrap.com/#sle.

G. Tape joints of rigid insulation in accordance with roofing and insulation manufacturers' instructions.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.

B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.02 BOARD INSTALLATION UNDER CONCRETE SLABS

A. Place insulation under slabs on grade after base for slab has been compacted.

B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

C. Prevent insulation from being displaced or damaged while placing vapor retarder and placing slab.

3.03 BATT INSTALLATION

A. Install insulation and vapor retarder in accordance with manufacturer's instructions.

B. Install in exterior wall and roof spaces without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

E. Tape seal butt ends, lapped flanges, and tears or cuts in membrane.

F. At wood framing, place vapor retarder on warm side of insulation by stapling at 6 inches (152 mm) on center. Lap and seal sheet retarder joints over face of member.

G. At metal framing, place vapor retarder on warm side of insulation; lap and seal sheet retarder joints over face of member

H. Tape seal tears or cuts in vapor retarder.

I. Extend vapor retarder tightly to full perimeter of adjacent window and door frames and other items interrupting the plane of the membrane; tape seal in place.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

3.05 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION 072100

SECTION 072700
AIR / WEATHER RESISTANT BARRIER

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Air / Weather Resistant (WRB) barriers.

1.02 RELATED REQUIREMENTS

A. Section 076200 - Sheet Metal Flashing and Trim: Metal flashings installed in conjunction with air barriers.

B. Section 074113 - Metal Roof Panels: Self Adhering roof underlayment that acts as Air Barrier.

1.03 DEFINITIONS

A. Air Barrier: Airtight barrier made of material that is virtually air impermeable but water vapor permeable, both to amount as specified, with sealed seams and sealed joints to adjacent surfaces.

1.04 REFERENCE STANDARDS

A. AATCC Test Method 127 - Test Method for Water Resistance: Hydrostatic Pressure 2018, with Editorial Revision (2019).

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2023.

C. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials 2022a, with Editorial Revision (2023).

D. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials 2021a.

E. ASTM E2357 - Standard Test Method for Determining Air Leakage Rate of Air Barrier Assemblies 2018.

F. ICC-ES AC148 - Acceptance Criteria for Flexible Flashing Materials 2017, with Editorial Revision (2021).

G. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components 2023.

1.05 SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Manufacturer's Installation Instructions: Indicate preparation, installation methods, and storage and handling criteria.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.

B. Manufacturer Qualification: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture, and use secondary materials approved in writing by primary material manufacturer.

PART 2 PRODUCTS

2.01 AIR BARRIER MATERIALS (AIR IMPERMEABLE AND WATER VAPOR PERMEABLE)

A. Air Barrier Sheet, Mechanically Fastened:
   1. Air Permeance: 0.004 cfm/sq ft, maximum, when tested in accordance with ASTM E2178.
   2. Water Vapor Permeance: 10 perms, minimum, when tested in accordance with ASTM E96/E96M using Procedure A - Desiccant Method, at 73.4 degrees F.
   3. Water Penetration Resistance: Withstand a water head of 21 inches, minimum, for at least 5 hours, when tested in accordance with AATCC Test Method 127.
   4. Ultraviolet (UV) and Weathering Resistance: Approved by manufacturer for up to 90 days of weather exposure.

5. Surface Burning Characteristics: Flame spread index of 25 or less, and smoke developed index of 50 or less, Class A, when tested in accordance with ASTM E84.
6. Comply with NFPA 285 requirements for wall assembly.
7. Seam and Perimeter Tape: Polyethylene self-adhering type, mesh reinforced, 2-1/2 inches wide, compatible with sheet material; unless otherwise indicated.
8. Products:
   a. DuPont de Nemours, Inc; Tyvek Construction Wrap with FlexWrap, StraightFlash, VersaFlange, and Tyvek Tape: building.dupont.com/#sle.
   b. Henry Company; WeatherSmart Commercial: www.henry.com/#sle.
   c. Kingspan Insulation LLC; GreenGuard MAX Building Wrap: www.trustgreenguard.com/#sle.
   d. VaproShield, LLC; WrapShield IT - Integrated Tape: www.vaproshield.com/#sle.
9. Substitutions: See Section 012500 – Substitution Procedures

2.02 ACCESSORIES

A. Sealants, Tapes, and Accessories for Sealing Air Barrier and Adjacent Substrates: As indicated or in compliance with air barrier manufacturer's installation instructions.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and conditions are ready for work of this section.

B. Where existing conditions are responsibility of another installer, notify Architect of unsatisfactory conditions.

C. Do not proceed with this work until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

B. Clean and prime substrate surfaces to receive adhesives and sealants in accordance with manufacturer's installation instructions.

3.03 INSTALLATION

A. Install materials in accordance with manufacturer's installation instructions.

B. Air Barriers: Install continuous airtight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.

C. Apply sealants and adhesives within recommended temperature range in accordance with manufacturer's installation instructions.

D. Mechanically Fastened Sheets - On Exterior:
   1. Install sheets shingle fashion to shed water, with seams generally horizontal.
   2. Overlap seams as recommended by manufacturer, 6 inches, minimum.
   3. Overlap at outside and inside corners as recommended by manufacturer, 12 inches, minimum.
   4. For applications indicated to be airtight, seal seams, laps, penetrations, tears, and cuts with self-adhesive tape; use only large-headed, gasketed fasteners as recommended by manufacturer.
   5. Install air barrier underneath jamb flashings.
   6. At framed openings with frames having nailing flanges, extend sheet into opening and over flanges; at head of opening, seal sheet over flange and flashing.

E. Openings and Penetrations in Exterior Air Barriers:
   1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches onto air barrier and at least 6 inches up jambs; mechanically fasten stretched edges.
   2. At openings with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches wide; do not seal sill flange.

3. At openings with nonflanged frames, seal air barrier to each side of framing at opening using flashing at least 9 inches wide, and covering entire depth of framing.
4. At head of openings, install flashing under air barrier extending at least 2 inches beyond face of jambs; seal air barrier to flashing.
5. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.
6. Service and Other Penetrations: Form flashing around penetrating item and seal to air barrier surface.

3.04 PROTECTION

A. Do not leave materials exposed to weather longer than recommended by manufacturer.

END OF SECTION 072700

SECTION 074113
METAL ROOF PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal roof panel system of preformed steel panels.

B. Underlayment that acts as Air Barrier (Applied to exterior surface of old roofing)

1.02 RELATED REQUIREMENTS

A. Section 051200 - Structural Steel Framing: Roof framing and purlins.

B. Section 061000 - Rough Carpentry: Roof sheathing.

C. Section 072100 - Thermal Insulation: Rigid roof insulation.

D. Section 074213 - Metal Wall Panels: Preformed wall panels.

E. Section 079200 - Joint Sealants: Sealing joints between metal roof panel system and adjacent construction.

F. Section 133421- Structural Retrofit Roof Sub-Framing System

1.03 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix) 2022.

B. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures Most Recent Edition Cited by Referring Code or Reference Standard.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2022.

D. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength 2018a.

E. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection 2021.

F. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials 2022a, with Editorial Revision (2023).

G. ASTM E1592 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference 2005 (Reapproved 2017).

H. ASTM E1646 - Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference 1995 (Reapproved 2018).

I. ASTM E1680 - Standard Test Method for Rate of Air Leakage through Exterior Metal Roof Panel Systems 2016 (Reapproved 2022).

J. IAS AC472 - Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems 2018.

K. UL 580 - Standard for Tests for Uplift Resistance of Roof Assemblies Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Storage and handling requirements and recommendations.
   2. Installation methods.
   3. Specimen warranty.

C. Shop Drawings: Include layouts of roof panels, details of edge and penetration conditions, spacing and type of connections, flashings, underlayments, and special conditions.
   1. Show work to be field-fabricated or field-assembled.

D. Selection Samples: For each roofing system specified, submit color chips representing manufacturer's full range of available colors and patterns.

E. Verification Samples: For each roofing system specified, submit samples of minimum size 12 inches square, representing actual roofing metal, thickness, profile, color, and texture.

F. Manufacturer's qualification statement.

G. Test Reports: Indicate compliance of metal roofing system to specified requirements.

H. Warranty: Submit specified manufacturer's warranty and ensure that forms have been completed in Owner's name and are registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section and with at least three years of documented experience.
   1. Accredited by IAS in accordance with IAS AC472.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.

B. Store roofing panels on project site as recommended by manufacturer to minimize damage to panels prior to installation.

1.07 FIELD CONDITIONS

A. Do not install metal roof panels, eave protection membrane, underlayment, or _____ when surface, ambient air, or wind chill temperatures are below 45 degrees F.

1.08 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Finish Warranty: Provide 5-year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking. Complete forms in Owner's name and register with warrantor.

C. Special Warranty: Provide 2-year warranty for weathertightness of roofing system, including agreement to repair or replace metal roof panels that fail to keep out water commencing on the Date of Substantial Completion. Complete forms in Owner's name and register with warrantor.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Structural Metal Roof Panel Manufacturers:
   1. Mcelroy Metal; 238T; www.mcelroymetal.com
   2. Metal Sales; Magna-Loc-90: https://www.metalsales.us.com
   3. AEP Span; SpanSeam; www.aepspan.com
   4. MBCI; Battenlok HS: www.mbci.com
   5. Substitutions: See Section 012500 – Substitution Procedures

2.02 PERFORMANCE REQUIREMENTS

A. Metal Roof Panels: Provide complete roofing assemblies, including roof panels, clips, fasteners, connectors, and miscellaneous accessories, tested for compliance with the following minimum standards:

1. Structural Design Criteria: Provide panel assemblies designed to safely support design loads at support spacing indicated, with deflection not to exceed L/180 of span length(L) when tested in accordance with ASTM E1592.
   a. Dead Loads: Weight of roofing system.
   b. Live Loads: As required by ASCE 7.
2. Overall: Complete weathertight system tested and approved in accordance with ASTM E1592.
3. Wind Uplift: Class 90 wind uplift resistance of UL 580.
4. Air Infiltration: Maximum 0.06 cfm/sq ft at air pressure differential of 6.24 lbf/sq ft, when tested according to ASTM E1680.
5. Water Penetration: No water penetration when tested in accordance with procedures and recommended test pressures of ASTM E1646; perform test immediately following air infiltration test.
6. Thermal Movement: Design system to accommodate without deformation anticipated thermal movement over ambient temperature range of 100 degrees F.

2.03 STRUCTURAL METAL ROOF PANELS

A. General: Provide complete engineered system complying with specified requirements and capable of remaining weathertight while withstanding anticipated movement of substrate and thermally induced movement of roofing system.

B. Structural Metal Panels: Factory-formed panels with factory-applied finish.
   1. Steel Panels:
      a. Steel Thickness: Minimum 24 gauge, 0.024 inch.
   2. Width: Maximum panel coverage of 36 inches.

2.04 ATTACHMENT SYSTEM

A. Concealed System: Provide manufacturer's standard stainless steel or nylon-coated aluminum concealed anchor clips designed for specific roofing system and engineered to meet performance requirements, including anticipated thermal movement.

2.05 SECONDARY FRAMING

A. Secondary Framing for Roof Retrofit: Light gauge, asymmetrical section, steel zee profile framing precut with notches that match size, shape and spacing of existing metal roof seams.
   1. Products:
      a. See Section 133421 for Bidder Design Structural Retrofit Roof Sub-Framing System
      b. Substitutions: See Section 016000 - Product Requirements.

2.06 FABRICATION

A. Panels: Provide factory or field fabricated panels with applied finish and accessory items, using manufacturer's standard processes as required to achieve specified appearance and performance requirements.

2.07 FINISHES

A. Fluoropolymer Coil Coating System: Polyvinylidene fluoride (PVDF) multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent PVDF resin, and at least 80 percent of coil coated metal surfaces having minimum total dry film thickness (DFT) of 0.9 mil, 0.0009 inch; color and gloss as selected by Architect from manufacturer’s standard line.

2.08 ACCESSORIES

A. Miscellaneous Sheet Metal Items: Provide flashings, gutters, downspouts, trim, moldings, closure strips, preformed crickets, caps, and equipment curbs of the same material, thickness, and finish as used for the roofing panels. Items completely concealed after installation may optionally be made of stainless steel.

B. Rib and Ridge Closures: Provide prefabricated, close-fitting components of steel with corrosion resistant finish or combination steel and closed-cell foam.

C. Sealants:
   1. Exposed Sealant: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane.
   2. Concealed Sealant: Non-curing butyl sealant or tape sealant.

D. Underlayment: Self-adhering polymer modified asphalt sheet complying with ASTM D1970/D1970M, with strippable release film and top surface of woven polypropylene sheet.
   1. Sheet Thickness: 22 mil, 0.022 inch minimum total thickness.
   2. Self Sealability: Nail sealability in accordance with ASTM D1970/D1970M.
   3. Low Temperature Flexibility: Comply with ASTM D1970/D1970M.
   4. Water Vapor Permeance: 0.1 perm, maximum, when tested in accordance with ASTM E96/E96M using Desiccant Method (Method A).
   5. Products:
      a. Certainteed Roofing; WinterGuard HT - High Temperature Waterproofing Underlayment: www.certainteed.com/#sle.
      b. Henry Company; Blueskin RF200: www.henry.com/#sle.
      c. Henry Company; Blueskin PE200HT: www.henry.com/#sle.
      d. Polyglass USA, Inc; Polystick MTS Self-Adhered High Temperature Roof Underlayment: www.polyglass.us/#sle.
      e. System Components Corporation, Inc; FelTex SA300: www.systemcomponents.net/#sle.
      f. GCP Applied Technologies Inc; Grace Ice and Water Shield

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation of preformed metal roof panels until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Coordinate roofing work with provisions for roof drainage, flashing, trim, penetrations, and other adjoining work to ensure that completed roof will be free of leaks.

B. Separate dissimilar metals by applying a bituminous coating, self-adhering rubberized asphalt sheet, or other permanent method approved by metal roof panel manufacturer.

C. At locations where metal will be in contact with wood or other absorbent material subject to wetting, seal joints with sealing compound and apply one coat of heavy-bodied bituminous paint.

3.03 INSTALLATION

A. Overall: Install roofing system in accordance with approved shop drawings and metal roof panel manufacturer's instructions and recommendations, as applicable to specific project conditions; securely anchor components of roofing system in place allowing for thermal and structural movement.
   1. Install roofing system with concealed clips and fasteners, except as otherwise recommended by manufacturer for specific circumstances.
   2. Minimize field cutting of panels. Where field cutting is required, use methods that will not distort panel profiles. Use of torches for field cutting is prohibited.

B. Accessories: Install necessary components that are required for complete roofing assembly, including flashings, gutters, downspouts, trim, moldings, closure strips, preformed crickets, caps, equipment curbs, rib closures, ridge closures, and similar roof accessory items.

C. Roof Panels: Install metal roof panels in accordance with manufacturer's installation instructions, minimizing transverse joints except at junction with penetrations.
   1. Form weathertight standing seams incorporating concealed clips, using an automatic mechanical seaming device approved by panel manufacturer.

2. Install sealant or sealant tape at end laps and side joints as recommended by metal roof panel manufacturer.

3.04 CLEANING

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. Clean exposed sheet metal work at completion of installation. Remove grease and oil films, excess joint sealer, handling marks, and debris from installation, leaving the work clean and unmarked, free from dents, creases, waves, scratch marks, or other damage to the finish.

3.05 PROTECTION

A. Do not permit storage of materials or roof traffic on installed roof panels. Provide temporary walkways or planks as necessary to avoid damage to completed work. Protect roofing until completion of project.

B. Touch-up, repair, or replace damaged roof panels or accessories before Date of Substantial Completion.

END OF SECTION 074113

SECTION 074213
METAL WALL PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufactured metal panels for exterior wall panels, with related flashings and accessory components.

1.02 RELATED REQUIREMENTS

A. Section 054000 - Cold-Formed Metal Framing: Wall panel substrate.

B. Section 061000 - Rough Carpentry: Wall panel substrate.

C. Section 072100 - Thermal Insulation.

D. Section 072700 - Air Barriers: Air barrier under wall panels.

E. Section 074113 - Metal Roof Panels for metal roof panels and soffits

F. Section 079200 - Joint Sealants: Sealing joints between metal wall panel system and adjacent construction.

1.03 REFERENCE STANDARDS

A. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components 2023.

1.04 SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Product Data - Wall System: Manufacturer's data sheets on each product to be used, including:
   1. Physical characteristics of components shown on shop drawings.
   2. Storage and handling requirements and recommendations.
   3. Installation instructions and recommendations.

C. Shop Drawings: Indicate dimensions, layout, joints, construction details, support clips, and methods of anchorage.

D. Samples: Submit two samples of wall panel and soffit panel, 12 inches by 12 inches in size illustrating finish color, sheen, and texture.

E. Test Reports: Submit test report verifying compliance with NFPA 285 for previously-tested exterior wall assembly.

F. Manufacturer's qualification statement.

G. Installer's qualification statement.

H. Warranty Documentation for Installation of Building Rainscreen Assembly: Submit installer warranty and ensure that forms have been completed in Owner's name and registered with installer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in installing products specified in this section with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.

B. Store prefinished material off the ground and protected from weather; prevent twisting, bending, or abrasion; provide ventilation; slope metal sheets to ensure proper drainage.

C. Prevent contact with materials that may cause discoloration or staining of products.

1.07 FIELD CONDITIONS

A. Do not install wall panels when air temperature or relative humidity are outside manufacturer's limits.

1.08 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Finish Warranty: Provide 5-year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking. Complete forms in Owner's name and register with warrantor.

C. Special Warranty: Provide 2-year warranty covering water tightness and integrity of seals of metal wall panels. Complete forms in Owner's name and register with warrantor.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Wall Panels - Exposed Fasteners: Vertical Installation **(MTL-1)**
   1. AEP Span; HR-36
   2. Metal Sales; IC72
   3. MBCI; 7.2 Panel: www.mbci.com/#sle.
   4. McElroy Metal; Mega-Rib: www.mcelroymetal.com/#sle.
   5. Substitutions: See Section 016000 - Product Requirements.

B. Metal Wall Panels - Exposed Fasteners Horizontal Installation: **(MTL-2)**
   1. AEP Span; Flex Series; Nu-Wave
   2. Metal Sales; 7/8" Corrugated Wall
   3. MBCI; PBC: www.mbci.com/#sle.
   4. McElroy Metal; Multi-Cor: www.mcelroymetal.com/#sle.
   5. Substitutions: See Section 012500 – Substitution Procedures

2.02 METAL WALL PANEL SYSTEM

A. Wall Panel System: Factory fabricated prefinished metal panel system, site assembled.
   1. Provide exterior wall panels.
   2. Design and size components to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of wall.
   3. Maximum Allowable Deflection of Panel: L/180 for length(L) of span.
   4. Movement: Accommodate movement within system without damage to components or deterioration of seals, movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; and deflection of structural support framing.
   5. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.
   6. Fabrication: Formed true to shape, accurate in size, square, and free from distortion or defects; pieces of longest practical lengths.
   7. Corners: Factory-fabricated in one continuous piece with minimum 2-inch returns.

B. Exterior Wall Panels:
   1. Profile: Vertical and horizontal, as indicated; style as indicated.
   2. Material: Precoated steel sheet, 26 min gauge,
   3. Color: As selected by Architect from manufacturer's standard line.

C. Internal and External Corners: Same material, thickness, and finish as exterior sheets; profile to suit system; shop cut and factory mitered to required angles.

D. Expansion Joints: Same material, thickness and finish as exterior sheets; standard brake formed type, of profile to suit system.

E. Trim: Same material, thickness and finish as exterior sheets; brake formed to required profiles.

F. Anchors: Galvanized steel.

2.03 FINISHES

A. Exposed Surface Finish: Panel manufacturer's standard polyvinylidene fluoride (PVDF) coating, top coat over epoxy primer.

2.04 ACCESSORIES

A. Fasteners: Manufacturer's standard type to suit application; with soft neoprene washers, steel, hot dip galvanized. Fastener cap same color as exterior panel.
   1. Metal-to-Metal Fasteners: Self-drilling, self-tapping screws.

B. Field Touch-up Paint: As recommended by panel manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that building framing members are ready to receive panels.

B. Verify air barrier, see Section 072700, has been installed over wall panel substrate; see Section 054000.

3.02 PREPARATION

A. Protect surrounding areas and adjacent surfaces from damage during execution of this work.

3.03 INSTALLATION

A. Install panels on walls and soffits in accordance with manufacturer's instructions.

B. Protect surfaces in contact with cementitious materials and dissimilar metals with bituminous paint; allow to dry prior to wall panel installation.

C. Fasten panels to structural supports; aligned, level, and plumb.

D. Locate joints over supports.

E. Lap panel ends 2 inches, minimum.

F. Seal and place gaskets to prevent weather penetration. Maintain neat appearance.

3.04 TOLERANCES

A. Offset From True Alignment Between Adjacent Members Abutting or In Line: 1/16 inch, maximum.

B. Variation from Plane or Location As Indicated on Drawings: 1/4 inch, maximum.

3.05 CLEANING

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. Remove site cuttings from finish surfaces.

C. Remove protective material from wall panel surfaces.

D. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.

3.06 PROTECTION

A. Protect metal wall panels until completion of project.

B. Touch-up, repair, or replace damaged wall panels or accessories before Date of Substantial Completion.

END OF SECTION 074213

SECTION 074623
WOOD SIDING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wood siding with boards for walls and soffits.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Water-resistive barrier under siding.

B. Section 076200 - Sheet Metal Flashing and Trim: Product requirements for metal flashings and trim associated with wood siding for placement by this section.

C. Section 099113 - Exterior Painting: Prime and finish painting.

1.03 REFERENCE STANDARDS

A. APA 303 - Siding Manufacturing Specifications (Form B840) 2019.

B. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures Most Recent Edition Cited by Referring Code or Reference Standard.

C. WCLIB (GR) - Standard Grading Rules for West Coast Lumber No. 17 2018.

D. WWPA G-5 - Western Lumber Grading Rules 2021.

1.04 SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Product Data: Provide manufacturer's data on materials, component profiles, fastening methods, jointing details, sizes, surface texture, finishes, accessories, and _____; showing compliance with requirements, including:
   1. Physical characteristics of components shown on shop drawings.
   2. Storage and handling requirements and recommendations.
   3. Installation instructions and recommendations.

C. Samples: Submit two samples 12 by 12 inches in size illustrating surface texture.

D. Samples: Submit two samples 12 by 12 inches in size to applicator of finish paint for use in preparation of finish samples.

1.05 MOCK-UPS

A. Construct mock-up on project site incorporating required materials and workmanship, with minimum size of 4 feet long by 4 feet wide.

B. Mock-up may remain as part of work.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Comply with local wind load resistance requirements of ASCE 7.

2.02 WOOD SIDING AND SOFFIT MATERIALS

A. Grade lumber in accordance with the following:
   1. Western Red Cedar: WCLIB (GR).
   2. A Clear - 106-a: Grading rules of WCLIB.

B. Board Siding **(WD-1)**: Flat, western red cedar, maximum moisture content of 10 percent.
   1. Size: 1 inch thick, 6 inch high nominal board
   2. Profile: Tongue and groove. Flush Joint

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrates are ready to receive work.

B. Verify that water-resistive barrier has been correctly and completely installed over substrate; see Section 072700.

C. Do not begin until unacceptable conditions have been corrected.

D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Protect surrounding areas and adjacent surfaces during execution of this work.

3.03 INSTALLATION

A. Install siding, soffits, batten strips, and trim in accordance with manufacturer's instructions.

B. Fasten siding securely in place, level and plumb.
   1. Arrange for orderly nailing pattern, blind nail except over trim.
   2. Install siding for natural shed of water.
   3. Position cut ends over bearing surfaces, and sand cut edges smooth and clean.

C. Install board siding using single course method with 1 inch by 6 inch exposure.
   1. Nail at 12 inches on center.
   2. Miter horizontal joints tight at 45 degrees, miter external and miter internal corners.

D. Seal exposed wood substrates exposed to weather to prevent water accumulation and moisture intrusion.
   1. Seal penetrations.
   2. Seal exposed cuts of siding and trim; use of field-applied coatings is not permitted.

E. Install metal flashings at sills.

F. Exterior Soffit and Vents: Install in accordance with manufacturer's written instructions in locations as indicated on drawings; provide vents in locations as indicated on drawings.

G. Touch-up, repair, or replace wood siding materials having damaged factory-applied finish; notify Architect of damaged materials, and confirm acceptable process before completion of this work.

H. Sand work smooth and set exposed nails and screws.

3.04 TOLERANCES

A. Maximum Variation from Plumb and Level: 1/4 inch per 10 feet.

B. Maximum Offset from Joint Alignment: 1/16 inch.

3.05 CLEANING

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. Clean exposed work upon completion of installation; remove grease and oil films, excess joint sealer, handling marks, and debris from installation, leaving work clean and unmarked, free from dents, creases, waves, scratch marks, or other damage to finish.

3.06 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair, or replace damaged products before Date of Substantial Completion.

END OF SECTION 074623

SECTION 076200
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings, counterflashings, gutters, downspouts, sheet metal roofing, exterior penetrations, and other items indicated in Schedule.

B. Sealants for joints within sheet metal fabrications.

1.02 RELATED REQUIREMENTS

A. Section 077123 - Manufactured Gutters and Downspouts.

1.03 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix) 2022.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2022.

C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants 2018.

D. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free 2007 (Reapproved 2018).

E. CDA A4050 - Copper in Architecture - Handbook current edition.

F. SMACNA (ASMM) - Architectural Sheet Metal Manual 2012.

1.04 SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.01 SHEET MATERIALS

A. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24-gauge, 0.0239-inch (0.61 mm) thick base metal, shop pre-coated with PVDF coating.

1. Polyvinylidene Fluoride (PVDF) Coating: Superior performing organic powder coating, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system.

2.02 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Form pieces in longest possible lengths.

C. Hem exposed edges on underside 1/2 inch (13 mm); miter and seam corners.

D. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

E. Fabricate corners from one piece with minimum 18-inch (450 mm) long legs; seam for rigidity, seal with sealant.

F. Fabricate flashings to allow toe to extend 2 inches (50 mm) over roofing gravel. Return and brake edges.

2.03 GUTTERS AND DOWNSPOUTS

A. See Section 077123 for manufactured gutters and downspouts.

B. Gutters: SMACNA (ASMM) Rectangular profile.

C. Downspouts: Rectangular profile.

D. Gutters and Downspouts: Size indicated.

E. Accessories: Profiled to suit gutters and downspouts.
   1. Anchorage Devices: In accordance with SMACNA (ASMM) requirements.
   2. Gutter Supports: Brackets.
   3. Downspout Supports: Brackets.

F. Downspout Boots: Steel.

G. Downspout Extenders: Same material and finish as downspouts.

H. Seal metal joints.

2.04 EXTERIOR PENETRATION FLASHING PANELS

A. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.

2.05 ACCESSORIES

A. Fasteners: Galvanized steel, with soft neoprene washers.

B. Primer Type: Zinc chromate.

C. Concealed Sealants: Non-curing butyl sealant.

D. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.

E. Asphalt Roof Cement: ASTM D4586/D4586M, Type I, asbestos-free.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 INSTALLATION

A. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted..

B. Apply plastic cement compound between metal flashings and felt flashings.

C. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.

D. Secure gutters and downspouts in place with concealed fasteners.

E. Connect downspouts to downspout boots, and grout connection watertight.

END OF SECTION 076200

SECTION 077200
ROOF ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Roof curbs.

B. Eave vents.

C. Non-penetrating rooftop supports/assemblies

D. Non-penetrating roof fall protection anchors

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2023.

1.04 SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used.
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
   4. Maintenance requirements.

C. Shop Drawings: Submit detailed layout developed for this project and provide dimensioned location and number for each type of roof accessory.

D. Warranty Documentation:
   1. Submit manufacturer warranty.
   2. Ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store products under cover and elevated above grade.

PART 2 PRODUCTS

2.01 ROOF CURBS

A. Roof Curbs Manufacturers:
   1. AES Industries Inc: www.aescurb.com/#sle.
   2. The Pate Company: www.patecurbs.com/#sle.
   3. LMCurbs; Roof Curbs: www.lmcurbs.com/#sle.
   4. MKT Metal Manufacturing www.mktduct.com/#sle.
   5. Substitutions: See Section 012500 – Substitution Procedures

B. Roof Curbs Mounting Assemblies: Factory fabricated hollow sheet metal construction, internally reinforced, and capable of supporting superimposed live and dead loads and designated equipment load with fully mitered and sealed corner joints welded or mechanically fastened, and integral counterflashing with top and edges formed to shed water.
   1. Roof Curb Mounting Substrate: Curb substrate consists of standing seam metal roof panel system.
   2. Sheet Metal Material:
      a. Aluminum: 0.080 inch (2.03 mm) minimum thickness, with 3003 alloy, and H14 temper.
         1) Finish: Mill finish.

3. Roofing Cants: Provide integral sheet metal roofing cants dimensioned to begin slope at top of roofing system at 1:1 slope; minimum cant height 4 inches (102 mm).
4. Fabricate curb bottom and mounting flanges for installation directly on metal roof panel system to match slope and configuration of system.
    a. Extend side flange to next adjacent roof panel seam and comply with seam configurations and seal connection, providing at least 6 inch (152 mm) clearance between curb and metal roof panel flange allowing water to properly flow past curb.
    b. Where side of curb aligns with metal roof panel flange, attach fasteners on upper slope of flange to curb connection allowing water to flow past below fasteners, and seal connection.
    c. Maintain at least 12 inch (305 mm) clearance from curb, and lap upper curb flange on underside of down sloping metal roof panel, and seal connection.
    d. Lap lower curb flange overtop of down sloping metal roof panel and seal connection.
5. Provide layouts and configurations indicated on drawings.

C. Curbs Adjacent to Roof Openings: Provide curb on each side of opening, with top of curb horizontal for equipment mounting.
1. Provide preservative treated wood nailers along top of curb.
2. Insulate inside curbs with 1-1/2 inch (38 mm) thick fiberglass insulation.
3. Height Above Finished Roof Surface: 8 inches (203 mm), minimum.

2.02 ROOF VENTS

A. Eave Vents: Factory fabricated, formed panels with integral attachment flanges and snap-on cover.
1. Perforated Screen: 24-gauge, 0.0239-inch (0.61 mm) galvanized steel; with 54 percent open area perforation.
2. Finish: Manufacturer's standard mill finish.
3. Products:
    a. VULCAN VSC2120SL (9.6 NFVA / LF)
    b. 2” continuous with single nailing flange

2.03 NON-PENETRATING ROOFTOP SUPPORTS/ASSEMBLIES

A. Non-Penetrating Rooftop Support/Assemblies: Manufacturer-engineered and factory-fabricated, \ not requiring any attachment to roof structure and not penetrating roofing assembly.
1. Design Loadings and Configurations: As required by applicable codes:
    a. WAC 296-155-24510 (2)
    b. WISHA
    c. ANSI Z359.1-1992
    d. OSHA 1926.502,104B and subpart M
2. Height: Provide minimum clearance of 6 inches (152 mm) under supported items to top of roofing.
3. Support Spacing and Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
4. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.
5. Hardware, Bolts, Nuts, and Washers: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A153/A153M.
6. Roof attachment Products:
    a. Metal Roof Innovations, Ltd. S-5! Attachment Solutions; S-5! Utility System: www.s-5.com/#sle.
7. Substitutions: See Section 012500 – Substitution Procedures

2.04 NON-PENETRATING ROOFTOP FALL PROTECTION

A. Non-Penetrating Rooftop Support/Assemblies: Manufacturer-engineered and factory-fabricated, \ not requiring any attachment to roof structure and not penetrating roofing assembly.
1. Design Loadings and Configurations: As required by applicable codes:
    a. WAC 296-155-24510 (2)

b. WISHA
c. ANSI Z359.1-1992
d. OSHA 1926.502,104B and subpart M

2. Height: Provide minimum clearance of 6 inches (152 mm) under supported items to top of roofing.
3. Support Spacing and Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
4. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.
5. Hardware, Bolts, Nuts, and Washers: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A153/A153M.
6. Roof attachment Products:
   a. Metal Roof Innovations, Ltd. S-5! Attachment Solutions; S-5! Utility System: www.s-5.com/#sle.
7. Commercial Roof Anchor

   a. Frontline Multifunction 18" Commercial Roof Anchor
   b. Substitutions: See Section 012500 – Substitution Procedures

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using methods recommended by manufacturer for achieving acceptable results for applicable substrate under project conditions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions, in manner that maintains roofing system weather-tight integrity.

3.04 CLEANING

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. Clean installed work to like-new condition.

3.05 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION 077200

SECTION 079200
JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nonsag gunnable joint sealants.

B. Self-leveling pourable joint sealants.

C. Joint backings and accessories.

1.02 RELATED REQUIREMENTS

A. Section 092116 - Gypsum Board Assemblies: Sealing acoustical and sound-rated walls and ceilings.

1.03 REFERENCE STANDARDS

A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer 2015 (Reapproved 2022).

B. ASTM C794 - Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants 2018 (Reapproved 2022).

C. ASTM C834 - Standard Specification for Latex Sealants 2017 (Reapproved 2023).

D. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete 2020a.

E. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications 2022.

F. ASTM C920 - Standard Specification for Elastomeric Joint Sealants 2018.

G. ASTM C1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems 2023.

H. ASTM C1193 - Standard Guide for Use of Joint Sealants 2016 (Reapproved 2023).

I. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants 2022.

J. ASTM C1311 - Standard Specification for Solvent Release Sealants 2022.

K. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants 2018.

L. ASTM C1521 - Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints 2019 (Reapproved 2020).

M. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness 2015 (Reapproved 2021).

N. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension 2016 (Reapproved 2021).

O. ASTM D638 - Standard Test Method for Tensile Properties of Plastics 2022.

P. ASTM D695 - Standard Test Method for Compressive Properties of Rigid Plastics 2015.

Q. ASTM D4541 - Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers 2022.

R. SCAQMD 1168 - Adhesive and Sealant Applications 1989, with Amendment (2022).

1.04 SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Product Data: Submit manufacturer's technical datasheets for each product to be used; include the following:

1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
2. List of backing materials approved for use with the specific product.

3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
4. Substrates the product should not be used on.
5. Substrates for which use of primer is required.
6. Substrates for which laboratory adhesion and/or compatibility testing is required.
7. Installation instructions, including precautions, limitations, and recommended backing materials and tools.
8. Sample product warranty.
9. Certification by manufacturer indicating that product complies with specification requirements.

C. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.

D. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.

E. Sustainable Design Documentation: For sealants and primers, submit VOC content and emissions documentation; see Section 016116.

F. Preconstruction Laboratory Test Reports: Submit at least four weeks prior to start of installation.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience.

C. Preconstruction Laboratory Testing: Arrange for sealant manufacturer(s) to test each combination of sealant, substrate, backing, and accessories.
1. Adhesion Testing: In accordance with ASTM C794.
2. Compatibility Testing: In accordance with ASTM C1087.
3. Allow sufficient time for testing to avoid delaying the work.
4. Deliver sufficient samples to manufacturer for testing.
5. Report manufacturer's recommended corrective measures, if any, including primers or techniques not indicated in product data submittals.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Nonsag Sealants:
1. Adhesives Technology Corporation: www.atcepoxy.com/#sle.
2. Bostik Inc.: www.bostik-us.com/#sle.
3. Dow; www.dow.com/#sle.
4. Franklin International, Inc; www.titebond.com/#sle.
5. Hilti, Inc; www.hilti.com/#sle.
6. Pecora Corporation; www.pecora.com/#sle.
7. Sherwin-Williams Company; www.sherwin-williams.com/#sle.
8. Sika Corporation; www.usa.sika.com/#sle.
9. Tremco Commercial Sealants & Waterproofing; www.tremcosealants.com/#sle.
10. W.R. Meadows, Inc; www.wrmeadows.com/#sle.
11. Substitutions: See Section 012500 – Substitution Procedures

B. Self-Leveling Sealants:
1. Adhesives Technology Corporation; www.atcepoxy.com/#sle.
2. Bostik Inc; www.bostik-us.com/#sle.
3. Dow; www.dow.com/#sle.
4. Pecora Corporation; www.pecora.com/#sle.
5. Sherwin-Williams Company; www.sherwin-williams.com/#sle.
6. Sika Corporation; www.usa.sika.com/#sle.
7. Tremco Commercial Sealants & Waterproofing; www.tremcosealants.com/#sle.

8. W.R. Meadows, Inc; www.wrmeadows.com/#sle.
9. Substitutions: See Section 012500 – Substitution Procedures

2.02 JOINT SEALANT APPLICATIONS

A. Scope:
   1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to:
      a. Wall expansion and control joints.
      b. Joints between door, window, and other frames and adjacent construction.
      c. Joints between different exposed materials.
      d. Openings below ledge angles in masonry.
      e. Other joints indicated below.
   2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
      a. Joints between door, window, and other frames and adjacent construction.
      b. In sound-rated wall and ceiling assemblies, gaps at electrical outlets, wiring devices, piping, and other openings; between wall/ceiling and other construction; and other flanking sound paths.
         1) Exception: Such gaps and openings in gypsum board finished stud walls and suspended ceilings. See Section 092116 for additional information.
      c. Other joints indicated below.
   3. Do not seal the following types of joints:
      a. Joints indicated to be treated with manufactured expansion joint cover, or some other type of sealing device.
      b. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
      c. Joints where installation of sealant is specified in another section.
      d. Joints between suspended panel ceilings/grid and walls.

B. Sound-Rated Assemblies: Walls and ceilings identified as STC-rated, sound-rated, or acoustical.

2.03 JOINT SEALANTS - GENERAL

A. Sealants and Primers: Provide products having lower volatile organic compound (VOC) content than indicated in SCAQMD 1168.

2.04 NONSAG JOINT SEALANTS

A. Nonstaining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus and minus ____ percent, minimum.
   2. Nonstaining to Porous Stone: Nonstaining to light-colored natural stone when tested in accordance with ASTM C1248.
   3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
   4. Color: Match adjacent finished surfaces.

B. Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; not expected to withstand continuous water immersion or traffic.

C. Nonsag Traffic-Grade Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; explicitly approved by manufacturer for continuous water immersion and traffic without the necessity to recess sealant below traffic surface.
   1. Movement Capability: Plus and minus 25 percent, minimum.
   2. Hardness Range: 20 to 30, Shore A, when tested in accordance with ASTM C661.
   3. Color: Match adjacent finished surfaces.

D. Acrylic Emulsion Latex: Water-based; ASTM C834, single component, nonstaining, nonbleeding, nonsagging; not intended for exterior use.
   1. Color: Standard colors matching finished surfaces, Type OP (opaque).

2.05 ACCESSORIES

A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.

B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.

C. Masking Tape: Self-adhesive, nonabsorbent, nonstaining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.

D. Primers: Type recommended by sealant manufacturer to suit application; nonstaining.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

C. Verify that backer rods are of the correct size.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

3.03 INSTALLATION

A. Install this work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Provide joint sealant installations complying with ASTM C1193.

C. Install acoustical sealant application work in accordance with ASTM C919.

D. Install bond breaker backing tape where backer rod cannot be used.

E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

F. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

G. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Perform field quality control inspection/testing as specified in PART 1 under QUALITY ASSURANCE article.

C. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

END OF SECTION 079200

SECTION 081113
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Work under this section comprises of furnishing hollow metal doors and frames, including transom frames, sidelight and window frames with provision for glazed, paneled or louvered openings, fire labeled and non-labeled, as scheduled.
   1. Flush Steel Doors.
   2. Steel frames.
   3. Hollow Metal Framing Systems.

B. Related Sections: Related documents, drawings and general provisions of contract, including General and Supplementary Conditions and Division 1 specification sections apply to this section. The latest published edition of each reference applies.
   1. Division 6 – Rough Carpentry
   2. Division 8 – Wood Doors
   3. Division 8 – Door Hardware
   4. Division 8 – Glazing
   5. Division 9 – Painting and Coating
   6. Division 26 – Low Voltage Electrical Power Conductors and Cables
   7. Division 28 – Access Control

C. References: The intent of this document is that all hollow metal and its application will comply or exceed the standards identified below. The latest published edition of each reference applies.
   1. ANSI - American National Standards Institute - ansi.org
   2. NFPA - National Fire Protection Association
      a. NFPA 80 - Standard for Fire Doors and Other Opening Protectives
      b. NFPA 101 – Life Safety Code
      c. NFPA 105 – Standard Smoke Door Assemblies and Other Opening Protectives
      d. NFPA 252 - Standard Method of Fire Tests of Door Assemblies.
   3. DHI - Door and Hardware Institute – Door Security + Safety Professionals
      a. Installation Guide for Doors and Hardware.
      b. Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames.
      c. Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames.
   4. SDI - Steel Door Institute
      a. SDI-105 – Recommended Erection Instructions for Steel Frames
      b. SDI-107 – Hardware on Steel Doors (Reinforcement - Application)
      c. SDI-111 - Recommended Details for Standard Steel Doors, Frames, Accessories, and Related Components
      d. SDI-117 - Manufacturing Tolerances Standard Steel Doors and Frames
      e. SDI-118 – Basic Fire Door Requirements
      f. SDI A250.3 Test Procedure and Acceptance Criteria for Factory Applied Finish Coatings for Steel Doors and Frames
      g. SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, and Frame Anchors
      h. SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames
      i. SDI A250.8 - SDI-100 Specifications for Standard Steel Doors and Frames
      j. SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames
      k. SDI A250.11 - Recommended Erection Instructions for Steel Frames

l. SDI A250.13 Testing and Rating of Severe Windstorm Resistant Components for Swinging Door Assemblies

5. BHMA - Builders Hardware Manufacturers Association
   a. BHMA A156.115 - Hardware Preparations in Standard Steel Doors and Frames.
   b. BHMA A156.7 - Hinge Template Dimensions.
6. ASTM - American Society for Testing Materials
   a. ASTM A568/A568M-19a Standard Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements
   b. ASTM A879/A879M-12(2017) Standard Specification for Steel Sheet, Zinc Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface
   c. ASTM A653/A653M-19a Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
   d. ASTM A924/A924M-19 Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
   e. ASTM A1008/A1008M-18 Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable
7. ICC - International Code Counsel
   a. ICC A117.1 – Accessible and Usable Building and Facilities.
   b. ICC 500 Standard for the Design and Construction of Storm Shelters
8. UL - Building Materials Directory; Underwriters Laboratories Inc.
   a. UL 10B - Standard for Neutral Pressure Fire Tests of Door Assemblies
   b. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies
   c. UL 1784 – Air Leakage Test of Door Assemblies
   d. UL 752 – Standard for Bullet-Resisting Equipment
9. NAAMM/HMMA – National Association of Architectural Metal Manufacturers/Hollow Metal Manufacturers Association
   a. NAAMM/HMMA 840 – Guide Specification for Receipt, Storage, and Installation of Hollow Metal Doors and Frames.
10. WH - Certification Listings; Warnock Hersey International Inc.
11. Federal Emergency Management Agency (FEMA) 361 Guidelines, ICC500 - 2014
12. Miami - Dade County test protocols PA 201, PA 202 and PA 203.
13. Florida Building Code test protocols TAS 201, TAS 202 and TAS 203.
14. Texas Department of Insurance TDI - Complies with TAS 201, TAS 202 and TAS 203, Large Missile Impact.

1.02 SUBSTITUTIONS:

1. Substitutions: See Section 012500 – Substitution Procedures

1.03 SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Product Data: Manufacturer's standard details and catalog data indicating compliance with referenced standards and manufacturer's installation instructions.

C. Shop Drawings: Provide a schedule of doors and frames using same reference numbers for details and door openings as those on the contract documents. Shop drawings should include the following information to ensure doors and frames are properly prepared and coordinated to receive hardware.
   1. Elevations of each door and frame type.
   2. Details for door core.
   3. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
   4. Locations of cutouts for glass and louvers.
   5. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
   6. Mounting locations for hardware.

7. Thickness of reinforcement/preparations for hardware.
8. Details of anchorages, joints, field splices, and connections.
9. Details of accessories.
10. Details of moldings, removable stops, and glazing.
11. Fire ratings.
12. Finish.

D. Closeout Submittals to comply with Division 1, Closeout Submittals procedures.

E. Furnish copies of manufacturer's warranty information and maintenance instructions.

1.04 QUALITY ASSURANCE

A. Hollow Metal Distributor is to be a direct account of the manufacturer of the products furnished. In addition, that distributor must have in their regular employment an Architectural Hardware Consultant (AHC), Certified Door Consultant (CDC), an Architectural Openings Consultant (AOC), a Door & Hardware Consultant (DHC) or equivalent door and hardware industry experience who will be available to consult with the Architect and Contractor regarding any matters affecting the door and frame opening.

B. Manufacturer Qualifications: Certified Member of the Steel Door Institute in good standing.

C. Installer: Minimum five years documented experience installing products specified this Section.

D. Certificates:
1. Manufacturer's certification that products comply with referenced standards.
2. Hollow Metal Manufacturer must provide documentation that they are an SDI Certified Manufacturer.

E. Fire Rated Doors and Frames: Underwriters' Laboratories, Intertek Testing Services/Warnock Hersey, and Factory Mutual labeled fire doors and frames:
1. Provide labeled fire doors and frames in accordance with Underwriters Laboratories standard UL10C Positive Pressure Fire Tests of Door Assemblies.
2. Construct and install doors and frames to comply with current issue of NFPA 80.
3. Manufacture Underwriters' Laboratories labeled doors and frames in strict compliance to UL procedures, and provide the degree of fire protection, heat transmission and panic loading capability indicated by the opening class.
4. Manufacture Intertek Testing Services /Warnock Hersey labeled doors and frames in strict compliance to ITS/WH procedures and provide the degree of fire protection capability indicated by the opening class.
5. Manufacture Factory Mutual labeled doors and frames in strict compliance to FM procedures, and provide the degree of fire protection, heat transmission and panic loading capability indicated by the opening class.
6. Affix a physical label or approved marking to each fire door and/or fire door frame, at an authorized facility as evidence of compliance with procedures of the labeling agency.
7. Conform to applicable codes for fire ratings. It is the intent of this specification that doors, frames, hardware and their application comply or exceed the standards for labeled openings. In case of conflict between types required for fire protection, furnish type required by NFPA and UL.
8. Provide Temperature Rise Fire Door Assemblies in exit enclosures and exit passageway with maximum transmitted temperature end point rating of not more than 250 degrees F (121 degrees C) above ambient at the end of 30 minutes of the standard fire test exposure.
9. For openings required to be fire rated exceeding limitations of labeled assemblies, submit manufacturer's certification that each door and frame assembly has been constructed to conform to design, materials and construction equivalent to requirements for labeled construction.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Packing and Shipping

1. The use of non-vented plastic or canvas shelters that can create a humidity chamber shall be avoided to prevent rust or damage.
2. Provide cardboard wrapped or crated product to provide protection during transit and job site storage
3. Should wrappers become wet, remove immediately

B. Delivery and Site Acceptance
1. The supplier shall deliver all materials to the project site; direct factory shipments are not allowed unless agreed upon beforehand. Supplier shall coordinate delivery times and schedules with the contractor.
2. Deliver doors cardboard wrapped or crated to provide protection during transit and job site storage. Provide additional protection to prevent damage to any factory-finished doors. Mark all doors and frames with architects opening numbers as shown on the contract documents and shop drawings on the center hinge preparation location.
3. Upon delivery, check in doors and frames jointly with supplier. Inspect doors and frames upon delivery for damage, correct quantities or shortages. Minor damages may be repaired provided refinished items are equal in all respects to new work and acceptable to the architect. Otherwise, remove and replace damaged goods as directed. Note shortages and replace immediately.

C. Storage and Protection
1. Handle, store and protect products in accordance with the manufacturers printed instructions, ANSI/SDI A250.8 – Specifications for Standard Steel Doors and Frames, A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames, or ANSI/SDI A250.3 - Test Procedure and Acceptance Criteria for Factory Applied Finish Coatings for Steel Doors and Frames and NAAMM/HMMA 840 – Guide Specification for Receipt, Storage, and Installation of Hollow Metal Doors and Frames.
2. Store all materials in a dry area. All hollow metal material shall be stored so that it does not come in contact with water or moisture. Protect units from adverse weather elements.
3. Place units on 4 inch (102 mm) high wood sills to prevent rust and damage.
4. Store doors vertically under a properly vented cover, five units maximum in a stack with a ¼" space between doors to permit air circulation.
5. Store frames in an upright position with heads uppermost under cover.
6. Store assembled frames five units maximum in a stack with 2-inch (51 mm) space between frames to permit air circulation.

1.06 COORDINATION

A. Coordinate Work with other directly affected sections involving manufacture or fabrication of internal cutouts and reinforcement for door hardware, electric devices and recessed items.

B. Coordinate Work with frame opening construction, door and hardware installation.

C. Sequence installation to accommodate required door hardware.

D. Verify field dimensions for factory assembled frames prior to fabrication.

1.07 WARRANTY

A. Comply with Division 01 Closeout Submittals

B. All doors and frames shall be warranted in writing by the manufacturer against defects in materials and workmanship for a period of one (1) year commencing on the date of manufacture.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design - MESKER a dormakaba Brand, Web: http://meskerdoor.com
1. Acceptable Manufacturers:
a. Curries an ASSA Abloy Company
b. Steelcraft an Allegion Company
c. Stiles Custom Metal, Inc.

d. Forderer Cornice Works
e. Titan Metal Products
f. Door Components Inc
g. Security Metal Products Corp

B. Provide all steel doors and frames from a single SDI or NAAMM certified manufacturer.

2.02 GENERAL:

A. Physical performance: Units shall comply with the 1 million cycles swing test requirement per ANSI A250.4 - Level A.

B. Finishing:
1. Prime Gray to meet SDI A250.10

C. Electrical Requirements: Coordinate all electrical requirements for doors and frames. Make provisions for installation of electrical items so that wiring can be readily removed and replaced.
1. Provide cutouts and reinforcements required for metal doors and frames to accept electric components.
2. Frame with Electrical Hinges: Junction box welded over center hinge reinforcing. Top or bottom hinge locations are not permitted.
3. Coordinate with Section 08 71 00 (or Division 28) for electrified hardware items.

2.03 DOORS

A. General: Construct exterior/interior doors to the following designs and gauges:
1. Exterior and Non-Corrosive Doors: Zinc-Iron Alloy-Coated galvannealed steel (A40) (A60) or Zinc-Coated Galvanized steel (G90) that conforms to ASTM A653/A653M:
a. Thickness:
1) 16 gauge
b. Provide flush top/closed top channel for exterior swing-out doors to eliminate moisture penetration. Galvannealed steel top caps are permitted.
2. Interior Doors: Cold-rolled steel, ASTM A 1008/A 1008M:
a. Thickness:
1) 18 gauge
3. Interior Doors: Zinc-Iron Alloy-Coated galvannealed steel (A40) (A60) or Zinc-Coated Galvanized steel (G90) that conforms to ASTM A653/A653M at all areas where moisture is a concern:
a. Thickness:
1) 18 gauge
4. Door Thickness: 1-3/4 inches
5. Vertical edge seams: Provide doors with continuous vertical mechanical inter-locking joints at lock and hinge edges. Finish edges as follows:
a. Filled Vertical Edges (S): Continuous vertical mechanical interlocking joints with tack welds every 8 inches. Putty or filler applied to the edge seam and ground smooth.
6. Bevel hinge and lock door edges 1/8 inch (3 mm) in 2 inches (50 mm). Square edges on hinge and/or lock stiles are acceptable.
7. Reinforce top and bottom of doors with galvannealed 16 gauge minimum, welded to both panels.
8. Fire Rating: Supply door units bearing Labels for fire ratings indicated in Door Schedule for the locations indicated.
9. Core Adhesion System – Basis of design - Moisture Cure Polyurethane Hot Melt:
a. Adhesives are to cure completely, meaning once set, they cannot be re-melted and will not soften or freeze and lose adhesion.
b. Adhesive system will have an enhanced resistance to flame spread in its cured state designed to pass UL 10C, Positive Pressure Fire Tests of Door Assemblies.
c. Bonded assemblies will withstand prolonged exposure from -35°F(-37°C) to 200°F (93°C) temperatures without exhibiting any signs of bond failure.

d. Cured adhesive film will remain flexible to allow for differences in thermal expansion and contraction of various substrates without sacrificing bond performance.

10. Core Material
    a. Treadcore Polystyrene
11. Glass moldings and stops:
    a. Fabricate from minimum 20 gauge steel.
    b. Install trim into the door as a four-sided welded assembly with mitered, reinforced and welded corners.
    c. Trim: identical on both sides of the door.
    d. Labeled and non-labeled doors: use the same trim to match esthetics.
    e. Channeling requirements:
        1) Cutouts larger than 36” in height require 18-gauge perimeter channelings in the cutout of the door prior to installation of the lite kit our louver.
12. Hardware Reinforcements:
    a. Doors shall be mortised and adequately reinforced per the manufacturer’s guidelines for all hardware. Required mortise hardware reinforcements shall be drilled and tapped at the factory. Surface applied hardware shall be field drilled by hardware installer.
    b. Hinge reinforcements for full mortise hinges: minimum 7-gauge with an extra-long, high frequency top hinge reinforcement as a standard feature.
    c. Lock reinforcements: minimum 16-gauge.
    d. Closer reinforcements: minimum 14-gauge steel.
    e. Projection welded hinge and lock reinforcements to the edge of the door.
    f. Provided adequate reinforcements for other hardware as required.

B. Full Flush Doors:
    1. Basis of Design: Mesker N Series

2.04 DOOR FRAMES

A. General: Construct exterior/interior metal door frames to the following designs and gauges;
    1. Exterior Frames: Zinc-Iron Alloy-Coated galvannealed steel (A40) (A60) or Zinc-Coated Galvanized steel (G90) that conforms to ASTM A 653/A653M:
        a. Thickness:
            1) 14 gauge.
    2. Interior Frames in Masonry: Zinc-Iron Alloy-Coated galvannealed steel (A40) (A60) or Zinc-Coated Galvanized steel (G90) that conforms to ASTM A 653/A653M:
        a. Thickness:
            1) 16 gauge.
    3. Interior Frames in stud wall construction: cold rolled steel, ASTM A 1008/A 1008M.
        a. Thickness:
            1) 16 gauge.

B. Flush Steel Frames:
    1. Basis of Design: Mesker F-Series.
    2. Profile:
        a. Face:
            1) 2 Inches face dimension and types and throat dimensions indicated on the Door Schedule unless noted otherwise.
        b. Stops:
            1) Standard 5/8-inch-high stops
        c. Provide thermal break if noted in the details.
    3. Provide reinforcements and accessories for specified hardware per SDI 250.6.
    4. Anchors: Locate adjustable anchors in each jamb 6 inches from the top of the door opening to hold frame in rigid alignment.
        a. Exposed fastener type; recessed hole at base of jamb for countersunk fastener installation.

b. Welded in base anchors

5. Fire Rating: Supply frame units bearing Labels for fire ratings indicated in Door Schedule for the locations indicated.

2.05 HOLLOW METAL FRAMING SYSTEMS

A. Hollow Metal Framing Systems:
   1. Basis of Design: Mesker S-Series, M-Series.
   2. Components: Construct architectural stick frame assemblies of standard frame components, fabricated as specified.
      a. Exterior and Non-Corrosive Frame Material: Zinc-Iron Alloy-Coated galvannealed steel (A40) (A60) or Zinc-Coated Galvanized steel (G90) that conforms to ASTM A 653/A653M, 14 gauge galvannealed steel.
      b. Interior Frames in Masonry: Zinc-Iron Alloy-Coated galvannealed steel (A40) (A60) or Zinc-Coated Galvanized steel (G90) that conforms to ASTM A 653/A653M, 16 gauge galvannealed steel.
      c. Interior Frames in stud wall construction: 16 gauge cold rolled steel, ASTM A 1008/A 1008M steel.
      d. Include galvannealed components and internal reinforcements with galvannealed frames.
   3. Frame component requirements:
      a. Prepare required sticks at door openings and frame assemblies for hardware as specified in Section 087100.
      b. Fabricate frame assemblies from three basic components:
         1) Open Sections (perimeter members) identical in configuration to standard frames.
         2) Closed sections (intermediate members) with identical jamb depth, face dimensions, and stops as open sections.
         3) Sill sections: To be flush with both faces of adjacent vertical members. Cut individual components to length and notched to assure square joints and corners.
      c. Externally welded face joints at meeting mullions or between mullions and other frame members on the face surfaces only. Grind and finish face joints smooth.
      d. Fabricate frame assemblies for shipment to the jobsite completely welded.
         1) Field joints permissible only when the size of the total assembly exceeds shipping limitations.
         2) Fabricate oversized frames in sections designated for splicing in the field.
      e. Pierced and dimpled glazing beads for use with manufacturers' standard fasteners.
      f. Provide necessary anchors for jambs, heads, and sills of assemblies.
      g. Verify field dimensions as required. Do not begin fabrication until these dimensions have been verified and approved.
   4. Accessories:
      a. Glazing Bead: Formed steel sheet; screw-attached.

2.06 ACCESSORIES

A. Anchors: Manufacturer's standard framing anchors, specified in manufacturer's printed installation instructions for project conditions.

B. Astragals for pairs of doors: Manufacturer's standard for labeled and non-labeled openings.

C. Plaster Guards: Same material as door frame, minimum 24 gauge (0.5 mm) minimum; provide for all strike boxes. Plaster guards not mandatory on interior after set frames.

D. Silencers: Resilient rubber, Inserted type, three per strike jamb for single openings. Stick-on silencers shall not be permitted except on hollow metal framing systems.

E. Glazing: Specified in Section 088000.

F. All exterior doors and frames are to be prepared to receive future electronics as described in section 087100, Finish Hardware. Prepare interior frames as noted.

2.07 FABRICATION

A. Steel Frames:
   1. Fabricate steel door and frame units to be rigid, neat in appearance, and free from defects, warp, or buckle. Where practical, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at Project site. Comply with ANSI/SDI 100 requirements.
      a. Clearances shall comply with the requirements of NFPA 80.
   2. Factory-welded frames: Head and jamb intersecting corners mitered at 45 degrees, with back welded joints ground smooth.
      a. Continuous face weld the joint between the head and jamb faces along their length either internally or externally. Grind, prime paint, and finish smooth face joints with no visible face seams.
      b. Externally weld, grind, prime paint, and finish smooth face joints at meeting mullions or between mullions and other frame members per a current copy of ANSI/SDI A250.8.
   3. Provide temporary steel spreaders (welded to the jambs at each rabbet of door openings) on welded frames during shipment. Remove temporary steel spreaders prior to installation of the frame.

B. Tolerances shall comply with SDI-117 "Manufacturing Tolerances for Standard Steel Doors and Frames."

C. Fabricate concealed stiffeners, reinforcement, edge channels, louvers, and moldings from either cold-rolled or hot-rolled steel sheet.

D. Unless otherwise indicated, provide exposed fasteners with countersunk flat or oval heads for exposed screws and bolts.

E. Prepare doors and frames to receive mortised and concealed hardware per final door hardware schedule and templates provided by hardware supplier. Comply with applicable requirements of SDI-107 and ANSI-A115 Series specifications for door and frame preparation for hardware.

F. All exterior doors and frames are to be prepared to receive future electronics as described in section 087100, Finish Hardware. Prepare interior frames as noted.

G. Reinforce doors and frames to receive surface-applied hardware per SDI A250.6. Drilling and tapping for surface-applied hardware shall be done at Project site. Provide internal reinforcements for all doors to receive door closers and exit devices where scheduled.

H. Locate hardware as indicated on Shop Drawings or, if not indicated, per the Door and Hardware Institute's (DHI) "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."

2.08 FINLSHES

A. Chemical Treatment: Treat steel surfaces to promote paint adhesion.

B. Exposed door and frame surfaces to be cleaned and treated then coated with rust inhibitive primer. Water-based primer and color paint finishes to be free of Hazardous Air Pollutants (HAPS) and Volatile Organic Compounds (VOCs). Paint to comply with ANSI A250.3 and A250.10.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are acceptable before beginning installation of frames.
   1. Verify that completed openings to receive knock-down wrap-around frames are of correct size and thickness.
   2. Verify that completed concrete or masonry openings to receive butt type frames are of correct size.

B. Do not begin installation until conditions have been properly prepared.

C. Correct unacceptable conditions before proceeding with installation.

3.02 INSTALLATION

A. Install doors and frames in accordance with manufacturer's printed installation instructions and with Steel Door Institute's recommended erection instructions for steel frames SDI A250.11 and NAAMM/HMMA 840.

B. DHI – Door and Hardware Institute – Door Security + Safety Professionals – Installation Guide for Doors and Hardware

C. Fire Doors and Frames: Install in accordance with SDI A 250.11 and NFPA 80.
   1. To ensure compliance with Positive Pressure criteria as required by UBC7-2, UL10C, NFPA5000 and all applicable Local, State and National Code Jurisdictions, all Doors and Frames should be checked for accurate installation per Manufacturers installation instructions to provide proper fire and Smoke Gasketing as tested and listed.
   2. Fit hollow-metal doors accurately in frames, within clearances specified in SDI A 250.11 and SDI 100. Install fire rated doors with clearances specified in NFPA 80.

D. Comply with provisions of SDI-105, “Recommended Erection Instructions for Steel Door Frames,” unless otherwise indicated. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set.
   1. Except for frames located in existing concrete, masonry, or gypsum board assembly construction, place frames before constructing enclosing walls and ceilings.
   2. In masonry construction, install at least 3 wall anchors per jamb adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Acceptable anchors include masonry wire anchors and masonry T-shaped anchors. Use additional anchors as required for height per manufacturers’ installation instructions.
   3. At existing concrete or masonry construction, install at least 3 completed opening anchors per jamb adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Set frames and secure to adjacent construction with bolts and masonry anchorage devices. Use additional anchors as required for height per manufacturers’ installation instructions.
   4. In metal-stud partitions, install at least 3 wall anchors per jamb at hinge and strike levels. In steel-stud partitions, attach wall anchors to studs with screws. Secure Sill Anchors to floor. Use additional anchors as required for height per manufacturers’ installation instructions.
   5. Drywall series frames are designed for installation in interior applications after construction of wood or metal stud and drywall applications. Drywall series frames are provided with adjustable jamb lock anchors for secure installation. Install frames per manufacturers’ installation instructions. Adjust anchors and secure sill and baseboard anchors as provided.

E. Remove temporary steel spreaders prior to installation of frames.

F. Set frames accurately in position; plumb, align and brace until permanent anchors are set. After wall construction is complete, remove temporary wood spreaders.
   1. Field splice only at approved locations indicated on the shop drawings.
   2. Weld, grind, and finish as required to conceal evidence of splicing on exposed faces.

G. Provide full height 3/8 inch (9.5 mm) to 1-1/2 inch (38 mm) thick strip of polystyrene foam blocking at frames requiring grouting. Apply the strip to the back of the frame to facilitate field drilling or tapping.

H. Glaze and seal exterior transom, sidelight and window frames in accordance with HMMA-820 TN03.

I. Apply hardware in accordance with hardware manufacturers' instructions and Section 087100 of these Specifications. Install hardware with only factory-provided fasteners. Install silencers. Adjust door installation to provide 1/8” at head and 1/8” at strike and hinge jamb with door undercut to meet fire ratings and floor conditions to achieve maximum operational effectiveness and appearance.

3.03 ADJUST AND CLEAN

A. Adjust doors for proper operation, free from binding or other defects.

B. Clean and restore soiled surfaces. Remove scraps and debris and leave site in a clean condition.

C. Prime Coat Touch-Up: Immediately after erection, sand smooth rusted or damaged areas of prime coat, and apply touch-up of compatible air-drying primer.

D. Properly clean and apply paint to doors and frames in accordance with HMMA-840 TN01 and ANSI A250.8 appendix B along with Manufactures recommended surface preparation for painting.

3.04 PROTECTION

A. Protect installed products and finished surfaces from damage during construction.

END OF SECTION 081113

SECTION 081416
FLUSH WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flush wood doors; flush configuration; non-rated.

1.02 RELATED REQUIREMENTS

A. Section 081113 - Hollow Metal Doors and Frames.

B. Section 087100 - Door Hardware.

C. Section 088000 - Glazing.

1.03 REFERENCE STANDARDS

A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition 2014, with Errata (2016).

B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards 2021, with Errata.

1.04 SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.

C. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.

D. Samples: Submit two samples of door veneer, 12 by 12 inches in size illustrating wood grain, stain color, and sheen.

E. Warranty, executed in Owner's name.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with not less than three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Package, deliver and store doors in accordance with specified quality standard.

B. Accept doors on site in manufacturer's packaging, and inspect for damage.

C. Protect doors with resilient packaging sealed with heat shrunk plastic; do not store in damp or wet areas or areas where sunlight might bleach veneer; seal top and bottom edges with tinted sealer if stored more than one week, and break seal on site to permit ventilation.

1.07 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide manufacturer's warranty on interior doors for the life of the installation. Complete forms in Owner's name and register with manufacturer.

1. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Wood Veneer Faced Doors:

1. Krieger Specialty Products; www.kriegerproducts.com/#sle.
2. Masonite Architectural; Aspiro Select Wood Veneer Doors: www.architectural.masonite.com/#sle.

3. Oregon Door; www.oregondoor.com/#sle.
4. VT Industries, Inc; www.vtindustries.com/#sle.
5. Substitutions: See Section 012500 – Substitution Procedures

2.02 DOORS AND PANELS

A. Doors: See drawings for locations and additional requirements.
   1. Wood Veneer Faced Doors: 5-ply unless otherwise indicated.

B. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.
   1. Provide solid core doors at each location.
   2. Wood veneer facing with factory transparent finish.

2.03 DOOR AND PANEL CORES

A. Non-Rated Solid Core and 20 Minute Rated Doors: Type particleboard core (PC), plies and faces as indicated.

2.04 DOOR FACINGS

A. Veneer Facing for Transparent Finish: White birch, veneer grade in accordance with quality standard indicated, plain sliced (flat cut), with book match between leaves of veneer, running match of spliced veneer leaves assembled on door or panel face.
   1. Vertical Edges: Any option allowed by quality standard for grade.
   2. "Pair Match" each pair of doors; "Set Match" pairs of doors within 10 feet of each other when doors are closed.

2.05 DOOR CONSTRUCTION

A. Fabricate doors in accordance with door quality standard specified.

B. Cores Constructed with stiles and rails:

C. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.

D. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.

E. Provide edge clearances in accordance with the quality standard specified.

2.06 FINISHES - WOOD VENEER DOORS

A. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
   1. Transparent:
      a. System - 9, UV Curable, Acrylated Epoxy, Polyester or Urethane.
      b. Sheen: Satin.

2.07 ACCESSORIES

A. Door Window Frames: Door window frames with glazing securely fastened within door opening.
   1. Size: As indicated on drawings.
   2. Frame Material: 18 gauge, 0.0478 inch, galvanized steel.
   3. Metal Finish: Beige polyester powder coating.
   4. Glazing: 1/4 inch thick, tempered glass, in compliance with requirements of authorities having jurisdiction.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.02 INSTALLATION

A. Install doors in accordance with manufacturer's instructions and specified quality standard.

B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.

C. Use machine tools to cut or drill for hardware.

D. Coordinate installation of doors with installation of frames and hardware.

3.03 TOLERANCES

A. Comply with specified quality standard for fit and clearance tolerances.

B. Comply with specified quality standard for telegraphing, warp, and squareness.

3.04 ADJUSTING

A. Adjust doors for smooth and balanced door movement.

B. Adjust closers for full closure.

END OF SECTION 081416

SECTION 083100
ACCESS DOORS AND PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall- and ceiling-mounted access units.

1.02 RELATED REQUIREMENTS

A. Section 099123 - Interior Painting: Field paint finish.

1.03 SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.

C. Shop Drawings: Indicate exact position of each access door and/or panel unit.

D. Manufacturer's Installation Instructions: Indicate installation requirements.

PART 2 PRODUCTS

2.01 ACCESS DOORS AND PANELS ASSEMBLIES

2.02 WALL- AND CEILING-MOUNTED ACCESS UNITS

A. Manufacturers:
   1. Activar Construction Products Group, Inc. - JL Industries: www.activarcpg.com/#sle.
      a. Multipurpose Access Panel: Activar/JL Industries TM.
   2. ACUDOR Products Inc: www.acudor.com/#sle.
      a. Wall- and Ceiling-Mounted Units: ACUDOR DW-5058.
   3. Babcock-Davis: www.babcockdavis.com/#sle.
   4. Best Access Doors: www.bestaccessdoors.com/#sle.
      a. Universal Access Panel Drywall: Best Access Doors; Series BA-UAP.
   5. Substitutions: See Section 012500 – Substitution Procedures

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough openings are correctly sized and located.

B. Begin installation only after substrates have been properly prepared, and if the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to proceeding with this work.

B. Prepare surfaces using methods recommended by manufacturer for applicable substrates in accordance with project conditions.

3.03 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Install frames plumb and level in openings, and secure units rigidly in place.

C. Position units to provide convenient access to concealed equipment when necessary.

END OF SECTION 083100

SECTION 083613
SECTIONAL DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Overhead sectional doors, electrically operated.

B. Operating hardware and supports.

C. Electrical controls.

1.02 RELATED REQUIREMENTS

A. Section 087100 - Door Hardware: Lock cylinders.

B. Division 26 - Wiring Connections.

1.03 REFERENCE STANDARDS

A. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen 2004 (Reapproved 2012).

B. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference 2014 (Reapproved 2021).

C. DASMA 102 - American National Standard Specifications for Sectional Doors 2018.

D. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts 2008 (Reaffirmed 2020).

E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.

F. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Shop Drawings: Indicate opening dimensions and required tolerances, connection details, anchorage spacing, hardware locations, and installation details.

C. Product Data: Show component construction, anchorage method, and hardware.

D. Manufacturer's Installation Instructions: Include any special procedures required by project conditions.

E. Manufacturer's Qualification Statement.

F. Installer's Qualification Statement.

G. Operation Data: Include normal operation, troubleshooting, and adjusting.

H. Maintenance Data: Include data for motor and transmission, shaft and gearing, lubrication frequency, spare part sources.

I. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 WARRANTY

A. See Section 017800 - Closeout Submittals for warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Warranty: Include coverage for electric motor and transmission.

D. Provide five year manufacturer warranty for electric operating equipment.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Sectional Doors:
   1. Steel Insulated Full View - Basis of Design
      a. Clopay Building Products; 3728: www.clopaydoor.com/#sle.
   2. Flush insulated steel sandwich - Basis of Design
      a. Clopay Building Products; 3722: www.clopaydoor.com/#sle.
   3. Substitutions: See Section 012500 – Substitution Procedures

2.02 STEEL DOORS - FLUSH INSULATED STEEL, THERMALLY-BROKEN, POLYURETHANE INSULATED

A. Steel Doors: Flush steel, insulated; follow the roof pitch operating style with track and hardware; complying with DASMA 102, Commercial application.
   1. Performance: Withstand positive and negative wind loads equal to 1.5 times design wind loads specified by local code without damage or permanent set, when tested in accordance with ASTM E330/E330M, using 10 second duration of maximum load.
   2. Door Nominal Thickness: 2 inches thick.
   3. Thermal Resistance (R-Value): 18.4
   4. Air Leakage Rate: Less than 0.40 cfm/sf when tested in accordance with ASTM E283 at test pressure difference of 1.57 psf.
   5. Exterior Finish: Factory finished with acrylic baked enamel; Black color.
   6. Interior Finish: Factory finished with acrylic baked enamel; Black color.
   7. Glazed Lights: See drawings
   8. Electric Operation: Electric control station.

B. Door Panels: Steel construction; outer steel sheet of 20 gauge, 0.0359 inch minimum thickness, flush profile; inner steel sheet of 20 gauge, 0.0359 inch minimum thickness, flat profile; core reinforcement ___ inch sheet steel roll formed to channel shape, rabbeted weather joints at meeting rails; polyurethane insulation.

C. Window Frame: Manufacturers standard, finish to match.

D. Glazing: Fully tempered glass; insulated glass units; clear; 3/4 inch overall thickness.

2.03 COMPONENTS

A. Sill Weatherstripping: Resilient hollow rubber strip, one piece; fitted to bottom of door panel, full length contact.

B. Jamb Weatherstripping: Roll formed steel section full height of jamb, fitted with resilient weatherstripping, placed in moderate contact with door panels.

C. Head Weatherstripping: EPDM rubber seal, one piece full length.

D. Panel Joint Weatherstripping: Neoprene foam seal, one piece full length.

E. Lock: Inside center mounted, adjustable keeper, spring activated latch bar with feature to retain in locked or retracted position; interior and exterior handle.

F. Lock Cylinders: Keyed alike.

2.04 ELECTRIC OPERATION

A. Electric Operators:
   1. Mounting: Side mounted on cross head shaft.
   2. Motor Enclosure: As recommended by Mfr
   3. Motor Rating: 1/3 hp; continuous duty.
   4. Motor Voltage: 120 volts, single phase, 60 Hz.
   5. Motor Controller: NEMA ICS 2, full voltage, reversing magnetic motor starter.
   6. Controller Enclosure: NEMA 250, Type 1.
   7. Opening Speed: 8 inches per second.
   8. Brake: Adjustable friction clutch type, activated by motor controller.

9. Manual override in case of power failure.
10. Refer to Section 260583 for electrical connections.

B. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated; enclose terminal lugs in terminal box sized to comply with NFPA 70.

C. Control Station: Provide standard three button (Open-Close-Stop) momentary-contact control device for each operator complying with UL 325.
1. 24 volt circuit.
2. Surface mounted, at interior door jamb.
3. Entrapment Protection Devices: Provide sensing devices and safety mechanisms complying with UL 325.
a. Primary Device: Provide electric sensing edge, wireless sensing, NEMA 1 photo eye sensors, or NEMA 4X photo eye sensors as required with momentary-contact control device.

D. Safety Edge: Located at bottom of sectional door panel, full width; electro-mechanical sensitized type, wired to stop and reverse door direction upon striking object; hollow neoprene covered to provide weatherstrip seal.

E. Safety Edge: Located at bottom of sectional door panel, full width; electro-mechanical sensitized type, wired to stop and reverse door direction upon striking object; hollow neoprene covered to provide weatherstrip seal.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that wall openings are ready to receive work and opening dimensions and tolerances are within specified limits.

B. Verify that electric power is available and of the correct characteristics.

3.02 PREPARATION

A. Prepare opening to permit correct installation of door unit to perimeter air and vapor barrier seal.

B. Apply primer to wood frame.

3.03 INSTALLATION

A. Install door unit assembly in accordance with manufacturer's instructions.

B. Anchor assembly to wall construction and building framing without distortion or stress.

C. Securely brace door tracks suspended from structure. Secure tracks to structural members only.

D. Fit and align door assembly including hardware.

E. Coordinate installation of electrical service. Complete power and control wiring from disconnect to unit components.

3.04 TOLERANCES

A. Maximum Variation from Plumb: 1/16 inch.

B. Maximum Variation from Level: 1/16 inch.

C. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch from 10 ft straight edge.

D. Maintain dimensional tolerances and alignment with adjacent work.

3.05 ADJUSTING

A. Adjust door assembly for smooth operation and full contact with weatherstripping.

3.06 CLEANING

A. Clean doors and frames and glazing.

B. Remove temporary labels and visible markings.

3.07 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

B. Do not permit construction traffic through overhead door openings after adjustment and cleaning.

END OF SECTION 083613

SECTION 084313
ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum-framed storefront, with vision glass.

B. Aluminum doors and frames.

C. Weatherstripping.

1.02 RELATED REQUIREMENTS

A. Section 079200 - Joint Sealants: Sealing joints between frames and adjacent construction.

B. Section 084229 - Automatic Entrances.

C. Section 087100 - Door Hardware: Hardware items other than specified in this section.

D. Section 088000 - Glazing: Glass and glazing accessories.

1.03 REFERENCE STANDARDS

A. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site 2015.

B. AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems 2015.

C. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document) 2015.

D. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes 2021.

E. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric) 2021.

F. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen 2019.

G. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference 2014 (Reapproved 2021).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of other components that comprise the exterior enclosure.

1.05 SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, and internal drainage details.

C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.

D. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.

E. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.

F. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.

G. Manufacturer's qualification statement.

H. Installer's qualification statement.

I. Specimen warranty.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Handle products of this section in accordance with AAMA CW-10.

B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.08 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.09 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

D. Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Aluminum-Framed Storefronts:
1. Arcadia, Inc; www.arcadiainc.com/#sle.
2. Boyd Aluminum; www.boydaluminum.com/#sle.
3. Coral Architectural Products, a division of Coral Industries, Inc; www.coralap.com/#sle.
4. Kawneer North America; www.kawneer.com/#sle.
5. Manko Window Systems, Inc; www.mankowindows.com/#sle.
6. Oldcastle BuildingEnvelope; www.oldcastlebe.com/#sle.
7. Pittco Architectural Metals Inc; www.pittcometals.com/#sle.
8. Tubelite, Inc; www.tubeliteinc.com/#sle.
9. Trulite Glass & Aluminum Solutions, LLC; www.trulite.com/#sle.
10. YKK AP America, Inc; www.ykkap.com/commercial/#sle.
11. Substitutions: See Section 012500 – Substitution Procedures

2.02 ALUMINUM-FRAMED STOREFRONT

A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
1. Glazing Position: Centered (front to back).
2. Finish: Class I color anodized. (Interior storefront may be Class II)
   a. Factory finish all surfaces that will be exposed in completed assemblies.
3. Finish Color: Black.
4. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
5. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.

6. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
7. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
8. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
9. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.

B. Performance Requirements
1. Wind Loads: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
a. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
2. Air Leakage: 0.06 cfm/sq ft maximum leakage of storefront wall area when tested in accordance with ASTM E283/E283M at 1.57 psf pressure difference.
3. Air Leakage: 0.06 cfm/sq ft maximum leakage of storefront wall area when tested in accordance with ASTM E283/E283M at 1.57 psf pressure difference.

2.03 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system. (At exterior storefront locations)
1. Framing members for interior applications need not be thermally broken.
2. Glazing Stops: Flush.

B. Glazing: See Section 088000.

C. Swing Doors: Glazed aluminum.
1. Thickness: 1-3/4 inches.
2. Top Rail: 4 inches wide. +/- 1/2"
3. Vertical Stiles: 4-1/2 inches wide. +/- 1/2"
4. Bottom Rail: 10 inches wide.
5. Glazing Stops: Square.
6. Finish: Same as storefront.

2.04 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Fasteners: Stainless steel.

C. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

2.05 HARDWARE

A. Other Door Hardware: See Section 087100.

B. Weatherstripping: Wool pile, continuous and replaceable; provide on all doors.

C. Sill Sweep Strips: Resilient seal type, retracting, of neoprene; provide on all doors.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify that storefront wall openings and adjoining water-resistive and/or air barrier seal materials are ready to receive work of this section.

3.02 INSTALLATION

A. Install wall system in accordance with manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.

H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

I. Set thresholds in bed of sealant and secure.

J. Install hardware using templates provided.
   1. See Section 087100 for hardware installation requirements.

K. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES

A. Maximum Variation from Plumb: 0.06 inch per 3 feet non-cumulative or 0.06 inch per 10 feet, whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.04 FIELD QUALITY CONTROL

A. Provide services of storefront manufacturer's field representative to observe for proper installation of system and submit report.

B. See Section 014000 - Quality Requirements for general testing and inspection requirements.

C. Water-Spray Test: Provide water spray quality test of installed storefront components in accordance with AAMA 501.2 during construction process and before installation of interior finishes.
   1. Perform a minimum of two tests in each designated area as indicated on drawings.
   2. Conduct tests in each area prior to 10 percent and 50 percent completion of this work.

D. Repair or replace storefront components that have failed designated field testing, and retest to verify performance complies with specified requirements.

3.05 ADJUSTING

A. Adjust operating hardware and sash for smooth operation.

3.06 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths, and take care to remove dirt from corners and to wipe surfaces clean.

C. Upon completion of installation, thoroughly clean aluminum surfaces in accordance with AAMA 609 & 610.

3.07 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION 084313

SECTION 085413
FIBERGLASS WINDOWS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Factory fabricated fiberglass windows with fixed sash.

B. Glazed by factory.

1.02 RELATED REQUIREMENTS

A. Section 079200 - Joint Sealants: Sealing joints between frames and adjacent construction.

B. Section 088000 - Glazing.

1.03 REFERENCE STANDARDS

A. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for Windows, Doors, and Skylights 2022.

B. AAMA 502 - Voluntary Specification for Field Testing of Newly Installed Fenestration Products 2021.

C. ASTM E783 - Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors 2002 (Reapproved 2018).

D. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference 2015 (Reapproved 2023).

1.04 SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Product Data: Provide component dimensions, anchors, fasteners, glass and internal drainage details.

C. Shop Drawings: Indicate opening dimensions, framed opening tolerances, affected related work, installation requirements.

D. Manufacturer's Certificate: Certify that products of this section meet or exceed specified requirements.

E. Test Reports: Prior to submitting shop drawings or starting fabrication, submit test report(s) by independent testing agency showing compliance with performance requirements in excess of those prescribed by specified grade.

F. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.

G. Manufacturer's Qualification Statement.

H. Installer's Qualification Statement.

I. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect finished surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond when exposed to sunlight or weather.

1.07 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F.

B. Maintain this minimum temperature during and after installation of sealants.

1.08 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Correct defective Work within a ten year period after Date of Substantial Completion.

C. Provide ten year manufacturer warranty for insulated glass units from seal failure, interpane dusting or misting, and replacement of same. Include coverage for degradation of color finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fiberglass Windows:
1. Basis of Design: Milgard; C650
2. Cascadia Windows & Doors; CASCADIA UNIVERSAL SERIES Windows: www.cascadiawindows.com/#sle.
3. Marvin; Elevate Windows: www.marvin.com/#sle.
4. Pella Corporation; Pella Impervia Windows: www.pellacommercial.com/#sle.
5. Substitutions: See Section 012500 – Substitution Procedures

2.02 WINDOW UNITS

A. Fiberglass Windows: Hollow, tubular, multi-layer fiber reinforced material; factory fabricated; with vision glass, related flashings, anchorage and attachment devices.
1. Configuration: As indicated on drawings.
2. Product Type: FW - Fixed window in accordance with AAMA/WDMA/CSA 101/I.S.2/A440.
3. Color: Black Exterior and Interior.
4. Movement: Accommodate movement between window and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.
5. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.

2.03 COMPONENTS

A. Frames: Manufacturer's Standard
1. Type: Block type (for replacement windows).
2. Frame Corners: Mitered and joined with nylon corner locks.

B. Sills: See drawing details. Provide aluminum angle. Sill by wall panel installer.

C. Fasteners: Stainless steel.

D. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.

2.04 GLASS AND GLAZING MATERIALS

A. Glass and Glazing Materials:
1. Glass in Exterior Lights: Type Dual glazed with Argon and coating to provide .25 max u-factor, SHGC: .29.

2.05 HARDWARE NOT USED

2.06 FABRICATION

A. Fabricate framing, mullions and sash members with fusion welded corners and joints, in a rigid jig. Supplement frame sections with internal reinforcement where required for structural rigidity.

B. Form sills and stools in one piece. Slope sills for wash.

C. Form snap-in glass stops, closure molds, weather stops, and flashings for tight fit into window frame section.

D. Form weather stop flange to perimeter of unit.

E. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.

F. Arrange fasteners to be concealed from view.

G. Permit internal drainage weep holes and channels to migrate moisture to exterior. Provide internal drainage of glazing spaces to exterior through weep holes.

H. Factory glaze window units.

PART 3 EXECUTION

3.01 EXAMINATION

3.02 INSTALLATION

A. Install windows in accordance with manufacturer's instructions.

B. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.

C. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.

D. Set sill members and sill flashing in continuous bead of sealant.

E. Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

F. Install glass and infill panels using glazing method required to achieve performance criteria; see Section 088000.

3.03 TOLERANCES

A. Maximum Variation from Level or Plumb: 0.06 inches every 3 ft non-cumulative or 0.5 inches per 100 ft, whichever is less.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for independent field testing and inspection requirements, and requirements for monitoring quality of specified product installations.

B. Provide field testing of installed fiberglass windows by independent laboratory in accordance with AAMA 502 and AAMA/WDMA/CSA 101/I.S.2/A440 during construction process and before installation of interior finishes.

1. Field test for water penetration in accordance with ASTM E1105 using Procedure B - cyclic static air pressure difference; test pressure shall not be less than 1.9 psf.
2. Field test for air leakage in accordance with ASTM E783 with uniform static air pressure difference of 6.27 psf.

C. Repair or replace fenestration components that have failed designated field testing, and retest to verify performance complies with specified requirements.

3.05 ADJUSTING

A. Adjust hardware for smooth operation and secure weathertight closure.

3.06 CLEANING

A. Remove protective material from pre-finished surfaces.

B. Remove excess glazing sealant by moderate use of mineral spirits or other solvent acceptable to sealant manufacturer.

END OF SECTION 085413

SECTION 085653
SECURITY WINDOWS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Security transaction windows.

1.02 RELATED REQUIREMENTS

A. Section 079200 - Joint Sealants: Sealing joints between frames and adjacent construction.

B. Section 092116 - Gypsum Board Assemblies: Bullet-resistant sheathing and wallboard for bullet-resistant partitions and walls.

1.03 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum 2020.

B. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes 2021.

C. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric) 2021.

D. UL 752 - Standard for Bullet-Resisting Equipment Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Furnish anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, to be embedded into concrete or masonry, with setting diagrams and installation, to applicable installer in time for installation.

1.05 SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Product Data: Manufacturer's published data showing materials, construction details, dimensions of components, and finishes.

C. Shop Drawings: Drawings prepared specifically for this project, showing plans, elevations, sections, details of construction, anchorage to other work, hardware, and glazing.

D. Samples for Selection of Applied Finishes: Color charts for factory finishes.

E. Coordination Drawings: For each window opening, show locations and details of items necessary to anchor windows that must be installed by others, in sufficient detail that installer of those items can do so correctly without reference to the actual window itself.

F. Manufacturer's Qualification Statement.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Provide manufacturer's warranty agreeing to repair or replace windows and window components that fail within three years after Date of Substantial Completion due to, but not limited to, the following:

1. Structural failure, failure of welds, and deterioration of metals and finishes beyond that expected under detention use and normal weathering.
2. Failure of glazing due to excessive deflection of supporting members under wind load.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Security Transaction Windows:

1. Armortex; www.armortex.com.
2. Substitutions: See Section 012500 – Substitution Procedures

2.02 ASSEMBLIES

A. Security and Detention Windows:
   1. Dimensions, profiles, features, and performance specified and indicated on drawings are required; do not deviate unless specifically approved by Architect under substitution procedures; see Section 016000.
   2. Design to fit openings indicated on drawings; design to accommodate deviation of actual construction from dimensions indicated on drawings.
   3. Fabricate frames and sash with corners mitered or coped full depth with concealed welded joints.
   4. Design anchorages to provide performance equivalent to that required for window unit; provide anchorages at least equivalent to those by which the tested units were anchored to the test frame.
   5. Separate dissimilar metals to prevent corrosion by galvanic action by painting contact surfaces with primer or with sealant or tape recommended by manufacturer for the purpose.
   6. Weld components before finishing and in concealed locations, to greatest extent possible; minimize distortion and discoloration of finish; remove residue of welding; grind exposed welds smooth and finish to match.
   7. Label units to indicate which side is which, such as inside/outside or secure/non-secure; use labels that are removable after installation but durable enough not to be lost during delivery, storage, handling, and installation.

2.03 SECURITY TRANSACTION WINDOWS

A. Security Sliding Transaction Windows:
   1. Location: Built within exterior and interior wall, as indicated on drawings.
   2. Type of Use: Walk-up.
   3. Design Requirements:
      a. Provide window frames of “non-ricochet type" intended to permit capture and retention of attacking projectile, lessening potential of random injury or lateral penetration.
   4. Ballistic Resistance: Tested to meet UL 752, Level 1.
   5. Window Type: Sliding, single horizontal.
      a. Operation: Manual.
      b. Mounting: Projected from the wall surface.
      c. Window Size: As indicated on drawings.
      d. Size of Counter Space: Manufacturer's standard size.
   6. Glazing: Single (monolithic), clear, and ballistic resistant.
      a. Tempered safety glazing.
   7. Products:
      a. Armortex Wi-TW-AL-SW
   8. Substitutions: See Section 012500 – Substitution Procedures

2.04 ASSEMBLY COMPONENTS

A. Aluminum Framing: ASTM B221 (ASTM B221M) extrusions of alloy and temper selected by manufacturer for strength, corrosion resistance, and finish required; not less that 1/8 inch thick at any location of frame and sash members.

B. Frame Anchors: Mild steel plates, shapes, or bars, concealed in completed construction; provide anchorage devices as necessary to securely fasten windows to adjacent construction; use security fasteners for exposed anchors.
   1. Provide minimum of two anchors per side of window plus one additional anchor for each 18 inches or fraction thereof more than 36 inches in height or width.

C. Glazing Seals: Factory installed; molded EPDM or neoprene compressible gaskets and compression strips.

D. Deal Trays: Formed stainless steel, recessed into counter or sill for mounting under glazing frame.
   1. Style: Plain curved recess welded into counter or sill.

2. Clear Opening Height: 2 inches.
3. Tray Dimensions: Mfr. Standard size

2.05 FINISHES

A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that window openings are ready for installation of windows.

B. Verify that correct embedded anchors are in place and in proper location; repair or replace anchors as required to achieve satisfactory installation.

C. Notify Architect if conditions are not suitable for installation of windows; do not proceed until conditions are satisfactory.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions and drawing details.

B. Install windows in correct orientation (inside/outside or secure/non-secure).

C. Anchor windows securely in manner so as to achieve performance specified.

D. Set sill members and sill flashing in continuous bead of sealant.

3.03 ADJUSTING

A. Adjust operating components for smooth operation while also providing tight fit at contact points and a secure enclosure; lubricate operating hardware.

3.04 CLOSEOUT ACTIVITIES

A. Demonstrate operation and maintenance to designated Owner personnel.

END OF SECTION 085653

SECTION 087100
DOOR HARDWARE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Hardware for wood, aluminum, hollow metal, and miscellaneous doors as noted.

B. Hardware for fire-rated doors.

C. Thresholds.

D. Smoke and draft control seals.

E. Weatherstripping and gasketing.

1.02 RELATED REQUIREMENTS

A. Section 01 10 00 – Summary of Work: Access control work performed by Owner's third party contractor. Provided hardware shown as OFOI in this section.

B. Section 06 20 00 - Finish Carpentry: Wood door frames.

C. Section 08 11 13 - Hollow Metal Doors and Frames.

D. Section 08 11 16 - Aluminum Doors and Frames.

E. Section 08 14 16 - Flush Wood Doors.

F. Section 08 36 13 - Sectional Doors.

G. Section 08 43 13 - Aluminum-Framed Storefronts:

H. Division 28 – Security Access Integration

1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.

B. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen 2019.

C. DHI (H&S) - Sequence and Format for the Hardware Schedule 2019.

D. DHI (KSN) - Keying Systems and Nomenclature 2019.

E. DHI (LOCS) - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames 2004.

F. DHI WDHS.3 - Recommended Locations for Architectural Hardware for Flush Wood Doors 1993; also in WDHS-1/WDHS-5 Series, 1996.

G. ICC (IBC) - International Building Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.

I. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. NFPA 80 - Standard for Fire Doors and Other Opening Protectives 2022.

K. NFPA 101 - Life Safety Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

L. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives 2022.

M. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies 2022.

N. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with owner's third party access control contractor who is providing and installing hardware items identified as OFOI in this section:
   1. Security Solutions; 1619 N State St., Bellingham, WA 98225
      a. Contact: Tom McKellar, 360-734-4940, www.ssnw.co

B. Coordinate the manufacture, fabrication, and installation of products that door hardware is installed on.

C. Sequence installation to ensure facility services connections are achieved in an orderly and expeditious manner.

D. Preinstallation Meeting: Convene a preinstallation meeting one week prior to commencing work of this section; require attendance by affected installers and the following:
   1. Architect.
   2. Hardware Supplier's Architectural Hardware Consultant (AHC).
   3. Hardware Installer.
   4. Owner's Security Consultant.

E. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.

F. Keying Requirements Meeting:
   1. Schedule meeting at project site prior to Contractor occupancy.
   2. Attendance Required:
      a. Contractor.
      b. Owner.
      c. Hardware Supplier's Architectural Hardware Consultant (AHC).
      d. Door Hardware Installer.
      e. Owner's Security Consultant.
      f. Cylinder Manufacturer's Keying Consultant
   3. Agenda:
      a. Establish keying requirements.
      b. Verify locksets and locking hardware are functionally correct for project requirements.
      c. Verify that keying and programming complies with project requirements.
      d. Establish keying submittal schedule and update requirements.
   4. Incorporate "Keying Requirements Meeting" decisions into keying submittal upon review of door hardware keying system including, but not limited to, the following:
      a. Access control requirements.
      b. Key control system requirements.
   5. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.
   6. Deliver established keying requirements to manufacturers.

1.05 SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project, and includes construction details, material descriptions, finishes, and dimensions and profiles of individual components.

C. Shop Drawings - Door Hardware Schedule: A detailed listing that includes each item of hardware to be installed on each door.
   1. Prepared by or under supervision of Architectural Hardware Consultant (AHC).
   2. Comply with DHI (H&S) using door numbering scheme and hardware set numbers as indicated in Contract Documents.
      a. Submit in vertical format.
   3. List groups and suffixes in proper sequence.

4. Include complete description for each door listed.
5. Include manufacturer's and product names, and catalog numbers; include functions, types, styles, sizes and finishes of each item.
6. Include account of abbreviations and symbols used in schedule.

D. Shop Drawings - Electrified Door Hardware: Include diagrams for power, signal, and control wiring for electrified door hardware that include details of interface with building safety and security systems. Provide elevations and diagrams for each electrified door opening as follows:
1. Prepared by or under supervision of Architectural Hardware Consultant (AHC) and Electrified Hardware Consultant (EHC).
2. Elevations: Include front and back elevations of each door opening showing electrified devices with connections installed and an operations narrative describing how opening operates from either side at any given time.
3. Diagrams: Include point-to-point wiring diagrams that show each device in door opening system with related colored wire connections to each device.

E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

F. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
1. Bitting List: List of combinations as furnished.

G. Keying Schedule:
1. Submit three (3) copies of Keying Schedule in compliance with requirements established during Keying Requirements Meeting unless otherwise indicated.

H. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

I. Maintenance Materials and Tools: Furnish the following for Owner's use in maintenance of project.
1. See Division 1 - Product Requirements, for additional provisions.
2. Tools: One set of each special wrench or tool applicable for each different or special hardware component, whether supplied by hardware component manufacturer or not.

1.06 QUALITY ASSURANCE

A. Standards for Fire-Rated Doors: Maintain one copy of each referenced standard on site, for use by Architect and Contractor.

B. Installer Qualifications: Company specializing in performing work of the type specified for commercial door hardware with at least three years of documented experience.

C. Supplier Qualifications: Company with certified Architectural Hardware Consultant (AHC) and Electrified Hardware Consultant (EHC) to assist in work of this section.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Package hardware items individually; label and identify each package with door opening code to match door hardware schedule.

1.08 WARRANTY

A. Manufacturer Warranty: Provide manufacturer warranty against defects in material and workmanship for period indicated, from Date of Substantial Completion. Complete forms in Owner's name and register with manufacturer.
1. Closers: Thirty Five years, minimum.
2. Exit Devices: Five years, minimum.
3. Locksets and Cylinders: Three years, minimum.
4. Other Hardware: Two years, minimum.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Provide specified door hardware as required to make doors fully functional, compliant with applicable codes, and secure to extent indicated.

B. Door Pulls and Push Plates:
   1. Provide door pulls and push plates on doors without a lockset, latchset, exit device, or auxiliary lock unless otherwise indicated.

C. Closers:
   1. Provide door closer on each exterior door, unless otherwise indicated.
   2. Provide door closer on each fire-rated and smoke-rated door.

D. Thresholds:
   1. Exterior Applications: Provide at each exterior door, unless otherwise indicated.

E. Smoke and Draft Control Seals:
   1. Provide gasketing for smoke and draft control doors (Indicated as "S" on Drawings) that complies with local codes, requirements of assemblies tested in accordance with UL 1784.

F. Weatherstripping and Gasketing:
   1. Provide weatherstripping on each exterior door at head, jambs, and meeting stiles of door pairs, unless otherwise indicated.
   2. Provide door bottom sweep on each exterior door, unless otherwise indicated.
   3. Fabricate as continuous gasketing, do not cut or notch gasketing material.

G. Electrically Operated and/or Controlled Hardware: Provide necessary power supplies, power transfer hinges, relays, and interfaces as required for proper operation; provide wiring between hardware and control components and to building power connection in compliance with NFPA 70.

H. Fasteners:
   1. Provide fasteners of proper type, size, quantity, and finish that comply with commercially recognized standards for proposed applications.
   2. Provide machine screws for attachment to reinforced hollow metal and aluminum frames.
   3. Provide stainless steel machine screws and lead expansion shields for concrete and masonry substrates.
   4. Provide wall grip inserts for hollow wall construction.
   5. Fire-Resistance-Rated Applications: Comply with NFPA 80.
   6. Concealed Fasteners: Do not use through or sex bolt type fasteners on door panel sides indicated as concealed fastener locations, unless otherwise indicated or required per manufacturer's testing requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Provide door hardware products that comply with the following requirements:
   1. Applicable provisions of federal, state, and local codes.
      a. ICC (IBC).
      b. NFPA 101.
      c. Local codes as required.
   2. Accessibility: ADA Standards and ICC A117.1.
   3. Fire-Resistance-Rated Doors: NFPA 80, listed and labeled by qualified testing agency for fire protection ratings indicated, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.
   4. Hardware Preparation for Steel Doors and Steel Frames: BHMA A156.115.
   5. Hardware Preparation for Wood Doors with Wood or Steel Frames: BHMA A156.115W.
   6. Regulatory and Operational Requirements:
      a. Provide hardware for all openings, whether specified or not, in compliance with NFPA Standard No. 80, proper operation and local building code requirements. Where required, provide only hardware which has been tested and listed by UL or FM for types

and sizes of doors required and complies with requirements of door and door frame labels. Label hardware, as required, for compliance with pressure testing criteria as dictated in IBC.

b. Provide hardware which meets or exceeds handicap accessibility per local building code requirements. Conform to the Americans with Disabilities Act (ADA) of 1990 as amended by the D.O.J. September 15, 2010, as adopted by the Authority Having Jurisdiction (AHJ).

7. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified.

2.03 HINGES

A. Manufacturers:
1. Listed in Door Hardware Schedule: Best
2. Substitutions: Hager, McKinney
3. Continuous hinges are as manufactured by Best. Equals by ABH or Select are acceptable.

B. Butt Hinges: As applicable to each item specified.
a. Standard Weight Hinges: Minimum of two (2) permanently lubricated non-detachable bearings.
b. Heavy Weight Hinges: Minimum of four (4) permanently lubricated bearings on heavy weight hinges.
c. Template screw hole locations.
d. Pins: Easily seated, non-rising pins.
e. UL 10C listed for fire-resistance-rated doors.

C. Finishes: See Door Hardware Schedule.

D. Grades:
1. Butt Hinges: Comply with BHMA A156.1 and BHMA A156.7 for templated hinges.

E. Types:
1. Butt Hinges: Include full mortise hinges.

F. Options: As applicable to each item specified.

G. Quantities:
1. Butt Hinges: Three (3) hinges per leaves up to 90 inches in height. Add one (1) for each additional 30 inches in height or fraction thereof.
a. Hinge weight and size unless otherwise indicated in hardware sets:
1) For doors up to 36 inches wide and up to 1-3/4 inches thick provide hinges with a minimum thickness of 0.134 inch and a minimum of 4-1/2 inches in height.
2) For doors from 36 inches wide up to 42 inches wide and up to 1-3/4 inches thick provide hinges with a minimum thickness of 0.145 inch and a minimum of 4-1/2 inches in height.
3) For doors from 42 inches wide up to 48 inches wide and up to 1-3/4 inches thick provide hinges with a minimum thickness of 0.180 inch and a minimum of 5 inches in height.
4) For doors greater than 1-3/4 inches thick provide hinges with a minimum thickness of 0.180 inch and a minimum of 5 inches in height.
2. Continuous Hinges: One per door leaf.

H. Applications: At swinging doors.
1. Provide non-removable pins at out-swinging doors with locking hardware and all exterior doors.

I. Products:
1. Butt Hinges:
a. Concealed or Exposed bearing, five (5) knuckle.
b. Plain Bearing, Five (5) Knuckle.

2.04 KEYS AND CORES

A. Manufacturers:
   1. Listed in Door Hardware Schedule: Best Cormax Patented
   2. Substitutions: None – facility standard

B. Properties: Complying with guidelines of BHMA A156.28.
   1. Provide small format interchangeable core.
   2. Provide keying information in compliance with DHI (KSN) standards.
   3. Keying Schedule: Arrange for a keying meeting, with Architect, Owner and hardware supplier, and other involved parties to ensure locksets and locking hardware, are functionally correct and keying complies with project requirements.
   4. Keying: Master keyed.
   5. Include construction keying and control keying with removable core cylinders.
   6. Do not make brass construction cores and construction control and operating keys a part of Owner's permanent keying system, nor furnish in the same keyway (or key section) as Owner, permanent keying system.
   7. Key to new keying system.
   8. Supply keys in following quantities:
      a. Grand Master Keys: 1 each.
      b. Master Keys: 4 each.
      c. Construction Master Keys: 6 each.
      d. Construction Keys: 15 each.
      e. Construction Control Keys: 2 each.
      f. Control Keys if New System: 2 each.
      g. Extra Cylinder Cores: 10 each.
      h. Change Keys: 2 each for each keyed core.
   9. Provide key collection envelopes, receipt cards, and index cards in quantity suitable to manage number of keys.
   10. Deliver keys with identifying tags to Owner by security shipment direct from manufacturer.
   11. Permanent Keys and Cores: Stamped with applicable key marking for identification. Do not include actual key cuts within visual key control marks or codes. Stamp permanent keys "Do Not Duplicate."
   12. Include installation of permanent cores and return construction cores to hardware supplier. Construction cores and keys to remain property of hardware supplier.

2.05 LOCK CYLINDERS

A. Manufacturers:
   1. Listed in Door Hardware Schedule: Best

B. Properties:
   1. Lock Cylinders: Provide key access on outside of each lock, unless otherwise indicated.
      a. Provide cylinders from same manufacturer as locking device.
      b. Provide cams and/or tailpieces as required for locking devices.
      c. Provide cylinders with appropriate format interchangeable cores where indicated.

C. Material:
   1. Manufacturer's standard corrosion-resistant brass alloy.

D. Products:
   1. Rim/mortise.

2.06 CYLINDRICAL LOCKS

A. Manufacturers:
   1. Listed in Door Hardware Schedule: Best 9K
   2. Substitutions: Schlage ND, Sargent 10, Dorma C100

B. Properties:

1. Mechanical Locks:
    a. Fitting modified ANSI A115.2 door preparation.
    b. Door Thickness Fit: 1-3/8 inches to 2-1/4 inches thick doors.
    c. Construction: Hub, side plate, shrouded rose, locking pin to be a one-piece casting with a shrouded locking lug.
        1) Through-bolted anti-rotational studs.
    d. Bored Hole: 2-1/8 inch diameter.
    e. Backset: 2-3/8 inches unless otherwise indicated.
    f. Latch: Single piece tail-piece construction.
        1) Latchbolt Throw: 1/2 inch, minimum.
    g. Cylinders:
        1) Cylinder Core Types: Locks capable of supporting manufacturers' cores, as applicable.
    h. Lever Trim:
        1) Style: See Door Hardware Schedule.

C. Finishes: See Door Hardware Schedule.
    1. Core Faces: Match finish of lockset.

D. Material: Manufacturer's standard for specified lock.

E. Options:

F. Products: Cylindrical locks, including mechanical types.

2.07 EXIT DEVICES

A. Manufacturers:
    1. Listed in Door Hardware Schedule: Precision 2000
    2. Substitutions: Von Duprin 98, Sargent 8800, Dorma 9000

B. Properties:
    1. Touchpads: 'T" style metal touchpads and rail assemblies with matching chassis covers end caps.
    2. Latch Bolts: Stainless steel deadlocking with 3/4 inch projection using latch bolt.
    3. Cylinder: Include where cylinder dogging or locking trim is indicated.
    4. Strike as recommended by manufacturer for application indicated.
    5. Sound dampening on touch bar.
    6. Dogging:
        a. Non-Fire-Resistance-Rated Devices: Cylinder ____dogging.
        b. Fire-Resistance-Rated Devices: Manual dogging not permitted.
    7. Handing: Field-reversible.

C. Grades: Complying with BHMA A156.3, Grade 1.

D. Standards Compliance:
    1. Provide UL (DIR) listed exit device assemblies for fire-resistance-rated doors.
    2. Comply with UL 10C.

E. Code Compliance: As required by authorities having jurisdiction in the State in which the Project is located.

2.08 DOOR PULLS AND PUSH PLATES

A. Manufacturers:
    1. Listed in Door Hardware Schedule: Trimco
    2. Substitutions: Rockwood, Ives

B. Properties:
    1. Pull Type: Straight, unless otherwise indicated.
    2. Push Plate Type: Flat, with square corners, unless otherwise indicated.

C. Grades: Comply with BHMA A156.6.

D. Material: Stainless steel, unless otherwise indicated.

E. Products:
   1. Push-Pull Systems.

2.09 CLOSERS

A. Manufacturers:
   1. Listed in Door Hardware Schedule: Best EHD9000
   2. Substitutions: LCN 4041XP, Sargent 250

B. Properties:
   1. Surface Mounted Closers: Manufacturer's standard.
      a. Construction: R14 high silicon aluminum alloy or cast iron.
      b. Covers:
         1) Type: Standard for product selected.
            (a) Full.
         2) Material: Plastic.
         3) Finish: Painted.

C. Grades:
   1. Closers: Comply with BHMA A156.4, Grade 1.
      a. Underwriters Laboratories Compliance:
      b. Testing Standards Compliance: Meeting requirements of UL 10C for positive pressure.

D. Code Compliance: As required by authorities having jurisdiction in the State in which the Project is located.

E. Types:
   1. Rack-and-pinion, surface-mounted. 1-1/2 inches (36MM) minimum bore.

F. Installation:
   1. Mounting: Includes surface mounted installations.
   2. Mount closers on non-public side of door and stair side of stair doors unless otherwise noted in hardware sets.
   3. At outswinging exterior doors, mount closer on interior side of door.
   4. Provide adapter plates, shim spacers, and blade stop spacers as required by frame and door conditions.
   5. Where an overlapping astragal is included on pairs of swinging doors, provide coordinator to ensure door leaves close in proper order when automatic flush bolts are used

2.10 SWINGING DOOR OPERATORS

A. Manufacturers:
   1. Listed in Door Hardware Schedule: Dorma ED100
   2. Substitutions: Record, Horton

B. Properties:
   1. Where automatic operators are scheduled, provide complete assemblies of controls, switches, power supplies, relays, and parts/material recommended and approved by the manufacturer of the automatic operator for each individual leaf. Control both doors with actuators simultaneously at pairs. Locate actuators, key switches, and other controls as directed by Architect.
   2. Power-Assist Low Energy Operators:
      a. Construction: Manufacturer's standard units with full covers.
      b. Door Operation Limits:
         1) Weight: 600 lbs.
         2) Width: 48 inches.
         3) Temperature Range: 5 to 122 degrees F.

c. Function Adjustability: Selectable low-energy or power-assist applications. Low-energy function to cycle the door open as programmed. Power-assist function for decreased opening force when manually operated. Operator to have a programmable push-and-go functionality.
d. Auxiliary Power Supply: 24VDC, 1.5A and form C relay contact for controlling fail safe/secure locking devices 50VAC or DC at 1A max.
e. Programmable Operation: Include sweep speed, latch speed, and backcheck cushioning.
f. Power-Open Functions: Include delay time, opening time, opening force, and opening angle.
1) Angle and door width selector.
2) Power boost feature.
g. On-board cycle counter.
h. Selectable jumper to accommodate push or pull side applications.
i. On/off strike delay when the operator must delay while a locking device releases.
j. Selectable on/off obstacle detection on closing.

3. Actuators:
a. Hard-Wired Units: Jamb mounted and tamper resistant.
1) Normally open switch.
2) Construction: Stainless-steel face plates, with heavy duty injection molded black ABS mounting boxes.
3) Face Plate: Include manufacturer's standard international accessibility symbol and text "Press to Open".

C. Grades:
1. Comply with BHMA A156.19.
2. Underwriters Laboratories Compliance:
a. Product Listing: UL (DIR) and ULC for use on fire-resistance-rated doors.
b. United States: UL 325.

D. Code Compliance: As required by authorities having jurisdiction in the State in which the Project is located.

E. Types:
1. Power-Assist Low-Energy Operators:

F. Options: As applicable to each item specified.
1. Delayed action, adjustable with an independent valve.
2. Advanced backcheck.
3. Heavy-duty arms and knuckles/elbows.
4. Adjustable, for force or angle of opening hold open.
5. Cushion limit stay.

G. Installation:
1. Operator Actuators: Include required back boxes, mounting rings, accessories as needed for fixed unit installation.

2.11 PROTECTION PLATES

A. Manufacturers:
1. Listed in Door Hardware Schedule: Trimco
2. Substitutions: Rockwood, Ives
3. Door edges are as manufactured by ABH. Equal products by Markar are acceptable.

B. Properties:
1. Plates:
a. Kick Plates: Provide along bottom edge of push side of every wood door with closer, except aluminum storefront and glass entry doors, unless otherwise indicated.
b. Edges: Beveled, on four (4) unless otherwise indicated.

C. Grades: Comply with BHMA A156.6.

D. Material: As indicated for each item by BHMA material and finish designation.
   1. Metal Properties: Stainless steel.

E. Installation:
   1. Fasteners: Countersunk screw fasteners

2.12 STOPS AND HOLDERS

A. Manufacturers:
   1. Listed in Door Hardware Schedule: Trimco
   2. Substitutions: Rockwood, Ives, Don Jo

B. General: Provide overhead stop/holder when wall or floor stop is not feasible.

C. Grades:
   1. Door Holders, Wall Bumpers, and Floor Stops: Comply with BHMA A156.16 and Resilient Material Retention Test as described in this standard.

D. Material: Base metal as indicated for each item by BHMA material and finish designation.

E. Types:
   1. Wall Bumpers: Bumper, concave, wall stop.
   2. Floor Stops: Provide with rubber bumper floor stop, heavy duty as specified.

F. Installation:
   1. Non-Masonry Walls: Confirm adequate wall reinforcement has been installed to allow lasting installation of wall bumpers.

2.13 WEATHERSTRIPPING AND GASKETING

A. Manufacturers:
   1. Listed in Door Hardware Schedule: National Guard
   2. Substitutions: Reese, Pemko

B. Grades: Comply with BHMA A156.22.

C. Products:
   1. Weatherstripping: See Door Hardware Schedule.
   2. Door Bottom Seals:
      a. Door Sweeps: See Door Hardware Schedule.
      b. Door Shoes: See Door Hardware Schedule.

2.14 MISCELLANEOUS ITEMS

A. Manufacturers:
   1. Listed in Door Hardware Schedule: Trimco
   2. Substitutions: Ives, Rockwood

B. Properties:
   1. Silencers: Provide at equal locations on door frame to mute sound of door's impact upon closing.
      a. Single Door: Provide three on strike jamb of frame.
      b. Pair of Doors: Provide two on head of frame, one for each door at latch side.
      c. Material: Rubber, gray color.

2.15 FINISHES

A. Finishes: Provide door hardware of same finish, unless otherwise indicated.
   1. Finish: 630; satin stainless steel. 652; satin chromium plated with steel base material, 626, satin chromium plated with brass/bronze base material and 689; aluminum painted, with any base material

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that doors and frames are ready to receive this work; labeled, fire-rated doors and frames are properly installed, and dimensions are as indicated on shop drawings.

B. Correct all defects prior to proceeding with installation.

C. Verify that electric power is available to power operated devices and of correct characteristics.

3.02 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and applicable codes.

B. Install hardware using the manufacturer’s fasteners provided. Drill and tap all screw holes located in metallic materials. Do not use “Riv-Nuts” or similar products.

C. Install hardware on fire-rated doors and frames in accordance with applicable codes and NFPA 80.

D. Install hardware for smoke and draft control doors in accordance with NFPA 105.

E. Use templates provided by hardware item manufacturer.

F. Do not install surface mounted items until application of finishes to substrate are fully completed.

G. Wash down masonry walls and complete painting or staining of doors and frames.

H. Complete finish flooring prior to installation of thresholds.

I. Door Hardware Mounting Heights: Distance from finished floor to center line of hardware item. As indicated in following list; unless noted otherwise in Door Hardware Schedule or on drawings.
   1. For Steel Doors and Frames: Install in compliance with DHI (LOCS) recommendations.
   2. For Wood Doors: Install in compliance with DHI WDHS.3 recommendations.
   3. Mounting heights in compliance with operational and ADA Standards:

J. Set exterior door thresholds with full-width bead of elastomeric sealant at each point of contact with floor providing a continuous weather seal; anchor thresholds with stainless steel countersunk screws.

K. Include in installation for existing doors and frames any necessary field modification and field preparation of doors and frames for new hardware. Provide necessary fillers, reinforcements, and fasteners for mounting new hardware and to cover existing door and frame preparations.

3.03 FIELD QUALITY CONTROL

A. Perform field inspection and testing under provisions of Division 1 - Quality Requirements.

B. Provide an Architectural Hardware Consultant (AHC) to inspect installation and certify that hardware and installation has been furnished and installed in accordance with manufacturer's instructions and as specified.

3.04 ADJUSTING

A. Adjust work under provisions of Division 1 - Execution and Closeout Requirements.

3.05 CLEANING

A. Clean finished hardware in accordance with manufacturer's written instructions after final adjustments have been made.

B. Clean adjacent surfaces soiled by hardware installation activities.

C. Replace items that cannot be cleaned to manufacturer's level of finish quality at no additional cost.

D. See Division 1 - Construction Waste Management and Disposal, for additional requirements.

3.06 PROTECTION

A. Protect finished Work under provisions of Division 1 - Execution and Closeout Requirements.

B. Do not permit adjacent work to damage hardware or finish.

3.07 MAINTENANCE

A. Approximately six months after the acceptance of hardware in each area, the hardware installer shall:
   1. Return to the project and re-adjust every item of hardware to restore proper function of doors and hardware.
   2. Consult with and instruct Owner's personnel in recommended additions to the maintenance procedures.
   3. Replace hardware items which have deteriorated or failed due to faulty design, materials or installation of hardware units.
   4. Prepare a written report of current and predictable problems (of substantial nature) in the performance of the hardware and submit to the Architect.

3.08 HARDWARE SCHEDULE

MANUFACTURERS

CODE	NAME	
AB	ABH	OVERHEAD STOPS
BE	BEST ACCESS SYSTEMS	HINGES, CLOSERS, LOCKS, CYLINDERS, ELECTRICAL COMPONENTS
DM	DORMA	OPERATORS
LO	LOCINOX	GATE HINGES/CLOSERS
NA	NATIONAL GUARD	GASKETS, THRESHOLDS
PR	PRECISION	EXIT DEVICES
RC	RCI	OPERATOR SWITCHES, POWER SUPPLIES
TR	TRIMCO	DOOR STOPS, FLAT GOODS

FINISH LIST

CODE	DESCRIPTION
628	SATIN ANODIZED ALUMINUM
626/652	SATIN CHROMIUM PLATED
630	SATIN STAINLESS STEEL
689	ALUMINUM PAINTED
BLK	BLACK
GREY	GREY

OPTIONS

CODE	DESCRIPTION
C	QUICK CONNECT WIRING SYSTEM (BEST, PRECISION)
RQE	REQUEST TO EXIT (BEST)
VIN	OCCUPANCY INDICATOR (BEST)
FL	FIRE EXIT DEVICE (PRECISION)
MLR	MOTORIZED LATCH RETRACTION (PRECISION)
TS	TOUCHBAR MONITOR SWITCH (PRECISION)
WTS	WEATHERIZED TOUCHBAR MONITOR SWITCH (PRECISION)
LBR	LESS BOTTOM ROD (PRECISION)
N MOUNTING	SPANNER THROUGH BOLT ATTACHMENT (TRIMCO)

CODE	DESCRIPTION
B4E	BEVELED 4 EDGES – KICK, MOP & ARMOR PLATES TRIMCO)
CS	COUNTER SINKING OF KICK, MOP & ARMOR PLATES (TRIMCO)
SSMS/EA	STAINLESS MACHINE SCREWS/EXPANSION ANCHORS (NGP)
OFOI	PROVIDED AND INSTALLED BY OWNER'S THIRD PARTY ACCESS CONTROL CONTRACTOR

SET #1 - EXTERIOR GATE - CARD ACCESS				
DOORS: 001				
1	SELF-CLOSING GATE HINGE	MAMMOTH HD X RAPTOR		LO
1	EXIT DEVICE	WTS 2114 X 4914D	630	PR
*1	ELECTROMAGNETIC LOCK	8380	630	RC
*2	HARNESS	WH-6E		BE
*1	HARNESS	WH-32P		BE
*2	HARNESS	WH-192		BE
*1	DOOR LOOP	9509-18S	630	RC
*1	POWER SUPPLY	DKPS-2A		RC

NOTE: FABRICATE GATE TO ACCEPT HARDWARE AS SPECIFIED. PROVIDE BRACKETS FOR PROPER MAGLOCK MOUNTING. CARD ACTIVATION MOMENTARILY RELEASES MAGLOCK AND ALLOWS ACCESS. TOUCHBAR SWITCH RELEASES MAGLOCK AND ALLOWS EXIT. PREVENT TAMPERING FROM THE EXTERIOR. CARD READER BY SECURITY ACCESS.

SET #2 - ENTRY - CARD ACCESS - AUTOMATIC				
DOORS: 100				
1	CONTINUOUS HINGE	661HD EPT	628	BE
*1	POWER TRANSFER	EPT-12C	630	PR
*1	EXIT DEVICE	C MLR TS 2403	630	PR
1	RIM CYLINDER	12E-72 PATD	626	BE
1	DOOR PULL	1191-4 TYPE N MOUNTING	630	TR
*1	OPERATOR	ED100LE PUSH ARM	628	DM
*1	PUSH BUTTON SWITCH	910NTC-HC-SS	630	RC
*1	PUSH BUTTON SWITCH	910TC-HC-SS	630	RC
1	FLOOR STOP	1214H	626	TR
1	DOOR SWEEP	200 NA		NA
1	SADDLE THRESHOLD	426 SSMS/EA		NA
*1	HARNESS	WH-6E		BE
*1	HARNESS	WH-12		BE
*1	HARNESS	WH-192		BE
*1	POWER SUPPLY	DKPS-2A		RC

NOTE: GASKETS BY DOOR MANUFACTURER. CARD ACTIVATION MOMENTARILY RETRACTS LATCH, ENERGIZES OPERATOR SWITCH AND ALLOWS ACCESS. INSIDE OPERATOR SWITCH ALWAYS ACTIVE. CARD READER AND REMOTE RELEASE BY SECURITY ACCESS. COORDINATE OPERATION WITH THE ARCHITECT AND OWNER. VERIFY THRESHOLD APPLICATION.

SET #3 - RESTROOM				
DOORS: 101				
3	**HINGES**	**CB179 4.5" X 4.5"**	**652**	**BE**
1	**PRIVACY SET**	**9K3-0L14D**	**626**	**BE**
1	**CLOSER**	**EHD9016 JT90**	**689**	**BE**
1	**KICK PLATE**	**K0050 10" X 2" LDW B4E CS**	**630**	**TR**
1	**MOP PLATE**	**KM050 6" X 1" LDW B4E CS**	**630**	**TR**
1	**WALL BUMPER**	**1270WV**	**630**	**TR**
1	**GASKETING**	**5050 B HEAD & JAMBS**		**NA**
SET #4 - TRAINING/BALLOT TAB - CARD ACCESS				
DOORS: 102, 102D, 127				
2	**HINGES**	**CB179 4.5" X 4.5"**	**652**	**BE**
***1**	**ELECTRIC HINGE**	**OFOI**	**652**	**BE**
***1**	**ELECTROMECHANICAL LOCK**	**OFOI**	**626**	**BE**
1	**CLOSER**	**EHD9016 JT90**	**689**	**BE**
1	**KICK PLATE**	**K0050 10" X 2" LDW B4E CS**	**630**	**TR**
1	**WALL BUMPER**	**1270WV**	**630**	**TR**
3	**SILENCERS**	**1229A**	**GREY**	**TR**
***1**	**HARNESS**	**OFOI**		**BE**
***1**	**HARNESS**	**OFOI**		**BE**
***1**	**HARNESS**	**OFOI**		**BE**
***1**	**POWER SUPPLY**	**OFOI**		**RC**
NOTE: CARD OR REMOTE ACTIVATION MOMENTARILY RELEASES LEVER AND ALLOWS ACCESS. CARD READER AND REMOTE ACCESS BY SECURITY ACCESS.				
SET #5 - EOC - CARD ACCESS				
DOORS: 102A				
5	**HINGES**	**CB179 4.5" X 4.5" NRP**	**652**	**BE**
***1**	**ELECTRIC HINGE**	**OFOI**	**652**	
1	**AUTO FLUSH BOLT SET**	**3815L X 3815L**	**626**	**TR**
1	**DUST PROOF STRIKE**	**3911**	**630**	**TR**
***1**	**ELECTROMECHANICAL LOCK**	**OFOI**	**626**	
1	**COORDINATOR**	**3094 SERIES**	**BLK**	**TR**
2	**MOUNTING BRACKETS**	**3095 OR 3096 AS REQUIRED**	**BLK**	**TR**
2	**CLOSERS**	**EHD9016 SPA90**	**689**	**BE**
2	**KICK PLATES**	**K0050 10" X 2" LDW B4E CS**	**630**	**TR**
2	**WALL BUMPERS**	**1270WV**	**630**	**TR**
1	**ASTRAGAL**	**139 A**		**NA**
2	**SILENCERS**	**1229A**	**GREY**	**TR**
***1**	**HARNESS**	**OFOI**		

*1	HARNESS	OFOI		
*1	HARNESS	OFOI		
*1	POWER SUPPLY	OFOI		

NOTE: CARD ACTIVATION MOMENTARILY RELEASES LEVER AND ALLOWS ACCESS. CARD READER BY SECURITY ACCESS. APPLY ASTRAGAL TO INACTIVE LEAF.

SET #6 - EOC/HALL/SERVER - CARD ACCESS

DOORS: 102B, 103, 108A, 116, 119, 125

2	HINGES	CB179 4.5" X 4.5" NRP	652	BE
*1	ELECTRIC HINGE	OFOI	652	BE
*1	ELECTROMECHANICAL LOCK	OFOI	626	BE
1	CLOSER	EHD9016 SPA90	689	BE
1	KICK PLATE	K0050 10" X 2" LDW B4E CS	630	TR
1	WALL BUMPER	1270WV	630	TR
3	SILENCERS	1229A	GREY	TR
*1	HARNESS	OFOI		
*1	HARNESS	OFOI		
*1	HARNESS	OFOI		
*1	POWER SUPPLY	OFOI		

NOTE: CARD ACTIVATION MOMENTARILY RELEASES LEVER AND ALLOWS ACCESS. CARD READER BY SECURITY ACCESS.

SET #7 - TRAINING/STAGING - CARD ACCESS

DOORS: 102C, 125A

2	HINGES	CB199 4.5" X 4.5" NRP	630	BE
*1	ELECTRIC HINGE	CECB199-12C 4.5" X 4.5"	630	BE
*1	ELECTROMECHANICAL LOCK	9KW3-7DEU15D C RQE	626	BE
1	LOCK ASTRAGAL	5001	630	TR
1	CLOSER	EHD9016 SPA90	689	BE
1	KICK PLATE	K0050 10" X 2" LDW B4E CS	630	TR
1	FLOOR STOP	1214H	626	TR
1	WEATHERSTRIP	5075 B HEAD & JAMBS		NA
1	DOOR SWEEP	200 NA		NA
1	SADDLE THRESHOLD	426 SSMS/EA		NA
*1	HARNESS	WH-6E		BE
*1	HARNESS	WH-50		BE
*1	HARNESS	WH-192		BE
*1	POWER SUPPLY	DKPS-2A		RC

NOTE: CARD ACTIVATION MOMENTARILY RELEASES LEVER AND ALLOWS ACCESS. CARD READER BY SECURITY ACCESS. VERIFY THRESHOLD APPLICATION.

SET #8 - OFFICE

DOORS: 104, 105, 107, 107A, 115, 117, 118, 121, 123

3	HINGES	CB179 4.5" X 4.5"	652	BE
1	LOCKSET	9K3-7AB14D PATD	626	BE
1	WALL BUMPER	1270WV	630	TR
3	SILENCERS	1229A	GREY	TR

SET #9 - UTILITY

DOORS: 106, 111

3	HINGES	CB179 4.5" X 4.5" NRP	652	BE
1	LOCKSET	9K3-7D14D PATD	626	BE
1	WALL BUMPER	1270WV	630	TR
3	SILENCERS	1229A	GREY	TR

SET #10 - EOC - CARD ACCESS

DOORS: 108

5	HINGES	CB168 4.5" X 4.5" NRP	652	BE
*1	ELECTRIC HINGE	CECB168-12C 4.5" X 4.5"	652	BE
*1	EXIT DEVICE	C MLR TS 2208 X 4908D LBR	630	PR
1	EXIT DEVICE	2201 LBR	630	PR
2	RIM CYLINDER	12E-72 PATD	626	BE
2	CLOSER	EHD9016 SPA90	689	BE
2	KICK PLATE	K0050 10" X 2" LDW B4E CS	630	TR
2	WALL BUMPER	1270WV	630	TR
1	GASKETING	5050 B HEAD & JAMBS		NA
1	GASKETING SET	A605 A SET		NA
*1	HARNESS	WH-6E		BE
*1	HARNESS	WH-12		BE
*1	HARNESS	WH-192		BE
*1	POWER SUPPLY	DKPS-2A		RC

NOTE: CARD ACTIVATION MOMENTARILY RETRACTS LATCH AND ALLOWS ACCESS. CARD READER BY SECURITY ACCESS.

SET #11 - BALLOT SORTING

DOORS: 108B

6	HINGES	CB179 4.5" X 4.5" NRP	652	BE
1	AUTO FLUSH BOLT SET	3810 X 3810	626	TR
1	DUST PROOF STRIKE	3911	630	TR
1	LOCKSET	9K3-7AB14D PATD	626	BE

1	COORDINATOR	3094 SERIES	BLK	TR
2	CLOSER	EHD9016 JT90	689	BE
2	KICK PLATE	K0050 10" X 2" LDW B4E CS	630	TR
1	WALL BUMPER	1270WV	630	TR
1	FLOOR STOP	1215CKU	626	TR
2	SILENCERS	1229A	GREY	TR

NOTE: ASTRAGAL ON INACTIVE LEAF BY DOOR MANUFACTURER.

SET #12 - EOC - CARD ACCESS

DOORS: 108C

2	HINGES	CB199 4.5" X 4.5" NRP	630	BE
*1	ELECTRIC HINGE	CECB199-12C 4.5" X 4.5"	630	BE
*1	EXIT DEVICE	C MLR TS 2103 X 1703A	630	PR
1	RIM CYLINDER	12E-72 PATD	626	BE
1	KICK PLATE	K0050 10" X 2" LDW B4E CS	630	TR
1	FLOOR STOP	1214H	626	TR
1	WEATHERSTRIP	5075 B HEAD & JAMBS		NA
1	DOOR SWEEP	200 NA		NA
1	SADDLE THRESHOLD	426 SSMS/EA		NA
*1	HARNESS	WH-6E		BE
*1	HARNESS	WH-12		BE
*1	HARNESS	WH-192		BE
*1	POWER SUPPLY	DKPS-2A		RC

NOTE: CARD ACTIVATION MOMENTARILY RETRACTS LATCH AND ALLOWS ACCESS. CARD READER BY SECURITY ACCESS. VERIFY THRESHOLD APPLICATION.

SET #13 - OVERHEAD DOOR

DOORS: 108D, 125B

1	MORTISE CYLINDER	1E-74 PATD	626	BE
1	PADLOCK	41B-722L PATD	626	BE

NOTE: VERIFY LOCKING REQUIREMENTS AND ADJUST AS NEEDED. BALANCE BY DOOR MANUFACTURER.

SET #14 - HALL - CARD ACCESS

DOORS: 109

1	CONTINUOUS HINGE	661HD EPT	628	BE
*1	POWER TRANSFER	EPT-12C	630	PR
*1	EXIT DEVICE	C MLR TS 2403	630	PR
1	RIM CYLINDER	12E-72 PATD	626	BE

1	DOOR PULL	1191-4 TYPE N MOUNTING	630	TR
1	CLOSER	EHD9016 SPA90 DP90	689	BE
1	FLOOR STOP	1215CKU	626	TR
*1	HARNESS	WH-6E		BE
*1	HARNESS	WH-12		BE
*1	HARNESS	WH-192		BE
*1	POWER SUPPLY	DKPS-2A		RC

NOTE: GASKETS BY DOOR MANUFACTURER. CARD ACTIVATION MOMENTARILY RETRACTS LATCH AND ALLOWS ACCESS. CARD READER AND REMOTE RELEASE BY SECURITY ACCESS. COORDINATE OPERATION WITH THE ARCHITECT AND OWNER.

SET #15 - STAFF BREAK ROOM

DOORS: 110

6	HINGES	CB179 4.5" X 4.5"	652	BE
2	PULL PLATE	1018-3	630	TR
2	PUSH PLATE	1001-3	630	TR
2	CLOSER	EHD9016 JT90	689	BE
2	KICK PLATE	K0050 10" X 2" LDW B4E CS	630	TR
2	WALL BUMPER	1270WV	630	TR
1	GASKETING	5050 B HEAD & JAMBS		NA
1	GASKETING SET	A605 A SET		NA

SET #16 - RESTROOM

DOORS: 112, 114

3	HINGES	CB179 4.5" X 4.5"	652	BE
1	PULL PLATE	1018-3	630	TR
1	PUSH PLATE	1001-3	630	TR
1	CLOSER	EHD9016 JT90	689	BE
1	KICK PLATE	K0050 10" X 2" LDW B4E CS	630	TR
1	MOP PLATE	KM050 6" X 1" LDW B4E CS	630	TR
1	WALL BUMPER	1270WV	630	TR
1	GASKETING	5050 B HEAD & JAMBS		NA

SET #17 - STORAGE

DOORS: 113

3	HINGES	CB179 4.5" X 4.5"	652	BE
1	LOCKSET	9K3-7D14D PATD	626	BE
1	WALL BUMPER	1270WV	630	TR
3	SILENCERS	1229A	GREY	TR

SET #18 - CLOSET

DOORS: 122				
3	**HINGES**	**CB179 4.5" X 4.5"**	**652**	**BE**
1	**PASSAGE SET**	**9K3-0N14D**	**626**	**BE**
1	**OVERHEAD STOP**	**4420 SERIES**	**630**	**AB**
3	**SILENCERS**	**1229A**	**GREY**	**TR**
SET #19 - OFFICE - CARD ACCESS				
DOORS: 120				
2	**HINGES**	**CB179 4.5" X 4.5"**	**652**	**BE**
***1**	**ELECTRIC HINGE**	**OFOI**	**652**	
***1**	**ELECTROMECHANICAL LOCK**	**OFOI**	**626**	
1	**WALL BUMPER**	**1270WV**	**630**	**TR**
3	**SILENCERS**	**1229A**	**GREY**	**TR**
***1**	**HARNESS**	**OFOI**		
***1**	**HARNESS**	**OFOI**		
***1**	**HARNESS**	**OFOI**		
***1**	**POWER SUPPLY**	**OFOI**		
NOTE: CARD ACTIVATION MOMENTARILY RELEASES LEVER AND ALLOWS ACCESS. CARD READER AND REMOTE RELEASE BY SECURITY ACCESS.				
SET #20 - ELECTRICAL				
DOORS: 124				
3	**HINGES**	**CB168 4.5" X 4.5" NRP**	**652**	**BE**
1	**EXIT DEVICE**	**FL 2103 X 4903D**	**630**	**PR**
1	**RIM CYLINDER**	**12E-72 PATD**	**626**	**BE**
1	**CLOSER**	**EHD9016 SPA90**	**689**	**BE**
1	**KICK PLATE**	**K0050 10" X 2" LDW B4E CS**	**630**	**TR**
1	**WALL BUMPER**	**1270WV**	**630**	**TR**
1	**GASKETING**	**5050 B HEAD & JAMBS**		**NA**
SET #21 - BALLOT SORTING - CARD ACCESS				
DOORS: 126				
5	**HINGES**	**CB179 4.5" X 4.5" NRP**	**652**	**BE**
***1**	**ELECTRIC HINGE**	**CECB179-12C 4.5" X 4.5"**	**652**	**BE**
1	**AUTO FLUSH BOLT SET**	**3810 X 3810**	**626**	**TR**
1	**DUST PROOF STRIKE**	**3911**	**630**	**TR**
***1**	**ELECTROMECHANICAL LOCK**	**9KW3-7DEU15D PATD C RQE**	**626**	**BE**
1	**COORDINATOR**	**3094 SERIES**	**BLK**	**TR**
2	**MOUNTING BRACKETS**	**3095 OR 3096 AS REQUIRED**	**BLK**	**TR**
2	**CLOSERS**	**EHD9016 SPA90**	**689**	**BE**

2	**WALL BUMPERS**	**1270WV**	**630**	**TR**
2	**SILENCERS**	**1229A**	**GREY**	**TR**
***1**	**HARNESS**	**WH-6E**		**BE**
***1**	**HARNESS**	**WH-50**		**BE**
***1**	**HARNESS**	**WH-192**		**BE**
***1**	**POWER SUPPLY**	**DKPS-2A**		**RC**

NOTE: CARD ACTIVATION MOMENTARILY RELEASES LEVER AND ALLOWS ACCESS. CARD READER BY SECURITY ACCESS. ASTRAGAL ON INACTIVE LEAF BY DOOR MANUFACTURER.

*** REQUIRES ELECTRONIC COORDINATION**

END OF SECTION 087100

SECTION 087113
AUTOMATIC DOOR OPERATORS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This section includes the following types of automatic door operators:
   1. Low-energy door operators for swinging doors.

B. Related Sections:
   1. Division 7 Sections for caulking to the extent not specified in this section.
   2. Division 8 Sections for Hollow Metal framed openings for applications furnished and installed separately in Division 8 Section.
   3. Division 8 Section “Door Hardware” for hardware to the extent not specified in this section.
   4. Division 8 Section “Glazing” for materials and installation requirements of glazing for automatic entrances.
   5. Division 26 and 28 Sections for electrical connections including conduit and wiring for automatic entrance operators and access-control devices.

1.03 REFERENCES

A. References: Comply with the version year adopted by the Authority Having Jurisdiction.
   1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
   2. ICC/IBC - International Building Code.
   3. CUL – Approved for use in Canada.
   4. NFPA 70 - National Electrical Code.
   5. NFPA 80 - Fire Doors and Windows.
   6. NFPA 101 - Life Safety Code.
   7. NFPA 105 - Installation of Smoke Door Assemblies.

B. American National Standards Institute (ANSI) / Builders Hardware Manufacturers Association (BHMA).
   1. ANSI/BHMA A156.19 Standards for Power Assist and Low Energy Power Operated Doors.

C. Underwriters Laboratories (UL).
   1. UL10C – Positive Pressure Fire Tests of Door Assemblies.
   2. UL 325 - Standard for Safety for Door, Drapery, Gate, Louver, and Window Operators and Systems.

D. American Association of Automatic Door Manufacturers (AAADM).

E. American Society for Testing and Materials (ASTM).
   1. ASTM B221 Standard Specification for Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire, Profiles and Tubes.
   2. ASTM B209 Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate.

F. American Architectural Manufacturers Association (AAMA).
   1. AAMA 611 Voluntary Specification for Anodized Architectural Aluminum.

G. National Association of Architectural Metal Manufacturers (NAAMM).
   1. Metal Finishes Manual for Architectural Metal Products.

H. International Code Council (IBC).
   1. IBC: International Building Code Building Code as adopted by the local jurisdiction.

1.04 DEFINITIONS

A. Activation device: Device that, when actuated, sends an electrical signal to the door operator to initiate the door operation.

B. Monitored Safety Devices: A tested system that works in conjunction with the automatic door control that detects the presence of a person or an object within a zone where contact could occur and provides a signal to stop the movement of the door.

C. AAADM: American Association of Automatic Door Manufacturers.

D. Operating ambient Temperature Range: 5 Degrees F to plus 122 degrees F (minus 15 C to 50 degrees C).

E. For automatic door terminology, refer to ANSI/BHMA A 156.19 for definitions of terms.

1.05 PERFORMANCE REQUIREMENTS

A. General: Provide automatic doors that have been designed and fabricated to comply with specified performance requirements, as demonstrated by testing manufacturers corresponding systems.

B. Compliance:
1. ICC/IBC International Building Code
2. ANSI/BHMA A 156.19 American National Standard for Power Operated Doors Pedestrian Doors.
3. UL 325 Listed
4. NFPA 70 National Electrical Code.
5. NFPA 101 Life Safety Code
6. CUL Approved for use in Canada
7. UL Listed Fire Door Operator with Automatic Closer

C. Automatic Door equipment accommodates medium to heavy pedestrian traffic.

D. Opening Force Requirements:
1. Power-Operated swinging doors shall open with a manual force not to exceed 30 lbf (133N) to set the door in motion and 15 lbf to fully open the door with force applied at 1” (25mm) from the latched edge of the door. The required force to prevent a stopped door from opening or closing shall to exceed 15 lbf (67N) measured 1” (25mm) from the latch edge of the door at any point during the opening or closing.

E. Closing Time:
1. Door operators shall be field adjustable to close 90 degrees to 10 degrees in 3 seconds or longer per ANSI/BHMA A 156.19 standard.
2. Door shall be field adjusted to close from 10 degrees to fully closed position in not less than 1.5 seconds.

1.06 SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Product Data: Manufacturer’s product data sheets including installation details, material descriptions, dimensions of individual components and profiles fabrication, operational descriptions and finishes.

C. Shop Drawings: For automatic entrances. Include plans, elevations, sections, details, hardware mounting heights, additional accessories and attachments to other work.

D. Samples: color samples of exposed finish as required.

E. Manufacturers Field Reports: Submit manufacturer’s field reports from AAADM certified technician of inspection and approval of doors for compliance with ANSI/BHMA A 156.19 after completion of installation.

F. Operating and Maintenance Manuals: Provide manufacturers operating, owners and maintenance manuals for each item specified as required in Division 01, Closeout Submittals.

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications: 10 years minimum of documented experience in manufacturing door equipment similar to that indicated within this specification with a proven record of successful service performance. A manufacturer with company certificate issued by AAADM.

B. Installer Qualifications: Installers, trained by the primary product manufacturers, with a minimum 5 years documented experience installing and maintenance of units similar in material, design, and extent to that indicated in this specification and whose work has resulted in construction with a record of successful in-service performance. Manufacturer's authorized representative who is trained and approved for installation and maintenance of units by AAADM required for this Project. Contact Dormakaba representative Matt Wood for costing and installation. 971-219-9287.

C. Source Limitations for Automatic Operators: Obtain each type of automatic door operator and senor components specified in this section from single source from single manufacturer.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

E. Power-Operated Door Standard: ANSI/BHMA A 156.19 Current year.

F. Emergency-Exit Door Requirements: Comply with requirements of authorities having jurisdiction for automatic entrances serving as a required means of egress.

1.08 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings to receive automatic entrances by field measurements before fabrication.

1.09 COORDINATION

A. Coordinate door operators with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish. Coordinate hardware for automatic entrances with hardware required for rest of project.

B. Electrical System Roughing-in: Coordinate layout and installation of automatic power door operator with connections to power supplies and access-control system.

1.10 WARRANTY

A. Automatic Door Operators to be free of defects in material and workmanship for a period of One (1) year from the date of substantial completion.

B. During the warranty period a factory trained technician shall preform service and affect repairs. A safety inspection shall be performed after each adjustment or repair and a completed inspection form submitted to the owner.

C. During the warranty period all warranty work shall be performed during normal working hours.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Basis of Design: dormakaba • Reamstown, PA • 1-844-773-2669 • Website: www.dormakaba.us
   1. Substitutions: See Section 012500 – Substitution Procedures

2.02 AUTOMATIC SWING DOOR OPERATOR

A. Model: DORMA, ED Series ED250 (Basis of Design) An Integrated, self-learning automatic swing door operator with an advanced CPU, a multistage gearbox with real time adaptive software and available user interface.
   1. Automatic Door Configuration:
      a. Configuration: Single swing door or pair of doors swinging.
      b. Traffic Pattern: as shown on drawings
      c. Mounting: Surface applied

B. Control Features
   1. Power-hold Close
   2. Built in Lock Delay
   3. On-Off-Hold Open switch control to control door function
   4. On-Off Power Switch
   5. Fire Alarm Integration
   6. Field Adjustable Handing

7. Push and Go
8. Power Assist Opening Activation
9. Intergraded Connections for Monitored Safety Sensors and other accessories.
10. Integrated access control

C. Door Control Features
1. Wind Load and Stack Pressure microprocessor monitored with power boost to ensure secure opening and closing in changing conditions.
2. Door Weight Max. ED 250 - 800 lbs.

D. Header Size: Narrow header at 4” height by 6” depth. Optional – Fine header height at 2 3/4" by 5” 1/8” depth if the application requires such. Provide full width at pairs of doors.

2.03 ACTIVATION DEVICES

A. Activation Device:
1. Touchless Wave Plates: activation sensor plate in stainless steel Microwave technology has an adjustable range of 2 inches to 24 inches.
2. RCI 910TC-HC-SS/910NTC-HC-SS Touchless Switches
3. Verify compliance with local jurisdiction.

2.04 ELECTRICAL

A. Electrical 115 V AC +/- 10% 50/60 Hz 6.6 A max.

2.05 ALUMINUM FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Anodized Finish:
1. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine doors and frames with Installer present, for compliance with requirements for installation tolerances, wall and floor construction and other conditions affecting performance of automatic entrances.

B. Examine roughing in for electrical source power to verify actual locations of wiring connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. General: Do not install damaged components. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure non-movement joints.

B. Entrances: Install automatic entrances plumb and true in alignment with established lines and grades without warp or rack of framing members and doors. Anchor securely in place.
1. Install surface-mounted hardware using concealed fasteners to greatest extent possible.
2. Set headers, carrier assemblies, tracks, operating brackets, and guides level and true to location with anchorage for permanent support.

C. Door Operators: Connect door operators to electrical power distribution system as specified in Division 26 Sections

D. Sealants: Comply with requirements specified in Division 07 Section "Joint Sealants" to provide seal between the operator housing and wall surface. installation.

E. Signage: Apply signage on both sides of each door and each sidelight as required by ANSI/BHMA A 156.19

3.03 FIELD QUALITY CONTROL

A. Manufacturer’s representative shall provide technical assistance and guidance for installation of automatic doors.

1. Factory trained and AAADM certified representative shall test and inspect each automatic door to determine compliance of the installed system to ANSI/BHMA A 156.19

3.04 ADJUSTING

A. Adjust door operators and controls for smooth and safe operation.

3.05 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by automatic operator installation promptly after installation.

3.06 DEMONSTRATION

A. Engage a factory authorized representative to train Owner's maintenance personnel to adjust, operate, and maintain safe operation of automatic entrances.

END OF SECTION 087113

SECTION 088000
GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Insulating glass units.

B. Glazing units.

C. Glazing compounds.

1.02 RELATED REQUIREMENTS

A. Section 072700 - Air Barriers.

B. Section 079200 - Joint Sealants: Sealants for other than glazing purposes.

C. Section 081113 - Hollow Metal Doors and Frames: Glazed lites in doors and borrowed lites.

D. Section 081416 - Flush Wood Doors: Glazed lites in doors.

E. Section 084313 - Aluminum-Framed Storefronts: Glazing provided as part of storefront assembly.

F. Section 085413 - Fiberglass Windows: Glazing provided by window manufacturer.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials Current Edition.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test 2015 (Reaffirmed 2020).

C. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers 2005 (Reapproved 2019).

D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants 2018.

E. ASTM C1036 - Standard Specification for Flat Glass 2021.

F. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass 2018.

G. ASTM C1193 - Standard Guide for Use of Joint Sealants 2016 (Reapproved 2023).

H. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass 2021a.

I. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings 2016.

J. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation 2019.

K. GANA (GM) - GANA Glazing Manual 2022.

L. GANA (SM) - GANA Sealant Manual 2008.

M. GANA (LGRM) - Laminated Glazing Reference Manual 2019.

N. IGMA TM-3000 - North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use 1990 (2016).

O. NFRC 100 - Procedure for Determining Fenestration Product U-factors 2020.

P. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence 2020.

Q. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems 2023.

1.04 SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Product Data on Insulating Glass Unit Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

D. Samples: Submit two samples 12" by 12" inch in size of glass units.

E. Certificate: Certify that products of this section meet or exceed specified requirements.

F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with GANA (GM), GANA (SM), GANA (LGRM), and IGMA TM-3000 for glazing installation methods. Maintain one copy on site.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

1.06 FIELD CONDITIONS

A. Do not install glazing when ambient temperature is less than 40 degrees F.

1.07 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Insulating Glass Units: Provide a five (5) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Float Glass Manufacturers:
1. Cardinal Glass Industries; www.cardinalcorp.com/#sle.
2. Guardian Glass, LLC; www.guardianglass.com/#sle.
3. Pilkington North America Inc; www.pilkington.com/na/#sle.
4. Vitro Architectural Glass (formerly PPG Glass); www.vitroglazings.com/#sle.
5. Substitutions: See Section 012500 – Substitution Procedures

2.02 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
1. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
2. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
3. Glass thicknesses listed are minimum.

B. Weather-Resistive Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure water-resistive barrier, vapor retarder, and/or air barrier.
1. In conjunction with weather barrier related materials described in other sections, as follows:
a. Air Barriers: See Section 072700.

C. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
3. Solar Optical Properties: Comply with NFRC 300 test method.

2.03 GLASS MATERIALS

A. Float Glass: Provide float glass based glazing unless otherwise indicated.

1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality - Q3.
2. Kind FT - Fully Tempered Type: Complies with ASTM C1048.
3. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.

2.04 INSULATING GLASS UNITS

A. Manufacturers:
1. Cardinal Glass Industries; www.cardinalcorp.com/#sle.
2. Guardian Glass, LLC; www.guardianglass.com/#sle.
3. Pilkington North America Inc; www.pilkington.com/na/#sle.Pilkington North America Inc; www.pilkington.com/na/#sle.
4. Vitro Architectural Glass (formerly PPG Glass); www.vitroglazings.com/#sle.
5. Substitutions: See Section 012500 – Substitution Procedures

B. Insulating Glass Units: Types as indicated.
1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
3. Spacer Color: Black.
4. Edge Seal:
   a. Color: Black.
5. Purge interpane space with dry air, hermetically sealed.

C. Type IG-1 - Insulating Glass Units: Vision glass, double glazed.
1. Applications: Exterior glazing unless otherwise indicated.
2. Space between lites filled with argon.
3. Outboard Lite: Annealed float glass, 1/4 inch thick, minimum.
   a. Tint: Clear.
   b. Coating: Low-E (passive type), on #2 surface.
4. Inboard Lite: Annealed float glass, 1/4 inch thick, minimum.
   a. Tint: Clear.
5. Total Thickness: 1 inch.
6. Thermal Transmittance (U-Value), Summer - Center of Glass: .38, maximum.
7. Visible Light Transmittance (VLT): _____ percent, nominal.
8. Solar Heat Gain Coefficient (SHGC): .61, maximum.

D. Type IG-2 - Insulating Glass Units: Safety glazing.
1. Applications:
   a. Glazed lites in exterior doors.
   b. Glazed sidelights and panels next to doors.
   c. Exterior locations as required by applicable federal, state, and local codes and regulations.
2. Space between lites filled with argon.
3. Glass Type: Same as Type IG-1 except use fully tempered float glass for both outboard and inboard lites.
4. Tint: Clear.
5. Total Thickness: 1 inch.
6. Thermal Transmittance (U-Value), Summer - Center of Glass: .38, maximum.
7. Solar Heat Gain Coefficient (SHGC): .61, maximum.

2.05 GLAZING UNITS

A. Type G-2 - Monolithic Interior Vision Glazing:
1. Applications: Interior glazing unless otherwise indicated.
2. Glass Type: Annealed float glass.
3. Tint: Clear.

4. Thickness: 1/4 inch, nominal.

B. Type G-3 - Monolithic Safety Glazing: Non-fire-rated.
1. Applications:
a. Glazed lites in doors, except fire doors.
b. Glazed sidelights to doors, except in fire-rated walls and partitions.
c. Other locations required by applicable federal, state, and local codes and regulations.
d. Other locations indicated on drawings.
2. Glass Type: Fully tempered safety glass as specified.
3. Tint: Clear.
4. Thickness: 1/4 inch, nominal.

2.06 GLAZING COMPOUNDS

A. Type GC-2 - Butyl Sealant: Single component; ASTM C920 Grade NS, Class 12-1/2, Uses M and A, Shore A hardness of 10 to 20; black color.

2.07 ACCESSORIES

A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.

B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Continuous by one half the height of the glazing stop by thickness to suit application, self adhesive on one face.

C. Glazing Tape, Back Bedding Mastic Type: Preformed, butyl-based, 100 percent solids compound with integral resilient spacer rod applicable to application indicated; 5 to 30 cured Shore A durometer hardness; coiled on release paper; black color.

D. Glazing Splines: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

3.02 PREPARATION

A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION, GENERAL

A. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.

3.04 INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)

A. Application - Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.

B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.

C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.

D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.05 CLEANING

A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.

B. Remove nonpermanent labels immediately after glazing installation is complete.

C. Clean glass and adjacent surfaces after sealants are fully cured.

D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.06 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION 088000

SECTION 089100
LOUVERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Louvers, frames, and accessories.

1.02 RELATED REQUIREMENTS

A. Section 076200 - Sheet Metal Flashing and Trim.

B. Section 233113 - HVAC Ducts and Casings: Ductwork attachment to louvers.

1.03 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix) 2022.

B. AMCA 511 - Certified Ratings Program Product Rating Manual for Air Control Devices 2021, with Editorial Revision (2022).

C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes 2021.

D. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric) 2021.

1.04 SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Product Data: Provide data describing design characteristics, maximum recommended air velocity, design free area, materials and finishes.

C. Shop Drawings: Indicate louver layout plan and elevations, opening and clearance dimensions, and tolerances; head, jamb and sill details; blade configuration, screens, blank-off areas required, and frames.

D. Maintenance Data: Include lubrication schedules, adjustment requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Louvers:
   1. Basis of Design: Greenheck
   2. Substitutions: See Section 012500 – Substitution Procedures

2.02 LOUVERS

A. Louvers: Factory fabricated and assembled, complete with frame, mullions, and accessories; AMCA Certified in accordance with AMCA 511.

2.03 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M),

2.04 FINISHES

A. Superior Performing Organic Coatings System: Polyvinylidene fluoride (PVDF) multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent PVDF resin, and at least 80 percent of aluminum extrusion and panels surfaces having minimum total dry film thickness (DFT) of 1.2 mils, 0.0012 inch.

B. Color: As selected from Manufacturer's Standard Colors

2.05 ACCESSORIES

A. Bird Screen: Interwoven wire mesh of steel, 14 gauge, 0.0641 inch diameter wire, 1/2 inch open weave, diagonal design.

B. Head and Sill Flashings: See Section 076200.

C. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared openings and flashings are ready to receive this work and opening dimensions are as indicated on shop drawings.

B. Verify that field measurements are as indicated.

3.02 INSTALLATION

A. Install louver assembly in accordance with manufacturer's instructions.

B. Coordinate with installation of flashings by others.

C. Install louvers level and plumb.

D. Align louver assembly to ensure moisture shed from flashings and diversion of moisture to exterior.

E. Secure louver frames in openings with concealed fasteners.

3.03 ADJUSTING

A. Adjust operable louvers for freedom of movement of control mechanism. Lubricate operating joints.

END OF SECTION 089100

SECTION 090561
COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This section applies to floors identified in Contract Documents that are receiving the following types of floor coverings:
   1. Carpet tile.

B. Removal of existing floor coverings.

C. Preparation of new and existing concrete floor slabs for installation of floor coverings.

D. Patching compound.

1.02 RELATED REQUIREMENTS

A. Section 014000 - Quality Requirements: Additional requirements relating to testing agencies and testing.

B. Section 033000 - Cast-in-Place Concrete: Limitations on curing requirements for new concrete floor slabs.

C. Section 033511 - Concrete Floor Finishes

D. Section 035400 - Cast Underlayment: Self-leveling underlayment applied as remediation treatment.

1.03 REFERENCE STANDARDS

A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50 mm] Cube Specimens) 2021.

B. ASTM C472 - Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters, and Gypsum Concrete 2020.

C. RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings 2011.

1.04 QUALITY ASSURANCE

PART 2 PRODUCTS

2.01 MATERIALS

A. Patching Compound: Floor covering manufacturer's recommended product, suitable for conditions, and compatible with adhesive and floor covering. In the absence of any recommendation from flooring manufacturer, provide a product with the following characteristics:
   1. Cementitious moisture-, mildew-, and alkali-resistant compound, compatible with floor, floor covering, and floor covering adhesive, and capable of being feathered to nothing at edges.
   2. Compressive Strength: 3000 psi, minimum, after 28 days, when tested in accordance with ASTM C109/C109M or ASTM C472, whichever is appropriate.
   3. Products:
      a. ARDEX Engineered Cements; ARDEX Feather Finish: www.ardexamericas.com/#sle.
      b. Floor Seal Technology, Inc: www.floorseal.com/#sle.
      c. H.B. Fuller Construction Products, Inc; TEC Feather Edge Skim Coat: www.tecspecialty.com/#sle.
      d. USG Corporation; Durock Brand Advanced Skim Coat Floor Patch: www.usg.com/#sle.
      e. Substitutions: See Section 016000 - Product Requirements.

B. Alternate Flooring Adhesive: Floor covering manufacturer's recommended product, suitable for the moisture and pH conditions present; low-VOC. In the absence of any recommendation from flooring manufacturer, provide a product recommended by adhesive manufacturer as suitable for substrate and floor covering and for conditions present.

PART 3 EXECUTION

3.01 CONCRETE SLAB PREPARATION

A. Perform following operations in the order indicated:
   1. Existing concrete slabs (on-grade and elevated) with existing floor coverings:
      a. Visual observation of existing floor covering, for adhesion, water damage, alkaline deposits, and other defects.
      b. Removal of existing floor covering.
   2. Preliminary cleaning.
   3. Specified remediation, if required.
   4. Patching, smoothing, and leveling, as required.
   5. Other preparation specified.
   6. Adhesive bond and compatibility test.
   7. Protection.

3.02 REMOVAL OF EXISTING FLOOR COVERINGS

A. Comply with local, State, and federal regulations and recommendations of RFCI (RWP), as applicable to floor covering being removed.

B. Dispose of removed materials in accordance with local, State, and federal regulations and as specified.

3.03 PRELIMINARY CLEANING

A. Clean floors of dust, solvents, paint, wax, oil, grease, asphalt, residual adhesive, adhesive removers, film-forming curing compounds, sealing compounds, alkaline salts, excessive laitance, mold, mildew, and other materials that might prevent adhesive bond.

B. Do not use solvents or other chemicals for cleaning.

3.04 PREPARATION

A. See individual floor covering section(s) for additional requirements.

B. Comply with requirements and recommendations of floor covering manufacturer.

C. Fill and smooth surface cracks, grooves, depressions, control joints and other non-moving joints, and other irregularities with patching compound.

D. Do not fill expansion joints, isolation joints, or other moving joints.

3.05 ADHESIVE BOND AND COMPATIBILITY TESTING

A. Comply with requirements and recommendations of floor covering manufacturer.

END OF SECTION 090561

SECTION 092116
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Performance criteria for gypsum board assemblies.

B. Acoustic insulation.

C. Gypsum wallboard.

D. Joint treatment and accessories.

1.02 RELATED REQUIREMENTS

A. Section 054000 - Cold-Formed Metal Framing: Structural steel stud framing.

B. Section 061000 - Rough Carpentry: Building framing and sheathing.

C. Section 072100 - Thermal Insulation: Acoustic insulation.

D. Section 079200 - Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.

E. Section 092216 – Non-Structural Metal Framing

1.03 REFERENCE STANDARDS

A. AISI S220 - North American Standard for Cold-Formed Steel Nonstructural Framing 2020.

B. AISI S240 - North American Standard for Cold-Formed Steel Structural Framing 2015, with Errata (2020).

C. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members 2015.

D. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories 2020.

E. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board 2017 (Reapproved 2022).

F. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products 2020.

G. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board 2020.

H. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs 2022.

I. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base 2019.

J. ASTM C1396/C1396M - Standard Specification for Gypsum Board 2017.

K. ASTM C1658/C1658M - Standard Specification for Glass Mat Gypsum Panels 2019, with Editorial Revision (2020).

L. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements 2009 (Reapproved 2016).

M. ASTM E413 - Classification for Rating Sound Insulation 2022.

N. GA-216 - Application and Finishing of Gypsum Panel Products 2021.

1.04 SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Product Data:
   1. Provide data on metal framing, gypsum board, accessories, and joint finishing system.

2. Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

C. Steel Framing Industry Association (SFIA) Certification:
1. Submit documentation that metal studs and connectors used on project meet or exceed requirements of International Building Code.
2. Submit current documentation of contractor and fabricator accreditation. Keep copies of each on-site during and after installation, and present upon request.

D. Installer's Qualification Statement.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store gypsum products and accessories indoors and keep above freezing. Elevate boards above floor, on nonwicking supports, in accordance with manufacturer's recommendations.

B. Store metal products to prevent corrosion.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.

B. Interior Partitions, Indicated as Acoustic: Provide completed assemblies with the following characteristics:
1. Acoustic Attenuation: STC of 50-54 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

2.02 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:
1. American Gypsum Company; www.americangypsum.com/#sle.
2. CertainTeed Corporation; www.certainteed.com/#sle.
3. Georgia-Pacific Gypsum; www.gpgypsum.com/#sle.
4. Gold Bond Building Products, LLC provided by National Gypsum Company; www.goldbondbuilding.com/#sle.
5. PABCO Gypsum; www.pabcogypsum.com/#sle.
6. USG Corporation; www.usg.com/#sle.
7. Substitutions: See Section 012500 – Substitution Procedures

B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
2. Glass mat faced gypsum panels, as defined in ASTM C1658/C1658M, suitable for paint finish, of the same core type and thickness may be substituted for paper-faced board.
3. At Assemblies Indicated with Fire-Resistance Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
4. Thickness:
   a. Vertical Surfaces: 5/8 inch.
   b. Ceilings: 5/8 inch.
5. Paper-Faced Products:
   a. American Gypsum Company; FireBloc Type X Gypsum Wallboard: www.americangypsum.com/#sle.
   b. American Gypsum Company; FireBloc Type C Gypsum Wallboard: www.americangypsum.com/#sle.
   c. CertainTeed Corporation; Type X Drywall: www.certainteed.com/#sle.
   d. Georgia-Pacific Gypsum; ToughRock Fireguard X: www.gpgypsum.com/#sle.
   e. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond Fire-Shield C 5/8" Gypsum Board: www.goldbondbuilding.com/#sle.
   f. USG Corporation; Sheetrock Brand Firecode X Panels 5/8 in. (15.9 mm): www.usg.com/#sle.

6. Substitutions: See Section 012500 – Substitution Procedures
7.

2.03 GYPSUM BOARD ACCESSORIES

A. Acoustic Insulation: See Section 072100.

B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.
   1. Products:
      a. Franklin International, Inc; Titebond GREENchoice Professional Acoustical Smoke and Sound Sealant: www.titebond.com/#sle.
      b. Liquid Nails, a brand of PPG Architectural Coatings; www.liquidnails.com/#sle.
      c. Specified Technologies Inc; Smoke N Sound Acoustical Sealant: www.stifirestop.com/#sle.
   2. Substitutions: See Section 012500 – Substitution Procedures

C. Finishing Accessories: ASTM C1047, extruded aluminum alloy (6063 T5) or galvanized steel sheet ASTM A924/A924M G90, unless noted otherwise.
   1. Types: As detailed or required for finished appearance.
   2. Special Shapes: In addition to conventional corner bead and control joints, provide U-bead at exposed panel edges.
   3. Products:
      a. Same manufacturer as framing materials.
      b. Phillips Manufacturing Co; www.phillipsmfg.com/#sle.
      c. Stockton Products; Extruded Aluminum: www.stocktonproducts.com/#sle.
   4. Substitutions: See Section 012500 – Substitution Procedures

D. Beads, Joint Accessories, and Other Trim: ASTM C1047, rigid plastic, galvanized steel, or rolled zinc, unless noted otherwise.
   1. Corner Beads: Low profile, for 90 degree outside corners.
      a. Products:
         1) CertainTeed Corporation; No-Coat Drywall Corner: www.certainteed.com/#sle.
         2) ClarkDietrich; Strait-Flex OS-300: www.clarkdietrich.com/#sle.
         3) Phillips Manufacturing Co; Everlast Corner Bead: www.phillipsmfg.com/#sle.
         4) Trim-Tex, Inc; www.trim-tex.com/#sle.
         5) Substitutions: See Section 016000 - Product Requirements.
   2. Architectural Reveal Beads:
      a. Reveal Depth: 5/8 inch.
      b. Reveal Width: 3/4 inch.
      c. Shapes: As indicated on drawings.
      d. Products:
         1) Phillips Manufacturing Co; J-400 Reveal Trim: www.phillipsmfg.com/#sle.
         2) Trim-Tex, Inc; www.trim-tex.com/#sle.
   3. Substitutions: See Section 012500 – Substitution Procedures

E. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.

F. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.02 ACOUSTIC ACCESSORIES INSTALLATION

A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

B. Acoustic Sealant: Install in accordance with manufacturer's instructions.

3.03 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Single-Layer Nonrated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.
   1. Exception: Tapered edges to receive joint treatment at right angles to framing.

C. Installation on Metal Framing: Use screws for attachment of gypsum board except face layer of nonrated double-layer assemblies, which may be installed by means of adhesive lamination.

D. Installation on Wood Framing: For rated assemblies, comply with requirements of listing authority. For nonrated assemblies, install as follows:
   1. Single-Layer Applications: Screw attachment.

3.04 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

3.05 JOINT TREATMENT

A. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
   1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated. No texture; Smooth
   2. Level 1: Fire-resistance-rated wall areas above finished ceilings, whether or not accessible in the completed construction.

B. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   1. Feather coats of joint compound so that camber is maximum 1/32 inch.

3.06 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

3.07 CLEANING

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

3.08 PROTECTION

A. Protect installed gypsum board assemblies from subsequent construction operations.

END OF SECTION 092116

SECTION 092216
NON-STRUCTURAL METAL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal partition, ceiling, and soffit framing.

B. Framing accessories.

1.02 RELATED REQUIREMENTS

A. Section 054000 - Cold-Formed Metal Framing: Requirements for structural, load-bearing, metal stud framing and exterior wall stud framing.

B. Section 072100 - Thermal Insulation: Acoustic insulation.

C. Section 079200 - Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.

D. Section 083100 - Access Doors and Panels.

E. Section 092116 - Gypsum Board Assemblies: Metal studs for gypsum board partition framing.

1.03 REFERENCE STANDARDS

A. AISI S220 - North American Standard for Cold-Formed Steel Nonstructural Framing 2020.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2022.

C. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs 2022.

1.04 SUBMITTALS

A. See Section 012500 – Substitution Procedures for submittal procedures.

B. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience and approved by manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Framing, Connectors, and Accessories:
   1. CEMCO: www.cemcosteel.com/#sle.
   2. ClarkDietrich: www.clarkdietrich.com/#sle.
   3. SCAFCO Corporation: www.scafco.com/#sle.
   4. Substitutions: See Section 016000 - Product Requirements.

2.02 FRAMING MATERIALS

A. Loadbearing Studs: As specified in Section 054000.

B. Non-Loadbearing Framing System Components: AISI S220; sheet steel, of size and properties necessary for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf.
   1. Studs: C-shaped with flat faces.
   2. Runners: U-shaped, sized to match studs.
   3. Furring: Hat-shaped sections, minimum depth of 7/8 inch.

C. Partition Head to Structure Connections: Provide track fastened to structure with legs of sufficient length to accommodate deflection, for friction fit of studs cut short and braced with continuous bridging on both sides.

D. Non-Loadbearing Framing Accessories:

1. Bracing and Bridging: ASTM A653/A653M G90 galvanized steel; for lateral bracing of wall studs with slots for engaging on-module studs.
2. Flexible Wood Backing: Fire-retardant-treated wood with sheet steel connectors.
   a. Products:
      1) ClarkDietrich; Danback: www.clarkdietrich.com/#sle.
3. Sheet Metal Backing: 0.0395 inch thick.
4. Fasteners: ASTM C1002 self-piercing self-tapping screws.
5. Anchorage Devices: Powder actuated.
6. Acoustic Insulation: See Section 072100.
7. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.

2.03 FABRICATION

A. Fabricate assemblies of framed sections to sizes and profiles required.

B. Fit, reinforce, and brace framing members to suit design requirements.

C. Fit and assemble in largest practical sections for delivery to site, ready for installation.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that rough-in utilities are in proper location.

3.02 INSTALLATION OF STUD FRAMING

A. Extend partition framing to structure where indicated and to ceiling in other locations.

B. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.

C. Partitions Terminating at Structure: Attach extended leg top runner to structure, maintain clearance between top of studs and structure, and brace both flanges of studs as indicated.

D. Align and secure top and bottom runners at 24 inches on center.

E. Fit runners under and above openings; secure intermediate studs to same spacing as wall studs.

F. Align stud web openings horizontally.

G. Secure studs to tracks using crimping method. Do not weld.

H. Fabricate corners using a minimum of three studs.

I. Install double studs at wall openings, door and window jambs, not more than 2 inches from each side of openings.

J. Coordinate installation of bucks, anchors, and blocking with electrical, mechanical, and other work to be placed within or behind stud framing.

K. Furring: Install at spacing and locations shown on drawings. Lap splices a minimum of 6 inches.

3.03 CEILING AND SOFFIT FRAMING

A. Install furring after work above ceiling or soffit is complete. Coordinate the location of hangers with other work.

B. Install furring independent of walls, columns, and above-ceiling work.

C. Securely anchor hangers to structural members or embed them in structural slab. Space hangers as required to limit deflection to criteria indicated. Use rigid hangers at exterior soffits.

D. Space main carrying channels at maximum 72 inches on center, and not more than 6 inches from wall surfaces. Lap splice securely.

E. Securely fix carrying channels to hangers to prevent turning or twisting and to transmit full load to hangers.

F. Place furring channels perpendicular to carrying channels, not more than 2 inches from perimeter walls, and rigidly secure. Lap splices securely.

END OF SECTION 092216

SECTION 095100
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical units.

1.02 RELATED REQUIREMENTS

A. Section 072100 - Thermal Insulation: Acoustical insulation.

1.03 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures Most Recent Edition Cited by Referring Code or Reference Standard.

B. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings 2022.

C. ASTM E1264 - Standard Classification for Acoustical Ceiling Products 2022.

D. UL (GGG) - GREENGUARD Gold Certified Products Current Edition.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.

B. Do not install acoustical units until after interior wet work is dry.

1.05 SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Shop Drawings: Indicate grid layout and related dimensioning.

C. Product Data: Provide data on suspension system components and acoustical units.

D. Samples: Submit two samples 12" x 12" inch in size illustrating material and finish of acoustical units.

E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Extra Acoustical Units: Quantity equal to 5 percent of total installed.

1.06 QUALITY ASSURANCE

A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.07 FIELD CONDITIONS

A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acoustic Tiles/Panels:
   1. Armstrong World Industries, Inc; www.armstrongceilings.com/#sle.
   2. Acoustic Ceiling Products, Inc; www.acpideas.com/#sle.

3. Acoustics First Corporation; www.acousticsfirst.com/#sle.
4. Certainteed Architectural; www.certainteed.com/ceilings-and-walls/#sle.
5. USG Corporation; www.usg.com/ceilings/#sle.
6. Substitutions: See Section 012500 – Substitution Procedures

B. Suspension Systems:
1. Same as for acoustical units.

2.02 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Ceiling systems designed to withstand the effects of earthquake motions determined according to ASCE 7 for Seismic Design Category D, E, or F and complying with the following:
1. Local authorities having jurisdiction.

2.03 ACOUSTICAL UNITS

A. Acoustical Units - General: ASTM E1264, Class A.
1. VOC Content: Certified as Low Emission by one of the following:
a. Product listing in UL (GGG).

B. Acoustical Panels, Type ACT 1 & 2: Painted mineral fiber, with the following characteristics:
1. Classification: ASTM E1264 Type III.
2. Size: 24 by 48 inches.
3. Thickness: 7/8 inch.
4. Panel Edge: Reveal.
5. Scoring: Single score down the middle (Like Armstrong Second Look)
6. Suspension System: Exposed grid.
7. Products:
a. Armstrong World Industries, Inc; Fine Fissured Second Look
: www.armstrongceilings.com/#sle.
1) Scoring Pattern: II
b. USG Corporation; Fine Fissured, Customline: www.usg.com/ceilings/#sle.
1) Scoring Pattern: 224

C. Acoustical Panels, Type ACT 3: Mineral fiber with membrane-faced overlay, with the following characteristics:
1. Classification: ASTM E1264 Type IV.
a. Form: 2, water felted.
b. Pattern: "E" - lightly textured.
2. Size: 24 by 48 inches.
3. Thickness: 5/8 inch.
4. Panel Edge: Square.
5. Tile Edge: Square.
6. Color: White.
7. Cleanability: Sprayable
8. Suspension System: Exposed grid.
9. Products:
a. Armstrong World Industries, Inc; VL: www.armstrongceilings.com/#sle.
b. USG Corporation; Mars Healthcare Acoustical Panels: www.usg.com/ceilings/#sle.

2.04 SUSPENSION SYSTEM(S)

A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.

B. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.

C. Exposed Suspension System: Hot-dipped galvanized steel grid with steel cap.
   1. Structural Classification: Intermediate-duty, when tested in accordance with ASTM C635/C635M.
   2. Profile: Tee; 15/16 inch face width.
   3. Finish: Baked enamel.
   4. Color: White.
   5. Products:
      a. Certainteed Architectural; 15/16" EZ Stab Classic System: www.certainteed.com/ceilings-and-walls/#sle.
      b. USG Corporation; Donn Brand ZXLA 15/16 inch Acoustical Suspension System: www.usg.com/ceilings/#sle.
   6. Substitutions: See Section 012500 – Substitution Procedures

2.05 ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

B. Hanger Wire: 12 gauge, 0.08 inch galvanized steel wire.

C. Seismic Clips: Manufacturer's standard clips for seismic conditions and to suit application.

D. Perimeter Moldings: Same metal and finish as grid.

E. Metal Edge Trim for Suspension Systems: Steel or extruded aluminum; provide attachment clips, splice plates, and preformed corner pieces for complete trim system.
   1. Trim Height: 4 inch.
   2. Finish: Baked enamel.
   3. Color: White.
   4. Products:
      a. Tamlyn; PACT Acoustical Trim: www.xtremeias.com/#sle.
      b. USG Corporation; Compasso Suspension Trim: www.usg.com/ceilings/#sle.
      c. Armstrong; Axiom Classic Perimeter Trim. www.armstrongceilings.com
   5. Substitutions: See Section 012500 – Substitution Procedures

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

3.02 PREPARATION

A. Install after major above-ceiling work is complete.

B. Coordinate the location of hangers with other work.

C. Provide hanger clips during steel deck erection. Provide additional hangers and inserts as required.

3.03 INSTALLATION - SUSPENSION SYSTEM

A. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

B. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
   1. Use longest practical lengths.

C. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

D. Seismic Suspension System, Seismic Design Categories D, E, F: Hang suspension system with grid ends attached to the perimeter molding on two adjacent walls; on opposite walls, maintain a 3/4 inch clearance between grid ends and wall.

E. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

F. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

G. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

H. Do not eccentrically load system or induce rotation of runners.

3.04 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Fit border trim neatly against abutting surfaces.

D. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

E. Cutting Acoustical Units:
   1. Make field cut edges of same profile as factory edges.

F. Lay acoustical insulation for a distance of 48 inches either side of acoustical partitions as indicated.

3.05 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

3.06 CLEANING

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. Clean surfaces.

END OF SECTION 095100

SECTION 096813
TILE CARPETING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Carpet tile, fully adhered.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied flooring.

B. Section 090561 - Common Work Results for Flooring Preparation: Removal of existing floor coverings, cleaning, and preparation.

1.03 SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.

C. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.

D. Accessory Samples: Submit two 4 inch long samples of edge strip and base cap.

E. Sustainable Design Submittal: Submit VOC content documentation for adhesives.

F. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.

G. Installer's Qualification Statement.

H. Operation and Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Extra Carpet Tiles: Quantity equal to 5 percent of total installed of each color and pattern installed.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum three years documented experience.

B. Installer Qualifications: Company specializing in installing carpet tile with minimum three years documented experience and approved by carpet tile manufacturer.

1.05 FIELD CONDITIONS

A. Store materials in area of installation for minimum period of 24 hours prior to installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: Shaw Contract; www.shawcontract.com
   1. Substitutions: See Section 016000 - Product Requirements.

2.02 MATERIALS

A. Tile Carpeting, Type CPT-1: manufactured in one color dye lot.
   1. Product: Haze Tile 5T037 manufactured by Shaw Contract.
   2. Tile Size: 18 X 36 inch, nominal.
   3. Color: myth 37505.
   4. Pattern: Brick.

B. Tile Carpeting, Type CPT-2: manufactured in one color dye lot.
   1. Product: Disperse Tile 5T184 manufactured by Shaw Contract.
   2. Tile Size: 9x36 inch, nominal.
   3. Color: routes 7550.
   4. Pattern: Herringbone.

C. Tile Carpeting, Type CPT-3: manufactured in one color dye lot.
   1. Product: Welcome II tile 5T031 manufactured by Shaw Contract.
   2. Tile Size: 24 x 24 inch, nominal.
   3. Color: ebony 31500.
   4. Pattern: 1/4 Turn.

D.

2.03 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by flooring material manufacturer.

B. Edge Strips: Rubber ,black color.

C. Adhesives:
   1. Compatible with materials being adhered; maximum VOC content of 50 g/L; CRI (GLP) certified.

D. Carpet Tile Adhesive: Recommended by carpet tile manufacturer; releasable type.

PART 3 EXECUTION

3.01 PREPARATION

A. Prepare floor substrates for installation of flooring in accordance with Section 090561.

B. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

C. Remove subfloor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with subfloor filler.

D. Vacuum clean substrate.

3.02 INSTALLATION

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install carpet tile in accordance with manufacturer's instructions.

C. Blend carpet from different cartons to ensure minimal variation in color match.

D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.

E. Lay carpet tile in square pattern, with pile direction parallel to next unit, set parallel to building lines.

F. Locate change of color or pattern between rooms under door centerline.

G. Fully adhere carpet tile to substrate.

H. Trim carpet tile neatly at walls and around interruptions.

I. Complete installation of edge strips, concealing exposed edges.

3.03 CLEANING

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. Remove excess adhesive without damage, from floor, base, and wall surfaces.

C. Clean and vacuum carpet surfaces.

END OF SECTION 096813

SECTION 098430
SOUND-ABSORBING WALL AND CEILING UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sound-absorbing wall panels.

B. Mounting accessories.

1.02 RELATED REQUIREMENTS

A. Section 099123 - Interior Painting.

1.03 SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Product Data: Manufacturer's printed data sheets for products specified.

C. Shop Drawings: Fabrication and installation details, panel layout, fabric orientation, and wood grain orientation.

D. Selection Samples: Manufacturer's color charts for fabric covering, indicating full range of fabrics, colors, and patterns available.

E. Verification Samples: Fabricated samples of each type of panel specified; 12 by 12 inch, showing construction, edge details, and fabric covering.

F. Manufacturer's qualification statement.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Protect acoustical units from moisture during shipment, storage, and handling. Deliver in factory-wrapped bundles; do not open bundles until units are needed for installation.

B. Store units flat, in dry, well-ventilated space; do not stand on end.

C. Protect edges from damage.

PART 2 PRODUCTS

2.01 ACOUSTICAL WALL PANELS

A. Manufacturers:

B. Acceptable Manufacturers:
   1. Basis of Design - Fsorb, 15135 90th Street, Suite 200 Redmond, WA 98052; www.f-sorb.com
   2. Substitutions: See Section 012500 – Substitution Procedures

C. General:

D. Acoustical Panels for Walls:
   1. Panel Size: 48" X 96" See drawing interior elevations.
   2. Panel Thickness: 1 inch.
   3. Corners: Square.
   4. Color: 1 color As selected by Architect from manufacturer's full range of standard colors.

2.02 FABRICATION

A. Tolerances: Fabricate to finished tolerance of plus or minus 1/16 inch for thickness, overall length and width, and squareness from corner to corner.

2.03 ACCESSORIES

A. Panel Adhesive: Acceptable to acoustical panel manufacturer for application as indicated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates for conditions detrimental to installation of acoustical units. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install acoustical units in locations as indicated, following manufacturer's installation instructions.

B. Align panels accurately, with edges plumb and top edges level. Scribe to fit accurately at adjoining work and penetrations.

3.03 CLEANING

A. Clean sound-absorptive panels upon completion of installation from dust and other foreign materials, following manufacturer's instructions.

3.04 PROTECTION

A. Provide protection of installed acoustical panels until Date of Substantial Completion.

B. Replace panels that cannot be cleaned and repaired to satisfaction of the Architect.

END OF SECTION 098430

SECTION 099113
EXTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
   1. Exterior Hollow Metal Doors and Frames
   2. Electrical: Paint any exposed conduits or j-boxes to match surrounding materials.

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
   5. Floors, unless specifically indicated.
   6. Glass.
   7. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

A. Section 099123 - Interior Painting.

B. Section 099600 - High-Performance Coatings.

C. Section 321723 - Pavement Markings: Painted pavement markings.

1.03 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency current edition.

B. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual Current Edition.

C. SSPC-SP 1 - Solvent Cleaning 2015, with Editorial Revision (2016).

D. SSPC-SP 2 - Hand Tool Cleaning 2018.

E. SSPC-SP 6 - Commercial Blast Cleaning 2007.

1.04 SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
   2. MPI product number (e.g. MPI #47).
   3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
   4. Manufacturer's installation instructions.
   5. If proposal of substitutions is allowed under submittal procedures, explanation of substitutions proposed.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.06 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the paint product manufacturer's temperature ranges.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply exterior paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

D. Minimum Application Temperatures for Latex Paints: 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.

B. Provide paints and finishes from the same manufacturer to the greatest extent possible.
   1. If a single manufacturer cannot provide specified products, minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.
   2. Substitutions: See Section 012500 – Substitution Procedures

C. Paints:
   1. Kelly-Moore Paints; www.kellymoore.com/#sle.
   2. PPG Paints; www.ppgpaints.com/#sle.
   3. Sherwin-Williams Company; www.sherwin-williams.com/#sle.
   4. Vista Paint Corporation; www.vistapaint.com/#sle.

2.02 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless required to be a field-catalyzed paint.
   1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   2. Supply each paint material in quantity required to complete entire project's work from a single production run.
   3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is described explicitly in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content:
   1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
      a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
   2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

C. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

D. Colors: To be selected from manufacturer's full range of available colors.
   1. Selection to be made by Architect after award of contract.

2. Allow for minimum of three colors for each system, unless otherwise indicated, without additional cost to Owner.

2.03 PAINT SYSTEMS - EXTERIOR

A. Paint E-OP - Exterior Surfaces to be Painted, Unless Otherwise Indicated: Including primed metal.
   1. Two top coats and one coat primer.
   2. Top Coat(s): Exterior Light Industrial Coating, Water Based; MPI #161, 163, or 164.
      a. Products:
         1) Sherwin-Williams Pro Industrial Multi-Surface Acrylic, Eg-Shel.
   3. Substitutions: See Section 012500 – Substitution Procedures

2.04 PRIMERS

A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
   1. Rust-Inhibitive Water Based Primer; MPI #107.
      a. Products:

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been properly prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

D. Test shop-applied primer for compatibility with subsequent cover materials.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

F. Galvanized Surfaces:
   1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
   2. Prepare surface according to SSPC-SP 2.

G. Ferrous Metal:
   1. Solvent clean according to SSPC-SP 1.
   2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
   3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 Commercial Blast Cleaning. Protect from corrosion until coated.

H. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

D. Apply each coat to uniform appearance.

E. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

F. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION 099113

SECTION 099123
INTERIOR PAINTING

PART 2 PRODUCTS

1.01 MANUFACTURERS

A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.

B. Paints:
   1. Basis of Design: Sherwin-Williams: www.sherwin-williams.com/#sle.
   2. Kelly-Moore Paints; www.kellymoore.com/#sle.
   3. PPG Paints: www.ppgpaints.com/#sle.
   4. Vista Paint Corporation: www.vistapaint.com/#sle.
   5. Substitutions: See Section 012500 – Substitution Procedures

C. Primer Sealers: Same manufacturer as top coats.

D. Substitutions: See Section 016000 - Product Requirements.

1.02 SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
   2. MPI product number (e.g. MPI #47).
   3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
   4. Manufacturer's installation instructions.
   5. If proposal of substitutions is allowed under submittal procedures, explanation of substitutions proposed.

1.03 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless intended to be a field-catalyzed paint.
   1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   2. Supply each paint material in quantity required to complete entire project's work from a single production run.
   3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content:
   1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
      a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
   2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

C. Flammability: Comply with applicable code for surface burning characteristics.

D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

E. Colors: To be selected from manufacturer's full range of available colors.
   1. Selection to be made by Architect after award of contract.
   2. Allow for minimum of three colors for each system, unless otherwise indicated, without additional cost to Owner.

3. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling under which they are mounted.

1.04 PAINT SYSTEMS - INTERIOR

A. Paint I-OP - Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board, wood, and aluminum.
   1. Two top coats and one coat primer.
   2. Top Coat(s): Interior Latex; MPI #43, 44, 52, 53, 54, or 114.
      a. Products:
         1) Sherwin-Williams ProMar 200 Zero VOC Interior Latex, Eg-Shel. (MPI #52)
         2) Substitutions: See Section 016000 - Product Requirements

B. Paint I-OP-MD-DT - Medium Duty Door/Trim: For surfaces subject to frequent contact by occupants, including metals:
   1. Medium duty applications include doors and door frames.
   2. Two top coats and one coat primer.
   3. Top Coat(s): High Performance Architectural Interior Latex; MPI #138, 139, 140, or 141.
      a. Products:
         1) Sherwin-Williams Pro Industrial Pre-Catalyzed Waterbased Epoxy, Semi-Gloss. (MPI #141)

C. Paint I-OP-DF - Dry Fall: Metals; exposed structure and overhead-mounted services in utilitarian spaces, including shop primed steel deck, structural steel, metal fabrications, galvanized ducts, galvanized conduit, galvanized piping, and Bottom side of existing metal roof..
   1. One top coat _____.
   2. Top Coat: Latex Dry Fall; MPI #118, 155, or 226.
      a. Products:
         1) Sherwin-Williams Pro Industrial Multi-Surface Acrylic, Eg-Shel. (MPI #155)
         2) Substitutions: See Section 016000 - Product Requirements
   3. Top Coat Sheen:
      a. Eggshell: MPI gloss level 3; use this sheen at all locations.

1.05 PRIMERS

A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.

1.06 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

2.01 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been adequately prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

E. Test shop-applied primer for compatibility with subsequent cover materials.

F. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:
   1. Gypsum Wallboard: 12 percent.

2. Interior Wood: 15 percent, measured in accordance with ASTM D4442.

2.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

F. Aluminum: Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

G. Galvanized Surfaces:

H. Ferrous Metal:
1. Solvent clean according to SSPC-SP 1.
2. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 Commercial Blast Cleaning. Protect from corrosion until coated.

I. Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.

J. Wood Doors to be Field-Finished: Seal wood door top and bottom edge surfaces with clear sealer.

2.03 APPLICATION

A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

C. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

D. Sand wood and metal surfaces lightly between coats to achieve required finish.

E. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

F. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

2.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for general requirements for field inspection.

2.05 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

2.06 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION 099123

SECTION 099300
STAINING AND TRANSPARENT FINISHING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes surface preparation and application of wood finishes on the following substrates:
   1. Exterior Substrates:
      a. Exposed Wood siding and soffits
   2. Interior Substrates:
      a. Exposed Wood ceiling.

B. Related Requirements:
   1. Section 099000 "Painting" for standard paint systems on interior and exterior substrates.

1.03 DEFINITIONS

A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

B. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.

C. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

D. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

E. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.04 ACTION SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Product Data: For each type of product indicated. Include preparation requirements and application instructions.

C. Samples for Verification: For each type of finish system and in each color and gloss of finish indicated.
   1. Submit Samples on representative samples of actual wood substrates, 8 inches square.
   2. Label each Sample for location and application area.

1.05 QUALITY ASSURANCE

A. Mockups: Apply mockups of each finish system indicated and each color selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Architect will select one surface to represent surfaces and conditions for application of each type of finish system and substrate.
      a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
      b. Other Items: Architect will designate items or areas required.
   2. Final approval of stain color selections will be based on mockups.
      a. If preliminary stain color selections are not approved, apply additional mockups of additional stain colors selected by Architect at no added cost to Owner.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F
   1. Maintain containers in clean condition, free of foreign materials and residue.
   2. Remove rags and waste from storage areas daily.

1.07 FIELD CONDITIONS

A. Apply finishes only when temperature of surfaces to be finished and ambient air temperatures are between 50 and 95 deg F

B. Do not apply finishes when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

C. Do not apply exterior finishes in snow, rain, fog, or mist.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Kelly-Moore Paints.
   2. Rodda Paint Co.
   3. Sherwin-Williams Company (The).
   4. PPG (Sikkens)
   5. Substitutions: See Section 012500 – Substitution Procedures

2.02 MATERIALS, GENERAL

A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."

B. Material Compatibility:
   1. Provide materials for use within each finish system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
   2. For each coat in a finish system, provide products recommended in writing by manufacturers of topcoat for use in finish system and on substrate indicated.

C. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction.
   1. Clear Wood Finishes, Varnishes: VOC not more than 350 g/L.
   2. Shellacs, Clear: VOC not more than 730 g/L.
   3. Stains: VOC not more than 250 g/L.
   4. Primers, Sealers, and Undercoaters: 200 g/L.

D. Stain Colors: As selected by Architect from manufacturer's full range. Natural Clear Stain

2.03 WOOD FILLERS

A. Wood Filler Paste: MPI #91.

2.04 PRIMERS AND SEALERS

A. Primer, Alkyd for Exterior Wood: MPI #5.

B. Shellac: MPI #88.

2.05 STAINS

A. Alkyd: MPI #6.2C-G5.

2.06 POLYURETHANE VARNISHES

A. Varnish, Aliphatic Polyurethane, Two-Component (Gloss Level 6 or 7): MPI #78.

2.07 SOURCE QUALITY CONTROL

A. Testing of Materials: Owner reserves the right to invoke the following procedure:
   1. Owner will engage the services of a qualified testing agency to sample wood finishing materials. Contractor will be notified in advance and may be present when samples are taken. If materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
   2. Testing agency will perform tests for compliance with product requirements.

3. Owner may direct Contractor to stop applying wood finishes if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying materials from Project site, pay for testing, and refinish surfaces finished with rejected materials. Contractor will be required to remove rejected materials from previously finished surfaces before refinishing with complying materials if the two finishes are incompatible or produce results that, in the opinion of the Architect, are aesthetically unacceptable.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Exterior Wood Substrates: 15 percent, when measured with an electronic moisture meter.

C. Maximum Moisture Content of Interior Wood Substrates: 10 percent, when measured with an electronic moisture meter.

D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

E. Proceed with finish application only after unsatisfactory conditions have been corrected.
   1. Beginning finish application constitutes Contractor's acceptance of substrates and conditions.

3.02 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and finishing.
   1. After completing finishing operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean and prepare surfaces to be finished according to manufacturer's written instructions for each particular substrate condition and as specified.
   1. Remove dust, dirt, oil, and grease by washing with a detergent solution; rinse thoroughly with clean water and allow to dry. Remove grade stamps and pencil marks by sanding lightly. Remove loose wood fibers by brushing.
   2. Remove mildew by scrubbing with a commercial wash formulated for mildew removal and as recommended by stain manufacturer.

D. Exterior Wood Substrates:
   1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
   2. Prime edges, ends, faces, undersides, and backsides of wood.
      a. For solid hide stained wood, stain edges and ends after priming.
      b. For varnish coated stained wood, stain edges and ends and prime with varnish. Prime undersides and backsides with varnish.
   3. Countersink steel nails, if used, and fill with putty or plastic wood filler tinted to final color. Sand smooth when dried.

E. Interior Wood Substrates:
   1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
   2. Apply wood filler paste to open-grain woods, as defined in "MPI Architectural Painting Specification Manual," to produce smooth, glasslike finish.
   3. Sand surfaces that will be exposed to view and dust off.
   4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

3.03 APPLICATION

A. Apply finishes according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
   1. Use applicators and techniques suited for finish and substrate indicated.
   2. Finish surfaces behind movable equipment and furniture same as similar exposed surfaces.
   3. Do not apply finishes over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

B. Apply finishes to produce surface films without cloudiness, holidays, lap marks, brush marks, runs, ropiness, or other surface imperfections.

3.04 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing finish application, clean spattered surfaces. Remove spattered materials by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from finish application. Correct damage by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced finished wood surfaces.

3.05 EXTERIOR WOOD-FINISH-SYSTEM SCHEDULE

A. Wood substrates, nontraffic surfaces, including glued-laminated construction.
   1. Alkyd system:
      a. Prime Coat: Primer, alkyd for exterior wood, MPI #5.
      b. Intermediate Coat: Alkyd, MPI #94
      c. Topcoat: Alkyd, MPI #94

3.06 INTERIOR WOOD-FINISH-SYSTEM SCHEDULE

A. Wood substrates, nontraffic surfaces, including wood trim, architectural woodwork, wood-based panel products.
   1. Clear, Two-Component Polyurethane System:
      a. Prime Coat: Two-component polyurethane matching topcoat.
      b. Intermediate Coat: Two-component polyurethane matching topcoat.
      c. Topcoat: Varnish, aliphatic polyurethane, two-component (Gloss Level 6 or Gloss Level 7), MPI #78.

END OF SECTION 099300

SECTION 099600
HIGH-PERFORMANCE COATINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. High performance coatings for all existing and new exterior exposed structural steel.

B. Surface preparation.

1.02 RELATED REQUIREMENTS

A. Section 099123 - Interior Painting: Requirements for mechanical and electrical equipment surfaces.

1.03 REFERENCE STANDARDS

A. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association Current Edition.

B. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual Current Edition.

C. SSPC-SP 1 - Solvent Cleaning 2015, with Editorial Revision (2016).

1.04 SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Product Data: Provide complete list of all products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
   2. MPI product number (e.g. MPI #47).
   3. Cross-reference to specified coating system(s) product is to be used in; include description of each system.
   4. Manufacturer's installation instructions.
   5. If proposal of substitutions is allowed under submittal procedures, explanation of all substitutions proposed.

C. Manufacturer's Certificate: Certify that high-performance coatings comply with VOC limits specified.

D. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

E. Maintenance Data: Include cleaning procedures and repair and patching techniques.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Extra Coating Materials: 1 gallon of each type and color.
   3. Label each container with manufacturer's name, product number, color number, and room names and numbers where used.

1.05 QUALITY ASSURANCE

A. Maintain one copy of each referenced document that applies to application on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

C. Applicator Qualifications: Company specializing in performing the work of this section with minimum 3 years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of coating, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Coating Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.07 FIELD CONDITIONS

A. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

B. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the coating product manufacturer.

C. Do not install materials when temperature is below 55 degrees F or above 90 degrees F.

D. Maintain this temperature range, 24 hours before, during, and 72 hours after installation of coating.

E. Restrict traffic from area where coating is being applied or is curing.

1.08 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Warranty: Include coverage for bond to substrate.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Only materials (primers, coatings, etc.) listed in the latest edition of the MPI Approved Product List (APL) are acceptable for use on this project.

B. Provide high performance coating products from the same manufacturer to the greatest extent possible.
   1. In the event that a single manufacturer cannot provide specified products, minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.
   2. Substitution of MPI-approved products by a different manufacturer is preferred over substitution of unapproved products by the same manufacturer.

C. High-Performance Coatings:
   1. Dow;www.dow.com/#sle.
   2. Precision Coatings; www.precisioncoatingsinc.com/#sle.
   3. Rhino Linings Corporation; www.rhinolinings.com/#sle.
   4. Sika Corporation; Sikagard Hygiene Urethane Wall System: www.sikafloorusa.com/#sle.
   5. Sherwin-Williams Company; www.protective.sherwin-williams.com/industries/#sle.
   6. Tnemec Company, Inc; www.tnemec.com/#sle.
   7. Substitutions: See Section 012500 – Substitution Procedures

2.02 HIGH-PERFORMANCE COATINGS

A. MPI Standards: Provide products that comply with MPI standards indicated and are listed in MPI Approved Products List.

B. Provide coating systems that meet the following minimum performance criteria, unless more stringent criteria are specified:

2.03 TOP COAT MATERIALS

A. Coatings - General: Provide complete multi-coat systems formulated and recommended by manufacturer for the applications indicated, in the thicknesses indicated; number of coats specified does not include primer or filler coat.

B. Urethane Coating
   1. Number of Coats: Two.

2. Product Characteristics:
   a. Comply with the performance requirements specified above for moderate exposure.
3. Top Coat(s): Polyurethane, Two-Component; MPI #72, #174.
   a. Sheen: Semi-Gloss.
   b. Products:
      1) Rust-Oleum Corporation; 9800 System DTM Urethane Mastic: www.rustoleum.com/#sle. (MPI #72)
      2) Sherwin-Williams; Acrolon 218 HS: www.protective.sherwin-williams.com/#sle. (MPI #72, #174)

C. Shellac: Pure, white type.

2.04 PRIMERS

A. Primers: Provide the following unless other primer is required or recommended by coating manufacturer.

2.05 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of coated surfaces.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Do not begin application of coatings until substrates have been properly prepared.

C. Verify that substrate surfaces are ready to receive work as instructed by the coating manufacturer. Obtain and follow manufacturer's instructions for examination and testing of substrates.

D. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

E. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

F. Test shop-applied primer for compatibility with subsequent cover materials.

G. Proceed with coating application only after unacceptable conditions have been corrected.
   1. Commencing coating application constitutes Contractor's acceptance of substrates and conditions.

3.02 PREPARATION

A. Protect adjacent surfaces and materials not receiving coating from spatter and overspray; mask if necessary to provide adequate protection. Repair damage.

B. Clean surfaces of loose foreign matter.

C. Remove substances that would bleed through finished coatings. If unremovable, seal surface with shellac.

D. Remove finish hardware, fixture covers, and accessories and store.

E. Existing Painted and Sealed Surfaces:
   1. Remove loose, flaking, and peeling paint. Feather edge and sand smooth edges of chipped paint.
   2. Clean with mixture of trisodium phosphate and water to remove surface grease and foreign matter.

F. Ferrous Metal:
   1. Solvent clean according to SSPC-SP 1.
   2. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and protect from corrosion until coated.

3.03 PRIMING

A. Apply primer to all surfaces, unless specifically not required by coating manufacturer. Apply in accordance with coating manufacturer's instructions.

3.04 COATING APPLICATION

A. Apply coatings in accordance with manufacturer's written instructions, to thicknesses specified and recommendations in MPI - Architectural Painting and Specification Manual.

B. Apply in uniform thickness coats, without runs, drips, pinholes, brush marks, or variations in color, texture, or finish. Finish edges, crevices, corners, and other changes in dimension with full coating thickness.

3.05 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

B. Clean surfaces immediately of overspray, splatter, and excess material.

C. After coating has cured, clean and replace finish hardware, fixtures, and fittings previously removed.

3.06 PROTECTION

A. Protect finished work from damage.

END OF SECTION 099600

SECTION 101419
DIMENSIONAL LETTER SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Dimensional letter signage.

1.02 SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Product Data: Manufacturer's product literature for each type of dimensional letter sign, indicating style, font, colors, locations, and overall dimensions of each sign.

C. Shop Drawings:
   1. Include dimensions, locations, elevations, materials, text and graphic layout, and attachment details.

D. Manufacturer's Installation Instructions: Include installation templates and attachment devices.

E. Manufacturer's qualification statement.

1.03 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Package dimensional letter signs as required to prevent damage before installation.

B. Store under cover and elevated above grade.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Dimensional Letter Signs:
   1. FASTSIGNS International, Inc; www.fastsigns.com/#sle.
   2. Inpro Corporation; www.inprocorp.com/#sle.
   3. Takeform; www.takeform.net/#sle.
   4. Substitutions: See Section 012500 – Substitution Procedures

2.02 DIMENSIONAL LETTERS

A. Applications: Building identification.
   1. Use individual metal letters.
   2. Mounting Location: Exterior as indicated on drawings.

B. Applications: Building's numerical address numbers
   1. Use individual metal letters.
   2. Mounting Location: Exterior as indicated on drawings.

C. Metal Letters:
   1. Material: Aluminum casting.
   2. Thickness: 1/8 inch minimum.
   3. Letter Height: See above
   4. Text and Typeface:
      a. Character Font: Helvetica, Arial, or other sans serif font.
      b. Character Case: Upper case only.
   5. Finish: Brushed, satin.
   6. Color: Natural Anodized.
   7. Mounting: Standf-off attachment.

2.03 ACCESSORIES

A. Concealed Screws: Noncorroding metal; stainless steel.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

B. Verify that electrical service is correctly sized and located to accommodate dimensional letter signs.

C. Notify Architect if conditions are not suitable for installation of signs; do not proceed until conditions are satisfactory.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install with horizontal edges level.

END OF SECTION 101419

SECTION 101423
SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Panel signage.
   1. Room-identification signs that are directly attached to the building.
   2. Evacuation plan and other code signage that is directly attached to the building.
   3. Sand-Blasted Wood Sign

1.02 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design 2010.

B. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.

1.03 SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Product Data: Manufacturer's product literature for each type of panel sign, indicating styles, font, foreground and background colors, locations, and overall dimensions of each sign.

C. Shop Drawings:
   1. Include dimensions, locations, elevations, materials, text and graphic layout, attachment details, and schedules.
   2. Schedule: Provide information sufficient to completely define each panel sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
      a. Submit for approval by Owner through Architect prior to fabrication.

D. Samples: Submit one sample of sign type S-8, of size similar to that required for project, indicating sign style, font, and method of attachment.

E. Selection Samples: Where colors, materials, and finishes are not specified, submit two sets of color selection charts or chips.

F. Manufacturer's Installation Instructions: Include installation templates and attachment devices.

G. Manufacturer's qualification statement.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Package signs as required to prevent damage before installation.

1.06 FIELD CONDITIONS

A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.

B. Maintain minimum ambient temperature during and after installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Panel Signage:
   1. ASE, Inc; asesigns.com
   2. Best Sign Systems, Inc; www.bestsigns.com/#sle.
   3. FASTSIGNS International, Inc; www.fastsigns.com/#sle.
   4. Mohawk Sign Systems, Inc; www.mohawksign.com/#sle.
   5. ASI Sign Systems; www.asisignage.com.
   6. APCO; https://www.apcosigns.com/

7. Architectural Metalcrafters; www.amcrafters.com
8. Studio 3 Signs; www.studio3signs.com
9. Substitutions: See Section 012500 – Substitution Procedures

B. Sand-Blasted Wood Sign:
1. Studio 3 Signs; www.studio3signs.com
2. Valley Sign; www.valley-sign.com
3. Signs of Seattle; www.signsofseattle.com
4. Substitutions: See Section 012500 – Substitution Procedures

2.02 REGULATORY REQUIREMENTS

A. Accessibility Requirements: Comply with ADA Standards and ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most restrictive requirements.

2.03 MATERIALS

A. Plastic Sheet
1. Cast methyl methacrylate monomer plastic sheet
   a. ASTM D790minimum flexural strength – 16,000 psi.
   b. Maximum continuous temperature – 180 – 200 degrees F.
   c. Matte non-glare finish.
2. Single ply modified acrylic plate.
   a. UV stable.
   b. Matte non-glare finish.
3. Lexan: Polycarbonate resin thermoplastic.

2.04 PANEL SIGNAGE

A. Panel Signage
1. Basis of Design: ASE, Inc Model: IN 500 Inlayed Acrylic
2. Description: Flat signs with applied character panel media, tactile characters.
3. Sign Size: As indicated on drawings.
4. Total Thickness: See drawing details
5. Sign Edges: Squared.
6. Letter Edges: Squared.
7. Corners: Squared.
8. Color and Font, unless otherwise indicated:
   a. Character Font: As indicated on drawings.
   b. Character Case: Upper case only.
   c. Background Color: As indicated on the drawings or if not indicated, as selected from mfr's standard color options..
   d. Character Color: Contrasting color.
9. Material: Acrylic plastic base with applied maclear face and plastic letters and braille.
10. Material: Brushed aluminum accent trim where occurs.
11. Tactile Letters: Raised 1/32 inch minimum.
12. Braille: Grade II, ADA-compliant.

2.05 SANDBLASTED WOOD SIGN (KITSAP COUNTY LOGO)

A. Material: Western Red Cedar
1. County logo electronic vector graphic file will be provided by Architect
2. Size: Approx. 4’10” wide x 3’-10” high
3. White areas of county logo outside of bird head to be clear cedar
4. White areas of county logo inside of bird head to be painted white
5. Black areas of county logo to be painted black
6. Red areas of county logo to be painted red

2.06 SIGNAGE APPLICATIONS

A. Room and Door Signs: As indicated on signage plan and schedule.

2.07 ACCESSORIES

A. Tape Adhesive: Double-sided tape, permanent adhesive.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

B. Notify Architect if conditions are not suitable for installation of signs; do not proceed until conditions are satisfactory.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install with horizontal edges level.

C. Locate panel signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.

END OF SECTION 101423

SECTION 102113.17
PHENOLIC TOILET COMPARTMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Phenolic toilet compartments.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Blocking and supports.

B. Section 102800 - Toilet, Bath, and Laundry Accessories.

1.03 REFERENCE STANDARDS

A. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar 2023.

1.04 SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Product Data: Provide data on panel construction, hardware, and accessories.

C. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall supports, door swings.

D. Samples: Submit two samples of partition panels, 6" x 6" inch in size illustrating panel finish, color, and sheen.

E. Manufacturer's Installation Instructions: Indicate special procedures.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Phenolic Toilet Compartments:
   1. All American Metal Corp - AAMCO; www.allamericanmetal.com/#sle.
   2. ASI Accurate Partitions; www.asi-accuratepartitions.com/#sle.
   3. ASI Global Partitions; www.asi-globalpartitions.com/#sle.
   4. Partition Systems International of South Carolina; Phenolic Toilet Partitions: www.psisc.com/#sle.
   5. Substitutions: See Section 012500 – Substitution Procedures

2.02 PHENOLIC TOILET COMPARTMENTS

A. Toilet Compartments: Factory fabricated doors, pilasters, and divider panels made of solid phenolic core panels with integral melamine finish, floor-mounted unbraced.
   1. Color: Single Color To be selected from mfr's standard colors.

B. Doors:
   1. Thickness: 3/4 inch.
   2. Width: 24 inch.
   3. Width for Handicapped Use: 36 inch.
   4. Height: 58 inch.

C. Panels:
   1. Thickness: 1/2 inch.
   2. Height: 58 inch.
   3. Depth: As indicated on drawings.

D. Pilasters:
   1. Thickness: 3/4 inch.
   2. Width: As required to fit space; minimum 3 inch.

2.03 ACCESSORIES

A. Pilaster Shoes: Formed ASTM A666 Type 304 stainless steel with No. 4 finish, 3 inch high, concealing floor fastenings.

B. Head Rails: Hollow anodized aluminum, 1 inch by 1-1/2 inch size, with anti-grip profile and cast socket wall brackets.

C. Wall and Pilaster Brackets: Polished stainless steel; manufacturer's standard type for conditions indicated on drawings.

D. Attachments, Screws, and Bolts: Stainless steel , tamper proof type.

E. Hardware: Polished stainless steel:
   1. Pivot hinges, gravity type, adjustable for door close positioning; two per door.
   2. Door Latch: Slide type with exterior emergency access feature.
   3. Door strike and keeper with rubber bumper; mounted on pilaster in alignment with door latch.
   4. Coat hook with rubber bumper; one per compartment, mounted on door.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify correct spacing of and between plumbing fixtures.

C. Verify correct location of built-in framing, anchorage, and bracing.

3.02 INSTALLATION

A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.

B. Maintain 3/8 inch to 1/2 inch space between wall and panels and between wall and end pilasters.

C. Attach panel brackets securely to walls using anchor devices.

D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.

E. Field touch-up of scratches or damaged finish will not be permitted. Replace damaged or scratched materials with new materials.

3.03 TOLERANCES

A. Maximum Variation From True Position: 1/4 inch.

B. Maximum Variation From Plumb: 1/8 inch.

3.04 ADJUSTING

A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.

B. Adjust hinges to position doors in partial opening position when unlatched. Return out-swinging doors to closed position.

C. Adjust adjacent components for consistency of line or plane.

END OF SECTION 102113.17

SECTION 102600
WALL AND DOOR PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Corner guards.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Blocking for wall and corner guard anchors.

B. Section 092216 - Non-Structural Metal Framing: Placement of supports in stud wall construction.

1.03 REFERENCE STANDARDS

A. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics 2023, with Editorial Revision.

B. ASTM F476 - Standard Test Methods for Security of Swinging Door Assemblies 2023.

1.04 SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Product Data: Indicate physical dimensions, features, wall mounting brackets with mounted measurements, anchorage details, and rough-in measurements.

C. Shop Drawings: Include plans, elevation, sections, and attachment details. Show design and spacing of supports for protective corridor handrails, required to withstand structural loads.

D. Manufacturer's Instructions: Indicate special procedures, perimeter conditions requiring special attention.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project:
   1. See Section 016000 - Product Requirements, for additional provisions.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver wall and door protection items in original, undamaged protective packaging. Label items to designate installation locations.

B. Protect work from moisture damage.

C. Protect work from UV light damage.

D. Do not deliver products to project site until areas for storage and installation are fully enclosed, and interior temperature and humidity are in compliance with manufacturer's recommendations for each type of item.

E. Store products in either horizontal or vertical position, in compliance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Corner Guards:
   1. Babcock-Davis; www.babcockdavis.com/#sle.
   2. Construction Specialties, Inc; Acrovyn Solid Color and Chameleon Crash Rails: www.c-sgroup.com/#sle.
   3. Inpro; www.inprocorp.com/#sle.
   4. Koroseal Interior Products; www.koroseal.com/#sle.
   5. Substitutions: See Section 012500 – Substitution Procedures

2.02 PERFORMANCE CRITERIA

A. Impact Strength: Unless otherwise noted, provide protection products and assemblies that have been successfully tested for compliance with applicable provisions of ASTM D256 and/or ASTM F476.

2.03 PRODUCT TYPES

A. Corner Guards - Flush Mounted:
   1. Material: Type 304 stainless steel, No. 4 finish, _____ gauge, _____ inch thick.
   2. Performance: Resist lateral impact force of 100 lbs at any point without damage or permanent set.
   3. Width of Wings: 2 inches.
   4. Corner: Square.
   5. Color: As selected from manufacturer's standard colors.
   6. Length: One piece.

2.04 FABRICATION

A. Fabricate components with tight joints, corners and seams.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough openings, concealed blocking, and anchors are correctly sized and located.

3.02 INSTALLATION

A. Install components in accordance with manufacturer's instructions, level and plumb, secured rigidly in position to supporting construction.

B. Position corner guard 4 inches above finished floor to ____ inches high.

END OF SECTION 102600

SECTION 102800
TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Commercial toilet accessories.

B. Under-lavatory pipe supply covers.

C. Utility room accessories.

1.02 RELATED REQUIREMENTS

A. Section 224000 - Plumbing Fixtures: Under-lavatory pipe and supply covers.

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design 2010.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.

C. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service 2022.

D. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar 2023.

E. ASTM C1036 - Standard Specification for Flat Glass 2021.

F. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror 2018.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.

1.05 SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Commercial Toilet, Shower, and Bath Accessories:
   1. Basis of Design: Bobrick; www.bobrick.com
   2. Other Acceptable Manufactrer's
      a. Bradley Corporation; www.bradleycorp.com/#sle.
   3. Substitutions: See Section 012500 – Substitution Procedures

B. Under-Lavatory Pipe Supply Covers:
   1. Plumberex Specialty Products, Inc; www.plumberex.com/#sle.
   2. Substitutions: See Section 012500 – Substitution Procedures

2.02 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
   1. Grind welded joints smooth.
   2. Fabricate units made of metal sheet of seamless sheets with flat surfaces.

B. Keys: Provide 2 keys for each accessory to Owner; master key lockable accessories.

C. Stainless Steel Sheet: ASTM A666, Type 304.

D. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.

E. Mirror Glass: Annealed float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.

F. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.

G. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.03 FINISHES

A. Stainless Steel: Satin finish, unless otherwise noted.

B. Galvanizing for Items Other than Sheet: Comply with ASTM A123/A123M; galvanize ferrous metal and fastening devices.

2.04 COMMERCIAL TOILET ACCESSORIES

A. Toilet Paper Dispenser: Double roll, surface mounted bracket type, stainless steel.
   1. Products:
      a. Bobrick; B-4288.
      b. Substitutions: Section 016000 - Product Requirements.

B. Paper Towel Dispenser: Electric, roll paper type.
   1. Cover: Stainless steel.
   2. Paper Discharge: Touchless automatic.
   3. Capacity: 8 inch diameter roll.
   4. Mounting: Surface mounted.
   5. Power: Battery operated.
   6. Refill Indicator: Illuminated refill indicator.
   7. Products:
      a. Bobrick: B-72974.

C. Soap Dispenser: Liquid soap dispenser, wall-mounted, surface, with stainless steel cover and horizontal stainless steel tank and working parts; push type soap valve, check valve, and window gauge refill indicator, tumbler lock.
   1. Products:
      a. Substitutions: Section 016000 - Product Requirements.

D. Mirrors: Stainless steel framed, 1/4 inch thick annealed float glass; ASTM C1036.
   1. Annealed Float Glass: Silvering, protective and physical characteristics in compliance with ASTM C1503.
   2. Frame: 0.05 inchangle shapes, with mitered and welded and ground corners, and tamperproof hanging system; satin finish.
   3. Backing: Full-mirror sized, minimum 0.03 inch galvanized steel sheet and nonabsorptive filler material.
   4. Products:
      a. Bobrick: B-2908 2436.
      b. Substitutions: Section 016000 - Product Requirements.

E. Seat Cover Dispenser: Stainless steel, surface-mounted, reloading by concealed opening at base, tumbler lock.
   1. Products:
      a. Bobrick: B-221.
      b. Substitutions: Section 016000 - Product Requirements.

F. Grab Bars: Stainless steel, smooth surface.
   1. Standard Duty Grab Bars:
      a. Push/Pull Point Load: 250 pound-force, minimum.

b. Dimensions: 1-1/4 inch outside diameter, minimum 0.05 inch wall thickness, exposed flange mounting, 1-1/2 inch clearance between wall and inside of grab bar.
c. Length and Configuration: As indicated on drawings.
d. Products:
1) Bobrick: B-6806.99.
2) Substitutions: Section 016000 - Product Requirements.

G. Sanitary Napkin Disposal Unit: Stainless steel, surface-mounted, self-closing door, locking bottom panel with full-length stainless steel piano-type hinge, removable receptacle.
1. Products:
a. Bobrick: B-270.
b. Substitutions: Section 016000 - Product Requirements.

2.05 UNDER-LAVATORY PIPE AND SUPPLY COVERS

A. Specified in 224000 - Plumbing Fixtures.

B. Under-Lavatory Pipe and Supply Covers:
1. Insulate exposed drainage piping, including hot, cold, and tempered water supplies under lavatories or sinks to comply with ADA Standards.
2. Exterior Surfaces: Smooth non-absorbent, non-abrasive surfaces.
3. Construction: 1/8 inch flexible PVC.
4. Color: White.
5. Products:
a. Plumberex Specialty Products, Inc; Plumberex Handy-Shield Maxx: www.plumberex.com/#sle.
b. Substitutions: See Section 016000 - Product Requirements.

2.06 UTILITY ROOM ACCESSORIES

A. Mop and Broom Holder: 0.05 inch thick stainless steel, Type 304, hat-shaped channel.
1. Holders: Three spring-loaded rubber cam holders.
2. Length: 36 inches.
3. Length: Manufacturer's standard length for number of holders.
4. Products:
a. Bobrick: B-223.
b. Substitutions: 016000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

C. Verify that field measurements are as indicated on drawings.

3.02 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.

B. Provide templates and rough-in measurements as required.

3.03 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.
1. Grab Bars: As indicated on drawings.
2. Other Accessories: As indicated on drawings.

3.04 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION 102800

SECTION 104400
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire extinguishers.

B. Fire extinguisher cabinets.

C. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Wood blocking product and execution requirements.

1.03 REFERENCE STANDARDS

A. FM (AG) - FM Approval Guide Current Edition.

B. NFPA 10 - Standard for Portable Fire Extinguishers 2022.

C. UL (DIR) - Online Certifications Directory Current Edition.

1.04 SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Product Data: Provide extinguisher operational features.

C. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

D. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Extinguishers:
   1. Activar Construction Products Group, Inc. - JL Industries; Cosmic Extinguisher - Multipurpose Chemical: www.activarcpg.com/#sle.
   2. Ansul, a Tyco Business; www.ansul.com/#sle.
   3. Kidde, a unit of United Technologies Corp; www.kidde.com/#sle.
   4. Nystrom, Inc; www.nystrom.com/#sle.
   5. Oval Brand Fire Products; Oval Dry Chemical Fire Extinguisher - Multipurpose ABC: www.ovalfireproducts.com/#sle.
   6. Potter-Roemer; www.potterroemer.com/#sle.
   7. Pyro-Chem, a Tyco Business; www.pyrochem.com/#sle.
   1. Substitutions: Substitutions: See Section 012500 – Substitution Procedures
   8. Fire Extinguisher Cabinets and Accessories:
   9. Activar Construction Products Group, Inc. - JL Industries; Ambassador Series: www.activarcpg.com/#sle.
   10. Kidde, a unit of United Technologies Corp; www.kidde.com/#sle.
   11. Larsen's Manufacturing Co; www.larsensmfg.com/#sle.
   12. Nystrom, Inc; www.nystrom.com/#sle.
   13. Oval Brand Fire Products; Cabinets for Low Profile Extinguishers: www.ovalfireproducts.com/#sle.
   14. Potter-Roemer; www.potterroemer.com/#sle.
   2. Substitutions: Substitutions: See Section 012500 – Substitution Procedures
   15.

2.02 FIRE EXTINGUISHERS

A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.

1. Provide extinguishers labeled by UL (DIR) or FM (AG) for purpose specified and as indicated.

B. Water Type Fire Extinguishers: Stainless steel tank, pressurized, with premixed antifreeze solution, including hose and nozzle.
   1. Class: 2-A type.

2.03 FIRE EXTINGUISHER CABINETS

A. Cabinet Construction: Non-fire rated.

B. Cabinet Configuration: Semi-recessed type.

C. Finish of Cabinet Exterior Trim and Door: No.4 - Brushed stainless steel.

2.04 ACCESSORIES

A. Lettering: FIRE EXTINGUISHER decal, or vinyl self-adhering, pre-spaced black lettering in accordance with authorities having jurisdiction (AHJ).

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.03 SCHEDULES

A. Corridors: Water Type, Class 2-A, 2 1/2 gallon (11 L) capacity, polished chrome finish, placed in 12 inch (300 mm) wide by 30 inch (760 mm) high by 10 inch (250 mm) deep recessed polished stainless steel cabinet; locate two per floor.

END OF SECTION 104400

SECTION 107500
FLAGPOLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum Flagpoles.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete base and foundation construction.

1.03 REFERENCE STANDARDS

A. AASHTO M 36 - Standard Specification for Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains 2016 (Reapproved 2020).

B. ASTM B241/B241M - Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube 2022.

C. NAAMM FP 1001 - Guide Specifications for Design Loads of Metal Flagpoles 2007.

1.04 SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Product Data: Provide data on pole, accessories and configurations.

C. Shop Drawings: Indicate detailed dimensions, base details, anchor requirements, and imposed loads.

D. Maintenance Data: Provide lubrication and periodic maintenance requirement schedules.

1.05 QUALITY ASSURANCE

A. Designer Qualifications: Design flagpole foundation under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed the State in which the Project is located.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Spiral wrap flagpole with protective covering and pack in protective shipping tubes or containers.

B. Protect flagpole and accessories from damage or moisture.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Flagpoles:
   1. Concord American Flagpole; Internal - Independence: www.concordamericanflagpole.com/#sle.
   2. Morgan-Francis Flagpoles & Accessories; www.morgan-francis.com/#sle.
   3. Pole-Tech Co, Inc; www.poletech.com/#sle.
   4. Substitutions: See Section 012500 – Substitution Procedures

2.02 FLAGPOLES

A. Flagpoles: Designed in accordance with NAAMM FP 1001
   1. Material: Aluminum.
   2. Design: Cone tapered.
   3. Mounting: Ground mounted type.
   4. Nominal Height: 30 ft; measured from nominal ground elevation.
   5. Halyard: Internal type.

2.03 POLE MATERIALS

A. Aluminum: ASTM B241/B241M , 6063 alloy , T6 temper.

2.04 ACCESSORIES

A. Finial Ball: Aluminum, 6 inch diameter.

2.05 MOUNTING COMPONENTS

A. Foundation Tube Sleeve: AASHTO M 36, corrugated 16 gauge, 0.0598 inch steel, galvanized, depth as indicated.

B. Pole Base Attachment: Flush; steel base with base cover.

C. Lighting Ground Rod: copper rod, 3/4 inch diameter.

D. Lightning Ground Cable: Copper No. 6 AWG, soft drawn.

2.06 FINISHING

A. Aluminum: Mill finish.

B. Finial: Gold anodized finish.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that concrete foundation is ready to receive work and dimensions are as indicated on shop drawings.

3.02 PREPARATION

A. Coat metal sleeve surfaces below grade and surfaces in contact with dissimilar materials with asphaltic paint.

3.03 INSTALLATION

A. Install flagpole , base assembly, and fittings in accordance with manufacturer's instructions.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1 inch.

3.05 ADJUSTING

A. Adjust operating devices so that halyard and flag function smoothly.

END OF SECTION 107500

SECTION 113013
RESIDENTIAL APPLIANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Kitchen appliances.

1.02 RELATED REQUIREMENTS

A. Section 221005 - Plumbing Piping: Plumbing connections for appliances.

B. Section 260583 - Wiring Connections: Electrical connections for appliances.

1.03 REFERENCE STANDARDS

A. UL (DIR) - Online Certifications Directory Current Edition.

1.04 SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Product Data: Manufacturer's data indicating dimensions, capacity, and operating features of each piece of residential equipment specified.

C. Copies of Warranties: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Electric Appliances: Listed and labeled by UL (DIR) and complying with NEMA Standards (National Electrical Manufacturers Association).

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide five (5) year manufacturer warranty on refrigeration system of refrigerators.

PART 2 PRODUCTS

2.01 KITCHEN APPLIANCES

A. Provide Equipment Eligible for Energy Star Rating: Energy Star Rated.

B. Refrigerator: Free-standing, top-mounted freezer, and frost-free.
   1. Capacity: Total minimum storage of 21.9 cubic ft; minimum 15 percent freezer capacity.
   2. Energy Usage: Minimum 20 percent more energy efficient than energy efficiency standards set by U.S. Department of Energy (DOE).
   3. Width: 33"
   4. Features: Include glass shelves and light in freezer compartment.
   5. Exterior Finish: Porcelain enameled steel, color Stainless Steel.
   6. Manufacturers:
      a. Frigidaire Home Products; www.frigidaire.com/#sle.
      b. GE Appliances; GTS22KYNRFS: www.geappliances.com/#sle.
      c. Whirlpool Corp; www.whirlpool.com/#sle.
      d. Substitutions: See Section 012500 – Substitution Procedures

C. Microwave
   1. Capacity: 1.1 cubic ft.
   2. Power: 800 watts.
   3. Features: Include turntable, cooktop light, night light, 2-speed exhaust fan, built-in trim kit, undercabinet mounting kit.
   4. Exterior Finish: Black.
   5. Manufacturers:
      a. Frigidaire Home Products; www.frigidaire.com/#sle.
      b. GE Appliances; PEM31SFSS: www.geappliances.com/#sle.

c. Whirlpool Corp; www.whirlpool.com/#sle.
d. Substitutions: See Section 012500 – Substitution Procedures

END OF SECTION 113013

SECTION 122113
HORIZONTAL LOUVER BLINDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Horizontal slat louver blinds.

B. Operating hardware.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Concealed wood blocking for attachment of headrail brackets.

1.03 SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Product Data: Provide data indicating physical and dimensional characteristics.

C. Samples: Submit two samples,6 inch long illustrating slat materials and finish, cord type and color.

D. Manufacturer's Installation Instructions: Indicate special procedures.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Horizontal Louver Blinds Without Side Guides:
   1. Basis of Design:
      a. Hunter Douglas Architectural; CD Model: www.hunterdouglasarchitectural.com/#sle.
         1) CL82 1" Mini Aluminum Blind
   2. Other Acceptable Manufacturers:
      a. Levolor; Metal Blinds: www.commercial.levolor.com/#sle.
      b. SWFcontract, a division of Springs Window Fashions, LLC; www.swfcontract.com/#sle.
   3. Substitutions: See Section 012500 – Substitution Procedures

2.02 BLINDS

A. Description: Horizontal slat louvers hung from full-width headrail with full-width bottom rail.

B. Manual Operation: Control of raising and lowering by cord with full range locking; blade angle adjustable by control wand.

C. Metal Slats: Spring tempered pre-finished aluminum; square slat corners, with manufacturing burrs removed.
   1. Width: 1 inch.

D. Slat Support: Woven polypropylene cord, ladder configuration.

E. Head Rail: Pre-finished, formed aluminum box, with end caps; internally fitted with hardware, pulleys, and bearings for operation; same depth as width of slats.

F. Headrail Attachment: Wall brackets.

2.03 FABRICATION

A. Determine sizes by field measurement.

B. Fabricate blinds to fit within openings with uniform edge clearance of 1/2" inch.

C. Fabricate blinds to cover window frames completely.

D. At openings requiring multiple blind units, provide separate blind assemblies with space of 1/2 inch between blinds, located at window mullion centers.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that openings are ready to receive the work.

B. Ensure structural blocking and supports are correctly placed. See Section 061000.

3.02 INSTALLATION

A. Install blinds in accordance with manufacturer's instructions.

B. Secure in place with flush countersunk fasteners.

3.03 TOLERANCES

A. Maximum Offset From Level: 1/8 inch.

3.04 ADJUSTING

A. Adjust blinds for smooth operation.

3.05 CLEANING

A. Clean blind surfaces just prior to occupancy.

END OF SECTION 122113

SECTION 123200
MANUFACTURED WOOD CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufactured standard and custom casework, with cabinet hardware.

B. Countertops.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Blocking and nailers for anchoring casework.

B. Section 079200 - Joint Sealants: Sealing joints between casework and countertops and adjacent walls, floors, and ceilings.

C. Section 092116 - Gypsum Board Assemblies: Reinforcements in metal-framed partitions for anchoring casework.

D. Section 224000 - Plumbing Fixtures: Sinks and fittings installed in casework.

1.03 REFERENCE STANDARDS

A. AWI (QCP) - Quality Certification Program Current Edition.

B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition 2014, with Errata (2016).

C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards 2021, with Errata.

D. BHMA A156.9 - Cabinet Hardware 2020.

E. ISFA 2-01 - Classification and Standards for Solid Surfacing Material 2013.

F. NEMA LD 3 - High-Pressure Decorative Laminates 2005.

1.04 SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Product Data: Component dimensions, configurations, construction details, joint details, attachments.

C. Shop Drawings: Indicate casework types, sizes, and locations, using large scale plans, elevations, and cross sections. Include rough-in and anchors and reinforcements, placement dimensions and tolerances, clearances required, and keying information.

D. Samples for Finish Selection: Fully finished, for color selection. Minimum sample size: 2 inches by 3 inches.
   1. Plastic laminate samples, for color, texture, and finish selection.

E. Maintenance Data: Manufacturer's recommendations for care and cleaning.

F. Finish touch-up kit for each type and color of materials provided.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

B. Quality Certification: Comply with AWI (QCP) woodwork association quality certification service/program in accordance with requirements for work specified in this section.
   1. Provide labels or certificates indicating that the installed work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
   2. Provide designated labels on shop drawings as required by certification program.
   3. Provide designated labels on installed products as required by certification program.
   4. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.
   5. Replace, repair, or rework all work for which certification is refused.

C. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience and approved by manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect items provided by this section, including finished surfaces and hardware items during handling and installation. For metal surfaces, use polyethylene film or other protective material standard with the manufacturer.

B. Acceptance at Site:
   1. Do not deliver or install casework until the conditions specified under Part 3, Examination Article of this section have been met. Products delivered to sites that are not enclosed and/or improperly conditioned will not be accepted if warping or damage due to unsatisfactory conditions occurs.

C. Storage:
   1. Store casework in the area of installation. If necessary, prior to installation, temporarily store in another area, meeting the environmental requirements specified under Part 3, "Site Verification of Conditions" Article of this section.

1.07 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion, at no additional cost to Owner. Defects include, but are not limited to:
   1. Ruptured, cracked, or stained finish coating.
   2. Discoloration or lack of finish integrity.
   3. Cracking or peeling of finish.
   4. Failure of hardware.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Plastic Laminate Casework:
   1. Beck Cabinet Company; www.beckcabinet.com
   2. Custom Source Woodworking Inc.; www.cswinc.com
   3. Frontier Door + Cabinet; www.frontierdoor.com
   4. Genothen Holdings; www.genothen.com
   5. Pacific Cabinets; www.pacificcabinets.com
   6. Substitutions: See Section 012500 – Substitution Procedures

2.02 CASEWORK, GENERAL

A. Quality Standard: AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Plastic Laminate Faced Cabinets: Custom Grade.

2.03 FABRICATION

A. Assembly: Shop assemble casework items for delivery to site in units easily handled and to permit passage through building openings.

B. Construction: As required for selected grade.

C. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.

2.04 PLASTIC-LAMINATE-CLAD CASEWORK

A. Plastic-Laminate-Clad Casework: Solid wood and wood panel construction; each unit self-contained and not dependent on adjacent units or building structure for rigidity; in sizes necessary to avoid field cutting except for scribes and filler panels. Include adjustable levelers for base cabinets.
   1. Style: Flush overlay. Ease doors and drawer fronts slightly at edges.

2. Cabinet Nominal Dimensions: Unless otherwise indicated, provide cabinets of widths and heights indicated on drawings, and with following front-to-back dimensions:
   a. Base Cabinets: 23 inch.
   b. Tall Cabinets: _____ inches.
   c. Wall Cabinets: 14 inches.
3. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline.
   a. Finish: Matte or suede, gloss rating of 5 to 20.
   b. Surface Color and Pattern: As selected by Architect from manufacturer's full line.
   c. Exposed Interior Surfaces: Thermally fused laminate.
      1) Color: White.
   d. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.
   e. Cap exposed plastic laminate finish edges with material of same finish and pattern.

2.05 COUNTERTOPS

A. Types: More than one type is required.
   1. Restroom Vanities: Solid Surface Countertop
   2. Other Countertops: Plastic Laminate

B. Fabricate in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 11 - Countertops, Custom Grade, unless otherwise noted.

C. Plastic Laminate Countertops (Typical UNO): High pressure decorative laminate sheet bonded to substrate.
   1. Manufacturer's standard configuration for exposed edges, back and end splashes.
   2. Fabricate in accordance with manufacturer's standard requirements.

D. Solid Surfacing Countertops: Solid surfacing sheet or plastic resin casting over continuous substrate.
   1. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
      a. Thickness: ½”

E. Vanity Support:
   1. Vanity Brackets: Concealed vertical leg, side-of-stud mounting.
      a. Material: Steel plates.
         1) Finish: Manufacturer's standard, factory-applied powder coat.
         2) Color: Black.
         3) Plate Thickness: 1/2 inch.
         4) Plate Width: 2-1/2 inches.
         5) Bracket Depth: 22”
         6) Bracket Spacing: Min
      b. Product:
         1) Centerline Brackets; Floating Wall Mount: www.countertopbracket.com
   2. Vanity End Wall Supports:
      a. 1 ½” x 1 ½” x .125” Stl Angle at side walls for vanity countertop support

2.06 CABINET HARDWARE

A. Manufacturer's standard types, styles and finishes.

B. Comply with BHMA A156.9 requirements.

C. Shelves in Cabinets:
   1. Shelf Standards and Rests: Vertical standards with rubber button fitted rests, satin chromium plated over nickel on base material.

D. Swinging Doors: Hinges, pulls, and catches.
   1. Hinges: Concealed, number as required by referenced standards for width, height, and weight of door.
      a. Concealed Hinges: Installed in cabinet edge, and on door back, bright chromium plated over nickel on base material.
   2. Pulls: Aluminum wire pulls, 4 inches wide.
   3. Catches: Magnetic.

E. Drawers: Pulls and slides.
   1. Pulls: Aluminum wire pulls, 4 inches wide.
   2. Slides: Steel, full extension arms, ball bearings; self-closing; capacity as recommended by manufacturer for drawer height and width.

2.07 ACCESSORIES

A. Plastic Edge Banding: Extruded PVC, convex shaped; smooth finish; self locking serrated tongue; of width to match component thickness.
   1. Use at exposed edges.

B. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.

C. Sealant for Use in Casework Installation:
   1. Manufacturer's recommended type.

PART 3 EXECUTION

3.01 PREPARATION

A. Large Components: Ensure that large components can be moved into final position without damage to other construction.

3.02 EXAMINATION

A. Site Verification of Environmental Conditions:
   1. Do not deliver casework until the following conditions have been met:
      a. Building has been enclosed (windows and doors sealed and weather-tight).
      b. An operational HVAC system that maintains temperature and humidity at occupancy levels has been put in place.
      c. Ceiling, overhead ductwork, piping, and lighting have been installed.
      d. Installation areas do not require further “wet work” construction.

B. For Base Cabinets Installation: Examine floor levelness and flatness of installation space. Do not proceed with installation if encountered floor conditions required more than 1/2 inch leveling adjustment. When installation conditions are acceptable, for each space, establish the high point of the floor. Set and make level and plumb first cabinet in relation to this high point.

C. For Wall Cabinets Installation: Examine wall surfaces in installation space. Do not proceed with installation if the following conditions are encountered:
   1. Maximum variation from plane of masonry wall exceeds 1/4 inch in 10 ft and 1/2 inch in 20 ft or more, and/or maximum variation from plumb exceeds 1/4 inchper story.
   2. Maximum Variation of finished gypsum board surface from true flatness: 1/8 inch in 10 feet in any direction.

D. Verify adequacy of support framing and anchors.

E. Verify that service connections are correctly located and of proper characteristics.

3.03 INSTALLATION

A. Perform installation in accordance with manufacturer's instructions.

B. Use anchoring devices to suit conditions and substrate materials encountered. Use concealed fasteners to the greatest degree possible. Use exposed fasteners only where allowed by approved shop drawings, or where concealed fasteners are impracticable.

C. Set casework items plumb and square, securely anchored to building structure.

D. Align cabinets to adjoining components, install filler and/or scribe panels where necessary to close gaps.

E. Fasten together cabinets in continuous runs, with joints flush, uniform and tight. Misalignment of adjacent units not to exceed 1/16 inch. In addition, do not exceed the following tolerances:
   1. Variation of Tops of Base Cabinets from Level: 1/16 inch in 10 feet.
   2. Variation of Faces of Cabinets from a True Plane: 1/8 inch in 10 feet.
   3. Variation of Adjacent Surfaces from a True Plane (Lippage): 1/32 inch.
   4. Variation in Alignment of Adjacent Door and Drawer Edges: 1/16 inch.

F. Base Cabinets: Fasten cabinets to service space framing and/or wall substrates, with fasteners spaced not more than 16 inches on center. Bolt adjacent cabinets together with joints flush, tight, and uniform.

G. Install hardware uniformly and precisely.

H. Countertops: Install countertops intended and furnished for field installation in one true plane, with ends abutting at hairline joints, and no raised edges.

I. Replace units that are damaged, including those that have damaged finishes.

3.04 ADJUSTING

A. Adjust operating parts, including doors, drawers, hardware, and fixtures to function smoothly.

3.05 CLEANING

A. Clean casework and other installed surfaces thoroughly.

3.06 PROTECTION

A. Do not permit finished casework to be exposed to continued construction activity.

B. Protect casework and countertops from ongoing construction activities. Prevent workmen from standing on, or storing tools and materials on casework or countertops.

C. Repair damage, including to finishes, that occurs prior to Date of Substantial Completion, using methods prescribed by manufacturer; replace units that cannot be repaired to like-new condition.

END OF SECTION 123200

SECTION 133421
STRUCTURAL RETROFIT ROOF SUB-FRAMING SYSTEM

PART 1 - GENERAL

1.01 DESCRIPTION

A. The structural retrofit roof sub-framing system will provide support for a new metal roofing system and insulation constructed over the existing building roof. It shall be engineered in accordance with the specified code and design loading and shall transfer positive acting loads at each attachment location into an existing structural member.

B. Furnish labor, material, tools, equipment and services for the fabrication of retrofit roof sub-framing as indicated, in accordance with provisions of the Contract Documents.

C. Completely coordinate work with work of other trades.

D. Although such work is not specifically indicated, the contractor/installer shall coordinate with the metal roof system supplier to furnish and install supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation.

E. Reference Division 1 for General Requirements

1.02 RELATED WORK

A. Section 05 40 00 - Cold-Formed Metal Framing

B. Section 07 21 00 - Thermal Insulation

C. Section 07 40 00 - Metal Roofing.

D. Section 07 72 00 - Roof Accessories.

1.03 QUALITY ASSURANCE AND REFERENCES

A. ASTM International
   1. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   2. ASTM A 1011/A 1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, arbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability , and Ultra-High Strength.
   3. Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.

B. American Iron and Steel Institute (AISI)
   1. ANSI/AISC 360-16: - Specification for Structural Steel for Buildings, [2016 Edition].

C. American Institute of Steel Construction (AISC)
   1. ANSI/AISC 360-16: - Specification for Structural Steel for Buildings, [2016 Edition].

1.04 SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Product Data: Submit manufacturer's product data, including installation instructions.

C. Shop Drawings: Submit manufacturer's shop drawings for sub-purlins indicating gauge, yield strength, flange and web sizes, cut-out dimensions, and punch pattern for attachment holes in base flange.

D. Design Data: Submit design data from independent engineering firm indicating table of wind uplift capacity of sub-purlins.

E. Any design clarifications that may be requested by the City of Bremerton Building department.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store materials in accordance with manufacturer's instructions.

B. Store sub-purlins from corrosion, deformation, and other damage.

C. Store sub-purlins off ground, with 1 end elevated to provide drainage.

1.06 EXISTING ROOF SYSTEM AND PRE-CONSTRUCTION INSPECTION

A. The existing roof is a R-Panel installed over pre-engineered metal building roof Z Purlins.

B. Conduct a detailed inspection of the existing roof(s) to identify any existing roof elements that are a cause for concern such as: panel deterioration, structural deterioration, equipment curbs, plumbing and electrical penetrations, special flashing requirements, and any other items that should be submitted to the Architect for review and evaluation.

C. Perform a detailed survey of the existing roof(s) and confirm the existing panel dimensions, type and profile. In the case of existing standing seam roofing it should be determined if the existing roof employs standard or tall clips. If high panel clips are existing, the standoff dimension must be determined.

D. Record field measurements on the existing roof geometry including width, length, eave height, roof pitch and purlin spacing. This information is to be forwarded to the retrofit sub-framing system manufacturer for coordination and integration into the design and installation documents.

1.07 DESIGN REQUIREMENTS

A. General
1. Design for approval and installation in accordance with the Contract Documents, a complete retrofit sub-framing and metal roof panel assembly as a structural package.
2. Engineer and factory fabricate sub-framing system in accordance with applicable references.
3. Coordinate design with the retrofit sub-framing manufacturer and the metal roof panel manufacturer to perform as one engineered structural package where the metal roof system controls the placement of sub-framing members.
4. Any additions/revisions to sub-framing members as a result of field conditions and/or demands, shall be the contractor's responsibility, and shall be submitted for review and approval by the manufacturer.

B. Engineering Design Criteria: (Confirm with Structural Drawing Notes)
1. Building Code: 2018 IBC
2. Occupancy Group: A, B, S-1
3. Occupancy Category: IV
4. Importance Factor: 1.0
5. Minimum Roof Snow Load: 30 psf
6. Wind Speed: 110 mph
7. Exposure Category: B
8. Enclosure: Enclosed

PART 2 - PRODUCTS

2.01 MANUFACTURER QUALIFICATIONS

A. Manufacturer shall have a minimum of five years experience in manufacturing and fabrication of retrofit sub-framing systems of this nature.

B. Light-gauge steel sub-framing components specified in this section shall be produced in a factory environment by roll forming and press-brake equipment assuring the highest level of quality control.

C. Acceptable Manufacturers
1. Roof Hugger, LLC., PO Box 1027, Odessa, Florida 33556. Toll Free Phone (800) 771-1711.Toll Free Fax (877) 202-2254. Phone (813) 909-4424. Fax (813) 948-4742. Website: www.roofhugger.com. E-Mail: sales@roofhugger.com
2. Other manufacturers must submit a request for approval prior to the established bid date according to applicable Division 1 Section(s) and shall be equal to Roof Hugger, Inc.
3. Substitutions: See Section 012500 – Substitution Procedures

2.02 RETROFIT STEEL SUB-PURLINS

A. Standard Retrofit Factory-notched Sub-Purlins: "Roof Hugger".

B. Description:
   1. 1-piece, custom-notched and punched, Z-shaped section
   2. Pre-punched to nest over existing through-fastened, low clip and high clip standing seam roof panel ribs for low-profile attachment
   3. Pre-punched for attachment fasteners
   4. Integrally formed Anti-Rotational Arm as required for high clip standing seam panels.
   5. Fastens directly into existing purlins, joists or structural decking with fasteners.

C. Material
   1. Galvanized steel, ASTM A 653 or A 1011, G-90, yield strength 50 KSI
   2. Thickness: As determined by manufacturer's professional engineer.
   3. Web Height: [Basis of Design: 5 1/2 inches] As determined by manufacturer's professional engineer.
   4. Base Flange Width: Pre-punch base flange to manufacturer's standard unless otherwise specified.
   5. Top Flange Width: Nominally 2inches with 0.25inch minimum stiffening lip unless otherwise specified.
   6. Length: Nominally 10 feet long, plus an additional +/- 1inch top flange extension for part lap or per manufacturer’s recommendations.

D. Attachment Fasteners/Anchorage
   1. As determined by manufacturer's professional engineer.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine existing roof areas to receive sub-purlins. Notify Architect if areas are not acceptable or structurally adequate. Do not begin installation until unacceptable conditions have been corrected.

B. Verify existing purlins and eave struts are in good serviceable condition, without rust-thru offlanges

C. Field Verify Before Ordering of and Installation of Sub-Purlins:
   1. Existing panel profile and panel rib dimensions.
   2. Existing panel run-out by measuring roof over several 20-foot areas to confirm

3.02 INSTALLATION OF SUB-FRAMING AND OTHER ROOFTOP APPURTENCES

A. Install sub-purlins in accordance with manufacturer's instructions at locations indicated on the standard details or Engineered Drawings if provided.

B. Install sub-purlins directly over existing purlins and fasten to existing purlin through existing panel pan section.

C. Install fasteners per linear foot or as directed by Manufacturer.

D. Install sub-purlins directly over existing purlins and fasten to existing purlin through existing panel pan section.

E. Press the Roof Hugger sub-purlins over the sub-rafters on the existing purlin lines in areas where they are specified and install fasteners shown on mfr's engineered Drawings. through the base flange of the sub-purlin, through the sub-rafter and then into the existing purlins being careful to maintain the alignment of the sub-rafters.

F. Install sub-purlins onto the integral sub-rafters between the existing purlins as specified with 1/4”-14 threads per inch, DP3 fasteners, typically one fastener on each side of the sub-rafter unless otherwise specified.

G. Where the sub-purlin is attached to the existing roof panel the pre-punched base flange hole should be drilled out to the correct diameter to allow for the installation of a #17-14 fastener through the Roof Hugger and into the existing roof panel.

H. Where the sub-purlin passes over the fitted sub-rafter, fasten through the top flange of the sub-purlin with a #10-16 pancake head fastener into the top of the new fitted sub-rafter.

I. Removal of Existing Roof Fasteners: Do not remove existing roof fasteners unless installation of sub-purlins over fasteners causes sub-purlins to “roll” or “porpoise”. Some distortion of base flange of sub-purlins caused by existing roof fasteners is normal

J. Existing Rooftop Components and Equipment
   1. When mechanical equipment locations conflict with retrofit roof sub-framing components, the contractor will provide additional framing that accommodates the relocation, replacement or re-flashing of the equipment. Submit construction details for this condition to the Architect.
   2. Comply with provisions of project manual and local building codes for extending, relocating and flashing vent pipes.
   3. Comply with project manual and local building codes for extending, relocating ducts and curbs.

K. New Equipment within the New Roof Cavity
   1. Review all clearances, attachment requirements, penetrations, and other critical details as necessary for the proper installation of any equipment to be installed within the new roof cavity.
   2. Obstructions with new sub-purlins shall be avoided. If cutting of sub-purlins is necessary, a continuous top flange must be provided to provide continuous bearing for the new metal roof system.

SECTION 200000
GENERAL MECHANICAL REQUIREMENTS

PART 1 GENERAL

1.01 GENERAL

A. Includes, but not limited to, furnishing labor, materials, and equipment for completion of work unless indicated or noted otherwise. See Division 1 for sequence of work.

B. Work indicated on the mechanical plans and in the specifications that will not be performed by this Mechanical Contractor (i.e. duct and pipe block-outs, penetrations through walls, floors, and attic, wall patching, work indicated to be performed by other Contractors, etc.) shall be coordinated with the General Contractor prior to bid. The Mechanical Contractor is responsible for identifying quantity, size, and type of work with the General Contractor. Work not coordinated will be the responsibility of the Mechanical Contractor and shall not be charged as additional cost to the Owner.

C. All work included in Division 22 and 23 shall be the responsibility of a single Mechanical Subcontractor. The scope of work identified in these sections can be performed by different subcontractors, but one must take responsibility for coordination. The subcontractor will be identified by the General Contractor at the Pre-Construction Meeting.

D. This Contractor shall obtain and pay for all permits required by State and local authorities governing the installation of the mechanical work. It is the Contractor's responsibility to contact all utility organizations serving the building, prior to bid, and to include all charges for inspections, installation of materials, equipment, and connection of all required utilities.

E. Furnish exact location of electrical connections and complete information on motor controls to Division 26, prior to bid.

F. Put heating, ventilating, cooling, and exhaust systems into full operation and continue their operation during each working day of testing and balancing.

G. Make changes in mechanical drive systems (pulleys, belts, VFD’s, motor speed, etc.) and dampers or add dampers as required for correct balance as recommended by Section 230593 and at no additional cost to Owner. All equipment shall be provided with a single point electrical connection, unless otherwise indicated.

H. The drawings and specifications are complementary and what is called for in either is binding as if called for in both.

I. The ductwork and accessibility to HVAC equipment shall take precedence over all other equipment in the ceiling interstitial spaces or other mechanical areas including, but not limited to, sprinkler piping, heating piping, domestic water piping, and electrical conduit.

1.02 RELATED SECTIONS

A. General and Supplementary Conditions and Division 1 apply to this Section.

1.03 SUBMITTALS REQUIREMENTS OF THIS SECTION

A. Access doors

1.04 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:
   1. Perform work in accordance with applicable Codes.
   2. In case of differences between building codes, state laws, local ordinances, utility company regulations, and Contract Documents, the most stringent shall govern.

B. Product Approvals: See paragraphs elsewhere in this specification.

C. Warranties:
   1. In addition to guarantee specified in General Conditions, guarantee heating, cooling, and plumbing systems to be free from noise in operation that may develop from failure to construct system in accordance with Contract Documents.

2. In order to be protected, secure proper guarantees from suppliers and Subcontractors.
3. Provide certificates of warranty for each piece of equipment. Clearly record "start-up" date of each piece of equipment on certificate. Include certificates as part of Operation & Maintenance Manual.

D. Manufacture: Use domestic made pipe, pipe fittings, and motors on Project.

E. Identification: Motor and equipment name plates as well as applicable UL and AGA labels shall be in place when Project is turned over to Owner.

1.05 CODES AND STANDARDS

A. Codes and agencies having jurisdictional authority over mechanical installation.
1. Washington State Energy Code – Latest Approved Edition
2. International Building Code – Latest Approved Edition
3. International Fire Code – Latest Approved Edition
4. International Mechanical Code – Latest Approved Edition
5. Uniform Plumbing Code – Latest Approved Edition
6. Local Sewer and Water District Requirements
7. State and County Department of Health
8. Local Fire Marshal
9. Puget Sound Air Pollution Control
10. State of Washington Boiler and Unfired Pressure Vessel Inspection Law
11. Occupational Safety and Health Administration (OSHA)
12. Washington Industrial Safety and Health Act (WISHA)
13. National Fire Protection Association (NFPA)

B. ASME code stamp required on all pressure vessels and relief valves. Certificate required from the State Boiler Inspector showing approval of the equipment and its installation.

1.06 SYSTEMS DESCRIPTION

A. Site Inspection:
1. Examine premises and understand the conditions which may affect performance of work of this Division before submitting proposals for this work.
2. No subsequent allowance for time or money will be considered for any consequence related to failure to examine site conditions.

1.07 DESIGN DRAWINGS

A. Mechanical drawings are not shop drawings and are intended to show general arrangement of piping, ductwork, equipment, etc. Follow as closely as actual building construction and work of other trades will permit.

B. Consider architectural, structural, and electrical drawings part of this work in so far as these drawings furnish information relating to design and construction of building. Architectural drawings take precedence over mechanical drawings.

C. Because of small scale of mechanical drawings, it is not possible to indicate all offsets, fittings, and accessories which may be required. The Mechanical Contractor shall include in the bid a sufficient quantity of offsets, fittings, and accessories for the size of the project, based upon the contractor’s experience, necessary to facilitate mechanical utility installation. No additional costs shall be charged for additional offsets, fittings, and accessories required for installation of the mechanical utilities shown on the design drawings. Investigate structural and finish conditions affecting this work and arrange work accordingly, providing such fittings, valves, and accessories required in meeting the design conditions.

1.08 PRE-CONSTRUCTION COORDINATION MEETING

A. This Contractor is responsible to participate in coordination meetings with the General Contractor, Fire Protection Contractor, and other subcontractors needing to coordinate special requirements (such as electrical contractor, HVAC contractor, plumbing contractor, etc.)

B. Coordination meetings shall consider elevations, required clearances, and routings of all trades to assure that all trades can be installed without conflict.

C. The outcome of this coordination shall allow each system (Mechanical, Fire Protection, Plumbing, Electrical, etc.) to be installed without further conflicts for space or locations.

D. Failure to coordinate with other trades and/or existing conditions that result in the removal and re-installation of systems shall not be charged as additional costs.

1.09 COORDINATION DRAWINGS

A. Develop coordination drawings, and other pre-installation coordination methods as necessary to coordinate layouts prior to installation. Coordination drawings shall consist of overlay drawings, or other similar methods to graphically indicate plumbing, fire protection, HVAC, electrical, and other similar elements in a single location in order to identify conflicts. All elements shall be drawn to scale. Coordination drawings are not required to be submitted for approval, except where indicated otherwise in the specification. However, a minimum of one hard copy of coordination drawings shall be present on site at all times and made available to the Architect/Engineer (A/E) Representative upon request. If coordination drawings are not on file, or if systems are not installed per coordination drawings, costs and delays of required re-engineering, replacement, and other work required to correct conflicts shall be solely the Contractor's.
   1. Contractor shall have the underground coordination drawings available upon request by A/E Representative within 60 days after Notice to Proceed.
   2. Contractor shall have the aboveground coordination drawings available upon request by A/E Representative within 90 days after Notice to Proceed.

B. Coordination drawings shall consist of:
   1. Drawing sheets developed sequentially by each trade with all components drawn to scale and color coded to represent each trade.

C. Where coordination drawings, or other preinstallation coordination methods show that available space is inadequate or that modifications will affect architectural elements, request information from the Architect before proceeding with work. No additional payment will be made for installation conflicts which could have been identified by coordination drawings or other pre-installation coordination methods.

D. Make runs parallel with lines of building. Utilize space efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

E. Each subcontractor shall:
   1. Indicate the exact name, location, and dimension of each element to be provided by that subcontractor.
   2. Arrange components as necessary to avoid conflict with new and existing conditions and the work of other subcontractors as directed by the General Contractor.
   3. Note requirements for sleeves, block-outs, cutting, patching, access doors, blocking, supports, inserts, and other similar items.
   4. Notify the General Contractor of conflicts.
   5. Approve the coordination drawings when all conflicts are resolved and an acceptable layout is obtained.

F. The General Contractor shall coordinate the layouts indicated on the coordination drawings and resolve any conflicts prior to commencement of subject portions of the work.

1.10 ELECTRICAL

A. All electrical work, conduit, boxes, and devices in connection with control wiring as required to install the control equipment as specified herein or shown on the drawings shall be furnished and installed complete by the Division 26 Contractor.

B. All electrical work performed under this Section of the Specifications shall conform to all applicable portions of the Division 26 specifications and shall conform to all governing codes.

C. All equipment shall be factory wired to a junction box for connection to electrical service.

D. Where a piece of equipment specified includes an electric motor, the motor shall be furnished and mounted by this Contractor. Motor starter, disconnect switches, and wiring from the electrical panel to the motor control devices and to the motor shall be provided by the Division 26 Contractor unless stated otherwise in the mechanical specification and/or on the mechanical drawings.

E. All motor controllers and equipment panels (including but not limited to packaged equipment, custom control panels, custom air handler panels, etc.) shall comply with NEC (including, but not limited to, marking on controllers and labeling requirements).

1.11 TEMPORARY HEATING

A. Temporary heating for facility during construction phase shall not be supplied by the permanent system installed under these specifications, unless all of the following are satisfied:
   1. Product warranties shall be extended to account for construction use. Contractor shall furnish certified document stating such extended warranties.
   2. Contractor shall obtain letter of approval from the Owner stating that they understand equipment expected life may be shortened due to severe usage.
   3. Contractor shall be responsible for pressure cleaning all coils and vacuum cleaning all ductwork prior to occupancy.

1.12 PRODUCT HANDLING AND PROTECTION

A. Contractor is responsible for protection of all material, equipment and apparatus provided under this Section from damage, water, corrosion, freezing and dust, both in storage and when installed, until final project acceptance.

B. Provide temporary heated and sheltered storage facilities for material and equipment.

C. Completely cover motors and other moving machinery to protect from dirt and water during construction.

D. Handle and protect equipment and/or material in manner precluding unnecessary fire hazard.

E. Equipment requiring rotation and/or lubrication during storage shall have records maintained and witnessed on a monthly basis and forwarded to the Architect/Engineer prior to acceptance. Provide recorded maintenance for the O&M Manual.

F. Material or equipment damaged because of improper storage or protection will be rejected.

G. Equipment finish that is damaged by handling, storage, etc. shall be corrected by the Contractor at no additional cost to the Owner.

1.13 DEFINITIONS

A. Finished Spaces: Spaces used for habitation or occupancy where rough surfaces are plastered, paneled, or otherwise treated to provide a pleasing appearance

B. Unfinished Spaces: Spaces used for storage or work areas, such as fan rooms, mechanical and boiler rooms, etc., where appearance is not a factor

C. Concealed Spaces: Spaces out of sight. For example, above ceilings; below floors; between double walls; furred-in areas; pipe and duct shafts; and similar spaces

D. Exposed: Open to view. For example, pipe running through a room and not covered by other construction

E. Outside: Open to view up to 5 feet beyond the exterior side of walls, above the roof, and unexcavated or crawl spaces

F. Conditioned Space: An area, room, or space within the building envelope insulation

G. Replace: Existing mechanical equipment and components shall be demolished and discarded from the project site or as directed otherwise. New mechanical equipment and components shall be installed in the area where the existing mechanical equipment and components were demolished or as indicated on the contract documents.

H. Removed: Existing mechanical equipment and components identified on the contract documents shall be taken apart, taken down, and discarded from the project site unless directed otherwise on plan. Removed items shall not be brought back to the project site for use or reinstallation.

I. Reinstall: Existing mechanical equipment and components identified on the contract documents that need to be taken down and installed in the same or new location.

1.14 ABBREVIATIONS

ADA	Americans with Disabilities Act
A/E	Architect/Engineer
AFF	Above Finish Floor
AGA	American Gas Association
AMCA	Air Moving & Conditioning Association
ANSI	American National Standards Institute
APWA	American Public Works Association
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society of Testing & Materials
AWWA	American Water Works Association
BFF	Below Finish Floor
BHP	Brake Horsepower
BTU	British Thermal Unit
CFM	Cubic Feet per Minute
CISPI	Cast Iron Soil Pipe Institute
fpm	feet per minute
FS	Federal Specifications
FDC	Fire Department Connection
FCO	Flush Cleanout
FD	Floor Drain
FPWH	Freeze Proof Wall Hydrant
GPM	Gallons per Minute
HP	Horsepower
IAPMO	International Association of Plumbing and Mechanical Officials
IAQ	Indoor Air Quality
IEEE	Institute of Electrical and Electronics Engineers
KW	Kilowatt
LPG	Liquefied Petroleum Gas
MBH	One Thousand British Thermal Units per Hour
MS	Military Specifications
MSS	Manufacturers Standardization Society
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NP	Non-Potable Water
NPSH	Net Positive Suction Head
OS&Y	Outside Screw and Yoke
PIV	Post Indicator Valve
PDI	Plumbing and Drainage Institute
per	in accordance with
POC	Point of Connection
PSI	Pounds per Square Inch Gauge Pressure
PVC	Polyvinyl Chloride
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SP	Static Pressure
SWP	Steam Working Pressure
UL	Underwriter's Laboratories

VFD	Variable Frequency Drive
VTR	Vent Thru Roof
wg	Water Gauge (inches of water)
WP	Working Pressure
WPL	Weatherproof Louver
WQA	Water Quality Association

* Additional abbreviations are as listed on the drawings or elsewhere in these specifications.

1.15 SCHEDULE OF VALUES

A. General: Provide schedule of values per Division 1 and related project requirements:
   1. Division 22 and 23 Breakdown: Provide schedule of values for each building, broken down into labor and materials per specification section at a minimum. Further breakdown into subcategories is at the option of the Contractor, except as noted below:
      a. Section 200000 - General Mechanical Requirements: Provide a subcategory for “Mechanical Punchlist, Closeout and Owner Training”. The dollar value for this subcategory shall be no less than 2.25% of the total dollar value of the Division 22 and 23 work (or as indicated in Division 1, whichever is higher). The contractor shall receive payment upon completion of all Mechanical Punchlist and Closeout items and Owner Training.
      b. Section 200000 - General Mechanical Requirements: Provide a subcategory for “Pre-Construction Coordination Meeting.” The dollar value for this subcategory shall be no less than 1% of the total dollar value of the Division 22 and 23 work. Contractor shall submit the meeting's sign in sheet to the Engineer for review. The sign in sheet shall include the printed and signed names of the General and all subcontractors who attended the meeting. The contractor shall receive payment once the sign-in sheet has been verified to meet the Pre-Instruction Coordination requirements of this Section.
      c. Section 200000 - General Mechanical Requirements: Provide a subcategory for “Coordination Drawings”. The dollar value for this subcategory shall be no less than 1% of the total dollar value of the Division 22 and 23 work. The contractor shall receive payment upon Engineer’s verification of Coordination Drawing completion, in accordance with the requirements of this Section.
      d. Section 230800 - Commissioning HVAC System: The dollar value for “Commissioning” shall in no case be less than 0.75% of the total dollar value of the Division 22 and 23 work (or as indicated in Division 1, whichever is higher). The contractor shall receive payment upon completion of all outstanding commissioning items as identified by the commissioning agent, Engineer, and/or Owner.
      e. Section 230900 - Energy Management & Control Systems: Provide a subcategory for “Trend Logs”. The dollar value for this subcategory shall be no less than 1% of the total dollar value of the Division 23 work. The contractor shall receive payment upon completion of the trend logs in accordance with the requirements of this Section and Section 230900.

B. The Contractor is advised that in addition to payments held out for retainage and project final completion (i.e. “Mechanical Punchlist, Closeout, and Owner Training”), as specified above and in Division 1, the Owner reserves the right to withhold 10% of the funds for any of the above categories until the systems (of that category) have been proven to operate as specified and have been completely tested, adjusted, and balanced.

1.16 SUBMITTAL PROCEDURES

A. All material used on the project shall be new and free of defects. The Architect and/or Engineer reserve the right to reject any material, the appearance of which has been damaged on the site or in shipment. The material shall be of pre-approved equal quality to that which is specified. Should the make and type of material differ from that specified, the Contractor may be required to submit catalog and engineering data (samples if requested) necessary to make a comparison and determine its suitability. The Contractor shall also bear the cost of all changes to any aspect of the project (electrical, mechanical, building, etc.) made necessary by any approved substitutions. Approved substitutions include those listed as approved manufacturers or approved substitutions. Tentative approval of substitute material and equipment will be made prior to bid only. Such request for approval shall be made two weeks in advance of the bid opening to allow time to assess its suitability. Failure to obtain approval prior to bid shall require the successful bidder to furnish materials and equipment only as specified herein (see paragraph 2.01, this specification).

B. Equipment submittals shall be submitted per one of the following processes as selected by the Architect/Engineer Representative and/or Owner:
   1. Electronic Submittal Process:
      a. The Contractor shall upload one complete PDF file of the Electronic Submittal Package to the Architect's SharePoint Site for approval. The Electronic Submittal package shall include the following:
         1) All required submittals (i.e. equipment cut sheets, shop drawings, etc.) per each specification section.
         2) Table of contents identifying each specification section, submittal requirement of each specification, and the manufacturer name and model number of each item submitted.
         3) Index sheet for each specification section.
         4) Submission of PDF files of individual specifications or equipment cuts will be automatically rejected.
         5) The Contractor shall complete and upload a Submittal Information Form, in Microsoft WORD format, for the A/E team to review. The equipment submittal will not be considered "Received" nor will a review be provided until both the Electronic Submittal Package and Submittal information Form have been uploaded.
         6) If the Electronic Submittal Process is not feasible for a particular submittal section (i.e. samples, certain shop drawings, recorded videos, CD's, etc.), the Contractor shall submit a request in writing to the A/E Representative to deviate from the Electronic Submittal Process. If acceptable by the A/E Representative the Contractor shall follow the Hard Copy Submittal Process for the submission.
   2. Hard Copy Submittal Process:
      a. The Contractor shall submit to the Architect, for approval, complete information on all equipment and materials to be provided on the project. Provide copies as specified by Division 1 and at a minimum provide six (6) copies of the manufacturer's catalog and engineering data, shop drawings of shop fabricated equipment, and instruction data for each item included under this Section of the Specifications. The Contractor shall submit a typed, signed list including all items to be furnished on the project. The signature on the aforementioned list shall indicate that the Contractor has examined the suitability of all material and equipment with respect to compliance with these specifications. The Contractor's approval shall also indicate that physical dimensions of the equipment have been verified with the installation requirements and were found to cause no interference therewith.
      b. Furnish submittals in a hard-back, three-ring binder. The binder shall have tabs which are indexed with a Table of Contents. The Table of Contents shall correlate an index number for each individual specification number. If the equipment submittal is not bound to the Engineer's satisfaction, it may be rejected.

3. Review of submittal data by the Engineer or Architect does not relieve the Contractor of responsibility for quantities, measurements, and compliance with the intent of all contract documents.
4. Furnish submittals generally according to the list below. Individual sections may contain more specific submittal listing of the particular section labeled “Submittal Requirements.” Furnish on each particular section and the following equipment:
   a. Pipe
   b. Pipe Insulation
   c. Duct Insulation and Lining
   d. Hot Water Tanks
   e. Plumbing Fixtures
   f. Valves
   g. Pipe Hangers
   h. Piping Specialties
   i. Pumps
   j. Fire Sprinkler Equipment
   k. HVAC Equipment
   l. Temperature Control Equipment and Shop Drawings
   m. Air Balance Contractor
   n. Fire Marshal Stamped and Approved Shop Drawings for Fire Sprinkler System
   o. Any material found to be installed without prior approval will be required to be removed and replaced with only specified material at Contractor's cost.
   p. Mechanical Drawings for the project have been developed by the Engineer using AutoCAD™ Revision 2015 software. These drawing files will be made available to the Contractor for development of shop drawings and/or "As-Builts" for a fee of $30.00 per sheet. Full payment to be made prior to release of drawing files.

1.17 OPERATION AND MAINTENANCE MANUAL FOR MECHANICAL SYSTEMS

A. Bind Operation & Maintenance Manual for Mechanical Systems in three-ring, hard-backed binder with clear plastic pocket on spine. Spine of each binder shall have the following typewritten lettering inserted:

OPERATION
AND
MAINTENANCE
MANUAL
FOR MECHANICAL SYSTEMS

B. Provide master index at beginning of Manual showing items included. Use plastic permanent tab indexes for Sections of Manual.

C. First Section shall consist of name, address, and phone number of Architect, General Contractor, and Mechanical, Plumbing, Sheet Metal, Refrigeration, Temperature control, and Electrical Subcontractors. Also include complete list of equipment installed with name, address, and phone number of each vendor.

D. Provide Section for each type of item of equipment.

E. Submit copies as specified by Division 1 and at a minimum provide three (3) copies of Operation & Maintenance Manual to Architect for his approval.

F. Include descriptive literature (Manufacturer's catalog data) of each manufactured item. Literature shall show capacities and size of equipment used and be marked indicating each specific item with applicable data underlined.

G. Include all warranties/guarantees including extended warranties.

H. Include all start-up logs.

I. Operating Instructions shall include:
   1. General description of each mechanical system.

2. Step-by-step procedure to follow in putting each piece of mechanical equipment into operation.
3. Provide schematic control diagrams for all systems. Each diagram shall show locations of start-stop switches, insertion thermostats, room thermostats, thermometers, firestats, pressure gauges, automatic valves, and refrigeration accessories. Mark correct operating settings for each control instrument on these diagrams.
4. Provide diagram for electrical control system showing wiring of related electrical control items such as firestats, fuses, interlocks, electrical switches, and relays.
5. Provide drawing of each temperature control panel identifying components on panels and their function.

J. Maintenance Instructions shall include:
1. Manufacturer's maintenance instructions for each piece of mechanical equipment installed in Project. Instructions shall include name of vendor, installation instructions, parts numbers and lists, operation instructions of equipment, and maintenance and lubrication instructions.
2. Summary list of mechanical equipment requiring lubrication showing name of equipment, location, and type and frequency of lubrication.
3. List of mechanical equipment used, indicating name, model, serial number, and name plate data of each item together with number and name associated with each system item.

1.18 COMMISSIONING

A. General Requirements: The building’s systems shall be tested to ensure that control devices, components, equipment, and systems are calibrated, adjusted, and operate in accordance with the approved plans and specifications. This shall include the following:
1. Commissioning Plan
2. Systems Testing and Balancing
3. Controls Functional Performance Testing
4. Preliminary Commissioning Report
5. Post Construction Documentation
6. Final Commissioning Report

B. Commissioning Plan: A commissioning plan shall be developed by a registered design professional or approved agency and shall include at a minimum the following:
1. A detailed explanation of the design intent
2. Equipment and systems to be tested
3. Functions to be tested (for example, economizer control, discharge air temperature control, etc.)
4. Conditions under which the test shall be performed
5. Measurable criteria for acceptable performance

C. System Testing and Balancing: Provide testing and balancing as specified in Sections 230593 and 230595.

D. Controls Functional Performance Testing: Functional testing shall demonstrate the correct installation and operation of each component, system, and system to system intertie relationship in accordance with the plans and specifications. This demonstration is to prove operation, function, and maintenance serviceability for each of the commissioned systems. Testing shall include all modes of operation, including:
1. All modes as described in the sequence of operation
2. Performance of alarms
3. Mode of operation upon a loss of power and restored power
4. The HVAC control system shall be tested to ensure that control devices, components, equipment, and systems are calibrated, adjusted, and operate in accordance with the plans and specifications.

E. Preliminary Commissioning Report: The preliminary commissioning report, completed and certified by the registered design professional or approved agency, shall be provided to the Owner. The preliminary commissioning report shall include test procedures and results, and shall identify the following:
   1. Deficiencies found during testing which have not been corrected at the time of report preparation and the anticipated date of correction.
   2. Deferred tests which cannot be performed at the time of report preparation due to climatic conditions. Include the climatic conditions required for testing and the anticipated date of each deferred test.
   3. Record of progress and completion of operator training.

F. Post Construction Documentation: Provide Operation and Maintenance (O&M) data, as-built record drawings, final commissioning report, and test and balance report, as specified in this section, within 90 days of the date of receipt of the Certificate of Occupancy.

G. Final Commissioning Report: Provide a complete report of test procedures and results to the Engineer and the Owner. The report shall identify the following:
   1. Procedures and results of all functional performance tests
   2. Disposition of all deficiencies found during testing, including details of corrective measures used or proposed

H. The Contractor is responsible to submit to the code official a commissioning compliance checklist, Figure C408.1.2.1 of the WSEC, signed by the building owner.

1.19 WARRANTY

A. All warranty information shall be submitted as part of the “Operation and Maintenance Manual for Mechanical Systems” in this section.

B. All warranties for mechanical and plumbing equipment shall start upon completion of commissioning.

1.20 AS-BUILT DRAWINGS

A. The Contractor shall maintain, in addition to coordination drawings, an as-built set of prints that clearly identify all deviations from the original design. The As-Built drawings shall be drafted per one of the following methods:
   1. Draft all revisions on a separate dark layer, on the coordination drawing set. The Contractor shall maintain a copy of the original coordination drawing set.
   2. Draft all revisions on the design drawings with a red color pencil.

B. This red lined set shall identify all drawing revisions including addenda items, change orders, and Contractor revisions.

C. Drawings shall show locations of all underground pipe and duct installed by this Contractor. Underground pipes and ducts shall be shown with cross section elevations. All pipe, raceway, manholes, or lines of other trades shall be included.

D. The Contractor shall update all references to specific products to indicate products actually installed on project. This shall include, but not be limited to, air handlers, heat pumps etc.
   1. Upon completion of the Division 22 and 23 Work, the Contractor shall deliver the red lined drawings and one set of neatly drafted as-built drawings on electronic media in ACAD 2015 format and PDF files to the Engineer for transmittal through the Engineer to the Owner.

PART 2 PRODUCTS

2.01 APPROVED MANUFACTURERS

A. Any reference to the specifications or on the drawings to any article, device, product, material, fixture, form, or type of construction by manufacturer, name, make, or catalog number shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition.

B. The manufacturers listed as Approved Manufacturers are approved to bid the project for the items indicated without obtaining prior approval. Other manufacturers desiring to bid the project require prior approval.

C. The listing of a manufacturer as an Approved Manufacturer does not necessarily mean that the products of that manufacturer are equal to those specified. The listing is only an indication of those manufacturers which may be capable of manufacturing, or have in the past manufactured, items equal to those specified, and is intended to aid the Contractor in identifying manufacturers.

D. Products provided by Approved Manufacturers shall be equal to or superior to the specified manufacturer's item in function, appearance, and quality, and shall fulfill all requirements of the plans and specifications. The Architect/Engineer shall be the final judge as to whether an item meets these requirements or not. If a manufacturer is not certain that his product meets these requirements or not, then the manufacturer shall submit data as required to obtain the Design Consultant's approval prior to bid opening.

E. The approval of a manufacturer applies to the manufacturer only and does not relieve the Contractor from the responsibility of meeting all applicable requirements of the plans and specifications.

F. Contractor shall be responsible for all costs to other trades and all revisions required in accommodating any products which are different from those specified or shown.

G. In reviewing a manufacturer for acceptance, factors considered include the following: engineering data showing item's performance, proper local representation of manufacturer, likelihood of future manufacturer's local support of product, service availability, previous installation, previous use by Owner/Engineer/Architect, and record, product quality, availability/quality of maintenance and operation data, capacity/performance compared to specified items, acoustics, items, geometry/access utility needs, and similar concerns.

H. If approval is received to use other than specified items, responsibility for specified capacities and ensuring that items to be furnished will fit space available lies with this Division.

I. If non-specified equipment is used and it will not fit job site conditions, this Division assumes responsibility for replacement with items named in Specification.

2.02 ACCESS DOORS

A. This Contractor shall be responsible for furnishing and installing flush mounted access doors in walls, ceilings, floors, and chases where the following equipment is concealed and is not accessible through same.
   1. Valves (shut off, balancing, control, trap primers, etc.)
   2. Dampers (control, balancing, fire, smoke, etc.)

B. Doors shall be UL listed 20 ga. cold rolled steel with concealed hinge, screwdriver operated lock and prime coated. Furnish suitable for area mounted. Provide stainless steel access doors for non-painted surfaces (i.e. tile, MDF).

C. Approved Manufacturers:
   1. Milcor
   2. Acudor
   3. Greenheck
   4. Nystrom
   5. Duro Dyne

PART 3 EXECUTION

3.01 WORKMANSHIP

A. This Contractor shall provide completed systems with a neat and finished appearance. If, in the judgment of the Engineer, any portion of the work has not been performed in a workmanlike manner or is left in a rough, unfinished state, this Contractor will be required to remove, reinstall, or replace same and patch and paint surrounding surfaces in a manner acceptable to the Engineer, without increase in cost to the Owner.

3.02 FINAL INSPECTION

A. Final Inspection:
   1. Prior to acceptance of the mechanical work, the Contractor shall put all mechanical systems into operation for a period of not less than 5 working days so that they may be inspected by the Architect/Engineer and the Owner's representatives.
   2. The time of the final inspection shall be mutually agreed to by the Owner, Engineer, and Contractor.
   3. The Contractor shall furnish adequate staff to operate the mechanical systems during inspection.

3.03 OPERATION AND MAINTENANCE TRAINING

A. Upon completion of the work, and after all tests and final inspection of the work by the Authority(s) having jurisdiction, the Contractor shall demonstrate and instruct the Owner's designated operation and maintenance personnel in the operation and maintenance of the various mechanical systems. The Contractor shall arrange scheduled instruction periods with the Owner. The Contractor's representatives shall be Superintendents or Foremen knowledgeable in each system and Supplier's Representative when so specified.

B. Scheduled instruction periods shall be:
   1. HVAC System Controls 16 Hours
   2. HVAC Equipment Maintenance 8 Hours
   3. Plumbing Equipment 4 Hours

C. The contractor shall, at a minimum, include an Owner Training sign-in sheet in the O&M Manual that indicates the start and end times of the training and the type of training provided. Owner shall sign off on the Owner training sign-in sheet to be considered complete and satisfactory to Owner.

D. Costs for time involved by Contractor shall be included in the bid.

3.04 CLOSEOUT SUBMITTALS

A. Requirements: Final approval of mechanical installation will be recommended upon completion of the following:
   1. Completion of all punchlist items
   2. Owner Training Sign-In sheet with Owner's signature
   3. Permit Submittal
   4. Valve Diagrams
   5. Reproducible As-Built drawings delivered to Architect
   6. Air Balance Report
   7. Asbestos Free Statement
   8. Guarantees
   9. Equipment Manufacturer of all HVAC compressor units shall provide start-up logs
   10. EMCS Trend Logs

3.05 PREPARATION

A. New Buildings: Each Section of this Division shall bear expense of cutting, patching, repairing, and replacing of work of other Sections required because of its fault, error, tardiness, or because of damage done by it.

B. Existing Buildings:

1. Cut carefully to minimize necessity for repairs to existing work. Do not cut beams, columns, or trusses.
2. Patch and repair walls, floors, ceilings, and roofs with materials of same quality and appearance as adjacent surfaces unless otherwise shown. Surface finishes by General Contractor.
3. Cutting, patching, repairing, and replacing pavements, sidewalks, roads, and curbs to permit installation of work of this Division is responsibility of Section installing work.
4. This work shall be scheduled such that utility services and/or existing systems for the facility are not interrupted during normal operating hours, without prior written permission of the Owner's representative. Work that is performed during normal operational hours shall not interfere with the normal function of the facility's daily operation.
5. The Mechanical Contractor shall be responsible for the removal of all existing mechanical equipment and utilities indicated to be removed on the drawings. The Mechanical Contractor shall also be responsible for the removal and reinstallation of all existing mechanical equipment and utilities that will interfere with installation and operation of any new construction indicated or required and shall be responsible for the removal of all existing mechanical equipment and utilities indicated to be abandoned that will interfere with installation and operation of any new construction indicated or required. All mechanical equipment (other than piping) to be removed shall remain the property of the Owner, and shall be transported, stored, or disposed of, as directed by the Owner. This will be at no cost to the Owner.

3.06 INSTALLATION

A. Install mechanical equipment to permit easy access for normal maintenance, and so that parts requiring periodic replacement or maintenance, (e.g., coils, heat exchanger bundles, sheaves, filters, motors, bearings, etc.) can be removed. Relocate items which interfere with access.

B. Provide access doors in equipment, ducts, and walls/ceilings as required to allow for inspection and proper maintenance.

C. Valves, damper operators, and other devices which are manually adjusted or operated shall be located so as to be easily accessible by a person standing on the floor. Any such items which are not in the open shall be made accessible through access openings in the building construction.

D. Gauges, thermometers, instrumentation, and other components which are installed to monitor equipment performance, operating conditions, etc., shall be oriented so as to be easily read by a person standing on the floor. Provide necessary brackets and hangers as needed.

E. If circumstances at a particular location make the accessible installation of an item difficult or inconvenient, the situation shall be discussed with the Architect/Engineer before installing the item in a poor access location.

F. Belts, pulleys, couplings, projecting set screws, keys, and other rotating parts which may pose a danger to personnel, shall be fully enclosed or guarded in accordance with OSHA regulations.

G. Dissimilar Metals: Provide separations between all dissimilar metals. Where not specified in another way, use 10 mil black plastic tape wrapped at point of contact or plastic centering inserts.

H. Provide offsets around all electrical panels (and similar electrical equipment) to maintain space clear above and below panel to structure and clearance of 3.5 feet directly in front of panel, except where indicated otherwise or required by NEC to be more. Such offsets are typically not shown on the drawings, but are required per this paragraph.

I. Piping Through Framing: Piping through framing shall be installed in the approximate center of the member. Where located such that nails or screws are likely to damage the pipe, a steel plate at least 1/16-inch thick shall be installed to provide protection. At metal framing, wrap piping to prevent contact of dissimilar metals. At metal and wood framing, provide plastic pipe insulators at piping penetrations through framing nearest each fixture and on at least 48-inch centers.

J. Safety Protection: All ductwork, piping, and related items installed by this Contractor that present a safety hazard (i.e., items installed at/near head height, items projecting into maintenance access paths, etc.) shall be covered (at hazardous area) with 3/4" thick elastomeric insulation and 2" wide reflective red/white striped self-sticking safety tape.

K. Equipment Access: Access to equipment is of utmost importance. Contractor shall apply extra attention to the laying out of pipe and duct routings, and in coordinating all work. Poor access to equipment will not be accepted. Contractor shall note that in essentially all areas, piping routed in ceiling space needs to run in joist space, necessitating elbows/fittings/transitions at crosses with other trades, at structural beams, and at all connections to mains and branches. Hatched areas at HVAC units indicate equipment access areas. These (and all other) access areas shall be clear of obstructions. The Mechanical Contractor is responsible to coordinate and ensure that all trades stay clear of access areas for any Division 22 and 23 furnished equipment.

L. Ensure that items to be furnished fit space available. Make necessary field measurements to ascertain space requirements including those for connections and furnish and install equipment of size and shape so final installation shall suit true intent and meaning of Contract Documents.

M. Pipe Installation: Install piping in longest reasonable lengths. The use of short lengths of pipe with multiple couplings where a single length of pipe could have been used is not acceptable.

3.07 CONCRETE BASES

A. Provide a 3-inch high "minimum" concrete base under boilers, hot water tanks, and floor-mounted pumps located in mechanical/utilities spaces. Provide 6" thick structural concrete pad for equipment located outside the building or as detailed on drawings.

3.08 ADJUSTMENT AND CLEANING

A. Properly lubricate equipment before Owner's acceptance.

B. Clean exposed piping, ductwork, equipment, and fixtures, remove debris from site. Repair all damaged finishes and leave everything in working order.

C. Remove stickers from fixtures and adjust flush valves.

3.09 PAINTING

A. Paint all exposed pieces of equipment if not factory finished or painted under the Architectural Section of these specifications. Paint shall be one coat primer and two coats enamel color as directed by the Architect.

3.10 REBATES

A. Furnish vendor invoices on heat pumps to Owner after installation for power company rebates.

3.11 REQUESTS FOR INFORMATION (RFI)

A. It is our intent to provide a timely response for RFIs regarding Division 22 and 23 Work. To further expedite this process, if a suggestion can be determined or derived at by the initiator of the RFI, it is required this suggestion be supplied with the submitted RFI. If no suggestion is given where one is possible, the RFI will be returned as incomplete. RFI’s will be returned to the Contractor within seven (7) business days from the time received by the Architect/Engineer Representative.

END OF SECTION 200000

SECTION 220300
EXCAVATION AND BACKFILL FOR MECHANICAL UNDERGROUND UTILITIES

PART 1 GENERAL

1.01 GENERAL INCLUDES

A. Excavation and Associated Grading

B. Trenching and Trench Protection

C. Backfilling and Compaction

D. Verification of Existing Utilities

E. Protection of Utilities

1.02 RELATED SECTIONS

A. Section 221005 - Plumbing Piping

1.03 QUALITY ASSURANCE

A. Inspection of Job Conditions: Prior to starting work and during work, the installer shall examine the work by others, site and job conditions under which excavation, trenching, and backfilling for underground utilities work will be performed, and notify the General Contractor in writing of unsatisfactory conditions or work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

B. Codes and Standards: Comply with requirements of the following codes and standards (Latest Edition) except as modified herein:
   1. International Conference of Building Officials, "Uniform Building Code"
   2. Local requirements for all utility work
   3. OSHA and WISHA regulations
   4. APWA Standard Specifications

1.04 RESPONSIBILITY

A. The Contractor is solely responsible for compliance with the requirements of the drawings, specifications, local codes and standards, proper construction coordination with work of other trades, and protection and worker's safety. Contractor shall advise Design Consultant of any discrepancy in, or disagreement with the specifications and/or drawings prior to starting work and not proceed until issue is resolved. Commencement of work shall indicate Contractor's acknowledgement of his expertise in this type of work. Any delay resulting from failure to comply with this procedure will not be basis for an extension of the completion date.

1.05 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced.

B. American Society of Testing and materials (ASTM) publications:

1.	D 422-63	Particle Size Analysis of Soils
2.	D 423-66	Liquid Limit of Soils
3.	D 424-59	Plastic Limit and Plasticity Index of Soils
4.	D 1557-78	Moisture Density Relations of Soils using a 10 lb. (4.54kg) Rammer and 18-inch (457 mm) Drop
5.	D 2167-66	Density of Soil In-Place by the Rubber Balloon Method
6.	D 2217-66	Wet preparation of Soil Samples for Particle-Size Analysis and Determination of Soil Contents
7.	D 2487-69	Classification of Soils for Engineering Purposes
8.	D 2922-81	Test Methods for Density of Soil and Soil-Aggregate In Place by Nuclear Methods (Shallow Depth)
9.	E 548-79	Generic Criteria for Use in the Evaluation of Testing and Inspection Agencies

1.06 OPERATION AND MAINTENANCE REQUIREMENTS OF THIS SECTION

A. Not Applicable

PART 2 MATERIALS

2.01 APPROVED MANUFACTURERS

A. Not applicable

2.02 SATISFACTORY MATERIALS

A. Materials classified as ASTM D2487, Unified Soil Classification System as SW, SP, GW, and GP are satisfactory for backfill use. Materials classified as SP-SM, GP-GM, GM, GC, and ML are also satisfactory for backfill use provided that they contain moisture contents suitable for the intended use and are reasonably free of organic matter. Native material, not considered unsatisfactory as specified below, may comply, except that no material shall have any object with a dimension exceeding 2 inches.

2.03 UNSATISFACTORY MATERIALS

A. Materials classified in ASTM D2487, Unified Soil Classification System as PT, OH, and OL are unsatisfactory. Unsatisfactory materials also include man-made fills, refuse and all materials containing excessive organic matter or having moisture contents which are not suitable for the intended use, or having objects with dimensions exceeding 2 inches (boulders, etc.).

2.04 UNSTABLE MATERIAL

A. Unstable material shall consist of material too wet to properly support the utility pipe, conduit or appurtenance structure.

2.05 GRAVELLY SAND BORROW MATERIAL

A. Gravelly sand borrow material to provide backfill, or replace unsuitable soil, shall meet the requirements of SW, SP, GW, and GP materials, except that the maximum percentage passing the No. 200 sieve shall not exceed 5% based on the soil fraction passing the U.S. No. 4 sieve, and not contain discrete particles greater than 2 inches in diameter.

2.06 DEGREE OF COMPACTION

A. Degree of compaction shall be expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D1557, Method C. Minimum compaction requirements shall be as specified in PART 3.

2.07 DRAINAGE GRAVEL

A. Shall be 3/4-inch washed gravel with no more than 2% passing 1/2-inch sieve opening

2.08 SPECIAL BEDDING AND INITIAL BACKFILL MATERIAL

A. Minus 3/8-inch washed pea gravel

Unified Soil Classification (USC) System (from ASTM D 2487)				
Major Divisions			**Group Symbol**	**Typical Names**
Course-Grained Soils More than 50% retained on the No. 200 sieve	**Gravels** 50% or more of course fraction retained on the No. 4 sieve	Clean Gravels	GW	Well-graded gravels and gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines
		Gravels with Fines	GM	Silty gravels, gravel-sand-silt mixtures
			GC	Clayey gravels, gravel-sand-clay mixtures

Unified Soil Classification (USC) System (from ASTM D 2487)				
Major Divisions			**Group Symbol**	**Typical Names**
	Sands 50% or more of course fraction passes the No. 4 sieve	Clean Sands	SW	Well-graded sands and gravelly sands, little or no fines
			SP	Poorly graded sands and gravelly sands, little or no fines
		Sands with Fines	SM	Silty sands, sand-silt mixtures
			SC	Clayey sands, sand-clay mixtures
Fine-Grained Soils More than 50% passes the No. 200 sieve	**Silts and Clays** Liquid Limit 50% or less		ML	Inorganic silts, very fine sands, rock four, silty or clayey fine sands
			CL	Inorganic clays of low to medium plasticity, gravelly/sandy/silty/lean clays
			OL	Organic silts and organic silty clays of low plasticity
	Silts and Clays Liquid Limit greater than 50%		MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts
			CH	Inorganic clays or high plasticity, fat clays
			OH	Organic clays of medium to high plasticity
Highly Organic Soils			PT	Peat, muck, and other highly organic soils

Prefix: G = Gravel, S = Sand, M = Silt, C = Clay, O = Organic Suffix: W = Well Graded, P = Poorly Graded, M = Silty, L = Clay, LL < 50%, H = Clay, LL > 50%

PART 3 EXECUTION

3.01 EXCAVATION

A. If workers enter any trench or other excavation four or more feet in depth that does not meet the open pit requirements of WSDOT Section 2.09.3(3)B, it shall be shored and cribbed. The Contractor alone shall be responsible for worker safety. All trench safety systems shall meet the requirements of the Washington Industrial Safety and Health Act, Chapter 49.17 RCW.

B. Excavation of every description and of whatever substances encountered shall be performed to allow the installation of all utilities at the lines and grades as required. During excavation, material satisfactory for backfilling shall be stockpiled in an orderly manner at a distance from the banks of the trench sufficient to avoid overloading and to prevent slides or cave-ins. Adequate drainage shall be provided for the stockpiles and surrounding areas by means of ditches, dikes, or other approved methods. The stockpiles shall also be protected from contamination with unsatisfactory excavated material or other material that may destroy the quality and fitness of the suitable stockpiled material.

C. If the Contractor fails to protect the stockpiles and any material becomes unsatisfactory as a result, such material shall be removed and replaced with satisfactory on-site or imported material from approved sources at no additional cost to the Owner.

D. Excavated material not required or not satisfactory for backfill shall be removed from the site and shall be disposed of off site, at the Contractor's expense, at the Contractor's waste area. Any excess satisfactory excavated materials shall not be mixed with unsatisfactory materials. Unsatisfactory materials shall not cover available suitable materials, or be disposed of in such a manner as to interfere with subsequent borrow operations.

E. Grading shall be done as may be necessary to prevent surface water from flowing into the excavation, and any water accumulating therein shall be removed so that the stability of the bottom and sides of the excavation is maintained. Unauthorized over-excavation shall be backfilled in accordance with paragraph 3.05 BACKFILLIING at no additional cost to the Owner.

F. The Contractor shall provide any dewatering needed and is considered incidental to the Contract.

3.02 TRENCH EXCAVATION

A. The trench shall be excavated as recommended by the manufacturer of the pipe to be installed unless shown otherwise on the drawings. Where recommended trench widths are exceeded, redesign shall be performed by the Contractor using stronger pipe or special installation procedures. The cost of this redesign and the increased pipe or installation procedures shall be borne by the Contractor without additional cost to the Owner.

B. Bottom Preparation: The bottoms of trenches shall be accurately graded to provide uniform bearing and support for the bottom quadrant of each section of the pipe and for bedding. Bell holes shall be excavated to the necessary size at each joint or coupling to eliminate point bearing. Stones of 2 inches or greater in any dimension, or as recommended by the pipe manufacturer, whichever is smaller, shall be removed to avoid point bearing.

C. Removal of Unsuitable Material: Where unsuitable material is encountered in the bottom of the trench, such material shall be removed to the depth directed and replaced to the proper grade with select granular material as provided in paragraph 3.05 BACKFILLING. When removal of unsuitable material is required due to the fault or neglect of the Contractor in his performance of the work, the resulting material shall be excavated and replaced by the Contractor without additional cost to the Owner.

D. Bedding: The bedding surface for the pipe shall provide a firm foundation of uniform density throughout the entire length of the pipe. The pipe shall be bedded carefully in a soil foundation accurately shaped and rounded to conform to the lowest one-fourth of the outside portion of circular pipe or to the lower curved portion of pipe arch for the entire length of pipe or arch. When necessary, the bedding shall be taped. Bell holes and depressions for joints shall be only of such length, depth, and width as required for properly making the particular type joint. Provide bedding using pea gravel where noted on the drawings.

3.03 EXCAVATION FOR APPURTENANCES

A. Excavation for manholes, catch basins, inlets, or similar structures below ground shall be sufficient to leave at least 12 inches clear between the outer structure surfaces and the face of the excavation or support members. When concrete or masonry is to be placed in an excavated area, special care shall be taken not to disturb the bottom of the excavation. Excavation to the final grade level shall not be made until just before the concrete or masonry is to be placed.

3.04 JACKING, BORING, AND TUNNELING

A. Unless otherwise indicated, excavation shall be by open cut, except that sections of a trench may be jacked, bored, or tunneled if the pipe, cable or duct can be safely and properly installed and backfill can be properly tamped in such sections.

3.05 BACKFILLING

A. Backfill material shall be compacted to 6" layers and as specified in Paragraph 3.07.
   1. Trench Backfill: Trenches shall be backfilled to finish grade. The trench shall be backfilled to above the top of pipe prior to performing the required pressure tests (except that where piping requires insulation, the pipe shall have an initial test prior to insulating and then a final test as specified herein). The joints and couplings shall be left uncovered during the pressure test.

2. Replacement of Unstable Material: Unstable material removed from the bottom of the trench of excavation shall be replaced with select granular material or gravel borrow placed in layers not exceeding 6 inches loose thickness.
3. Bedding and Initial Backfill: Bedding shall consist of satisfactory materials. Initial backfill shall be in 6-inch lift.

3.06 SPECIAL REQUIREMENTS

A. Special requirements for excavation, backfill, and bedding relating to the specific utilities are as follows:
   1. Domestic Water Lines: Trenches shall be of a depth to provide a minimum cover of 3.0 feet from the existing ground surface, or from the indicated finished grade, whichever is lower, to the top of the pipe. Except that branch lines serving individual fixtures within building footprint shall have minimum of 1.0-foot cover. Bedding shall use "special bedding" materials as specified in paragraph 2.07.
   2. Backflow Preventer Fire Vault: Provide special bedding as specified in this Section.
   3. Where piping passes under footings, provide concrete fill starting 12 inches above pipe for excavated length and width of footing above pipe for footing support. Concrete specification shall match same provided for footing.

3.07 COMPACTION

A. Each layer of fill, or the excavated subgrade, shall be compacted to at least 95%, per ASTM D1557, of laboratory maximum density. Compaction shall be accomplished by approved tamping rollers, pneumatic-tired rollers, three-wheel power rollers, or other approved compaction equipment.

3.08 PROTECTION

A. Newly graded excavated or bedded areas shall be protected from traffic and from erosion, and any settlement or washing away that may occur from any cause, prior to acceptance, shall be repaired and grades reestablished to the required elevations and slopes.

END OF SECTION 220300

SECTION 220513
COMMON MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General construction and requirements

B. Single phase electric motors

C. Three phase electric motors

D. Electronically Commutated Motors (ECM)

1.02 RELATED REQUIREMENTS

A. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections

B. Section 262913 - Enclosed Controllers

1.03 REFERENCE STANDARDS

A. IEEE 112 - IEEE Standard Test Procedure for Polyphase Induction Motors and Generators; 2004

B. NEMA MG 1 - Motors and Generators; 2017

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements

1.04 SUBMITTALS

A. Product Data: Provide wiring diagrams with electrical characteristics and connection requirements.

B. Manufacturer's Installation Instructions: Indicate setting, mechanical connections, lubrication, and wiring instructions.

C. Operation Data: Include instructions for safe operating procedures.

D. Maintenance Data: Include assembly drawings, bearing data including replacement sizes, and lubrication instructions.

1.05 QUALITY ASSURANCE

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

B. All motors shall be UL listed.

C. Motors shall not be smaller than indicated on drawings; however, motors shall be of adequate size to drive the respective equipment when handling the quantities specified without exceeding the nameplate full load current at any conditions encountered in actual operation. If it becomes evident that a motor furnished is too small to meet these requirements as a result of the Contractor using substituted equipment or having revised the system arrangement, the Contractor shall replace it with a motor of adequate size at no additional cost to the Owner. This Contractor shall also arrange with the Electrical Contractor to increase the size of the wiring, motor starter, and other accessories as required to serve the larger motor at no additional cost to the Owner.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weather-proof covering. For extended outdoor storage, remove motors from equipment and store separately.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Baldor Electric Company/ABB Group
B. Leeson Electric Corporation
C. General Electric
D. Westinghouse
E. Reliance
F. Allis-Chalmers
G. Gould
H. Century
I. Wagner
J. US Motors Marathon
K. Regal-Beloit Corporation (Century)

2.02 GENERAL CONSTRUCTION AND REQUIREMENTS

A. Electrical Service: Refer to Section 260583 for required electrical characteristics.
B. Nominal Efficiency:
   1. All motors 1 HP and larger shall be energy efficient type and shall meet the 2015 Washington State Energy Code requirements.
C. Construction:
   1. Open drip-proof type except where specifically noted otherwise.
   2. Motors located outdoors exposed to weather shall have corrosion resistant finish and shall be totally enclosed fan cooled (TEFC) or totally enclosed non-ventilated (TENV) type.
   3. Design for continuous operation in 104 degrees F environment.
   4. Design for temperature rise in accordance with NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.
D. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, and power factor.
E. Wiring Terminations:
   1. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.
   2. For fractional horsepower motors where connection is made directly, provide threaded conduit connection in end frame.

2.03 SINGLE PHASE POWER - SPLIT PHASE MOTORS

A. Starting Torque: Less than 150 percent of full load torque
B. Starting Current: Up to seven times full load current
C. Breakdown Torque: Approximately 200 percent of full load torque
D. Drip-proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA Service Factor, prelubricated sleeve or ball bearings
E. Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, prelubricated ball bearings

2.04 SINGLE PHASE POWER - PERMANENT-SPLIT CAPACITOR MOTORS

A. Starting Torque: Exceeding one fourth of full load torque
B. Starting Current: Up to six times full load current
C. Multiple Speed: Through tapped windings

D. Open Drip-proof or Enclosed Air Over Enclosure: Class A (50 degrees C temperature rise) insulation, minimum 1.0 Service Factor, prelubricated sleeve or ball bearings, automatic reset overload protector

2.05 SINGLE PHASE POWER - CAPACITOR START MOTORS

A. Starting Torque: Three times full load torque

B. Starting Current: Less than five times full load current

C. Pull-up Torque: Up to 350 percent of full load torque

D. Breakdown Torque: Approximately 250 percent of full load torque

E. Motors: Capacitor in series with starting winding; provide capacitor-start/capacitor-run motors with two capacitors in parallel with run capacitor remaining in circuit at operating speeds

F. Drip-proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA Service Factor, prelubricated sleeve bearings

G. Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, prelubricated ball bearings

2.06 ELECTRONICALLY COMMUTATED MOTORS (ECM)

A. Manufacturers:
   1. US Motors, a brand of NIDEC Motor Corporation

B. ECM shall conform to the motor requirements listed above. In addition, the Contractor purchasing the equipment that includes the ECM is responsible for ensuring the ECM motor speed control is set to match the required component operation. The ECM motor speed control may be preset by the equipment manufacturer. The Contractor purchasing the equipment shall provide documentation showing the appropriate ECM motor control board jumper pins, dip switches and/or multi-pin plugs settings for correct equipment component operation.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.

C. Check line voltage and phase and ensure agreement with nameplate.

END OF SECTION 220513

SECTION 220517
SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe sleeves

B. Pipe sleeve-seals

1.02 REFERENCE STANDARDS

A. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type); 2016

B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a (Reapproved 2017)

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures

B. Seals

1.04 QUALITY ASSURANCE

A. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

PART 2 PRODUCTS

2.01 PIPE SLEEVES

A. Vertical Piping:
   1. Sleeve Length: 1 inch above finished floor
   2. Provide sealant for watertight joint.
   3. Blocked Out Floor Openings: Provide 1-1/2-inch angle set in silicon adhesive around opening.
   4. Drilled Penetrations: Provide 1-1/2-inch angle ring or square set in silicone adhesive around penetration.

B. Sheet Metal: Pipe passing through interior walls, partitions, and floors, unless steel or brass sleeves are specified below.

C. Pipe Passing Through Below Grade Exterior Walls:
   1. Zinc coated or cast-iron pipe
   2. Provide watertight space with link rubber or modular seal between sleeve and pipe on both pipe ends.

D. Pipe Passing Through Concrete Beam Flanges, except where Brass Pipe Sleeves are Specified:
   1. Galvanized steel pipe or black iron pipe with asphalt coating.
   2. Connect sleeve with floor plate except in mechanical rooms.

E. Clearances:
   1. Provide allowance for insulated piping.
   2. Wall, Floor, Partitions, and Beam Flanges: 0.5 inch greater than external/pipe diameter.
   3. All Rated Openings: Caulked tight with fire stopping material complying with ASTM E814 in accordance with Section 078400 to prevent the spread of fire, smoke, and gases.

2.02 PIPE-SLEEVE SEALS

A. Manufacturers:
   1. Flexicraft Industries; PipeSeal
   2. GPT Thunderline; Link-Seal

B. Modular/Mechanical Seal:
   1. Provide watertight seal between pipe and wall/casing opening.

PART 3 EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and foreign material, from inside and outside, before assembly.

3.02 INSTALLATION

A. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

B. Install piping to conserve building space, to not interfere with use of space and other work.

C. Install piping and pipe sleeves to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

D. Structural Considerations:

E. Provide sleeves when penetrating footings, floors, walls, partitions, and similar elements. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
   1. Underground Piping: Caulk pipe sleeve watertight with mechanically expandable chloroprene inserts with bitumen sealed metal components.
   2. Aboveground Piping:
      a. Pack solid using mineral fiber complying with ASTM C592.
      b. Fill space with an elastomer caulk to a depth of 0.50 inch where penetrations occur between conditioned and unconditioned spaces.
   3. All Rated Openings: Caulk tight with fire stopping material conforming to ASTM E814 in accordance with Section 078400 to prevent the spread of fire, smoke, and gases.
   4. Caulk exterior wall sleeves watertight with mechanically expandable chloroprene inserts with mastic-sealed components.

F. Manufactured Sleeve-Seal Systems:
   1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.
   2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
   3. Locate piping in center of sleeve or penetration.
   4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
   5. Tighten bolting for a water-tight seal.
   6. Install in accordance with manufacturer's recommendations.

G. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, unions, and couplings for servicing are consistently provided.

H. Insulation shall run continuous through sleeves in non-fire rated elements. Insulation shall not run continuous through sleeves in fire rated elements unless the fire sealant system used is UL accepted for use with insulated pipes.

I. Do not place sleeves around soil, waste, vent, or roof drain lines passing through concrete floors on grade.

END OF SECTION 220517

SECTION 220523
GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Angle valves
B. Ball valves
C. Check valves
D. Gate valves
E. Globe valves
F. Lubricated plug valves
G. Thermostatic balancing valves
H. Balancing valves

1.02 RELATED REQUIREMENTS

A. Section 200000 - General Mechanical Requirements
B. Section 220548 - Vibration and Seismic Controls for Plumbing Piping and Equipment
C. Section 220553 - Identification for Plumbing Piping and Equipment
D. Section 220719 - Plumbing Piping Insulation
E. Section 221005 - Plumbing Piping

1.03 ABBREVIATIONS AND ACRONYMS

A. CWP: Cold working pressure
B. EPDM: Ethylene propylene copolymer rubber
C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber
D. NRS: Non-rising stem
E. OS&Y: Outside screw and yoke
F. PTFE: Polytetrafluoroethylene
G. RS: Rising stem
H. TFE: Tetrafluoroethylene
I. WOG: Water, oil, and gas

1.04 REFERENCE STANDARDS

A. ASME B1.20.1 - Pipe Threads, General Purpose (Inch); 2013
B. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2015
C. ASME B16.5 - Pipe Flanges and Flanged Fittings NPS 1/2 Through NPS 24 Metric/Inch Standard; 2017
D. ASME B16.10 - Face-to-Face and End-to-End Dimensions of Valves; 2017
E. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2012
F. ASME B16.34 - Valves - Flanged, Threaded and Welding End; 2017
G. ASME B31.9 - Building Services Piping; 2014
H. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing and Fusing Operators; 2017
I. ASTM A48/A48M - Standard Specification for Gray Iron Castings; 2003 (Reapproved 2016)
J. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings; 2004 (Reapproved 2014)

K. ASTM A536 - Standard Specification for Ductile Iron Castings; 1984 (Reapproved 2014)

L. ASTM B61 - Standard Specification for Steam or Valve Bronze Castings; 2015

M. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings; 2017

N. AWWA C606 - Grooved and Shouldered Joints; 2015

O. MSS SP-45 - Bypass and Drain Connections; 2003 (Reaffirmed 2008)

P. MSS SP-67 - Butterfly Valves; 2017

Q. MSS SP-70 - Cast Iron Gate Valves, Flanged and Threaded Ends; 2011

R. MSS SP-71 - Cast Iron Swing Check Valves, Flanged and Threaded Ends; 2011, with Errata (2013)

S. MSS SP-72 - Ball Valves with Flanged or Butt-Welding Ends for General Service; 2010a

T. MSS SP-78 - Cast Iron Plug Valves, Flanged and Threaded Ends; 2011

U. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves; 2013

V. MSS SP-85 - Cast Iron Globe & Angle Valves, Flanged and Threaded Ends; 2011

W. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010

X. MSS SP-125 - Gray Iron and Ductile Iron In-Line, Spring-Loaded, Center-Guided Check Valves; 2010

Y. NSF 61 - Drinking Water System Components - Health Effects; 2017

Z. NSF 372 - Drinking Water System Components - Lead Content; 2016

1.05 SUBMITTALS

A. Product Data: Provide data on valves including manufacturer's catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

B. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts listings.

C. Maintenance Materials: Furnish Owner with one wrench for every ten plug valves, in each size of square plug valve head.

1.06 QUALITY ASSURANCE

A. Manufacturer:
   1. Obtain valves for each valve type from single manufacturer.
   2. Company must specialize in manufacturing products specified in this section, with not less than three years of documented experience.

B. Welding Materials and Procedures: Conform to ASME BPVC-IX.

C. Domestic water fittings, joining materials, and all other appurtenances in contact with potable water shall be lead-free except those specifically exempted in Section 3874 of the Safe Water Drinking Act.
   1. Lead-free shall mean:
      a. Not containing more than 0.2% lead when used with respect to solder and flux; and
      b. Not more than a weighted average of 0.25% when used with respect to the wetted surfaces of pipes, pipe fittings, plumbing fittings, and fixtures

1.07 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:
   1. Minimize exposure of operable surfaces by setting plug and ball valves to open position.
   2. Protect valve parts exposed to piped medium against rust and corrosion.
   3. Protect valve piping connections such as grooves, weld ends, threads, and flange faces.
   4. Adjust globe, gate, and angle valves to the closed position to avoid clattering.
   5. Secure check valves in either the closed position or open position.

6. Adjust butterfly valves to closed or partially closed position.

B. Use the following precautions during storage:
   1. Maintain valve end protection and protect flanges and specialties from dirt.
      a. Provide temporary inlet and outlet caps.
      b. Maintain caps in place until installation.
   2. Store valves in shipping containers and maintain in place until installation.
      a. Store valves indoors in dry environment.
      b. Store valves off the ground in watertight enclosures when indoor storage is not an option.

C. Exercise the following precautions for handling:
   1. Handle large valves with sling, modified to avoid damage to exposed parts.
   2. Avoid the use of operating handles or stems as rigging or lifting points.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. See drawings for specific valve locations.

B. Listed pipe sizes shown using nominal pipe sizes (NPS) and nominal diameter (DN).

C. Provide the following valves for the applications if not indicated on drawings:
   1. Shutoff: Ball, gate
   2. Throttling: globe
   3. Swing Check (Pump Outlet):
      a. 2 NPS and Smaller: Bronze swing check valves with bronze or nonmetallic disc
      b. 2-1/2 NPS and Larger for Domestic Water: Iron swing check valves with closure control, metal or resilient seat check valves

D. Substitutions of valves with higher CWP classes or WSP ratings for same valve types are permitted when specified CWP ratings or WSP classes are not available.

E. Required Valve End Connections for Non-Wafer Types:
   1. Copper Tube:
      a. 2 inch and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below
      b. 2-1/2 inch to 4 inch: Grooved or flanged ends except where threaded valve-end option is indicated in valve schedules below
      c. 5 inch and Larger: Grooved or flanged ends

F. Domestic, Hot and Cold Water Valves:
   1. 2 NPS and Smaller:
      a. Ball: One piece, full port, bronze with bronze trim
      b. Bronze Swing Check: Class 125, bronze disc
      c. Bronze Gate: Class 125, NRS
      d. Bronze Globe: Class 125, bronze disc
   2. 2-1/2 NPS and Larger:
      a. Iron, 2-1/2 NPS to 4 NPS: Provide with threaded or flanged ends
      b. Iron Ball: Class 150
      c. Iron Single-Flange Butterfly: 200 CWP, EPDM seat, aluminum-bronze disc
      d. Iron Grooved-End Butterfly: 175 CWP
      e. Iron Swing Check: Class 125, metal seats
      f. Iron Swing Check with Closure Control: Class 125, lever and spring
      g. Iron Grooved-End Swing Check: 300 CWP
      h. Iron Center-Guided Check: Class 125, compact-wafer, metal seat
      i. Iron Plate-Type Check: Class 125; single plate; metal seat
      j. Iron Gate: Class 125, NRS
      k. Iron Globe: Class 125

2.02 GENERAL REQUIREMENTS

A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.

B. Valve Sizes: Match upstream piping unless otherwise indicated.

C. Valve Actuator Types:
   1. Handwheel: Valves other than quarter-turn types
   2. Hand Lever: Quarter-turn valves 6 NPS and smaller
   3. Wrench: Plug valves with square heads

D. Valves in Insulated Piping: With 2 NPS stem extensions and the following features:
   1. Gate Valves: Rising stem
   2. Ball Valves: Extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
   3. Butterfly Valves: Extended neck
   4. Memory Stops: Fully adjustable after insulation is installed

E. Valve-End Connections:
   1. Threaded End Valves: ASME B1.20.1
   2. Flanges on Iron Valves: ASME B16.1 for flanges on iron valves
   3. Pipe Flanges and Flanged Fittings 1/2 inch through 24 inches: ASME B16.5
   4. Solder Joint Connections: ASME B16.18
   5. Grooved End Connections: AWWA C606

F. General ASME Compliance:
   1. Ferrous Valve Dimensions and Design Criteria: ASME B16.10 and ASME B16.34
   2. Solder-joint Connections: ASME B16.18
   3. Building Services Piping Valves: ASME B31.9

G. Valve Materials for Potable Water: NSF 61 and NSF 372

H. Bronze Valves:

I. Valve Bypass and Drain Connections: MSS SP-45

J. Source Limitations: Obtain each valve type from a single manufacturer.

2.03 BRONZE, ANGLE VALVES

A. Class 125: CWP Rating: 200 psig:
   1. Comply with MSS SP-80, Type 1
   2. Body: Bronze; ASTM B62, with integral seat and screw in bonnet
   3. End Connections: Pipe thread
   4. Stem: Bronze
   5. Disc: Bronze
   6. Packing: Asbestos free
   7. Handwheel: Bronze or aluminum
   8. Manufacturers:
      a. Nibco
      b. Stockham
      c. Apollo
      d. McGuire
      e. Chicago Faucets

2.04 BRONZE, BALL VALVES

A. General:
   1. Fabricate from dezincification resistant material.
   2. Copper alloys containing more than 15 percent zinc are not permitted.

B. One Piece, Reduced Port with Bronze Trim:
   1. Comply with MSS SP-110
   2. WSP Rating: 400 psi
   3. CWP Rating: 600 psi
   4. Body: Bronze
   5. End Connections: Pipe press
   6. Seats: PTFE

C. Two Piece, Full Port with Stainless Steel Trim:
   1. Comply with MSS SP-110
   2. WSP Rating: 150 psi
   3. WOG Rating: 600 psi
   4. Body: Forged bronze or dezincified-brass alloy
   5. Ends Connections: Pipe thread or solder
   6. Seats: PTFE or TFE
   7. Stem: Bronze, blowout proof
   8. Ball: Stainless steel, vented
   9. Manufacturers:
      a. Nibco
      b. Stockham
      c. Apollo
      d. Jomar

D. Three Piece, Full Port with Stainless Steel Trim:
   1. Comply with MSS SP-110
   2. WSP Rating: 150 psi
   3. CWP Rating: 600 psi
   4. Body: Bronze
   5. End Connections: Pipe thread or press
   6. Seats: PTFE or TFE
   7. Stem: Stainless steel
   8. Ball: Stainless steel, vented
   9. Manufacturers:
      a. Nibco
      b. Stockham
      c. Apollo
      d. Jomar

2.05 STAINLESS STEEL, BALL VALVES

A. Two Piece, Full Port with Stainless Steel Trim:
   1. Comply with MSS SP-110
   2. WSP Rating: 150 psi
   3. CWP Rating: 2,000 psi
   4. Seats: PFTE
   5. Stem: Stainless steel, blowout proof
   6. Ball: Stainless steel, vented
   7. Manufacturers:
      a. Nibco
      b. Stockham
      c. Apollo

B. Three Piece, Full Port with Stainless Steel Trim:
   1. Comply with MSS SP-110
   2. WSP Rating: 150 psi
   3. WOG Rating: 2,000 psi

4. Seats: PFTE
5. Stem: Stainless steel, blowout proof
6. Ball: Stainless steel, vented
7. Bolts: Stainless steel
8. Manufacturers:
    a. Nibco
    b. Stockham
    c. Apollo

2.06 BRONZE, LIFT CHECK VALVES

A. General:
1. Fabricate from dezincification resistant material.
2. Copper alloys containing more than 15 percent zinc are not permitted.

B. Class 125:
1. Comply with MSS SP-80, Type 1, Metal Disc to Metal Seat and Type 2, Nonmetallic Disc to Metal Seat.
2. CWP Rating: 200 psi
3. Design: Vertical flow
4. Body: Comply with ASTM B61 or ASTM B62, bronze
5. End Connections: Threaded
6. Disc (Type 1): Bronze
7. Manufacturers:
    a. Nibco
    b. Stockham
    c. Apollo

2.07 BRONZE, SWING CHECK VALVES

A. General:
1. Fabricate from dezincification resistant material.
2. Copper alloys containing more than 15 percent zinc are not permitted.

B. Class 125: CWP Rating: 200 psig (1380 kPa).
1. Pressure and Temperature Rating: MSS SP-80, Type 3
2. Design: Y-pattern, horizontal or vertical flow
3. Body: Bronze, ASTM B62
4. End Connections: Threaded
5. Disc: Bronze
6. Manufacturers:
    a. Nibco
    b. Stockham
    c. Apollo

2.08 BRONZE, GATE VALVES

A. General:
1. Fabricate from dezincification resistant material.
2. Copper alloys containing more than 15 percent zinc are not permitted.

B. Non-Rising Stem (NRS):
1. Class 125: CWP Rating: 200 psig
2. Ends: Threaded or solder joint
3. Manufacturers:
    a. Nibco
    b. Stockham
    c. Apollo

2.09 BRONZE, GLOBE VALVES

A. General:
   1. Fabricate from dezincification resistant material.
   2. Copper alloys containing more than 15 percent zinc are not permitted.

B. Class 125: CWP Rating: 200 psig:
   1. Disc: PTFE.
   2. Manufacturers:
      a. Nibco
      b. Stockham
      c. Apollo

2.10 LUBRICATED PLUG VALVES

A. Regular Gland and Cylindrical with Flanged Ends:
   1. Comply with MSS SP-78, Type II
   2. Class 125: CWP Rating: 200 psi
   3. Body: ASTM A48/A48M or ASTM A126, cast iron with lubrication sealing system
   4. Pattern: Regular or short
   5. Plug: Cast iron or bronze with sealant groove.
   6. Manufacturers:
      a. Nibco
      b. Stockham
      c. Apollo

2.11 THERMOSTATIC BALANCING VALVES

A. Furnish and install as indicated on the plans, an automatic balancing valve in the domestic hot water piping. Balancing valve shall be self-contained and fully automatic without additional piping or control mechanisms.
   1. Balancing Valve shall regulate the flow of recirculated domestic hot water based on water temperature entering valve, regardless of system operating pressure.
      a. When fully closed, balancing valve shall bypass a minimum flow to maintain dynamic control of the recirculating loop, and provide a means for system sanitizing.
      b. Balancing valve shall be factory set to 110°F.
         1) Balancing valve shall modulate between open and closed position within a 10°F range.
      c. Balancing valve shall be available in sizes ranging from ½” NPT to 2” NPT to match pipe size on plans.

B. Balancing valve body and all internal components shall be constructed of stainless steel with major components constructed of stainless steel or EPDM.
   1. Balancing valve sizes ½” through 2” shall be rated to 200 PSIG maximum working pressure.
      a. All balancing valves shall be standard tapered female pipe thread, NPT.
   2. All balancing valves shall be rated to 300°F maximum working temperature.
   3. Balancing valves shall be ANSI/AWWA C800 compliant.
   4. Thermal actuator shall be spring operated and self-cleaning, delivering closing thrust sufficient to keep orifice opening free of scale deposits.
      a. Thermal actuator shall be rated for a minimum of 200,000 cycles.

C. Provide valve with a union and isolation ball valves.

D. Manufacturers:
   1. Circuit Solver model CSUA by ThermOmegaTech
   2. Acorn
   3. Bell and Gossett

2.12 BALANCING VALVES

A. Each valve shall have two ¼" NPT brass metering ports with Nordel check valves and gasketed caps located on both sides of valve seat. Two additional ¼" NPT connections with brass plugs are to be provided on the opposite side of the metering ports for use as drain connections. Drain connections and metering ports are to be interchangeable to allow for measurement flexibility when valves are installed in tight locations.

B. Valves are to be of the "Y" pattern, modified, equal percentage globe style, and provide three functions:
   1. Precise flow measurement
   2. Precision flow balancing
   3. Positive drip tight shut off

C. Valves shall provide multi-turn, 360° adjustable with a micrometer type indicator located on valve handwheel. Valve handwheel shall have a memory feature, which will provide a means for locking the valve position after the system is balanced. 90° turn adjustable valves are not acceptable.

D. Valve Sizes ½" - 2": Valve body shall be bronze with ultra-high strength engineered resin or stainless-steel plug. The plug shall have precision-contoured channels to distribute flow uniformly across valve seat. Low-lead brass stem and high strength resin handwheel and sleeve. Valves shall have a minimum of four full 360° handwheel turns.

E. Single Turn Mini Sweat Size (1/2" to 3/4"):
   1. Valve shall be globe style design with bronze body, solder end connection, bronze trim with EPDM plug, high strength resin handwheel with valve position locking inserts, and two ¼" NPT brass metering ports with Nordel check valves and gasketed caps located on both sides of the valve seat.
   2. Valve shall provide three functions:
      a. Precision flow measurement
      b. Precision flow balancing
      c. Positive drip tight shut-off
   3. Valve shall provide 360° single turn adjustment range with indicating scale on valve handwheel.
   4. The valve shall be installed with flow in the direction of the arrow on the valve body and installed at least five pipe diameters downstream from any fitting, and at least ten pipe diameters downstream from any pump, with two pipe diameters downstream from the valve free of any fittings. When installed, easy unobstructed access to the valve handwheel and metering ports for adjustment and measurements shall be provided. Mounting of valve in piping must prevent sediment build-up in metering ports.

F. Insulation (1/2" to 2"):
   1. Each valve shall be furnished with a pre-formed removable PVC insulation jacket to meet ASTM D 1784/class 14253-C, MEA#7-87, ASTM-E-84 and ASTM-136 with a flame spread rating of 50 or less. There will be provided sufficient mineral fiberglass insulation to meet ASHRAE 90.1-1989 specifications in operating conditions with maximum Fluid Design Operating Temperature Range of 141-200°F and Mean Rating Temperature of 125°F.

G. Manufacturers:
   1. Red-White Valve

PART 3 EXECUTION

3.01 EXAMINATION

A. Discard all packing materials and verify that valve interior, including threads and flanges is completely clean without signs of damage or degradation that could result in leakage.

B. Verify valve parts to be fully operational in all positions from closed to fully open.

C. Confirm gasket material to be suitable for the service, to be of correct size, and without defects that could compromise effectiveness.

D. Should valve be determined to be defective, replace with new valve.

3.02 INSTALLATION

A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.

B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.

C. Install check valves where necessary to maintain direction of flow as follows:
   1. Lift Check: Install with stem plumb and vertical.
   2. Swing Check: Install horizontal maintaining hinge pin level.
   3. Orient plate-type and center-guided into horizontal or vertical position, between flanges.

3.03 INSTALLATION OF THERMOSTATIC BALANCING VALVES

A. Install Thermostatic Balancing Valves in each domestic hot water return piping branch beyond last hot water device on that branch.

END OF SECTION 220523

SECTION 220548
VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 GENERAL REQUIREMENTS

A. Seismic Restraints shall be bidder-designed. Seismic Design Criteria are to be established per the International Building Code and ASCE along with Project Structural drawings.

B. Items not included in this specification shall not relieve the contractor of the responsibility of providing seismic bracing that meets all the criteria required by the referenced codes and in accordance with the seismic design guidelines and the project structural drawings.

1.02 SECTION INCLUDES

A. Vibration-isolated equipment support bases

B. Vibration isolators

C. External seismic snubber assemblies

D. Seismic restraint systems

E. Vibration-isolated and/or seismically engineered roof curbs

1.03 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete

1.04 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; 2016

B. ASCE 19 - Structural Applications of Steel Cables for Buildings; 2016

C. MFMA-4 - Metal Framing Standards Publication; 2004

D. ICC (IBC) - International Building Code; 2018

E. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems; 2008

F. Applicable Project Structural Drawings for Seismic Design Criteria

G. Applicable Manufacturer's Seismic Design Guides for Proprietary listed seismic braces and mounting hardware

1.05 SEISMIC DESIGN CRITERIA

A. Occupancy Category of Structure (I-IV) per ICC (IBC) or ASCE 7

B. Component Importance Factor (Ip) per ASCE 7

C. Mapped Acceleration Parameters (S1 and (Ss) per ICC (IBC) and Project Structural Drawings

D. Site Class (A - F) per ICC (IBC) and Project Structural Drawings

E. Site Coefficient (Fa) per ICC (IBC) and Project Structural Drawings

F. Site Coefficient (Fv) per ICC (IBC) and Project Structural Drawings

G. Seismic Design Category (A - D) based on Short Period Response Accelerations per ICC (IBC) and Project Structural Drawings

H. Seismic Design Category (A - D) based on 1-Second Period Response Acceleration per ICC (IBC) and Project Structural Drawings

I. Amplification Factor ap per ASCE 7

J. Response Modification Factor Rp per ASCE 7

1.06 SUBMITTALS

A. Shop Drawings:
   1. Include the seal of the Professional Engineer registered in the State of Washington in which the Project is located, on drawings and calculations which at a minimum include the following:

B. Periodic Special Inspections: The mechanical contractor shall provide a list of components/systems requiring periodic special inspections per ICC (IBC).

C. Special Certification Requirements: Each contractor responsible for the construction of a “Designated Seismic System” for active plumbing equipment that must remain operable following the design earthquake, or components with hazardous contents certified by the manufacturer to maintain containment following the design earthquake, shall submit a Manufacturer’s Certificate of Compliance for review and approval by the Registered Design Professional responsible for the design of the system. This information shall then be submitted to the AHJ.

1.07 QUALITY ASSURANCE

A. Comply with applicable building code.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Kinetics Noise Control, Inc

B. Mason Industries

C. Vibration Eliminator Company, Inc

2.02 PERFORMANCE REQUIREMENTS

A. General:
   1. All vibration isolators, base frames, and inertia bases to conform to all uniform deflection and stability requirements under all operating loads.

2.03 VIBRATION-ISOLATED EQUIPMENT SUPPORT BASES

2.04 VIBRATION ISOLATORS

A. General Requirements:
   1. Resilient Materials for Vibration Isolators: Oil, ozone, and oxidant resistant.

2.05 EXTERNAL SEISMIC SNUBBER ASSEMBLIES

A. Description: Steel snubbing assemblies designed for external attachment to both equipment and supporting structure that, as part of a complete system, restrain equipment motion in all directions during a seismic event while maintaining vibration isolation during normal operation.

B. Seismic Snubbing Elements:
   1. Air Gap: Between 0.125 inches and 0.25 inches unless otherwise indicated.
   2. Points of Contact: Cushioned with resilient material, minimum 0.25 inch thick; capable of being visually inspected for damage and replaced.

C. Lateral External:
   1. Performance: Equipment movement at each snubber location limited to a maximum of 0.25 inches in any direction without significantly degrading the vibration isolation capability of the isolator during normal operating conditions.

D. Omni Directional External:
   1. Performance: Equipment movement at each snubber location limited to a maximum of 0.25 inches in any direction without significantly degrading the vibration isolation capability of the isolator during normal operating conditions.

E. Horizontal Single Axis External:
   1. Performance: Equipment movement at each snubber location limited to a maximum of 0.25 inches in any direction without significantly degrading the vibration isolation capability of the isolator during normal operating conditions.

2.06 SEISMIC RESTRAINT SYSTEMS

A. Description: System components and accessories specifically designed for field assembly and attachment of seismic restraints.

B. Cable Restraints:
   1. Comply with ASCE 19
   2. Cables: Pre-stretched, galvanized steel wire rope with certified break strength
   3. Cable Connections: Use only swaged end fittings. Cable clips and wedge type end fittings are not permitted in accordance with ASCE 19
   4. Use protective thimbles for cable loops where potential for cable damage exists.

C. Rigid Restraints: Use MFMA-4 steel channel (strut), steel angle, or steel pipe for structural element; suitable for both compressive and tensile design loads.

D. Cable Restraints:
   1. Connections:
      a. Use overlapping wire rope U clips, cable clamping bolts, swaged sleeves, or seismically rated tool-less wedge insert lock connectors.

PART 3 EXECUTION

3.01 INSTALLATION - SEISMIC

A. Seismic Snubbers:
   1. Provide on all isolated equipment and piping.

B. Floor and Base-Mounted Equipment, Vibration Isolated Equipment and associated Vibration and Seismic Controls for Connections:
   1. Provide isolators and restraints designed for amplified code forces per ASCE 7 and with demonstrated ability to resist required forces including gravity, operational, and seismic forces.
   2. Where timber/wood floor or other substrate is inadequate for installation of lag bolts, screws, or other mechanical fasteners, install supplemental framing or blocking to transfer loads to structural elements.

C. Wall Mounted Mechanical Equipment:
   1. Anchoring to gypsum wallboard, plaster, or other wall finish that has not been engineered to resist imposed loads is not permitted.

D. Piping:
   1. Pipes and Connections Constructed of Ductile Materials (copper; ductile iron, steel or aluminum; and brazed, welded or screwed connections) and is 2.5 inches and larger and all fuel piping 1 inch and larger:
      a. Provide transverse bracing at spacing not more than 40.0 feet on center.
      b. For fuel liquid and gas piping, provide transverse bracing at spacing not more than 20.0 feet (6.1 m) on center.
      c. For fuel liquid and gas piping, provide longitudinal bracing at spacing not more than 40.0 feet (12.2 m) on center.
      d. Transverse bracing for one pipe section may also act as a longitudinal bracing for a pipe section connected perpendicular to it, if the bracing is installed within 2 feet of the elbow or tee of similar size.
      e. Piping conveying fluids at 100°F. and higher shall have expansion devices provided in between longitudinal braces to allow for thermal expansion.

f. Bracing may be omitted when the top of the pipe is suspended 12 inches or less from the supporting structural member and the pipe is suspended by an individual hanger.

2. Pipes and Connections Constructed of Non-Ductile Materials (cast iron, no-hub, plastic or non-UL listed grooved coupling pipe) and is 2.5 inches and larger:
   a. Transverse bracing for one pipe section may also act as a longitudinal bracing for a pipe section connected perpendicular to it, if the bracing is installed within 2 feet of the elbow or tee of similar size.
   b. Piping conveying fluids at 100°F. and higher shall have expansion devices provided in between longitudinal braces to allow for thermal expansion.
   c. Bracing may be omitted when the top of the pipe is suspended 12 inches or less from the supporting structural member and the pipe is suspended by an individual hanger.
3. For equipment 400 lbs. or greater, provide lateral force calculations per ICC (IBC) if required by the building official.
4. Provide earthquake bumpers for all equipment that is supported on isolators and weighing over 300 lbs. including base. Provide minimum of four bumpers for equipment weighing less than 2,000 lbs., and eight bumpers for heavier equipment.

E. Tanks:
1. Provide seismic bracing for hot water tanks.

END OF SECTION 220548

SECTION 220553
IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nameplates

B. Tags

C. Stencils

D. Pipe markers

1.02 RELATED REQUIREMENTS

A. Section 099123 - Interior Painting: Identification painting

1.03 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2015

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures

B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.

C. Operation and Maintenance Data:
   1. Valve Diagram: Provide an unlaminated copy of the valve diagram.
   2. Valve Tag Schedule: Provide an unlaminated copy of the valve tag schedule.
   3. Concealed Items Legend: Provide a color legend listing the colors used to label equipment above the ceiling.

D. Project Record Documents: Record actual locations of tagged valves.

PART 2 PRODUCTS

2.01 NAMEPLATES

A. Manufacturers:
   1. Brimar Industries, Inc
   2. Kolbi Pipe Marker Co
   3. Seton Identification Products

B. Description: Laminated three-layer plastic with engraved letters
   1. Letter Color: White
   2. Letter Height: 1/4 inch
   3. Background Color: Black
   4. Plastic: Conform to ASTM D709

2.02 TAGS

A. Manufacturers:
   1. Advanced Graphic Engraving
   2. Brady Corporation
   3. Brimar Industries, Inc
   4. Kolbi Pipe Marker Co
   5. Seton Identification Products

B. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2-inch diameter.

C. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2-inch diameter with smooth edges.

D. Valve Tag Chart: Typewritten letter size list hard laminated.

2.03 STENCILS

A. Manufacturers:
   1. Brady Corporation
   2. Kolbi Pipe Marker Co
   3. Seton Identification Products

B. Stencils: With clean cut symbols and letters of following size:

C. Stencil Paint: As specified in Section 099123, semi-gloss enamel, colors conforming to ASME A13.1.

2.04 PIPE MARKERS

A. Manufacturers:
   1. Brady Corporation
   2. Brimar Industries, Inc
   3. Kolbi Pipe Marker Co
   4. Seton Identification Products

B. Comply with ASME A13.1.

C. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

E. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

F. Identification Scheme, ASME A13.1:
   1. Primary: External Pipe Diameter, Uninsulated or Insulated
   2. Secondary: Color scheme per fluid service
      a. Water; Potable, Cooling, Boiler Feed, and Other: White text on green background

G. Color code assignments shall be verified with the Owner prior to ordering. Color code as follows:
   1. Potable Domestic Cold, Hot, and Hot Recirculation Water: Green with white letters
   2. Fire Quenching Fluids: Red with white letters

2.05 VALVE TAG SCHEDULES

A. Provide a Valve Tag Schedule for each piping system, typewritten, and reproduced on 8-1/2" x 11" bond paper, hard laminated. Tabulate valve number, piping system, system abbreviation (as shown on tag), location of valve (room or space), and variations for identification (if any). Mark valves which are intended for emergency shut-off and similar special uses, by special "flags", in margin of schedule.

2.06 VALVE DIAGRAM

A. Provide a Valve Diagram showing the location of all valves relative to the floor plan of the building. Each Valve Diagram shall be 11x17, hard laminated sheets. Each piping system shall be in a unique color and a legend noting the system colors shall be placed on the first page.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive identification products.

3.02 INSTALLATION

A. Install flexible nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags in clear view and align with axis of piping.

C. Install plastic pipe markers in accordance with manufacturer's instructions.

D. Install plastic tape pipe marker around pipe in accordance with manufacturer's instructions.

E. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.

F. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

3.03 PIPE MARKERS AND COLOR BANDS

A. Locate pipe markers and color bands as follows wherever piping is exposed to view in occupied space, machine rooms, accessible maintenance spaces and exterior non-concealed locations or in accessible ceiling spaces.
   1. Near each valve and control device
   2. Near each branch, excluding short take-offs for fixtures and terminal units; mark each pipe at branch where there could be question of flow pattern
   3. Near locations where pipes pass through walls or floor/ceilings, or enter non-accessible enclosures
   4. At access doors, manholes, and similar access points which permit view of concealed piping
   5. Near major equipment items and other points of origination and termination

3.04 PLUMBING EQUIPMENT IDENTIFICATION

A. Install engraved plastic laminate sign on or near each major item of plumbing equipment and each operation device. Provide signs for the following general categories of equipment and operational devices. Provide signs or suspended ceiling tile below mechanical equipment located above ceiling.
   1. Pumps and similar motor-driven units
   2. Tanks and pressure vessels

3.05 CONCEALED ITEMS

A. Items concealed above accessible ceilings requiring access, shall have the ceiling marked to indicate such item's location. The marking system shall consist of colored phenolic plates with ½" tall engraved lettering specifying the item concealed; plate shall be applied to ceiling T-bar framing with rivets or other owner approved method below the concealed item. Colors used shall be verified with Owner, and unless directed otherwise, shall be:
   1. Fire Protection System Components: Red
   2. Domestic Plumbing System Components: Green

3.06 VALVE TAG SCHEDULE

A. Provide the hard laminated Valve Tag Schedule in the mechanical/janitors room.

3.07 VALVE DIAGRAM

A. Provide the hard laminated Valve Diagram in the mechanical/janitors room.

END OF SECTION 220553

SECTION 220719
PLUMBING PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cellular glass insulation

B. Flexible elastomeric cellular insulation

C. Flexible removable and reusable blanket insulation

D. Glass fiber insulation

E. Hydrous calcium silicate insulation

F. Jacketing and accessories

1.02 RELATED REQUIREMENTS

A. Section 078400 - Firestopping

1.03 REFERENCE STANDARDS

A. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless-Steel Sheet, Strip, Plate, and Flat Bar; 2015

B. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2013

C. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement; 2007 (Reapproved 2013)

D. ASTM C449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement; 2007 (Reapproved 2013)

E. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2017

F. ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation; 2013

G. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2016

H. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2017

I. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation; 2016a

J. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013

K. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2013)

L. ASTM C1695 - Standard Specification for Fabrication of Flexible Removable and Reusable Blanket Insulation for Hot Service; 2010 (Reapproved 2015)

M. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2017

N. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016

O. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.05 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum 5 years of documented experience

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.07 FIELD CONDITIONS

A. Maintain ambient conditions required by manufacturers of each product.

B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723

2.02 GLASS FIBER INSULATION

A. Manufacturers:
   1. CertainTeed Corporation
   2. Johns Manville Corporation
   3. Knauf Insulation
   4. Owens Corning Corporation; Fiberglas Pipe Insulation ASJ
   5. Manson Insulation

B. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible
   1. K Value: ASTM C177, 0.24 at 75 degrees F
   2. Maximum Service Temperature: 850 degrees F
   3. Maximum Moisture Absorption: 0.2 percent by volume
   4. Maximum flame/smoke spread developed: 25/50

C. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches

D. Vapor Barrier Lap Adhesive: Compatible with insulation

E. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool

F. Outdoor Vapor Barrier Mastic: Vinyl emulsion type acrylic or mastic, compatible with insulation, black color

G. Outdoor Breather Mastic: Vinyl emulsion type acrylic or mastic, compatible with insulation, black color

H. Insulating Cement: ASTM C449

2.03 FLEXIBLE REMOVABLE AND REUSABLE BLANKET INSULATION

A. Insulation: ASTM C553 Type V; flexible, noncombustible
   1. Comply with ASTM C1695
   2. K Value: 0.37 at 100 degrees F, when tested in accordance with ASTM C177 or ASTM C518
   3. Minimum Service Temperature: 32 degrees F
   4. Maximum Service Temperature: 500 degrees F
   5. Maximum Water Vapor Absorption: Less than 5.0 percent by weight

2.04 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Manufacturer:
   1. Aeroflex USA, Inc
   2. Armacell LLC; AP Armaflex

3. K-Flex USA LLC; Insul-Tube
4. Durkflex

B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.
1. Minimum Service Temperature: Minus 40 degrees F
2. Maximum Service Temperature: 220 degrees F
3. Connection: Waterproof vapor barrier adhesive
4. K" Value: 0.25 Btu-in per hour per square foot °F at 75 degrees F
5. Maximum flame/smoke spread developed: 25/50
6. Maximum water vapor permeability, wet cup, perm-in 0.10
7. Fiber free, formaldehyde-free, and low VOC's
8. Install with fitting covers or installers shall have training through Armacell Qualified Installer Program (AQIP) or equivalent.
9. Provide black color in all cases except provide white color if exposed to view or specifically called out on the plans.

C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation

2.05 JACKETING AND ACCESSORIES

A. PVC Plastic:
1. Manufacturers:
a. Johns Manville Corporation; Zeston 2000
2. Jacket: One-piece molded type fitting covers and sheet material, gloss white color.
a. Minimum Service Temperature: 0 degrees F
b. Maximum Service Temperature: 150 degrees F
c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M
d. Thickness: 10 mil, 0.010 inch
e. Connections: Pressure sensitive color matching vinyl tape

B. Canvas Jacket: UL listed 6 oz/sq yd plain weave cotton fabric treated with dilute fire-retardant lagging adhesive
1. Lagging Adhesive: Compatible with insulation

C. Aluminum Jacket: ASTM B209 (ASTM B209M) formed aluminum sheet
1. Thickness: 0.016-inch sheet
2. Finish: Embossed
3. Joining: Longitudinal slip joints and 2-inch laps
4. Fittings: 0.016-inch-thick die shaped fitting covers with factory attached protective liner
5. Metal Jacket Bands: 3/8 inch wide; 0.015-inch-thick aluminum

D. Stainless Steel Jacket: ASTM A666, Type 304 stainless steel
1. Thickness: 0.010 inch
2. Finish: Smooth
3. Metal Jacket Bands: 3/8 inch wide; 0.010-inch-thick stainless steel

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Exposed Piping: Locate insulation and cover seams in least visible locations.

C. Neatly finish insulation at supports, protrusions, and interruptions.

D. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

E. Glass fiber insulated pipes conveying fluids below ambient temperature:
   1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
   2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

F. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.

G. Glass fiber insulated pipes conveying fluids above ambient temperature:
   1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive.
   2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

H. Insulated Pipe Supports and Shields:
   1. Install in place at each hanger and support as required by Section 221005 Plumbing Piping prior to insulating.
   2. Application: Piping 1-1/2 inches diameter or larger
   3. Shields: Galvanized steel or PVC as follows:
      a. 20 gauge (18 gauge for pipe larger than 3 inches) galvanized steel between pipe hangers or pipe hanger rolls and insulated pipe supports. Shield shall cover a minimum of 40% of the insulation where the pipe is supported from the bottom and 100% of the insulation where the pipe is clamped.
      b. PVC shield the full diameter of the pipe insulation with 20-gauge galvanized steel shield riveted to the PVC.
      c. Utilize the Armacell Insulguard pipe shield system.
   4. Insulated Pipe Supports Location: Between support shield and piping and under the finish jacket
   5. Insulated Pipe Support Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation. Provide 9 inches (230 mm) long insulated pipe support and 18-gauge galvanized steel shield for pipes larger than 3 inches.
   6. Insert Material: See Section 221005 Plumbing Piping.

I. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations except where prohibited by code. Finish at supports, protrusions, and interruptions. At fire separations, refer to Fire Stop Specification Section 078400.

J. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with PVC jacket and fitting covers.

K. Exposed Work: Finish with PVC jacket and fitting covers applied after pipe insulation is installed. A pre-cut "Hi-Lo Temp" insulation insert, conforming to the UL 25/50 rating, shall be snugly tucked around the fitting making sure the fitting is covered with the full thickness of insulation.
   1. All others provide covering in pad form, constructed as follows: Use 1-inch-thick Owens-Corning Fiberglas TIW Glass Wool, Type I, non-oiled, fully enclosed on all sides and edges within tight-weave canvas jacket. Attach Bergen hooks around edges of pad. Fit pad to device with edges tightly butted and secure with copper wire laced between hooks. Provide vapor seal where vapor seal is required for adjacent insulation.

L. Gauge Lines: Insulate to the gauge shutoff valve.

M. Elastomeric Insulation Installation:
   1. For PEX piping installation, elastomeric insulation shall be installed continuous through stud framing and all penetration locations through walls, floors, and ceilings.

2. Elastomeric insulation with wall thicknesses greater than 1” shall not be installed in air plenums unless specifically UL723 listed for use in a plenum.
3. All elastomeric foam and sheet seams shall be sealed with adhesive per the insulation manufacturer’s recommendations.
4. Install elastomeric insulation on all PEX domestic hot water and recirculation water piping.

3.03 PIPE HANGERS

A. Do not allow pipes to come in contact with hangers.

3.04 SCHEDULES

A. Plumbing Systems:
   1. Domestic Hot Water Supply (including Recirculation):
      a. Glass Fiber Insulation:
         1) For Pipe Size Range of 1/2 to 1-1/4 inch, provide insulation thickness of: 1 inch.
         2) For Pipe Size Range of 1-1/2 inch and greater, provide insulation thickness of: 1-1/2 inch.
      b. Flexible Elastomeric Cellular Insulation (PEX only): For all pipe sizes, provide insulation thickness of: 1 inch.
   2. Domestic Cold Water:
      a. Glass Fiber: For all pipe sizes on metal pipe, provide insulation thickness of: 1 inch.
      b. Flexible Elastomeric Cellular Insulation (PEX pipe): Not Required.

B. Other Systems:
   1. Copper Condensate Piping:
      a. Glass Fiber: For all pipe sizes, provide insulation thickness of: 1 inch.
      b. Flexible Elastomeric Cellular Insulation: For all pipe sizes, provide insulation thickness of: 1 inch.

END OF SECTION 220719

SECTION 221005
PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sanitary waste piping, buried within 5 feet of building
B. Sanitary waste piping, above grade
C. Domestic water piping, buried beyond 5 feet of building
D. Domestic water piping, buried within 5 feet of building
E. Domestic water piping, above grade
F. Storm drainage piping, buried within 5 feet of building
    1. Storm drainage piping, above grade
    2. Natural gas piping, buried beyond 5 feet of building
    3. Natural gas piping, buried within 5 feet of building
    4. Natural gas piping, above grade
    5. Pipe flanges, unions, and couplings
    6. Pipe hangers and supports
    7. Pipe sleeve-seal systems
    8. Pressure reducing valves
    9. Pressure relief valves
    10. Strainers

1.02 RELATED REQUIREMENTS

A. Section 220548 - Vibration and Seismic Controls for Plumbing Piping and Equipment
B. Section 220553 - Identification for Plumbing Piping and Equipment

1.03 REFERENCE STANDARDS

A. ANSI Z21.22 - American National Standard for Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems; 2015
B. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2012
C. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2013
D. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings - DWV; 2016
E. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV; 2012
F. ASME B31.9 - Building Services Piping; 2014
G. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing and Fusing Operators; 2017
H. ASSE 1003 - Performance Requirements for Water Pressure Reducing Valves for Domestic Water Distribution Systems; 2009
I. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014
J. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999 (Reapproved 2014)
K. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017
L. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless-Steel Tubing for General Service; 2015a
M. ASTM B32 - Standard Specification for Solder Metal; 2008 (Reapproved 2014)
N. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes; 2015a

O. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2016

P. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2016

Q. ASTM B306 - Standard Specification for Copper Drainage Tube (DWV); 2013

R. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube; 2016

S. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings; 2016

T. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2014

U. ASTM D2239 - Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter; 2012a

V. ASTM D2564 - Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems; 2012

W. ASTM D2609 - Standard Specification for Plastic Insert Fittings for Polyethylene (PE) Plastic Pipe; 2015

X. ASTM D2657 - Standard Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings; 2007 (Reapproved 2015)

Y. ASTM D2665 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings; 2014

Z. ASTM D2855 - Standard Practice for the Two-Step (Primer & Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets; 2015

AA. ASTM D3034 - Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2016

BB. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2017

CC. ASTM D4101 - Standard Specification for Polypropylene Injection and Extrusion Materials; 2014, with Editorial Revision (2016)

DD. ASTM F876 - Standard Specification for Crosslinked Polyethylene (PEX) Tubing; 2017

EE. ASTM F877 - Standard Specification for Crosslinked Polyethylene (PEX) Plastic Hot- and Cold-Water Distribution Systems; 2011a

FF. ASTM F1960 - Standard Specification for Cold Expansion Fittings with PEX Reinforcing Rings for Use with Cross-linked Polyethylene (PEX) Tubing; 2015

GG. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2011 (Amended 2012)

HH. AWWA C550 - Protective Interior Coatings for Valves and Hydrants; 2017

II. AWWA C606 - Grooved and Shouldered Joints; 2015

JJ. AWWA C651 - Disinfecting Water Mains; 2014

KK. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Transmission and Distribution; 2016

LL. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications; 2009 (Revised 2012)

MM. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2011 (Revised 2012)

NN. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2015

OO. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements; 2015

PP. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2015

QQ. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2016

RR. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2009

SS. NSF 61 - Drinking Water System Components - Health Effects; 2017

TT. NSF 372 - Drinking Water System Components - Lead Content; 2016

UU. PPI TR-4 - PPI Listing of Hydrostatic Design Basis (HDB), Hydrostatic Design Stress (HDS), Strength Design Basis (SDB), Pressure Design Basis (PDB), and Minimum Required Strength (MRS) Ratings For Thermoplastic Piping Materials or Pipe; 2017

VV. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions

1.04 SUBMITTALS

A. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

B. Welder Certificate: Include welders certification of compliance with ASME BPVC-IX.

C. Shop Drawings: For non-penetrating rooftop supports, submit detailed layout developed for this project, with design calculations for loadings and spacings.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements for additional provisions.

E. Operation and Maintenance Data:
   1. Domestic water sterilization test
   2. Domestic water pressure tests

1.05 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

C. Welding Materials and Procedures: Conform to ASME BPVC-IX and applicable state labor regulations.

D. Welder Qualifications: Certified in accordance with ASME BPVC-IX.

E. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

F. Domestic water fittings, joining materials, and all other appurtenances in contact with potable water shall be lead-free except those specifically exempted in Section 3874 of the Safe Water Drinking Act.
   1. Lead-free shall mean:
      a. Not containing more than 0.2% lead when used with respect to solder and flux; and
      b. Not more than a weighted average of 0.25% when used with respect to the vetted surfaces of pipes, pipe fittings, plumbing fittings, and fixtures

1.06 DELIVERY, STORAGE, AND HANDLING

A. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

B. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

B. Plenum-Installed Acid Waste Piping: Flame-spread index equal or below 25 and smoke-spread index equal or below 50 according to ASTM E84 or UL 723 tests.

2.02 SANITARY WASTE PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Cast Iron Pipe: Conform to CISPI 301, hubless pipe and fittings
   1. Manufacturers:
      a. AB&I
      b. Charlotte
      c. Tyler

B. Joints: CISPI 310, neoprene gasket and stainless-steel clamp and shield assemblies. Couplings shall be constructed of 300 Series type stainless steel with a minimum shield thickness equal to 0.007. There shall be a minimum of 2 bands for pipe sizes up to 4” and a minimum of 4 bands for pipe sizes 5” and larger. Coupling shall be capable of holding 15 psi of pressure. Sealing bands shall have a minimum thickness of 0.026 and require a minimum of 80-inch lbs. torque per band. Neoprene gasket shall meet ASTM C564.
   1. Manufacturers:
      a. Thermafit Heavy Duty
      b. Clamp-All HI-TORQ 80
      c. Husky 4000
      d. Ideal Pow'r-Gear
      e. MiFab MI-QXHUB

C. PVC Pipe: ASTM D2665 and ASTM D3034, schedule 40, DWV, solid core pipe.
   1. Fittings: PVC
   2. Joints: ASTM D2564
      a. Mechanical Joints: Mechanical joints on drainage pipe shall be made with an elastomeric seal conforming to ASTM C 1173, ASTM D 3212 or CSA CAN/CSA-B602. Mechanical joints shall not be installed in above-ground systems, unless otherwise approved. Joints shall be installed in accordance with the manufacturer’s instructions.
      b. Plastic to Cast Iron Mechanical Joints: CISPI 310, neoprene gasket and stainless-steel clamp and shield assemblies. Couplings shall be constructed of 300 Series type stainless steel with a minimum shield thickness equal to 0.015. There shall be a minimum of 2 bands for pipe sizes up to 4” and a minimum of 4 bands for pipe sizes 5” and larger. Coupling shall be capable of holding 15 psi of pressure. Sealing bands shall have a minimum thickness of 0.026 and require a minimum of 80-inch lbs. torque per band. Neoprene gasket shall meet ASTM C564.
         1) Manufacturers:
            (a) Husky 4200
      c. Solvent Cementing: Joint surfaces shall be clean and free from moisture. A purple primer that conforms to ASTM F 656 shall be applied. Solvent cement not purple in color and conforming to ASTM D 2564, CSA CAN/CSA-B137.3, CSA CAN/CSA-B181.2 or CSA CAN/CSA-B182.1 shall be applied to all joint surfaces. The joint shall be made while the cement is wet and shall be in accordance with ASTM D 2855. Solvent-cement joints shall be permitted above or below ground.
      d. Threaded Joints: Threads shall conform to ASME B1.20.1. Schedule 80 or heavier pipe shall be permitted to be threaded with dies specifically designed for plastic pipe. Approved thread lubricant or tape shall be applied on the male threads only.
   3. Manufacturers:
      a. Charlotte

b. Mueller Industries
c. Cresline

2.03 SANITARY WASTE PIPING, ABOVE GRADE

A. Cast Iron Pipe: Conform to CISPI 301, hubless pipe and fittings.
   1. Manufacturers:
      a. AB&I
      b. Charlotte
      c. Tyler

B. Joints: CISPI 310, neoprene gaskets and stainless-steel clamp-and-shield assemblies. Couplings shall be constructed of 300 Series type stainless steel. There shall be 2 bands for pipe sizes up to 4" and a minimum of 4 bands for pipe sizes 5" and larger. Sealing bands shall require a minimum of 60-inch lbs. torque per band. Neoprene gasket shall meet ASTM C 564.
   1. Manufacturers:
      a. Thermafit Regular Duty
      b. Tyler Standard No-Hub
      c. Clamp-All HI-TORQ 80
      d. Husky 2000
      e. Anaco
      f. Ideal Pow'r Gear
      g. MiFab MI-QHUB

C. Flashing: Lead flashing, 4 lbs. per sq. ft. of sheet lead flashing. Flashing skirt radius from the inserted pipe of at least 8 inches or 2-foot square.
   1. Manufacturers:
      a. Elmdor Stoneman

D. Vent Cap: Vandal Resistant. Cast Iron. Minimum of 2 to 1 open area compared to the cross-sectional area of the vent pipe
   1. Manufacturers:
      a. Elmdor Stoneman

E. PVC Pipe: ASTM D2665, schedule 40, DWV, solid core pipe
   1. Fittings: PVC
   2. Joints: ASTM D2564
      a. Mechanical Joints: Mechanical joints on drainage pipe shall be made with an elastomeric seal conforming to ASTM C 1173, ASTM D 3212 or CSA CAN/CSA-B602. Mechanical joints shall not be installed in above-ground systems, unless otherwise approved. Joints shall be installed in accordance with the manufacturer's instructions.
      b. Solvent Cementing: Joint surfaces shall be clean and free from moisture. A purple primer that conforms to ASTM F 656 shall be applied. Solvent cement not purple in color and conforming to ASTM D 2564, CSA CAN/CSA-B137.3, CSA CAN/CSA-B181.2 or CSA CAN/CSA-B182.1 shall be applied to all joint surfaces. The joint shall be made while the cement is wet and shall be in accordance with ASTM D 2855. Solvent-cement joints shall be permitted above or below ground.
      c. Threaded Joints: Threads shall conform to ASME B1.20.1. Schedule 80 or heavier pipe shall be permitted to be threaded with dies specifically designed for plastic pipe. Approved thread lubricant or tape shall be applied on the male threads only.
   3. Manufacturers:
      a. Charlotte
      b. Mueller Industries
      c. Cresline

2.04 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Copper Pipe: ASTM B42, hard drawn, type K (A)
   1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze
   2. Joints: AWS A5.8M/A5.8, BCuP copper/silver braze, lead free conforming to UPC standards for solder and all local code requirements
      a. Manufacturers:
         1) Canfield
         2) J.W. Harris
         3) Aqua-Clean

B. Cross-Linked Polyethylene (PEX) Pipe: ASTM F876 or ASTM F877.
   1. Manufacturers:
      a. Uponor, Inc
      b. Wirsbo
      c. Zurn Industries, LLC
      d. Viega
      e. Rehau
      f. Watts
      g. Mr. PEX
      h. Heat Link
   2. PPI TR-4 Pressure Design Basis:
      a. 100 psig at maximum 180 degrees F
   3. Fittings: Brass and copper
   4. Fittings: Brass and engineered polymer (EP) ASTM F1960
   5. Joints: Mechanical compression fittings
   6. Joints: ASTM F1960 cold-expansion fittings

2.05 DOMESTIC WATER PIPING, ABOVE GRADE

A. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), hard drawn
   1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze
   2. Joints: ASTM B32, alloy Sn95 solder, lead free conforming to UPC standards for solder and all local code requirements.
      a. Manufacturers:
         1) Canfield
         2) J.W. Harris
         3) Aqua-Clean
   3. Mechanical Press Sealed Fittings: Double pressed type, NSF 61 and NSF 372 approved or certified, utilizing EPDM, nontoxic synthetic rubber sealing elements.
      a. Manufacturers:
         1) Grinnell Products, a Tyco Business
         2) Viega LLC
         3) Nibco
   4. Mechanical Couplings on pipe 2.5" and larger: NSF 61
      a. Manufacturers:
         1) Victaulic
         2) Gruvlok

B. Cross-Linked Polyethylene (PEX) Pipe: ASTM F876 or ASTM F877. Pipe shall be NSF 61 and NSF 14 certified.
   1. Manufacturers:
      a. Uponor, Inc
      b. Viega LLC
      c. Zurn Industries, LLC
      d. Watts

e. Rehau
f. Mr. PEX
g. Heat Link

2. PPI TR-4 Pressure Design Basis:
   a. 100 psig at maximum 180 degrees F
3. Fittings: Brass and engineered polymer (EP) ASTM F1960
4. Joints: Mechanical compression fittings
5. Joints: ASTM F1960 cold-expansion fittings

2.06 STORM DRAINAGE PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Cast Iron Pipe: Conform to CISPI 301, hubless pipe and fittings.
   1. Manufacturers:
      a. AB&I
      b. Charlotte
      c. Tyler
   2. Joints: CISPI 310, neoprene gasket and stainless-steel clamp and shield assemblies. Couplings shall be constructed of 300 Series type stainless steel with a minimum shield thickness equal to 0.015. There shall be 2 bands for pipe sizes up to 4” and a minimum of 4 bands for pipe sizes 5” and larger. Coupling shall be capable of holding 15 psi of pressure. Sealing bands shall have a minimum thickness of 0.026 and require a minimum of 80-inch lbs. torque per band. Neoprene gasket shall meet ASTM C564.
      a. Thermafit Heavy Duty
      b. Clamp-All HI-TORQ 80

B. Copper Tube: ASTM B306, DWV.
   1. Fittings: ASME B16.23, cast copper, or ASME B16.29, wrought copper
   2. Joints: ASTM B32, alloy Sn50 solder

C. PVC Pipe: ASTM D2665 or ASTM D3034, schedule 40, DWV, solid core pipe
   1. Fittings: PVC
   2. Joints: ASTM D2564
      a. Mechanical Joints: Mechanical joints on drainage pipe shall be made with an elastomeric seal conforming to ASTM C 1173, ASTM D 3212 or CSA CAN/CSA-B602. Mechanical joints shall not be installed in above-ground systems, unless otherwise approved. Joints shall be installed in accordance with the manufacturer’s instructions.
      b. Solvent Cementing: Joint surfaces shall be clean and free from moisture. A purple primer that conforms to ASTM F 656 shall be applied. Solvent cement not purple in color and conforming to ASTM D 2564, CSA CAN/CSA-B137.3, CSA CAN/CSA-B181.2 or CSA CAN/CSA-B182.1 shall be applied to all joint surfaces. The joint shall be made while the cement is wet and shall be in accordance with ASTM D 2855. Solvent-cement joints shall be permitted above or below ground.
      c. Threaded Joints: Threads shall conform to ASME B1.20.1. Schedule 80 or heavier pipe shall be permitted to be threaded with dies specifically designed for plastic pipe. Approved thread lubricant or tape shall be applied on the male threads only.
   3. Manufacturers:
      a. Charlotte
      b. Mueller Industries
      c. Cresline

2.07 CONDENSATE PIPING

A. Schedule 40 PVC, solid core

B. Type L copper for use in air plenum, penetrating a fire wall, or used with gas-fired equipment

C. Insulate per Section 220719 Plumbing Piping Insulation.

2.08 FLANGES, UNIONS, AND COUPLINGS

A. Unions for Pipe Sizes 3 Inches and Under:
   1. Ferrous pipe: Class 150 malleable iron threaded unions
   2. Copper tube and pipe: Class 150 bronze unions with soldered joints

B. Flanges for Pipe Size Over 1 Inch:
   1. Ferrous Pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets
   2. Copper Tube and Pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets

C. Mechanical Couplings for Grooved and Shouldered Joints: Two or more curved housing segments with continuous key to engage pipe groove, circular C-profile gasket, and bolts to secure and compress gasket.
   1. Dimensions and Testing: In accordance with AWWA C606
   2. Housing Material: Provide ASTM A47/A47M malleable iron or ductile iron, galvanized.
   3. Gasket Material: Nitrile rubber suitable for operating temperature range from minus 20 degrees F to 180 degrees F.
   4. Bolts and Nuts: Hot dipped galvanized or zinc-electroplated steel.
   5. When pipe is field grooved, provide coupling manufacturer's grooving tools.
   6. Manufacturers:
      a. Grinnell Products, a Tyco Business
      b. Victaulic
      c. Gruvlok

D. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier

2.09 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports that comply with MSS SP-58.
   1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
   2. Hanger Rods: Threaded hot rolled steel, electro-galvanized or cadmium plated. Hanger rods shall be sized so that the total load (including pipe or duct, insulation, hangers, and fluid) does not exceed the following:
      a. 610 pounds for 3/8" diameter rods
      b. 1130 pounds for 1/2" diameter rods
   3. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
      a. Cold and Hot Pipe Sizes 6 inch and Larger: Double hangers.
   4. Trapeze Hangers: Welded steel channel frames attached to structure
   5. Vertical Pipe Support: Steel riser clamp, epoxy coated
   6. Steel: Provide structural steel per ASTM A36/A36M.
   7. Wood: Shall be fire treated
   8. Rooftop Supports for Low-Slope Roofs: Steel pedestals with bases that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified; and as follows:
      a. Bases: High-density polypropylene
      b. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly
      c. Steel Components: Stainless steel or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M
      d. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports; corrosion-resistant material
      e. Height: Provide minimum clearance of 6 inches under pipe to top of roofing.
      f. Manufacturers:
         1) PDH

2) Elcen
3) Grinnel
4) B-line
5) Miro Industries, Inc
6) Unistrut
7) Caddy
8) Tolco

B. Plumbing Piping - Drain, Waste, and Vent:
1. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring
2. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis
3. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook
4. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp
5. Copper Pipe Support: Carbon steel ring, adjustable, copper plated

C. Plumbing Piping - Water:
1. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring
2. Hangers for Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis
3. Hangers for Hot Pipe Sizes 2 Inches to 4 Inches: Carbon steel, adjustable, clevis
4. Hangers for Hot Pipe Sizes 6 Inches and Over: Adjustable steel yoke, cast iron pipe roll, double hanger
5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook
6. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp
7. Wall Support for Hot Pipe Sizes 6 Inches and Over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast-iron pipe roll
8. Copper Pipe Support: Carbon steel ring, adjustable, copper plated

D. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193
2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01
3. Concrete Screw Type Anchors: Complying with ICC-ES AC193
4. Masonry Screw Type Anchors: Complying with ICC-ES AC106
5. Concrete Adhesive Type Anchors: Complying with ICC-ES AC308
6. Other Types: As required
7. Manufacturers:
   a. Powers Fasteners, Inc
   b. Rawplug
   c. Phillips
   d. Hilti
   e. Caddy

E. Insulated Pipe Inserts and Insulation Shields:
1. Insulated pipe insert shall have no more than 5% deformation at 100 psi and a thermal conductivity no more than 0.38 Btu/hr./sq. ft./degree F/1-inch thick at 75°F.
2. Insulated pipe insert shall be same thickness as adjoining pipe insulation and sized to match pipe in which it is used on. See Section 220719 for insulation sizes.
3. Where elastomeric insulation is being used, pipe inserts may be omitted.
4. Provide shield per Section 220719 Plumbing Piping Insulation.
5. Manufacturers:
   a. TPS Thermal Pipe Shields
   b. B-Line
   c. Clement Support Services

d. Snappitz

F. PEX Pipe Hangers and Supports:
1. Provide continuous steel channel pipe supports at all horizontal PEX pipe runs greater than 6'-0" in length.
a. Steel Channel Pipe Supports:
1) 23-gauge, galvanized steel channel with a copper tube size controlled outside diameter
2) Steel channel pipe supports shall be available in lengths up to 9'-0" for pipe sizes ½" - 3 ½".
3) Secure pipe to channel support with stainless steel straps rated for 300-pound tensile strength.
2. Manufacturers:
a. Uponor PEX-a Pipe, or approved equivalent
3. All horizontal PEX pipe shall utilize steel brackets, clevis, J-hangers, or trapeze style hangers.

2.10 PIPE SLEEVE-SEAL SYSTEMS

A. Manufacturers:
1. The Metraflex Company; MetraSeal
2. Link Seal

B. Modular/Mechanical Seal:
1. Elastomer-based interlocking links continuously fill annular space between pipe and wall-sleeve, wall or casing opening.
2. Watertight seal between pipe and wall-sleeve, wall or casing opening.
3. Size and select seal component materials in accordance to service requirements.
4. Glass reinforced plastic pressure end plates.

2.11 PRESSURE REDUCING VALVES

A. Manufacturers:
1. Amtrol Inc
2. Cla-Val Company
3. Flomatic Valves
4. Watts Regulator Company
5. Wilkins
6. Apollo Conbraco

B. Up to 2 Inches:
1. ASSE 1003, bronze body, stainless steel, and thermoplastic internal parts, fabric reinforced diaphragm, strainer, threaded single union ends.

C. Over 2 Inches:
1. ASSE 1003, cast iron body with interior lining complying with AWWA C550, bronze fitted, elastomeric diaphragm and seat disc, flanged.

2.12 PRESSURE RELIEF VALVES

A. ANSI Z21.22, AGA certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated.

B. Pressure:
1. Manufacturers:
a. Cla-Val Co
b. Watts Regulator Company

C. Temperature and Pressure:
1. Manufacturers:
a. Cla-Val Co
b. Watts Regulator Company

2.13 STRAINERS

A. Manufacturers:
   1. Armstrong International, Inc
   2. Bell and Gossett
   3. Apollo Conbraco
   4. Hoffman
   5. Wheatley
   6. Nibco

B. Size 2 inch and Under:
   1. Threaded brass body for 175 psi CWP, Y pattern with 1/32-inch stainless steel perforated screen
   2. Class 150, threaded bronze body 300 psi CWP, Y pattern with 1/32-inch stainless steel perforated screen

C. Size 1-1/2 inch to 4 inch:
   1. Class 125, flanged iron body, Y pattern with 1/16-inch stainless steel perforated screen

D. Size 5 inch and Larger:
   1. Class 125, flanged iron body, basket pattern with 1/8-inch stainless steel perforated screen

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that excavations are to required grade, dry, and not over-excavated.

3.02 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.03 GENERAL INSTALLATION

A. Furnish and install complete system of piping, valved as indicated or as necessary to completely control entire apparatus. Pipe drawings are diagrammatic and indicate general location and connections. Piping may have to be offset, lowered, or raised as required or directed at site. This does not relieve this Division from responsibility for proper erection of systems of piping in every respect. Install in accordance with manufacturer's instructions.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

D. Consult all drawings for location of pipe spaces, ducts, electrical equipment, ceiling heights, door openings, window openings, and other details and report discrepancies or possible conflicts to Architect/Engineer before installing pipe.

E. Allow sufficient clearances for installation of pipe insulation in thickness specified. If interferences occur, reroute piping to accommodate insulation.

F. Install piping to maintain headroom, conserve space, and not interfere with use of space, removal of other equipment, ducts, or devices, or block access to doors, windows, or access openings.

G. Group piping whenever practical at common elevations.

H. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

I. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

J. Provide access where valves and fittings are not exposed.

K. Establish elevations of buried piping outside the building to ensure not less than 3.3 ft (1 m) of cover.

L. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

M. Provide support for utility meters in accordance with requirements of utility companies.

N. Install valves with stems upright or horizontal, not inverted. Refer to Section 220523.

O. Install water piping to ASME B31.9.

P. Sleeve pipes passing through partitions, walls and floors.

Q. Do not use reducing bushings, street elbows, or close nipples.

R. T-drill procedure for connecting pipes will not be allowed.

S. All piping in finished areas shall be installed concealed unless specifically noted otherwise.

T. Provide escutcheons where pipe passes through walls, floors, or ceilings.

U. Install all exposed piping parallel to the closest wall and in a neat, workmanlike manner.

V. Bury water piping 6 inches minimum below bottom of slab and encase in 2 inches minimum of sand.

W. Strainers: Install strainers as indicated. Provide plugged gate or ball valve in blow-off connection on strainers, valve shall be same size as blow-off tapping. Final blow-off shall have a hose connection fitting.

X. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.

Y. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.

Z. Inserts:
   1. Provide inserts for placement in concrete formwork.
   2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
   3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
   4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

AA. Pipe Hangers and Supports:
   1. Install in accordance with ASME B31.9.
   2. Support horizontal piping as indicated.
   3. Install hangers to provide minimum 1/2-inch space between finished covering and adjacent work.
   4. Place hangers within 12 inches of each horizontal elbow.
   5. Use hangers with 1-1/2-inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
   6. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
   7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
   8. Provide copper plated hangers and supports for copper piping.
   9. Provide hangers adjacent to motor-driven equipment with vibration isolation; see Section 220548.
   10. Support cast iron drainage piping at every joint.

BB. Manufactured Sleeve-Seal Systems:
1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.
2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
3. Locate piping in center of sleeve or penetration.
4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
5. Tighten bolting for a watertight seal.
6. Install in accordance with manufacturer's recommendations.

CC. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

3.04 SOIL, WASTE, VENT, AND STORM DRAIN SYSTEMS

A. Place cleanouts as follows:
1. Where shown on plans and near bottom of each stack and riser.
2. At every 90 degrees change of direction for horizontal lines.
3. Every 100 feet of horizontal run.
4. Extend cleanout to accessible surface. Do not place cleanouts in carpeted floors. In such locations, use wall type cleanouts.

B. Vent entire waste system to atmosphere. Discharge vent pipe minimum 14 inches above roof. Join lines together in least practicable number before projecting above roof. Set back vent lines so they will not pierce roof near edge or valley. Install vent piping penetrating roofed areas to maintain integrity of roof assembly.

C. Use torque wrench to obtain proper tension in cinch bands on above ground hubless cast iron pipe. Butt ends of pipe against centering flange of coupling.

D. Flash pipes passing through roof (or as shown on the plan) fitted snugly around pipes and caulk between flashing and pipe with flexible waterproof compound. Provide counterflashing fitting with vandal resistant screws. Extend lead up and turn in a minimum of 1" into the pipe. Flashing base shall be at least 24 inches square (or 8-inch radius).

E. Install an expansion joint in each vertical straight run of PVC or polypropylene soil, waste, vent, and drain pipe at intervals in excess of 30 feet. Install and anchor pipe per expansion joint manufacturer’s instructions. Provide access panel as required for servicing the expansion joint.

F. Install vertical waste pipe to comply with standard installation practices for suds control.

G. Provide hubless cast iron for the first 20 feet downstream of drains located in the kitchen and boiler room.

H. Reducing size of pipe in the direction of flow is prohibited.

I. Install drainage piping at the following minimum slopes unless otherwise indicated:
1. Building soil and waste drain: 2 percent downward in the direction of flow unless indicated otherwise on the plans
2. Building storm drain: 1 percent downward in direction of flow

J. Field Quality Control:
1. Test storm drainage piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
a. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
b. Leave uncovered and unconcealed new, altered, extended, or replaced storm drainage piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.

c. Test Procedure: Test storm drainage piping on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts until completion of inspection, water level must not drop. Inspect joints for leaks.
d. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
e. Prepare reports for tests and required corrective action.

2. Test force-main piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
a. Leave uncovered and unconcealed new, altered, extended, or replaced force-main piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
b. Cap and subject piping to static-water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
c. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
d. Prepare reports for tests and required corrective action.

K. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

3.05 CROSS-LINKED POLYETHYLENE (PEX) PIPE

A. Provide stainless steel inserts at compression stop valves.

B. All couplings, elbows, tees, reducing tees, adapters, and any other connecting devices shall be of the same manufacturer as the PEX piping.

C. Kinked tubing shall be reformed in accordance with manufacturer’s recommendation or cut out and replaced.

D. 90-degree direction turns and wall penetrations shall be provided with a bend support or elbow fitting.

E. Copper sweated and threaded connections are to be made prior to PEX connections.

F. Transition PEX to copper at fire walls. Provide fire stop sealants at fire rated walls.

G. PEX tubing shall be fully seated against shoulder of fitting.

H. Horizontal piping shall be supported every 32".

I. Vertical piping shall be supported every 4'.

J. Allow 1/8" to 3/16" of slack per foot of run for expansion and contraction.

K. PEX tubing shall be installed to allow for expansion and contraction. Do not rigidly attach to structure.

L. Provide sleeves where PEX piping passes through masonry walls.

M. Protect tubing from nail/screw damage with suitable steel plate protectors.

N. The minimum bend radius of PEX tubing is six times its diameter. Smaller radius turns shall be provided with an elbow.

O. Provide insulators where PEX piping passes through metal studs.

P. Supply stops shall be provided with a pipe bracket support from adjacent structure, a pipe clamp, tube talon, and a plastic or metal bend support. (Sioux Chief Universal Slider Bracket or approved equal).

Q. Insulation does not have to be continuous at hanging brackets and clamps.

R. Plastic speed clips may be used for connection to structure. Speed clips shall be listed for use on PEX piping.

3.06 APPLICATION

A. Install unions downstream of valves and at equipment or apparatus connections.

B. Provide flow controls in water recirculating systems where indicated.

3.07 TOLERANCES

A. Drainage Piping: Establish invert elevations within 1/2 inch vertically of location indicated and slope to drain at minimum of 1/4 inch per foot slope.

B. Water Piping: Slope at minimum of 1/32 inch per foot and arrange to drain at low points.

3.08 DOMESTIC WATER PIPING TESTS

A. Tests: As the work progresses each section of the water system shall be tested under a 100psi hydrostatic test held for 2 hours without reduction of pressure (a pressure fluctuation of +/- 1 psi is acceptable). If any leaks occur or piping or valves are found to be defective, same shall be removed and new material installed, and the test made on that section again until all material is found to be satisfactory. Such test shall be made in the presence of the Owner's Representative.

B. Provide written test documentation in the operation and maintenance manual.

3.09 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Prior to starting work, verify system is complete, flushed, and clean.

B. Ensure acidity (pH) of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).

C. Inject disinfectant, free chlorine in liquid, powder, tablet, or gas form throughout system to obtain 50 to 80 mg/L residual.

D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.

E. Maintain disinfectant in system for 24 hours.

F. If final disinfectant residual tests less than 25 mg/L, repeat treatment.

G. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.

H. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

I. Provide test results in the operation and maintenance manual.

3.10 SERVICE CONNECTIONS

A. Provide new sanitary sewer services. Before commencing work, check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.

B. Provide new water service complete with approved reduced pressure backflow preventer and water meter with by-pass valves, pressure reducing valve, and sand strainer.
   1. Provide sleeve in wall for service main and support at wall with reinforced concrete bridge. Caulk enlarged sleeve and make watertight with pliable material. Anchor service main inside to concrete wall.

3.11 SCHEDULES

A. Pipe Hanger Spacing:
   1. Metal Piping:
      a. Pipe Size: 1/2 inch to 1-1/4 inch:
         1) Maximum Hanger Spacing: 6.5 ft
         2) Hanger Rod Diameter: 3/8 inches
      b. Pipe Size: 1-1/2 inch to 2 inch:
         1) Maximum Hanger Spacing: 10 ft
         2) Hanger Rod Diameter: 3/8 inch

c. Pipe Size: 2-1/2 inch to 3 inch:
   1) Maximum Hanger Spacing: 10 ft
   2) Hanger Rod Diameter: 1/2 inch
d. Pipe Size: 4 inch to 6 inch:
   1) Maximum Hanger Spacing: 10 ft
   2) Hanger Rod Diameter: 5/8 inch
e. Pipe Size: 8 inch to 12 inch:
   1) Maximum hanger spacing: 14 ft
   2) Hanger Rod Diameter: 7/8 inch
f. Pipe Size: 14 inch and Over:
   1) Maximum Hanger Spacing: 20 ft
   2) Hanger Rod Diameter: 1 inch

2. Plastic Piping:
   a. All Sizes:
      1) Maximum Hanger Spacing: 6 ft
      2) Hanger Rod Diameter: 3/8 inch

END OF SECTION 221005

SECTION 221006
PLUMBING PIPING SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Thermometers
B. Pressure Gauges
C. Unions
D. Flexible Connectors
E. Trap Primers
F. Aquastats
G. Drains
H. Cleanouts
I. Refrigerator valve and recessed box
J. Backwater valves
K. Backflow preventers
L. Double check valve assemblies
M. Water hammer arrestors
N. Mixing valves

1.02 REFERENCE STANDARDS

A. ASME A112.6.4 - Roof, Deck, and Balcony Drains; 2008 (Reaffirmed 2012)
B. ASSE 1011 - Performance Requirements for Hose Connection Vacuum Breakers; 2004, with Errata
C. ASSE 1012 - Performance Requirements for Backflow Preventers with an Intermediate Atmospheric Vent; 2009
D. ASSE 1013 - Performance Requirements for Reduced Pressure Principle Backflow Preventers and Reduced Pressure Principle Fire Protection Backflow Preventers; 2011
E. ASSE 1019 - Performance Requirements for Wall Hydrant with Backflow Protection and Freeze Resistance; 2011 (Reaffirmed 2016)
F. NSF 61 - Drinking Water System Components - Health Effects; 2017
G. NSF 372 - Drinking Water System Components - Lead Content; 2016
H. PDI-WH 201 - Water Hammer Arresters; 2010

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures
B. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.
C. Manufacturer's Instructions: Indicate Manufacturer's Installation Instructions. Indicate assembly and support requirements.
D. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views, etc. for the following:
    1. Trap primers
    2. Thermostatic mixing valves
    3. Backflow prevention devices
    4. Aquastats

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept specialties on site in original factory packaging. Inspect for damage.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

2.02 THERMOMETERS

A. Adjustable angle type, 304 stainless steel stem, 5" reading dial type, true anti-parallax-dial black numerals, markings in degrees F., stainless steel, double-strength glass viewing window. Provide sockets with extension necks where installed on insulated piping.

B. Thermometer Temperature Ranges:
   1. Domestic Cold Water, range of 0 - 100 degrees F with 1 degree F increments
   2. Domestic Hot Water, range of 30 - 180 degrees F with 2 degrees F increments

C. Manufacturers:
   1. Ashcroft
   2. March
   3. Weiss
   4. Tel-Tru
   5. Winters
   6. Taylor

2.03 PRESSURE GAUGES

A. Glycerin filled type, 2.5” reading dial with aluminum face and black numerals, markings in English units, 304 stainless steel case and acrylic lens. Provide each gauge with snubber and needle valve. Provide sockets with extension necks where installed on insulated piping.

B. Pressure Gauge Ranges:
   1. Domestic Hot Water, range 0 - 160 PSI with numeral intervals of 20 PSI and 2 PSI inter-graduations
   2. Domestic Cold Water, range 0 - 160 PSI with numeral intervals of 20 PSI and 2 PSI inter-graduations
   3. Compressed Air, range 0 - 160 PSI with numeral intervals of 20 PSI and 2 PSI inter-graduations

C. Manufacturers:
   1. Ashcroft
   2. Marsh
   3. Weiss
   4. Tel-Tru
   5. Winters
   6. Taylor

2.04 UNIONS

A. Dielectric Waterways: Inert, non-corrosive thermoplastic lining with zinc electroplated casing, rated at 300 psi at 225 deg. F., conforming to NSF 61. Type and size to match piping.
   1. Manufacturers:
      a. Walter Vallett Company V-line
      b. Clear Flow

B. Unions on Copper Pipe:
   1. In 2" Pipe and Smaller: Wrought copper solder joint copper to copper union.
   2. In 2.5" Pipe and Larger: Brass flange unions.
   3. Manufacturers:
      a. Watts
      b. Nibco
      c. Mueller

2.05 TRAP PRIMERS

A. Provide an approved trap primer at each floor drain, funnel drain, shower drain, janitor mop sink, and floor sink.
   1. Automatic Trap Primers (Water Pressure Drop Activated): Up to 4 traps may be served by a single trap primer and trap primer distribution system. Automatic primers shall be concealed in every case, located in pipe spaces or wall cavities; and where not accessible in a pipe space, provide an access panel. Elevate trap primer at increments of 12” per 20 linear foot of pipe run to trap.
      a. Manufacturers:
         1) JR Smith
         2) Sioux Chief Manufacturing
         3) Mifab
         4) Precision Plumbing Products
   2. Trap primer Tailpieces: 17 GA chrome plated. To be installed on lavatories and hand sinks only. One trap may be served by a single tailpiece trap primer. Provide with stainless steel braided primer hose and escutcheon.
      a. Manufacturers:
         1) JR Smith
         2) Watts
         3) Zurn

2.06 AQUASTATS

A. Automatic Timer Kit:
   1. The timer kit shall be UL approved.
   2. The timer kit shall be installed on the connection box of the pump.
   3. The timer kit will be suitable for 115/120V, 60 HZ operation.
   4. The timer shall provide automatic ON-OFF. It shall also have the option of providing manual ON-OFF control.

B. Aquastats:
   1. The aquastat shall be UL approved.
   2. The aquastat shall be connected to the lead wires in the connection box of the pump.
   3. The aquastat will be suitable for 115/120V, 60 HZ operation.
   4. The aquastat shall provide thermostat control to the circulator. It will turn OFF (open) at 120°F (48.9°C) water temperature and ON (closed) at 100°F (37.8°C) water temperature.

C. Automatic Timer Kit and Aquastat Combination:
   1. The automatic timer kit and aquastat shall be combined to provide automatic time and temperature control to the pump.
   2. When the automatic timer and the aquastat are used together, the pump will only circulate water when the ON time conditions are met and when the water temperature is low enough to cause the aquastat to switch ON.

D. Manufacturers:
   1. Bell & Gossett
   2. Honeywell

2.07 CLEANOUTS

A. Manufacturers:
   1. Jay R. Smith Manufacturing Company
   2. Josam Company
   3. MIFAB, Inc: www.mifab.com/#sle
   4. Watts
   5. Zurn Industries, LLC

B. Cleanouts at Exterior Surfaced Areas:
   1. Round cast nickel bronze access frame and non-skid cover.

C. Cleanouts at Interior Finished Floor Areas:
   1. Lacquered cast iron body with anchor flange, reversible clamping collar, threaded top assembly, and round gasketed scored cover in service areas and round gasketed depressed cover to accept floor finish in finished floor areas.

D. Cleanouts at Interior Finished Wall Areas:
   1. Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless-steel access cover secured with machine screw.

2.08 REFRIGERATOR VALVE AND RECESSED BOX

A. Box Manufacturers:
   1. Guy Gray
   2. Oatey Supply Chain Services, Inc

2.09 BACKFLOW PREVENTERS

A. Provide letter of certification to Owner.

B. Type and configuration shall conform to local authority requirements.

C. REDUCED PRESSURE BACKFLOW PREVENTORS
   1. Manufacturers:
      a. Conbraco Industries, Inc
      b. Watts Regulator Company, a part of Watts Water Technologies
      c. Zurn Industries, LLC
   2. Reduced Pressure Backflow Preventers:
      a. ASSE 1013; cast bronze body and stainless-steel springs; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve that opens under back pressure in case of diaphragm failure, and non-threaded vent outlet.

D. DOUBLE CHECK-VALVE ASSEMBLIES
   1. Manufacturers:
      a. Conbraco Industries, Inc
      b. Watts Regulator Company, a part of Watts Water Technologies
      c. Zurn Industries, LLC
   2. Double Check Valve Assemblies:
      a. ASSE 1012; Bronze body with corrosion resistant internal parts and stainless-steel springs; two independently operating check valves with intermediate atmospheric vent.

2.10 WATER HAMMER ARRESTORS

A. Manufacturers:
   1. Jay R. Smith Manufacturing Company
   2. Sioux Chief; 650 Series
   3. Watts Regulator Company, a part of Watts Water Technologies: www.wattsregulator.com/#sle
   4. Wade; WP5-100

5. Zurn Industries, LLC; 1250 XL

B. Water Hammer Arrestors:
   1. Piston-type with sized in accordance with PDI-WH 201, sufficient volume of air to dissipate the calculated kinetic energy generated in the piping system
   2. Arrestors shall be effective when installed at any angle.
   3. Provide isolation valve for service.
   4. Maximum working temperature of 250 degrees F
   5. Maximum working pressure 350 PSIG
   6. Performance per ANSI/ASSE 1010-2004 Standard

2.11 MIXING VALVES

A. Thermostatic Mixing Valves:
   1. Manufacturers:
      a. Leonard Valve Company
      b. Bradley
      c. Apollo Conbraco
      d. Lawler
      e. Powers
      f. Acorn
      g. Armstrong
   2. Recirculation Station: Recirculation station shall consist of thermostatic mixing valve in combination with piping assembly, inlet/outlet shutoff valves, pressure/temperature gauges, circulation pump (see pump schedule), circuit setter balancing valve, etc. All components pre-assembled to enamel coated strut and tested by manufacturer.
   3. Thermostatic Mixing Valves: The thermostatic water mixing valve (TMV) shall consist of a liquid-filled thermal motor control mechanism with a positive shut-off of hot water when cold water supply is lost. The TMV shall allow a restricted cold flow in the event of loss or interruption of the hot water supply. All flow is shut off in the event of thermostat failure. The TMV shall be constructed of bronze bodies with corrosion resistant components and shall be equipped with integral checkstops, thermometer, outlet temperature gauge, and removable strainers. The TMV shall control the temperature to within +/- 3 degrees from low flow to the maximum flow rate scheduled.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Thermometers: Install thermometers and thermal wells in piping at locations indicated, and so as to be easily read.

C. Pressure Gauges: Install pressure gauges at each side of pressure reducing valves; and as indicated.

D. Unions: Install unions in pipe connections to control valves, coils, regulators, reducers, all equipment, and where it may be necessary to disconnect the equipment or piping for repairs or maintenance; and as indicated.

E. Install (1) piston type water hammer arrestor at each quick acting valve for branch supply lines up to 20’ in length serving plumbing fixture groups. Install water hammer arrestor between last two fixtures, for branch supply lines exceeding 20’ in length, serving plumbing fixture groups. Size per manufacturer’s instructions.

F. Thermostatic Mixing Valves: Install in accordance with installation detail and the manufacturer’s recommendations.

G. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.

H. Encase exterior cleanouts in concrete flush with grade.

I. Install floor cleanouts at elevation to accommodate finished floor.

J. Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, and interior and exterior hose bibbs.

K. Pipe relief from backflow preventer to nearest drain.

L. Install water hammer arrestors complete with accessible isolation valve on hot and cold-water supply piping to fast acting valves such as water closet flush valves, washer machines, etc.

M. Install an approved trap primer at each floor drain, funnel drain, shower drain, janitor mop sink, and floor sink.

END OF SECTION 221006

SECTION 223000
PLUMBING EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water Heaters:

B. Diaphragm-type compression tanks

C. In-line circulator pumps

D. Condensate removal pumps

1.02 RELATED REQUIREMENTS

A. Section 220548 - Vibration and Seismic Controls for Plumbing Piping and Equipment

B. Section 230513 - Common Motor Requirements for HVAC Equipment

C. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections

1.03 REFERENCE STANDARDS

A. ABMA STD 9 - Load Ratings and Fatigue Life for Ball Bearings; 2015

B. ABMA STD 11 - Load Ratings and Fatigue Life for Roller Bearings; 2014

C. ANSI Z21.10.1 - Gas Water Heaters - Volume I - Storage Water Heaters with Input Ratings of 75,000 Btu per Hour or Less; 2014

D. ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1 - Rules for Construction of Pressure Vessels; 2017

E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014

F. NSF 372 - Drinking Water System Components - Lead Content; 2016

G. NSF 61 - Drinking Water System Components - Health Effects; 2017

H. UL 174 - Standard for Household Electric Storage Tank Water Heaters; Current Edition, Including All Revisions

I. UL 778 - Standard for Motor-Operated Water Pumps; Current Edition, Including All Revisions

1.04 SUBMITTALS

A. Product Data:
   1. Provide dimensional drawings of water heaters indicating components and connections to other equipment and piping.
   2. Indicate pump type, capacity, and power requirements.
   3. Provide certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.
   4. Provide electrical characteristics and connection requirements.

B. Project Record Documents: Record actual locations of components.

C. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number. Include pump performance curves with pump.

D. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Certifications:
   1. Water Heaters: NSF approved
   2. Electric Water Heaters: UL listed and labeled to UL 174
   3. Water Tanks: UL listed units, for units with a storage tank of less than 120 gallons. All others to be ASME labeled to ASME BPVC-VIII-1

4. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated

B. Identification: Provide pumps with manufacturer's name, model number, and rating/capacity identified by permanently attached label.

C. Performance: Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.07 WARRANTY

A. Provide five-year manufacturer warranty for domestic water storage tanks. Provide one year manufacturer warranty for domestic water heater parts.

PART 2 PRODUCTS

2.01 WATER HEATERS

A. Manufacturers:
1. A.O. Smith Water Products Co
2. Bock Water Heaters, Inc
3. Rheem
4. State
5. Lochinvar
6. Bradford White
7. PVI
8. Heat Transfer Products

B. Commercial Electric:
1. Type: Factory-assembled and wired, electric, vertical storage
2. Performance:
   a. Maximum Working Pressure: 150 psig
3. Controls: Automatic immersion water thermostat; externally adjustable temperature range from 60 to 180 degrees F, flanged or screw-in nichrome elements, high temperature limit thermostat.
4. Accessories:
   a. Water Connections: Brass
   b. Dip Tube: Brass
   c. Drain valve
   d. Anode: Magnesium
   e. Temperature and Pressure Relief Valve: ASME labeled.
5. Tank: Welded steel ASME labeled pressure vessel; glass lining, mounted on steel channel base with lifting lugs, insulated with 2-inch glass fiber; enclosed with 16-gage, 0.0598-inch steel jacket; baked enamel finish.
6. Controls: Ventilated control cabinet, factory-wired with solid state progressive sequencing step controller, fuses, magnetic contactors, control transformer, pilot lights indicating main power and heating steps, control circuit toggle switch, electronic low-water (probe-type) cut-off, high temperature limit thermostat, flush-mounted temperature and pressure gauges.
7. Heating Elements: Flange-mounted immersion elements; individual elements sheathed with Incoloy corrosion-resistant metal alloy, rated less than 75 W/sq in.

2.02 DIAPHRAGM-TYPE COMPRESSION TANKS

A. Manufacturers:
1. Amtrol Inc
2. Bell & Gossett, a xylem brand

3. Taco, Inc
4. Wilkins
5. Armstrong

B. Construction: Welded steel, tested and stamped in accordance with ASME BPVC-VIII-1; supplied with National Board Form U-1, rated for working pressure of 125 psig, with flexible EPDM diaphragm sealed into tank, and steel legs or saddles

C. Accessories: Pressure gage and air-charging fitting, tank drain; precharge to 55 psig

2.03 IN-LINE CIRCULATOR PUMPS, BRONZE

A. Manufacturers:
1. Armstrong Fluid Technology
2. Bell & Gossett, a xylem brand
3. Taco
4. Grundfos

B. Casing: Bronze, rated for 125 psig working pressure, with stainless steel rotor assembly

C. Impeller: Bronze

D. Shaft: Alloy steel with integral thrust collar and two oil lubricated bronze sleeve bearings

E. Seal: Carbon rotating against a stationary ceramic seat suitable for continuous operation at 225 degrees F

F. Drive: Flexible coupling

G. Pump must be capable of being serviced without disturbing piping connections.

H. Pump shall be water lubricated type for horizontal or vertical installation.

I. Each pump shall be factory tested. It shall then be thoroughly cleaned and painted with at least one coat of high-grade machinery enamel prior to shipment.

J. Entire pump to be NSF 372 certified

K. See Section 230513 - Common Motor Requirements for HVAC Equipment if equipment schedule calls out for any variable drive or ECM requirements.

2.04 IN-LINE CIRCULATOR PUMPS, STAINLESS STEEL

A. Manufacturers:
1. Armstrong Fluid Technology
2. Bell & Gossett, a xylem brand
3. Taco
4. Grundfos

B. Casing: Stainless steel, rated for 125 psig working pressure

C. Impeller: Polyphenylene ether/high impact polystyrene blend or stainless steel

D. Shaft and Bearings: Ceramic or stainless steel

E. Seal: Carbon rotating against a stationary ceramic seat suitable for continuous operation at 225 degrees F

F. Pump must be capable of being serviced without disturbing piping connections.

G. Pump shall be water lubricated type for horizontal or vertical installation.

H. Each pump shall be factory tested. It shall then be thoroughly cleaned and painted with at least one coat of high-grade machinery enamel prior to shipment.

I. Entire pump to be NSF 372 certified

J. See Section 230513 - Common Motor Requirements for HVAC Equipment if equipment schedule calls out for any variable drive or ECM requirements

2.05 CONDENSATE REMOVAL PUMPS

A. Manufacturers:
   1. Franklin Electric Company
   2. Liberty Pumps Inc
   3. Little Giant
   4. Hartell
   5. Saniflo

B. Construction: Commercial grade, nonferrous pump with stainless steel shaft, integral discharge check valve, integral float switch, safety switch, thermoplastic reservoir, motor assembly, and power cord with ground.

C. Safety: UL 778

PART 3 EXECUTION

3.01 INSTALLATION

A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions of certification, if any.

B. Coordinate with plumbing piping and related fuel piping work to achieve operating system.

C. Domestic Water Heaters:
   1. Water heaters shall each have a relief valve sized to match heat input and set to relieve at 120 psi.
   2. Install temperature-pressure relief valve on hot water heater and pipe discharge directly above funnel of floor drain or as shown on plans.
   3. If system has a hot water recirculating line and/or check valve in the cold-water supply to tank, provide a pre-charged, type expansion tank. Size per schedule or Hot Water Tank Piping Diagram. Provide ASME rated expansion tank on water heaters that are ASME rated.
   4. Electric water heaters installed in unconditioned space or on a concrete floor shall be placed on incompressible insulation having a minimum insulation value of R-10.
   5. On all water heaters, provide and install seismic bracing per SMACNA zone 3.
   6. For water heaters larger than 199 MBH and water heater boilers of any size, contact boiler inspector for preliminary layout approval prior to final piping. Ensure installation meets all manufacturers required clearances as well as local code (WAC and L&I).
   7. Provide and install brass fittings between water heater and piping connections. Dielectric fitting connections are not acceptable.
   8. Install condensate drain to nearest floor sink, floor drain, or mop sink or as indicated on the plans.
   9. Install flue and combustion air intake per manufacturer's recommendations and not to exceed water heater listed equivalent lengths.

D. Domestic Water Storage Tanks:
   1. Provide steel pipe support, independent of building structural framing members.
   2. Clean and flush prior to delivery to site. Seal until pipe connections are made.

E. Pumps:
   1. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

END OF SECTION 223000

SECTION 224000
PLUMBING FIXTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flush valve water closets
B. Wall hung urinals
C. Lavatories
D. Sinks
E. Under-lavatory pipe supply covers
F. Electric water coolers
G. Service sinks
H. Floor Drains
I. Hydrants
J. Hose Bibbs

1.02 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010
B. ASTM D3222 - Standard Specification for Unmodified Poly(Vinylidene Fluoride) (PVDF) Molding Extrusion and Coating Materials; 2005 (Reapproved 2015)
C. ASHRAE Std 18 - Methods of Testing for Rating Drinking-Water Coolers with Self-Contained Mechanical Refrigeration; 2013
D. ASME A112.6.1M - Supports for Off-the-Floor Plumbing Fixtures for Public Use; 1997 (Reaffirmed 2017)
E. ASME A112.18.1 - Plumbing Supply Fittings; 2012
F. ASME A112.19.2 - Ceramic Plumbing Fixtures; 2013
G. ASME A112.19.4M - Porcelain Enameled Formed Steel Plumbing Fixtures; 1994 (R2009)
H. ASME A112.19.14 - Six Liter Water Closets Equipped with Dual Flushing Device; 2013
I. ASSE 1014 - Performance Requirements for Backflow Prevention Devices for Hand-Held Showers; 2005
J. ASSE 1070 - Performance Requirements for Water Temperature Limiting Devices; 2015
K. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2013
L. ASTM C1822 - Standard Specification for Insulating Covers on Accessible Lavatory Piping; 2015
M. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2017
N. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015
O. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; 2013
P. NEMA LD 3 - High-Pressure Decorative Laminates; 2005
Q. NSF 61 - Drinking Water System Components - Health Effects; 2017
R. NSF 372 - Drinking Water System Components - Lead Content; 2016

1.03 SUBMITTALS

A. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

B. Manufacturer's Instructions: Indicate installation methods and procedures.

C. Maintenance Data: Include fixture trim exploded view and replacement parts lists.

D. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept fixtures on site in factory packaging. Inspect for damage.

B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.06 WARRANTY

A. Provide five-year manufacturer warranty for electric water coolers.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.02 FLUSH VALVE WATER CLOSETS

A. Water Closets: Vitreous china, ASME A112.19.2, Wall hung or floor mounted as noted on Equipment Schedule, siphon jet flush action, china bolt caps.
   1. Bowl: ASME A112.19.2; As noted on Architectural elevations high with elongated rim
   2. Flush Valve: Exposed (top spud)
   3. Handle Height: 44 inches or less
   4. Outlet Size: 2 inches
   5. Color: White
   6. Assemblies need to have a current Maximum performance (MaP) rating of 800 or more and be listed as a WaterSense approved fixture.
   7. Manufacturers:
      a. American Standard, Inc
      b. Kohler Company
      c. Zurn Industries, Inc
      d. Mansfield
      e. Sloan
      f. Toto

B. Flush Valves: ASME A112.18.1, diaphragm type, complete with vacuum breaker stops and accessories
   1. Provide manual or sensor flush valve as indicated on the equipment schedule.
   2. Sensor-Operated Type: Solenoid operator, hard wired or battery powered as noted on Equipment Schedule, infrared sensor and over-ride push button.
   3. Exposed Type: Chrome plated, escutcheon, integral screwdriver stop
   4. Handle placed on turn-around side for ADA applications.
   5. Manufacturers:
      a. American Standard, Inc
      b. Delany Products
      c. Sloan Valve Company

d. Zurn Industries, Inc
e. Geberit
f. Toto
g. Moen

C. Seats:
1. Manufacturers:
a. American Standard, Inc: www.americanstandard-us.com/#sle
b. Bemis Manufacturing Company
c. Church Seat Company
d. Zurn Industries, Inc
2. Solid white plastic, open front, extended back, self-sustaining hinge, brass bolts, without cover

D. Water Closet Carriers:
1. Manufacturers:
a. JOSAM Company
b. Zurn Industries, Inc
c. J.R. Smith
d. Wade
e. Watts
2. ASME A112.6.1M; adjustable cast iron frame, integral drain hub and vent, adjustable spud, lugs for floor and wall attachment, threaded fixture studs with nuts and washers. Provide heavy duty carriers (500 pound rated) as a minimum unless specifically called out as light duty carriers on the plans. Provide extra heavy-duty carriers (750 pound rated or greater) as noted on the plans.

2.03 WALL HUNG URINALS

A. Wall Hung Urinal Manufacturers:
1. American Standard, Inc
2. Kohler Company: www.kohler.com/#sle
3. Zurn Industries, Inc; EcoVantage Z5798 High-Efficiency Urinal System
4. Mansfield
5. Sloan
6. Toto

B. Urinals: Vitreous china, ASME A112.19.2, wall hung with side shields and concealed carrier.
1. Flush Volume: 0.125 gallons, maximum
2. Flush Style: Washout
3. Flush Valve: Exposed (top spud)
4. Trap: Integral
5. Removable stainless-steel strainer
6. Supply Size: 3/4 inch
7. Outlet Size: 1-1/2 inches

C. Flush Valves: ASME A112.18.1, diaphragm type, complete with vacuum breaker stops and accessories
1. Provide manual or sensor flush valve as indicated on the equipment schedule.
2. Exposed Type: Chrome plated, escutcheon, integral screwdriver stop
3. Manufacturers:
a. American Standard, Inc
b. Delany Products
c. Sloan Valve Company
d. Zurn Industries, Inc
e. Geberit
f. Toto

g. Moen

D. Carriers:
1. Manufacturers:
a. JOSAM Company
b. Zurn Industries, Inc
c. J.R. Smith
d. Wade
e. Watts
2. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded fixture studs for fixture hanger, bearing studs

2.04 LAVATORIES

A. Lavatory Manufacturers:
1. American Standard, Inc
2. Kohler Company
3. Zurn Industries, Inc
4. Mansfield
5. Sloan
6. Toto

B. Vitreous China Wall Hung Basin: ASME A112.19.2; vitreous china wall hung lavatory, Size as indicated on Equipment Schedule minimum, with 4-inch-high back, rectangular basin with splash lip, front overflow, and soap depression.
1. Drilling Centers: 4 inches

C. Steel Counter Top Basin: ASME A112.19.4M; porcelain on steel self-rimming counter top lavatory, Size as indicated on Equipment Schedule with drillings on 4 inch centers, front overflow, soap depression, seal of putty, caulking, or concealed vinyl gasket

D. Vitreous China Counter Top Basin: ASME A112.19.2; vitreous china self-rimming counter top lavatory, Size as indicated on Equipment Schedule with drillings on 4 inch centers, front overflow, soap depression, seal of putty, caulking, or concealed vinyl gasket

E. Vitreous China Under-Mount Basin: ASME A112.19.2; vitreous china under-mount lavatory, front overflow, mounting kit and template by manufacturer
1. Bowl size: Size as indicated on Equipment Schedule

F. Supply Faucet Manufacturers:
1. American Standard, Inc
2. Kohler Company
3. Zurn Industries, Inc
4. Chicago Faucets
5. Symmons
6. Toto
7. T&S Brass
8. Speakman
9. Moen
10. Mac Faucets

G. Supply Faucet: ASME A112.18.1; chrome plated supply fitting with open grid strainer, water economy aerator with maximum flow of 0.5 gallon per minute (low-flow), handles or sensor as indicated on Equipment Schedule
1. P-Trap:
a. 17-gauge seamless chrome plated brass
b. Adjustable, ground joint swivel
c. 2" water seal
d. Provide cleanout

e. Manufacturers
   1) Just Manufacturing
   2) Engineered Brass Company
   3) McGuire Manufacturing

2.05 SINKS

A. Sink Manufacturers:
   1. Just
   2. Elkay

B. Single Compartment Bowl: ASME A112.19.3; 18 gage, 0.0359 inch (0.91 mm) thick, Type 304 stainless steel, self rimming and undercoated, with ledge back drilled for trim
   1. Drain: 3-1/2-inch crumb cup and tailpiece
   2. Verify amount of hole punches required for each sink prior to ordering.

C. Double Compartment Bowl: ASME A112.19.3; 18 gage, 0.0359 inch (0.91 mm) thick, Type 304 stainless steel, self rimming and undercoated, with ledge back drilled for trim
   1. Drain: 3-1/2-inch crumb cup and tailpiece
   2. Verify amount of hole punches required for each sink prior to ordering.

2.06 UNDER-LAVATORY PIPE SUPPLY COVERS

A. Manufacturers:
   1. Plumberex Specialty Products, Inc
   2. ProWrap

B. General:
   1. Insulate exposed drainage piping including hot, cold and tempered water supplies under lavatories or sinks per ADA Standards.
   2. Adhesives, sewing threads and two-ply laminated materials are prohibited.
   3. Exterior Surfaces: Smooth nonabsorbent with no finger recessed indentations for easy cleaning.
   4. Construction: 1/8-inch PVC with antimicrobial, antifungal and UV resistant properties.
      a. Provide one piece injected molded design with internal bridge at top of J-bend to prevent separating.
      b. Comply with ASTM C1822 Type III for covers on accessible lavatory piping.
      c. Thermal Resistance: R value of 0.504 or lower when tested by ASTM C177
      d. Microbial and Fungal Resistance for Interior and Exterior: Comply with ASTM G21

C. Under-Lavatory Covers with Snap-Lock Fasteners:
   1. Manufacturers:
      a. Plumberex Specialty Products, Inc: Plumberex Pro-Extreme
   2. Construction: PVC with antimicrobial, antifungal, and UV-resistant properties, one piece injected molded design with internal bridge at top of J-bend to prevent separating.
   3. Fasteners: Reusable, snap-locking fasteners with no sharp or abrasive external surfaces. No cable ties allowed.
   4. Maintenance: Valve and supply cover shall be accessible for maintenance without removal and with removable, reusable access cap.
   5. Provide with weep hole for condensation drainage and ventilation.
   6. Vandal Resistance: Internal line grooves for trimming not easily torn by hand. All trim line grooves shall require tool cutting only.
   7. Color: High gloss white

2.07 ELECTRIC WATER COOLERS

A. Electric Water Cooler Manufacturers:
   1. Elkay Manufacturing Company
   2. Haws Corporation
   3. Oasis, a Lynn Tilton Company

4. Murdock Manufacturing

B. Water Cooler: Electric, mechanically refrigerated; surface ADA mounted; stainless steel top, stainless steel body, elevated anti-squirt bubbler with stream guard, automatic stream regulator, push button, mounting bracket; integral air-cooled condenser and stainless-steel grille.
   1. Capacity: Provide a minimum of 8 gallons per hour of 50 degrees F water with inlet at 80 degrees F and room temperature of 90 degrees F, when tested in accordance with ASHRAE Std 18.
   2. Electrical: 115 V, 60 Hertz compressor, 6-foot cord and plug for connection to electric wiring system including grounding connector. Coordinate receptacle location with EC

C. Bottle Filler: Materials to match fountain. See below for specifications.

D. If labeled 'Vandal Resistant' on Equipment Schedule, provide heavy duty, 14-gauge stainless steel cabinet with vandal resistant screw hardware. Provide stainless steel louver screening to prevent objects from being inserted into cabinet.

2.08 SERVICE SINKS

A. Service Sink Manufacturers:
   1. Florestone
   2. Fiat
   3. Acorn

B. Bowl: 36 by 24 by 10 inch high unless otherwise stated in the plumbing fixture schedule, white molded stone, floor mounted, with one-inch-wide shoulders, vinyl bumper guard, stainless steel strainer

C. Accessories:
   1. 4 feet of 1/2 inch diameter plain end reinforced plastic hose
   2. Hose clamp hanger
   3. Mop hanger

2.09 FLOOR DRAINS (F.D.)

A. Cast iron body, heavy duty floor drain, with 5" nickel bronze adjustable strainer head, vandal proof screws, and trap primer connections. Size outlet to match pipe size shown on drawings. Where used for shower drain, provide with chrome plated strainer. Furnish with 6" diameter strainer and funnel where indicated.

B. Cast iron body, heavy duty floor drain, with Type 'N' 7" diameter, nickel bronze grate, vandal proof screws, and trap primer connections. Size outlet to match pipe size shown on drawings. Use in mechanical rooms and utility spaces.

C. Floor drains labeled medium duty, light duty, or commercial duty are not allowed.

D. Manufacturers:
   1. J.R. Smith
   2. Josam
   3. Zurn
   4. Wade
   5. MIFAB
   6. Watts

2.10 HYDRANTS

A. Wall Hydrants: Approved freeze-proof type with integral anti-siphon vacuum breaker, self-draining, ¾ hose connection, loose key operated:
   1. Manufacturers:
      a. Zurn: Z-1310
      b. Wade: W-8620 with union elbow
      c. Smith: 5609

d. Josam: 71050
e. Woodford: 65
f. Acorn: 8161

B. Wall Hydrant (dual temperature): Hot and cold supply, non-freeze type with vacuum breaker device, ¾" hose connection, loose key operated:
1. Manufacturers:
a. Smith: 5660
b. Zurn: Z-1325
c. Woodford: 22
d. Acorn: 8146

C. Wall Box Hydrants: Freezeproof type with integral anti-siphon vacuum breaker, ¾" hose connection, loose key operated, enclosed in a bronze or stainless-steel box for flush wall installation with hinged door and key lock:
1. Manufacturers:
a. Jay R. Smith: 5509QT
b. Zurn: Z-1300
c. Woodford: B 65
d. Acorn: 8160

D. Wall Box Hydrant (dual temperature): Hot and cold supply, approved freeze-proof type with vacuum breaker device, ¾" hose connection, loose key operated, enclosed in a bronze box for flush wall installation with hinged door and operating key lock:
1. Manufacturers:
a. J.R. Smith: 5560
b. Zurn: Z-1325
c. Woodford: HCB67
d. Acorn: 8156

E. Ground Box Hydrant Freezeproof Flush Type (Non-Potable): Approved encased freeze-proof type, ¾" hose connection, enclosed in a rough bronze box for flush with grade installation with hinged cover with operating key lock:
1. Manufacturers:
a. Zurn: Z-1360
b. J.R. Smith: 5810
c. Woodford: Y95

2.11 HOSE BIBBS

A. Surface Mounted: Approved types with integral vacuum breaker, ¾" hose connection, chrome plated face and loose key:
1. Manufacturers:
a. J.R. Smith: 5618
b. Woodford: Model 75
c. Chicago Faucet: Model 387-E27CP
d. Acorn: 8141

B. Surface Mounted in a Box: Approved type with integral vacuum breaker, ¾" hose connection, enclosed in box for flush wall installation with hinged door and operating key lock.
1. Manufacturers:
a. Woodford: Model B75
b. Zurn: Z1350-VB
c. J.R. Smith: 5518
d. Acorn: 8151

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.

B. Verify that electric power is available and of the correct characteristics.

C. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

3.02 PREPARATION

A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.03 INSTALLATION

A. Install each fixture with a removable trap to be easily removable for servicing and cleaning.

B. Provide chrome plated rigid supplies to fixtures with loose key stops, reducers, and escutcheons.

C. Install components level and plumb.

D. Make fixture floor connections with approved brand of cast iron floor flange, soldered or caulked securely to waste pipe.

E. Make joints between fixtures and floor flanges tight with approved fixture setting compound or gaskets.

F. Caulk between fixtures and wall and floor with white butyl rubber non-absorbent caulking compound. Point edges.

G. Install and connect all Kitchen Fixtures. Provide chrome plated brass waste, "Just" or equal.

H. Provide concealed arm supports for wall mounted china lavatories.

I. All exposed metal shall be chrome-plated brass.

J. Provide floor-mount fixture support with concealed heavy steel stanchion and supporting plate for lavatories and urinals.

K. Provide floor-mount fixture support for wall-hung water closets, and with 2” no-hub auxiliary inlet at each location of back-to-back water closet and urinal.

L. Provide flush valve supply support on all WC and urinal carriers.

M. Provide rear anchor support for all heavy-duty WC carriers.

N. Provide trap primer and connection to p-trap of showers, floor sinks, floor drains, and service sinks.

O. On ADA water closets, provide flush valve handle or tank handle on side facing wheelchair turn around.

P. All ADA lavatory P-trap and angle stop assemblies shall be insulated with institutional A.D.A. insulator kit as manufactured by E.B.C. or equal. Abrasion resistant exterior cover shall be smooth and have 1/8" wall minimum over cushioned foam insert. Fasteners shall remain substantially out of sight. Use part 500RHS on offset P-trap if required.

Q. Sensor Type Fixtures: Mechanical contractor to coordinate with electrical contractor for installation of all infra-red sensor type fixtures. Transformer kit provided and installed by mechanical contractor, all electrical connectors, wire connections, and testing by electrical contractor.

R. Hose Bibb: Install one (1) hose bibb in each toilet room with 2 or more water closets, urinals or a combination thereof, mount at 18" under one lavatory.

S. Wall Hydrant: Install at 18" above finished grade, unless otherwise indicated.

3.04 INTERFACE WITH WORK OF OTHER SECTIONS

A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

3.05 ADJUSTING

A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.06 CLEANING

A. Clean plumbing fixtures and equipment.

B. Polish chrome finish at completion of Project.

C. Remove all manufacturers' labels tags, and protective plastic.

D. Polish floor drain covers.

3.07 PROTECTION

A. Protect installed products from damage due to subsequent construction operations.

B. Repair or replace damaged products before Date of Substantial Completion.

3.08 MOUNTING HEIGHTS

A. Fixture Heights: Install fixtures to heights above finished floor as indicated on the architectural elevation drawings. Architectural elevation dimensions take precedent over the following heights:

1. Water Closet:
    a. Standard: 16-17 inches to top of seat
    b. ADA: 17-19 inches to top of seat
    c. Pre-school and Kindergarten: 13 inches to top of seat (Upon approval by District)
2. Urinal:
    a. Standard: 24 inches from floor to bottom lip
    b. ADA: 16 inches from floor to bottom lip
    c. Pre-school and Kindergarten: 16 inches from floor to bottom lip
3. Lavatory:
    a. Standard: 29 inches from floor to top of apron
    b. ADA: 33 inches from floor to top of apron with 29 inches clearance under fixture
4. Drinking Fountain:
    a. Standard: 40 inches from floor to bubbler height
    b. ADA: 36 inches from floor to bubbler height with 27 inches clearance under fixture
5. Shower Heads and Control Valve:
    a. Adult Male: 69.5 inches to bottom of head
    b. Adult Female: 64.5 inches to bottom of head
    c. Standard control valve: 48 inches above finished floor
    d. ADA control valve: 40 inches above finished floor

END OF SECTION 224000

SECTION 230513
MOTORS AND VARIABLE DRIVES

PART 1 GENERAL

1.01 GENERAL

A. Includes, but not limited to, motors 1/12 HP or larger used in Division 23.

1.02 RELATED SECTIONS

A. General Conditions, Division 1

B. Section 200000 – General Mechanical Requirements

1.03 SUBMITTALS REQUIREMENTS OF THIS SECTION

A. All variable drives.

B. Total harmonic voltage distortion calculation.

1.04 OPERATION AND MAINTENANCE REQUIREMENTS OF THIS SECTION

A. Check out sheet for each variable drive showing all programmed parameters. Date of check out, and name and company address of employee responsible for checkout.

B. Programming manual explaining how to access and change all programmable points.

C. International wiring diagram for each different unit.

D. Parts diagram with replacement parts listed.

E. Trouble shooting guide.

PART 2 PRODUCTS

2.01 MOTORS

A. Motors located indoors shall be open frame, drip-proof type, unless indicated otherwise. Motors located outdoors exposed to weather shall have corrosion resistant finish and shall be totally enclosed fan cooled (TEFC) or totally enclosed non-ventilated (TENV) type, unless indicated otherwise. Motors used in fans serving dishwashing hoods shall be TEFC type.

B. All motors shall be UL listed.

C. All motors used with variable frequency drives shall be premium efficiency inv*ert*er ready and shall be capable of running at least 85 Hz.

D. All motors 1 HP and larger shall be energy efficient type and shall meet the 2015 Washington State Energy Code requirements.

E. All fan motors 1/12 HP or greater and less than 1 HP shall be Electronically Commutated Motors (ECM) or shall have a minimum motor efficiency of 70 percent when rated in accordance with DOE 10 C.F.R. 431. These motor speeds shall be adjustable.

F. Motors shall not be smaller than indicated on drawings; however, motors shall be of adequate size to drive the respective equipment when handling the quantities specified without exceeding the nameplate full load current at any conditions encountered in actual operation. If it becomes evident that a motor furnished is too small to meet these requirements as a result of the Contractor using substituted equipment or having revised the system arrangement, the Contractor shall replace it with a motor of adequate size at no additional cost to the Owner. This Contractor shall also arrange with the Electrical Contractor to increase the size of the wiring, motor starter and other accessories as required to serve the larger motor at no additional cost to the Owner.

G. ECM (Electrically Commutated Motors) shall conform to the motor requirements listed above. In addition, the Contractor purchasing the HVAC equipment that includes the ECM is responsible for ensuring the ECM motor control speed control is set to match the required component operation. The ECM motor control speed control may be preset by the HVAC equipment manufacturer. The Contractor purchasing the HVAC equipment shall provide documentation showing the appropriate ECM motor control board jumper pins, dip switches and/or multi-pin plugs settings for correct HVAC equipment component operation.

H. Approved Manufacturers:
   1. General Electric
   2. Westinghouse
   3. Reliance
   4. Allis-Chalmers
   5. Gould
   6. Century
   7. Wagner
   8. Baldor
   9. U.S. Motors Marathon

2.02 VARIABLE FREQUENCY DRIVES (VFD UNDER 5 HP)

A. Variable Frequency Drives (VFD):
   1. Description:
      a. Provide enclosed adjustable speed drives suitable for operating at the current, voltage, and horsepower indicated on the equipment schedule. Conform to requirements of NEMA ICS 3.1.
      b. VFD shall not increase the voltage distortion above 5% at the input terminals of the VFD or line filters. The manufacturer shall make all modifications to the drive necessary to meet this requirement.

B. Ratings:
   1. VFD must operate, without fault or failure, when voltage varies plus or minus 10 percent from rating and frequency varies plus or minus 5 percent from rating.
   2. VFD shall be voltage as shown on schedule.
   3. Operating Ambient Temperature: 14 degrees F to 104 degrees F.
   4. Humidity: non-condensing to 95%.
   5. Altitude: to 3300 feet, higher altitudes achieved by derating.
   6. Starting Torque: 100% starting torque shall be available from 0.5 Hz to 60 Hz.
   7. Overload capability: 110% of rated F.L.A. (full load amps) for 60 seconds; 150% of rated F.L.A., instantaneously.
   8. The VFD must meet the requirements for Radio Frequency Interface (RFI) above 7 MHz as specified by FCC regulations, part 15, subpart J, Class A devices.
   9. In compliance with IEEE 519, the Total Harmonic Voltage Distortion for the VFD shall be no greater than 5%, the supplier of the VFD shall provide a dc bus choke or line reactors to ensure compliance. In order to estimate THVD the following is needed: Point of Common Coupling (PCC) and the KVA, and secondary voltage of the supply transformer. Assume 5.00% transformer impedance. If no transformer is present assume 50% of service demand.
   10. VFDs must have a minimum short circuit rating of 65 Kamps RMS without additional input fusing.

C. Design:
   1. VFD shall employ microprocessor-based inverter logic, isolated from all power circuits.
   2. VFD shall include surface mount technology, with conformal coating.

3. VFD shall employ a PWM (pulse width modulated) inverter system, consisting of:
   a. Input Section:
      1) VFD input power stage shall convert three-phase AC line power into a fixed DC voltage via a solid-state full wave diode rectifier, with MOV (metal oxide varistor) protection.
   b. Intermediate Section:
      1) DC bus as a supply to the VFD Output Section shall maintain a fixed voltage with filtering and short circuit protection.
      2) DC Bus shall be interfaced with the VFD diagnostic logic circuit, for continuous monitoring and protection of the power components.
   c. Output Section:
      1) Insulated gate bipolar transistors (IGBT's) shall convert DC bus voltage to variable frequency and voltage.
      2) PWM sine coded output to the motor.
4. The VFD must be selected for operation at carrier frequencies at or above 5 kHz without derating to satisfy the conditions for current, voltage and horsepower as indicated on the equipment schedule.
5. VFD shall include one independent remote reference input. The input shall be 0 - 10 VDC or 4 – 20mA. Input shall respond to a programmable bias and gain.
6. VFD shall include a minimum of two digital input terminals:
   a. Reverse rotation direction
   b. Remote Reset
7. VFD shall provide terminals for remote contacts, to allow starting in the automatic mode.
8. VFD shall include one fully rated form “A” contact and one fully rated form “C” contact. The contact purpose is selectable and shall provide one of two functions:
   a. Drive Running
   b. Drive Faulted
9. VFD shall include a power loss ride of 2 seconds.
10. VFD shall include front mounted control operators that set the motor overheat drive shutdown, set the acceleration and deceleration, and set the output frequency limits. Operating mode (auto or manual) and speed setting functions shall also be provided.
11. VFD shall include electronic thermal overload protection for both the drive and motor. The electronic thermal motor overload shall be approved by UL. If the electronic thermal motor overload is not approved by UL, a separate UL approved thermal overload relay shall be provided in the VFD enclosure.
12. VFD shall include the following program functions:
    a. Auto restart capability.
    b. Stall prevention capability.
    c. Ability to close fault contact after the completion of all fault restart attempts.
13. VFD shall include factory settings for all parameters, and the capability for those settings to be reset.
14. VFD shall include the capability to adjust the following functions, while the VFD is running:
    a. Forward/Reverse direction.
    b. Acceleration adjustment from 0 to 3600 seconds.
    c. Deceleration adjustment from 0 to 3600 seconds.
    d. One preset speed.
15. All units to be provided with fused disconnect integral to the VFD. Fuse sized for the equipment per NEC.

D. Product Options:
   1. Provide the following:
      a. RFI (radio frequency interference) filters to attenuate possible VFD generated noise. The addition of these filters should reduce the line conducted noise levels within the limits of FCC regulations, part 15, subpart J, for Class A devices.

b. Current limiting input fusing for the protection of VFD semiconductor devices.
c. Line reactors reduce the effect of the load and line side transients on the drive. May be used on either the input side or output side of the drive.
d. “DC bus reactor”, to attenuate harmonic distortion.
e. DV/DT Filtering: When inverter duty type motors are not provided, maximum allowed VFD output rise is 1000 volts in 2 microseconds.

E. Fabrication:
1. Enclosure: NEMA Type 1 unless otherwise specified on drawings.

F. Source Quality Control:
1. In-circuit testing of all printed circuit boards shall be conducted, to insure the proper mounting and correct value of all components.
2. All printed circuit boards shall be burned in for 96 hours, at 85 degrees C.
3. Final printed circuit board assemblies shall be functionally tested, via computerized test equipment. All tests and acceptance criteria shall be preprogrammed. All tests results shall be stored as detailed quality assurance data.
4. All fully assembled controls shall be functionally tested, with fully loaded induction motors. The combined test data shall then be analyzed, to insure adherence to quality assurance specifications.
5. Inspect and production test, under load each completed VFD assembly.

G. Acceptable Manufacturers:
1. Square D
2. ABB
3. Yaskawa
4. Danfoss

2.03 VARIABLE FREQUENCY DRIVES (VFD 5 HP AND OVER)

a.
2. Miscellaneous Options:
a. RFI (radio frequency interference) filters to attenuate possible VFD generated noise. The addition of these filters should reduce the line conducted noise levels within the limits of FCC regulations, part 15, subpart J, for Class A devices.
b. Current limiting input fusing for the protection of VFD semiconductor devices.
c. Line reactors reduce the effect of the load and line side transients on the drive. May be used on either the input side or output side of the drive.
d. DV/DT Filtering: When inverter duty type motors are not provided, maximum allowed VFD output rise is 1000 volts in 2 microseconds.
e. Pressure transducer (3 to 15 PSI input = 0 to 10 V DC output), to convert a pneumatic signal into a VFD auto reference signal.

B. Fabrication:
1. Enclosure: NEMA Type 1 unless otherwise specified on drawings.

C. Source Quality Control:
1. In-circuit testing of all printed circuit boards shall be conducted, to insure the proper mounting and correct value of all components.
2. All printed circuit boards shall be burned in for 96 hours, at 85 degrees C.
3. Final printed circuit board assemblies shall be functionally tested, via computerized test equipment. All tests and acceptance criteria shall be preprogrammed. All tests’ results shall be stored as detailed quality assurance data.
4. All fully assembled controls shall be functionally tested, with fully loaded induction motors. The combined test data shall then be analyzed, to insure adherence to quality assurance specifications.
5. Inspect and production test, under load each completed VFD assembly.

D. Approved Manufacturers:
   1. Square D
   2. ABB
   3. Yaskawa
   4. Danfoss

PART 3 EXECUTION

Not Applicable

END OF SECTION 230513

SECTION 230529
HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 GENERAL

A. Includes:
   1. Pipe Hangers and Supports
   2. Duct Hangers and Supports
   3. Mechanical Equipment Anchors and Supports

1.02 RELATED SECTIONS

A. General Conditions, Division 1

B. Section 200000 – General Mechanical Requirements

C. Section 222000 – Excavation & Backfill for Mechanical Underground Utilities

D. Section 230548 – Vibration and Seismic Control

E. Section 230719 – HVAC Piping Insulations

F. Section 232300 – Refrigerant Piping

1.03 QUALITY ASSURANCE

A. Pipe Hanger Standards: (MSS) Manufacturers Standardization Society Standards SP-58-2002, SP-89-2003, and SP-69-2003.

B. All methods, materials, and workmanship shall conform to the International Building Code (IBC) and International Mechanical Code (IMC), as amended and adopted by the authority having jurisdiction.

1.04 SUBMITTAL REQUIREMENTS OF THIS SECTION

A. Hangers

B. Struts

C. Anchors

D. Shop drawings are required for all equipment supports and fabricated supports or assemblies.

1.05 OPERATION AND MAINTENANCE OF THIS SECTION

A. Not Applicable

PART 2 PRODUCTS

2.01 APPROVED MANUFACTURERS

A. Hangers and Supports: Elcen, Grinnell, B-Line Systems, Unistrut, Caddy, Tolco, PHD

B. Anchors: Rawplug, Phillips, Hilti, Caddy, Powers

C. Rooftop Support Systems: Miro Industries, Inc

2.02 GENERAL HANGERS AND SUPPORTS

A. Hanger Rods: Threaded hot rolled steel, electro-galvanized or cadmium plated. Hanger rods shall be sized so that the total load (including pipe or duct, insulation, hangers, and fluid) does not exceed the following:

Nominal Rod Diameter	Maximum Load
3/8 Inch	610 Pounds
1/2 Inch	1130 Pounds

B. Hanger Straps: Galvanized steel. Straps shall be sized so that the total load does not exceed the following:

Strap Size	Maximum Load
1” x 22 Gauge	230 Pounds
1” x 20 Gauge	290 Pounds
1” x 18 Gauge	380 Pounds
1” x 16 Gauge	630 Pounds

C. Beam Attachments: Shall be of the following type:

MSS Type	Elcen Figure No.	Grinnel Figure No.
21	33, 34	131
22	67	66
23	29A	87
28	95	292, 228
30	95	229

D. Anchors: Masonry anchors shall be Phillips wedge anchors, Phillips "Red Head" or Rawl "Saber-Tooth".

E. Steel: Structural steel, per ASTM A36.

F. Wood: Shall be fire treated.

2.03 PIPE HANGERS AND SUPPORTS

A. All hangers used directly on copper pipe shall be copper plated or have a factory applied 1/16-inch thick (minimum) plastic coating on all contact surfaces.

B. Riser clamps shall be epoxy coated.

C. All other hangers, supports, and hardware shall be cadmium plated or galvanized.

D. Fire sprinkler supports shall comply with NFPA-13.

E. Pipe Hangers and Supports: Shall be of the following type (numbers are 'MSS'):

Maximum System Temperature	Insulated Pipe Type
120 to 450 Degrees	1, 3, 7, 9, 10, 41, 42, 43, 44, 45, 46, E
60 to 120 Degrees	1, 3, 7, 9, 10
33 to 59 Degrees	1, 3, 5, 7, 9, 10, 41, 42, 43, 44, 45, 46, E

F. Vertical Pipe Supports: MSS Type 8 riser clamp (Elcen Fig. 39 and 339; Grinnel Fig. 261 and 261C).

G. Trapeze Hangers: Shall be constructed of carbon steel angles, channels, or other structural shapes with flat surface for point of support. Trapeze hangers shall be supported with hanger rods suspended from concrete inserts or approved structural clips. Provide a steel washer plate (Elcen Fig. 84 or equal) where hanger rod nuts bear on trapeze hanger.

H. Insulated Pipe Inserts and Insulation Shields:
   1. Insulation material at pipe insert shall be calcium silicate with jacket of nylon reinforced kraft paper bonded to aluminum foil cover on insulation. Insulated pipe insert shall have no more than 5% deformation at 100 psi and a thermal conductivity no more than 0.38 Btu/hr./sq. ft./degree F/1-inch thick at 75°F.
   2. Insulated pipe insert shall be same thickness as adjoining pipe insulation and sized to match pipe in which it is used on. See Section 230719 for insulation sizes.
   3. Provide shield per Section 231119 HVAC Piping Specialties.
   4. Manufacturers:
      a. TPS Thermal Pipe Shields
      b. B-Line
      c. Clement Support Services

2.04 REFRIGERANT PIPE HANGERS AND SUPPORTS

A. All horizontal refrigerant pipe shall utilize clevis, strut-mounted, or trapeze style supports.

B. All hangers, supports, and hardware shall be cadmium-plated or galvanized where used indoors, and galvanized where used outdoors.

C. Secure refrigerant pipe to strut channel using either of the following:
   1. Snap in Shield Supports:
      a. Polypropylene Copolymer construction.
      b. Rated for an operating temperature of -40°F to 178°F.
      c. Material shall be paintable.
      d. UL 723 (ASTM E 84) listed.
      e. Meets UL 94 HB flammability standards.
      f. Approved Manufacturers:
         1) Eaton Snap 'N Shield
         2) TB Concept, Inc. Insuguard
   2. Insulated Pipe Inserts and Insulation Shields:
      a. Insulation material at pipe insert shall be calcium silicate with jacket of nylon reinforced Kraft paper bonded to aluminum foil cover on insulation. Insulated pipe insert shall have no more than 5% deformation at 100 psi and a thermal conductivity no more than 0.38 Btu/hr./sq. ft./degree F/1-inch thick at 75°F.
      b. Insulated pipe insert shall be same thickness as adjoining pipe insulation and sized to match pipe in which it is used on. See Section 230719 for insulation sizes.
      c. Provide shield per Section 231119 HVAC Piping Specialties.
      d. Manufacturers:
         1) TPS Thermal Pipe Shields
         2) B-Line
         3) Clement Support Services

D. Trapeze Hangers: Shall be constructed of carbon steel strut supports. Trapeze hangers shall be supported with hanger rods suspended from approved structural clips. Provide a steel washer plat (Elcen Fig. 84 or equal) where hanger rod nuts bear on trapeze hanger.

E. Clevis Hangers:
   1. ANSI/SP-69 and SP-58 (Type 1).
   2. Provide with electro-galvanized finish.
   3. Install snap-in shield, or insulated pipe inserts, and insulation shields at each clevis hanger support.
   4. Snap in shields shall comply with the following requirements:
      a. Material: Polypropylene
      b. UL-723 (ASTM E 84) and UL-2043
      c. Service Temperature: -40°F to 178°F
      d. Approved Manufacturers:
         1) Eaton Snap 'N Shield
         2) TB Concept Inc. Insuguard
   5. Insulated Pipe Inserts and Insulation Shields:
      a. Insulation material at pipe insert shall be calcium silicate with jacket of nylon reinforced Kraft paper bonded to aluminum foil cover on insulation. Insulated pipe insert shall have no more than 5% deformation at 100 psi and a thermal conductivity no more than 0.38 Btu/hr./sq. ft./degree F/1-inch thick at 75°F.
      b. Insulated pipe insert shall be same thickness as adjoining pipe insulation and sized to match pipe in which it is used on. See Section 230719 for insulation sizes.
      c. Provide shield per Section 231119 HVAC Piping Specialties.
      d. Manufacturers:
         1) TPS Thermal Pipe Shields
         2) B-Line
         3) Clement Support Services

6. Approved Manufacturers:
    a. Caddy
    b. PHD, Inc.
    c. B-Line

F. Vertical refrigerant pipe supports shall utilize struts with cushion clamps.
1. Cushion Clamps:
    a. Temperature: -65°F to 275°F
    b. Yellow trivalent plated mild steel
    c. Provide with nylon locknut washer
    d. Approved Manufacturers:
        1) Holdrite
        2) BlueRidge
        3) Caddy
        4) PHD, Inc.

2.05 DUCT HANGERS AND SUPPORTS

A. Hangers: As shown in SMACNA HVAC Duct Construction Standards.

B. Vertical Duct Supports at Floor: 1-1/2" x 1-1/2" x 1/8" (minimum) galvanized steel angle and to support ducts, as shown in SMACNA HVAC Duct Construction Standards Figure 4-6. For ducts over 30 inches wide, provide riser reinforcing with hanger rods between the riser support and riser reinforcing.

C. Vertical Duct Supports at Wall: 1-1/2" x 1/8" (minimum) strap or 1-1/2" x 1-1/2" x 1/8" (minimum) angle bracket and as shown in SMACNA HVAC Duct Construction Standards Figure 4-7.

D. Hanger Attachments to Structure: As shown in SMACNA HVAC Duct Construction Standard Figures 4-1, 4-2, 4-3 to suit building construction and as allowed on structural drawings. Where C-clamps are provided, retainer clips shall be used. Friction beam clamps shall not be used.

E. Hanger Attachments to Ducts: As shown in SMACNA HVAC Duct Construction Standards Figure 4-4.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

A. Provide all necessary bolts, nuts, washers, turnbuckles, rod connectors, and any other miscellaneous accessories required for the support and anchoring of all pipes, ducts, and mechanical equipment.

B. Install steel or wood backing in walls (anchored to studs) as required to provide support for items hung from walls.

C. Install concrete inserts and anchors in accordance with manufacturer's instructions.

D. All welded steel support assemblies shall have a power wire brush and primer paint finish.

E. Maximum spans between piping supports may be significantly less than the maximum spans allowed herein due to structural limitations of allowable loads on hangers. The most restrictive criteria shall govern. Reference structural drawings.

3.02 INSTALLATION OF PIPE HANGERS AND SUPPORTS

A. Use of zip ties or plastic straps is strictly prohibited.

B. Insulation shall be continuous at pipe hangers and supports. Insulation may only be broken at vertical pipe supports where insulated cushion clamps are utilized.

C. Above ground pipe shall be adequately anchored to the structure to prevent sagging and to keep pipe in alignment.

D. All pipe supports shall be provided with a means of adjustment for the aligning and leveling of the pipe after installation.

E. Installation and sizing of pipe supports and accessories shall be in accordance with the manufacturer's recommendations and standard MSS SP-89 and MSS SP-69, NFPA #13 for fire protection piping, UPC, and IMC.

F. Provide supports at each change in direction of piping.

G. Where mechanically coupled piping is used, a hanger shall be placed within 2 feet on each side of couplings, with hanger spacing in no case to exceed the following:

Nominal Pipe Diameter	Maximum Span Mechanically Coupled Piping
¾ to 1 Inch	7 Feet
1 ¼ to 1 ½ Inch	7 Feet

NOTE: Manufacturer's support instructions shall be used where it is more restrictive than the above. Above is for rigid coupled piping systems. Follow manufacturer's requirements for a flexible piping system, except that, in no case is spacing to be more than the above.

H. Copper Tubing: Maximum spacing between supports:

Nominal Tubing Diameter	Maximum Span Copper
½ Inch	5 Feet
¾ to 1 ¼ Inch	6 Feet
1 ½ to 2 ½ Inch	8 Feet
3 Inches and Larger	10 Feet

I. Soft Copper Pipe: Maximum spacing between supports:

Nominal Tubing Diameter	Maximum Span of Soft Copper
All Sizes	5 Feet

J. Vertical Piping Supports: Support piping at each floor line with pipe clamps and at intermediate points as required to prevent excessive pipe movement and so as to comply with the maximum spacings cited above. Support all pipe stacks at their bases with a concrete pier or suitable hanger. For vertical pipe drops which occur away from a wall or similar anchoring surface, provide angled bracing from nearest structure to provide rigid anchoring of pipe drop. Any pipe requiring insulation shall use an insulated pipe insert at pipe clamp with 360° shield.

K. Insulated Pipe Insert and Insulation Shields: Protect insulated pipe at point of support with pipe insert and shield as required by the following table:

Nominal Pipe Diameter in Inches	Insert Length in Inches**	Shield Length in Inches	Minimum Shield Gauge
½ to 1½*	6	6	20
2 to 3 ½	6	6	20
4 to 5	9	9	18
6 to 10	9	9	18

*Insulated pipe inserts and shields may be omitted for pipe supported from the bottom.
**Inserts shall be in place at the time of installing pipe.

L. Underground Pipe: Shall be evenly supported on approved bedding materials, as specified for the type of piping being used. Such bedding and backfilling shall be as specified in Section 222000.

3.03 INSTALLATION OF DUCT HANGERS AND SUPPORTS

A. Provide anchors and supports for all ductwork.

B. Rectangular Duct: Supports and hangers shall be of size and spacing as shown in SMACNA HVAC Duct Construction Standards for the appropriate class of duct. (Hangers maximum allowable loads shall not be as shown in SMACNA Tables but shall be as specified in these specifications.)

C. Round Duct: Supports and hangers shall be of size and spacing as shown in SMACNA HVAC Duct Construction Standards for the appropriate class of duct.

D. Maximum Hanger Spacing (provided duct gauge and reinforcement comply with SMACNA Standards for such spacing):

Duct Area	Maximum Spacing
Up to 4 sq. ft. (27” Diameter)	8 Feet
4.1 to 10 sq. ft. (28” to 42” Diameter)	6 Feet
10.1 sq. ft. and up (43” Diameter and up)	4 Feet

E. Provide supports at each change in direction of duct. Locate hangers at inside and outside corners of elbows, or at each end of fitting, on each side.

F. Provide additional supports at each side concentrated loads (such as modulating dampers, duct heaters, sound attenuators, etc.)

G. Provide supports for exterior ductwork per SMACNA HVAC Duct Construction Standards or as detailed on the drawings.

3.04 CEILING AIR TERMINALS/SERVICES

A. Ceiling mounted air terminals or services weighing less than 20 pounds shall be positively attached to the ceiling suspension main runners or to cross runners with the same carrying capacity as the main runners.

B. Terminals or services weighing 20 pounds but not more than 56 pounds in addition to the above shall have two No. 12 gauge hangers connected from the terminal or service to the ceiling system hangers or to the structure above. These wires may be slack.

C. Terminals or services weighing more than 56 pounds shall be supported directly from the structure above by approved hangers.

D. All air terminals that use side inlet "plenums" or have fire dampers shall be supported directly from the structure with approved hangers (regardless of total weight).

3.05 INSTALLATION OF MECHANICAL EQUIPMENT ANCHORS AND SUPPORTS

A. Provide anchoring and supports for all mechanical equipment.

B. Heating, Ventilating and Air Conditioning equipment where suspended from structure shall be supported per SMACNA HVAC Duct Construction Standards or as shown on the drawings.

C. Roof mounted equipment shall be installed on roof curbs provided with the equipment (unless indicated otherwise). Such equipment shall be anchored to the curb, with the curb anchored to the building structure.

D. Equipment shall be supported and anchored in such a way so that no equipment vibration is transmitted to the building structure.

E. Added supports and bracing shall be provided per Section 230548.

F. Provide curbing as shown on drawings and as required to support all mechanical equipment.

END OF SECTION 230529

SECTION 230548
VIBRATION AND SEISMIC CONTROL

PART 1 GENERAL

1.01 GENERAL REQUIREMENTS

A. This section includes, but not limited to vibration isolation and seismic restraint installation for all equipment, ductwork, and piping as described here-in.

B. Seismic Restraints shall be bidder-designed. Seismic Design Criteria are to be established per the International Building Code and ASCE along with Project Structural drawings.

C. Items not included in this specification shall not relieve the contractor of the responsibility of providing seismic bracing that meets all the criteria required by the referenced codes and in accordance with the seismic design guidelines and the project structural drawings.

1.02 REFERENCED CODE AND STANDARDS

A. The latest adopted versions of the following codes and standards apply to this section.
   1. International Building Code (IBC)
   2. National Fire Protection Association (NFPA-13)
   3. Seismic Restraint Manual – Guidelines for Mechanical Systems (SMACNA)
   4. ASCE 7-10, American Society of Civil Engineers “Minimum Design Loads for Buildings and Other Structures”
   5. Applicable Project Structural Drawings for Seismic Design Criteria
   6. Applicable Manufacturer’s Seismic Design Guides for proprietary listed seismic bracing and mounting hardware
   7. Where there is a conflict in requirements between these guidelines and above-mentioned codes the more stringent parameters shall prevail.

1.03 RELATED SECTIONS

A. General Conditions, Division 1 and Division 23

B. Section 200000 – General Mechanical Requirements

1.04 DESIGN CRITERIA

A. Occupancy Category of Structure (I-IV) per IBC or ASCE

B. Component Importance Factor (I_p) per ASCE

C. Mapped Acceleration Parameters (S_1 and (S_s) per IBC and Project Structural Drawings

D. Site Class (A – F) per IBC and Project Structural Drawings

E. Site Coefficient (F_a) per IBC and Project Structural Drawings

F. Site Coefficient (F_v) per IBC and Project Structural Drawings

G. Seismic Design Category (A – D) based on Short Period Response Accelerations per IBC and Project Structural Drawings

H. Seismic Design Category (A – D) based on 1-Second Period Response Acceleration per IBC and Project Structural Drawings

I. Amplification Factor a_p per ASCE

J. Response Modification Factor R_p per ASCE

1.05 SUBMITTAL REQUIREMENTS

A. Isolation Pads

B. Spring Isolators

C. Seismic Control:
   1. Include design calculations and details for selecting seismic restraints complying with performance requirements, design criteria, and analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

2. Design Calculations: Calculate static and dynamic loading due to equipment weight, operation, seismic, and wind forces required to select vibration isolators, seismic and wind restraints.
    a. Coordinate design calculations with wind load calculations required for equipment mounted outdoors. Comply with requirements in other sections for equipment mounted outdoors.
3. Seismic and Wind Restraint Details:
    a. Design Analysis: To support selection and arrangement of seismic and wind restraints. Include calculations of combined tensile and shear loads.
    b. Details: Indicate fabrication and arrangement. Detail attachments of restraint to the restrained items and to the structure. Show attachment locations, methods, and spacing's. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.
    c. Coordinate seismic-restraint and vibration isolation details with wind-restraint details required for equipment mounted outdoors.
4. Periodic Special Inspections: The mechanical contractor shall provide a list of components/systems requiring periodic special inspections per IBC.
5. Special Certification Requirements: Each contractor responsible for the construction of a "Designated Seismic System" for active mechanical equipment that must remain operable following the design earthquake, or components with hazardous contents certified by the manufacturer to maintain containment following the design earthquake shall submit a Manufacturer's Certificate of Compliance for review and approval by the Registered Design Professional responsible for the design of the system. This information shall then be submitted to the AHJ.
6. All brace or restraint components, mounting devices, snubbers and anchors.

1.06 OPERATION AND MAINTENANCE REQUIREMENTS OF THIS SECTION

A. Not Applicable

PART 2 PRODUCTS

2.01 NEOPRENE ISOLATORS

A. Isolation Pads: Oil resistant neoprene pads, minimum ¼-inch thick, with cross-ribbed or waffle design. Size pads for not more than 50 psi or as recommended by vibration isolator manufacturer.

B. Floor Mounted Isolators: Double deflection type neoprene mounts, having minimum deflection of 0.35 inch. All metal surfaces shall be neoprene covered, base plate shall have mounting holes, and top shall have threaded steel plate or threaded steel insert. Element shall be color coded or labeled with molded symbols to identify capacity. Mason Series ND, Amber Booth "RV" or approved.

C. Suspension Isolators: Shall be double deflection neoprene type, with isolator encased in open steel bracket and minimum 3/8-inch deflection. Hanger rod shall be isolated from steel bracket with neoprene grommets. Mason Series HD, Amber Booth "BRD" or approved.

2.02 SPRING ISOLATORS

A. General: The load carried by each isolator shall be carefully calculated and isolators selected so that the static deflection will be the same and the supported equipment will remain level. Isolators shall be so designed that the ends of the springs will remain parallel during and after deflection to operating height. At operating height, springs shall have additional travel to complete (solid) compression equal to at least 50 percent of the operating deflection. Suspension isolator springs shall have a static deflection (as shown on drawings) not less than 1-1/2", except that for units with components rotating at 1000 rpm and less, the static deflection shall be not less than 2 inches. Floor isolator springs shall have deflection of not less than 1 inch. All isolators shall provide at least 96% isolation efficiency. Note: Deflections other than these may be used where circumstances warrant and more optimum isolation results can be achieved.

B. Floor Type Spring Isolators: Shall be open spring type with approximate ratio between horizontal and vertical spring constant of 1.0. A ribbed neoprene acoustical friction pad shall be bonded to the underside of the isolator. Provide with height saving bracket.
   1. Approved Manufacturers:
      a. Mason Series SLF
      b. Amber Booth "SW" or approved

C. Floor Housed Type: Housed spring isolator with ductile iron housing, steel base plate with mounting holes, spring inspection ports, neoprene cushion, leveling screws.
   1. Approved Manufacturers:
      a. Mason Series SSLFH
      b. Amber Booth "XLS" or approved

D. Suspension Type Spring Isolators: Shall consist of a rigid steel frame, a stable steel spring in the bottom part of the frame, and double deflection neoprene isolating pad at the top of the frame. Where supporting rods pass through the frame, a clearance of not less than on half rod diameter shall be provided all around the rod.
   1. Approved Manufacturers:
      a. Mason Series DNHS
      b. Amber Booth "BSSR" or approved

2.03 SEISMIC RESTRAINTS

A. General:
   1. All seismic hangers and components shall be domestically made. Products designed domestically and fabricated in a foreign country are prohibited.
   2. Products not permitted include: powder actuated anchors, gas actuated anchors, or anchors requiring epoxy.
   3. Only Steel or Ductile Iron components shall be provided. No Cast Iron or Cast Aluminum components are allowed.
   4. Steel shall be per ASTM A36; hangers and other devices shall be as shown in “SMACNA Seismic Restraint Manual” or approved manufacturers seismic design guidelines.

B. Seismic Bracing (rigid and cable):
   1. Approved Manufacturers:
      a. Tolco
      b. International Seismic Application Technology (ISAT)
      c. Mason Industries
      d. Cooper B-Line
      e. Kinetics Noise Control
      f. AFCON
      g. Gripple
      h. PHD
      i. Unistrut
      j. Anvil or prior approved equal

C. Seismic Anchorages (for wood, steel and concrete):
   1. Approved Manufacturers:
      a. Hilti
      b. ITW Ramset/Red Head
      c. ITW Buildex
      d. Mason Industries
      e. Tolco, AFCON
      f. Simpson Strong-Tie
      g. Powers Fasteners, Inc. or prior approved equal

D. Flexible Connectors:
   1. Approved Manufacturers:
      a. Mason Industries
      b. Metraflex
      c. Victaulic
      d. Kinetics Noise
      e. International Seismic Application Technology (ISAT) or prior approved equal

E. Pipe Hanger Components:
   1. Approved Manufacturers:
      a. Tolco
      b. International Seismic Application Technology (ISAT)
      c. Mason Industries
      d. Cooper B-Line
      e. Kinetics Noise Control
      f. AFCON
      g. Gripple
      h. PHD
      i. Unistrut
      j. Anvil or prior approved equal

PART 3 EXECUTION

3.01 VIBRATION ISOLATION

A. Motorized equipment shall be mounted on or suspended from spring vibration isolators either integral or external to the equipment. Floor mounted or suspended isolators.

B. Unless otherwise indicated, resilient mounts for motorized equipment shall be of the type and size to provide maximum ten percent transmissibility. Use unhoused, free-standing stable steel springs which are preferred over housed spring assemblies. The horizontal stiffness of the spring shall be approximately equal to its vertical stiffness. The spring deflection shall be selected based on the equipment power range (HP), speed range (RPM), and static deflection of the supporting structural floor. It is a specific recommendation that whenever a steel spring is used, two pads of ribbed waffle-pattern neoprene be used in series with the spring.

C. The design of vibration dampening shall consider lateral load as well as vertical load and be suitably snubbed against earthquake forces.

D. A list of isolators accompanied by certified transmissibility ratings for the required duty shall be submitted for each item of equipment.

E. Unless noted otherwise, all vibration isolating equipment shall be of the same make and shall be submitted as one group.

F. All piping in the mechanical equipment rooms connected to vibrating equipment shall be supported from resilient ceiling hangers or from floor mounted resilient supports.

3.02 SEISMIC BRACING GENERAL REQUIREMENTS

A. Support and bracing from the structure to pipes, ducts and mechanical equipment shall conform to ASCE and the plumbing & HVAC industry standard SMACNA “Seismic Restraint Manual, Guidelines for Mechanical Systems” or approved manufacturer’s listed seismic assemblies.

B. Provide snubbers for all equipment that is supported on isolators and weighing over 400 lbs. including base. Provide minimum of four snubbers for equipment weighing less than 2,000 lbs., and eight snubbers for heavier equipment.

C. Curb-mounted rooftop units shall be provided with suitable bracing on four sides connecting unit with curb to prevent excessive movement in a seismic event. The contractor is responsible for proper seismic attachment of the rooftop curb to building structure.

D. Housekeeping pads shall be properly anchored to the roof deck or floor per ASCE.

3.03 SEISMIC BRACING GENERAL REQUIREMENTS - PIPING

A. When determining horizontal load requirements, consider all pipes full of water and maximum equipment heights unless calculated for other substances and equipment.

B. Seismic bracing shall not limit the expansion and contraction of the piping system. When thermal expansion or contraction is involved, longitudinal bracing shall be designed at the anchor point of the piping system. The longitudinal bracing and the connections must be capable of resisting the additional force induced by expansion and contraction.

C. Seismic bracing for fire sprinkler system piping and riser components shall be as specified per Division 21.

3.04 INSTALLATION

A. Installation of seismic restraints shall be as follows:
   1. Upon completion of installation of all seismic restraint materials and before start up of restrained equipment, all debris shall be cleaned from beneath all protected equipment, leaving equipment free to contact snubbers.
   2. All external utility connections to restrained equipment shall be designed to allow differential seismic motion without damage to the equipment or utility connections.
   3. Adjust isolators and restraints after piping systems have been filled and equipment is at its operating weight, following manufacturer’s written instructions.
   4. After equipment installation is completed, adjust limit stops following manufacturer’s written instructions so they are out of contact during normal operation.
   5. Adjust snubbers according to manufacturer's written instructions.
   6. Torque anchor bolts according to anchor manufacturer's written instructions to resist seismic forces.
   7. Attach piping to the trapeze per seismic restraint manufacturer’s design. Install cables so they do not bend across sharp edges of adjacent equipment or building structure.
   8. Install vertical braces to stiffen hanger rods and prevent buckling per seismic restraint manufacturer’s design. Clamp vertical brace to hanger rods. Requirements apply equally to hanging equipment. Do not weld vertical braces to rods.
   9. Housekeeping Pads must be adequately reinforced and adequately sized for proper installation of equipment anchors. Refer to seismic restraint manufacturer's written instructions

3.05 SPECIAL INSPECTIONS

A. When required continuous or periodic special inspections of the equipment and systems designated on the list provided by the mechanical contractor shall be performed in accordance with the IBC and ASCE. The owner shall reserve the right to employ an approved special inspector.

B. Per the IBC, the registered design professional in responsible charge may designate members of the A&E team to act as special inspectors provided those personnel meet the qualification requirements of the IBC to the satisfaction of the building official.

END OF SECTION 230548

SECTION 230553
MECHANICAL IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 DESCRIPTION

A. General Requirements: Drawings and general provisions of the Contract, including General and other Conditions and Division 1 - General Requirements sections, apply to the work specified in this Section.

1.02 STANDARDS

A. ANSI Compliance: Comply with ANSI A13.1 for lettering size, colors, and installed viewing angles of identification devices.

1.03 SCHEDULES

A. Submit Valve Schedule for each piping system, typewritten, and reproduced on 8-1/2" x 11" bond paper. Tabulate valve number, piping system, system abbreviation (as shown on tag), location of valve (room or space), and variations for identification (if any). Mark valves which are intended for emergency shut-off and similar special uses, by special "flags", in margin of schedule. Provide a framed copy of Valve Tag Schedule in the mechanical/janitors room.

1.04 OPERATION AND MAINTENANCE REQUIREMENTS OF THIS SECTION

A. Not Applicable

PART 2 PRODUCTS

2.01 APPROVED MANUFACTURERS

A. Not Applicable

2.02 PLASTIC PIPE MARKERS

A. Provide manufacturer's standard preprinted, flexible or semi-rigid, permanent, color-coded, plastic sheet pipe markers.
   1. Insulation: Furnish 1" thick molded fiberglass insulation with jacket for each plastic pipe marker to be installed on uninsulated pipes subjected to fluid temperatures of 125° F (52° C) or greater. Cut length to extend 2" beyond each end of plastic pipe marker.
   2. Small Pipes: For external diameters less than 6" (including insulation if any), provide full band pipe markers, extending 360° around pipe and minimum 12" long at each location, fastened by one of the following methods:
      a. Snap-on application of pre-tensioned semi-rigid plastic pipe marker.
      b. Adhesive lap joint in pipe marker overlap. Laminate or bonded application of pipe marker to pipe (or insulation).
      c. Strapped to pipe with nylon strap.
   3. Lettering: Manufacturer's standard pre-printed nomenclature which best describes piping system in each instance, as selected by Architect/Engineer in cases of variance with names as shown or specified.
      a. Arrows: Print each pipe marker with arrows indicating direction of flow, either integrally with piping system service lettering (to accommodate both directions), or as separate unit of plastic.

2.03 PLASTIC TAPE

A. Manufacturer's standard color-coded pressure-sensitive (self-adhesive) vinyl tape, not less than 3 mils thick.
   1. Width: Provide 1-1/2" wide tape markers on pipes with outside diameters (including insulation, if any) of less than 6".

2.04 PLASTIC VALVE TAGS

A. Provide manufacturer's standard plastic valve tags with printed enamel lettering, with piping system abbreviation in approximately 3/16" high letters and sequenced valve numbers approximately 3/8" high, and with 5/32" hole for fastener.

2.05 VALVE TAG FASTENERS

A. Manufacturer's standard solid brass (wire link or beaded type), or solid brass S-hooks of sizes required for proper attachment of tags to valves, and manufactured specifically for that purpose.

2.06 VALVE SCHEDULE FRAMES

A. For each page of Valve Schedule, provide glazed display frame, with screws for removable mounting on masonry walls. Provide frames of finished hardwood or extruded aluminum, with SSB-grade sheet glass.

2.07 ENGRAVED PLASTIC-LAMINATE SIGNS

A. Provide engraved stock phenolic plastic laminate, complying with FS L-P-387, engraved with engraver's standard letter style of sizes and wording, black with white core (letter color) except as otherwise indicated, punched for mechanical fastening except where adhesive mounting is necessary because of substrate.
   1. Thickness: 1/16" for units up to 20 sq in or 8" length; 1/8" for larger units.
   2. Fasteners: Self-tapping stainless-steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate substrate.
   3. Letter Size: No less than ½" tall. (Use unit# as noted on the equipment schedules)

B. Provide for all items on equipment schedules.

C. Provide for all emergency shut-offs.

2.08 PAINT

A. Behr Urethane Alkyd Satin Enamel.

B. Use appropriate primer.

PART 3 EXECUTION

3.01 COORDINATION

A. Where identification is to be applied to surfaces which require insulation, painting or other covering or finish including valve tags in finished mechanical spaces, install identification prior to installation of acoustical ceilings and similar removable concealment.

3.02 PIPING IDENTIFICATION

A. Install pipe markers on each system, and include arrows to show normal direction of flow.

3.03 PIPE MARKERS AND COLOR BANDS

A. Locate pipe markers and color bands as follows wherever piping is exposed to view in occupied space, machine rooms, accessible maintenance spaces and exterior non-concealed locations or in accessible ceiling spaces.
   1. Near each valve and control device.
   2. Near each branch, excluding short take-offs for fixtures and terminal units; mark each pipe at branch where there could be question of flow pattern.
   3. Near locations where pipes pass through walls or floor/ceilings, or enter non-accessible enclosures.
   4. At access doors, manholes, and similar access points which permit view of concealed piping.
   5. Near major equipment items and other points of origination and termination.
   6. Spaced intermediately at maximum spacing of 50' along each piping run, except reduce spacing to 25' in congested areas of piping and equipment.
   7. On piping above removable acoustical ceilings omit intermediately spaced markers.

8. Color assignments and stencil for piping identification shall be as listed below (colors used shall be verified with Owner prior to ordering).

Service	Color	Stencil
Refrigerant Liquid	Yellow	White
Sprinkler Work	Red	White
Condensate Piping	Green	White

9. Identification stenciling and flow arrows shall be following colors for proper contrast:

Arrows & ID Stenciling	Color Shade of Pipe
White	Red, Gray, Black and Green
Black	Yellows, Oranges and White

3.04 VALVE IDENTIFICATION

A. Provide valve tag on every valve, and control devices in each piping system; exclude check valves, valves within factory-fabricated equipment units, convenience and lawn watering hose bibbs, and shut-off valves at plumbing fixtures, HVAC terminal devices and similar rough-in connections of end-use fixtures and units. List each tagged valve in Valve Schedule for each piping system.

3.05 SCHEDULES

A. Mount Valve Schedule frames and schedules in riser rooms or as directed by Engineer.

3.06 MECHANICAL EQUIPMENT IDENTIFICATION

A. Install engraved plastic laminate sign on or near each major item of mechanical equipment and each operation device. Provide signs for the following general categories of equipment and operational devices. Provide signs on suspended ceiling tile below mechanical equipment located above ceiling.
   1. Pumps and similar motor-driven units.
   2. Fans, exhaust, and air handling units.
   3. Tanks and pressure vessels.

3.07 CONCEALED ITEMS

A. Items concealed above accessible ceilings requiring access, shall have the ceiling marked to indicate such item's location. The marking system shall consist of colored phenolic plates with ½" tall engraved lettering specifying the item concealed; plate shall be applied to ceiling T-bar framing with rivets or other owner approved method below the concealed item. Colors used shall be verified with Owner, and unless directed otherwise, shall be:

Item	Color
Heating System Equipment Component	Green
Fire Protection System Component	Red

B. Provide three (3) color legends (hard laminate) listing the above colors. Locate as directed by Owner.

END OF SECTION 230553

SECTION 230593
AIR SYSTEM TESTING AND BALANCING

PART 1 GENERAL

1.01 GENERAL

A. Includes, but not limited to, testing, balancing and adjusting of air heating, cooling and exhaust systems.

1.02 RELATED SECTION(S)

A. General Conditions and Division 1 apply to this section.

B. Division 23 shall make changes in pulley, belts, and dampers as required for correct balance as recommended by Air Testing & Balancing Agency at no additional cost to Owner.

C. Division 23 shall repair leaks in ductwork at no additional cost to Owner.

1.03 SYSTEM DESCRIPTION (PERFORMANCE REQUIREMENTS)

A. Perform testing and balancing in complete accordance with the Associated Air Balancing Council (AABC), National Environmental Balancing Bureau (NEBB), or National Balancing Council (NBC) standards and procedures.

B. Air Testing & Balance Agency shall perform tests specified, compile test data, and submit copies of complete test data to Contractor for forwarding to Architect/Engineer for evaluation and approval.

1.04 SUBMITTALS REQUIRED BY THIS SECTION

A. Company information including Washington State Contractors' license

B. Key personnel and resumes

C. AABC, NEBB, or NBC certifications

D. Provide reference of five (5) completed jobs of similar size and complexity.

1.05 OPERATION AND MAINTENANCE REQUIREMENTS OF THIS SECTION

A. Final air balance report shall be bound in the O & M Manual or provided under a separate volume.

B. Preliminary air balance report shall be submitted to the Architect/Engineer for approval. Preliminary report shall note all finished measured data.

C. Final Test Data:
   1. Provide project name, name and telephone number of balancing firm, GC, MC, Architect, and Engineer in the cover (or first page) of report.
   2. Provide a summary of air balance findings regarding airtightness of each ducted systems, deficiencies of equipment to meet design requirements, deficiencies of space pressure relationships, etc.
   3. Cover sheet shall have a statement from the site project manager that reads, "The air system testing and balancing report contained here in is true and factual based on actual field measurements and adjustments. I have personally performed or witnessed a minimum of 5% of the airflow tests."
   4. Each page of test report to have a unique page number.
   5. Provide fan curve or chart of each fan in system.
   6. Provide final approved test report in PDF format on CD. Provide one more CD than hard copies of test report.
   7. Obtain and provide a copy of the air barrier test (building tightness) whether or not the Air Balance Contractor produced the test.

1.06 QUALITY ASSURANCE (QUALIFICATIONS)

A. Mechanical Contractor shall procure services of an independent Air Testing & Balance Agency, which specializes in testing, and balancing of heating, ventilating, and cooling systems to balance, adjust, test air-moving equipment, air distribution, and exhaust systems.

B. Agency shall be approved in writing by Consultant.

C. Instruments used by Agency shall be accurately calibrated and maintained good working order.

D. If requested, conduct tests in presence of Architect/Owner/Engineer.

1.07 SEQUENCING & SCHEDULING

A. Mechanical Contractor shall award test and balance contract to approved agency upon receipt of his contract to proceed to allow Agency to schedule this work in cooperation with other Sections involved and comply with completion date.

B. Begin air testing and balancing upon completion of air cooling, heating, and exhaust systems including installation of all specialties and devices.

C. Mechanical Contractor shall put heating, ventilating, and cooling systems and equipment into full operation and continue their operation during each working day of testing and balancing.

PART 2 PRODUCT

Not applicable

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

A. Testing Procedure: Air Testing & Balancing Agency shall perform following tests and balance system in accordance with following requirements at design conditions of supply and a minimum outside air CFM (not 100% return or 100% economizer).

1. Test, adjust, and record fan rpm to design requirements.
2. Test and record motor amperes at design conditions.
3. Make pitot tube traverse of main supply duct and obtain design cfm at fans. (systems of 1000 CFM or greater)
4. Test and record system static pressures: suction, discharge, and clean filters (if applicable; for systems of 2000 CFM or greater)
5. Test, adjust, and record system for design cfm air.
6. Test, adjust, and record system for design cfm outside air.
7. Test, adjust, and record each diffuser, grille, and register to within 10% of design requirements.
8. On a floor plan, identify each diffuser, grille, and register to location and area using a designation symbol unique to that page.
9. Identify and list size, type, and manufacturer of diffusers, grilles, registers, and testing equipment. Use manufacturer's rating on equipment to make required calculations.
10. In readings and tests of diffusers, grilles, and registers, include required cfm and test cfm after adjustments.
11. In cooperation with Division 23, set adjustments of automatically operated dampers to operate as specified, indicated, or noted.
12. Adjust diffusers, grilles, and registers to minimize drafts.
13. Identify at each volume damper with permanent mark, the position of actuator handle once final balance has been achieved.
14. Measure and record all pressure differential relationships as identified by the control’s diagrams (i.e. labs, kitchen, pharmacy, art rooms, building pressure, etc). These measurements are to be taken when all HVAC is running after full balance has been completed. Note the measured reference points to determine the pressure differential.

15. For any spaces with exhaust and supply to them where design airflows cannot be obtained, the systems shall be adjusted to produce a negative pressure to the adjacent space (i.e., workrooms, restrooms, labs, nurse rooms, etc.)
16. When reconciling supply, return, outside, and exhaust air quantities, priority shall be placed on outside air quantities (typically, return air quantities noted on plans are for duct sizing only).
17. Where duct pressure sensors are noted in controls diagrams (i.e., variable volume systems) adjust system to its minimum pressure point that still achieves full airflow to all terminals. Record this setpoint in test report and provide data to controls contractor.
18. For variable volume systems, adjust sheave package to produce maximum airflow (or diversity as applicable) at 60 Hz with simulated filter loading. If maximum airflow cannot be obtained at 60 Hz, increase frequency until maximum airflow is obtained as allowed by the equipment manufacturer and maximum motor amperes. Record final values.
19. Verify that all gravity backdraft dampers are moving freely, open in proper direction, and are unbound.
20. After balancing system, measure terminal CFM when system is in 100% economizer. If supply is greater than design, coordinate with controls contractor or MC to provide damper stops to provide design CFM during 100% economizer.
21. On All Motors with Variable Drives: Set maximum amperage safety to protect motor from over loading.

B. Final Inspection & Adjustments:
   1. Balancing agency shall be represented at final inspection meeting by qualified testing personnel with balancing equipment and two copies of air balancing test report.
      a. Architect may choose and direct spot balancing of one zone. Differences between the spot balance and test report will be justification for requiring repeat of testing and balancing for entire building.
      b. Rebalancing shall be done in presence of Architect and subject to his approval.
      c. Spot balance and rebalance shall be performed at no additional cost to Owner.
   2. System shall be completely balanced and all reports submitted to Architect prior to prefinal inspection.
   3. Where equipment supplied to job site provides over 5% more air than schedule requirements, rooms supplied by that equipment shall have their supply air quantities increased by the ratio of actual total air quantity supplied to minimum air quantity required by schedule.

3.02 BALANCING FIRMS (APPROVED)

A. Hardin and Sons
B. MTW Design
C. Airtest Company, Inc.
D. American Air Balance Company
E. Advanced Mechanical Services, Inc.
F. Testing & Commissioning Services
G. Precision Test and Balance, Inc.

END OF SECTION 230593

SECTION 230713
EQUIPMENT/DUCTWORK INSULATION

PART 1 GENERAL

1.01 GENERAL

A. This section describes the insulation requirement to meet or exceed the 2018 Washington State Energy Code. Lining installation is per 233113.

1.02 RELATED SECTION(S)

A. General Conditions, Division 1

B. Section 200000 - General Mechanical Conditions

C. Section 233113 - Steel Ductwork

1.03 SUBMITTAL REQUIREMENTS OF THIS SECTION

A. Wrap Insulation

1.04 OPERATION AND MAINTENANCE REQUIREMENTS OF THIS SECTION

A. Not Applicable

PART 2 PRODUCTS

2.01 APPROVED MANUFACTURERS

A. Not Applicable

2.02 DUCTWORK INSULATION

A. Manufacturers: Manville Corporation Owens Corning, Knauf Insulation, Manson Insulation, or approved equal.

B. Flexible Fiber Glass Blanket (Wrap Insulation): Manville, Microlite Type 75 meeting ASTM C553, Type 1, Class B-2; flexible blanket.
   1. 'K' ('ksi') Value: 0.27 at 75°F (0.040 at 24°C) installed.
   2. Density and R-value:
      a. R-3.3: 1.0” inch of 1.5 to 3.0 lb/cu. Ft. glass fiber blanket.
      b. R-5.3: 2.0” inches of 0.75 lb/cu. Ft. or 1.5 inches of 1.5 to 3.0 lb/cu. Ft. glass fiber blanket.
      c. R-7: 3.0 inches of 0.75 lb/cu. Ft. or 2.0 inches of 1.5 to 3.0 lb/cu. Ft. glass fiber blanket.
   3. Vapor Barrier Jacket: FSK, aluminum foil reinforced with fiber glass yarn and laminated to fire-resistant kraft, secured with UL listed pressure sensitive tape and/or outward cinched expanded staples and vapor barrier mastic as needed.

C. Rigid Fiber Glass Board: Insulation Board meeting ASTM C 612 Type IA and IB; rigid.
   1. ‘K’ (‘ksi’) Value: ASTM C 177, 0.22 at 75°F mean temperature.
   2. Maximum Service Temperature: 450°F.
   3. Vapor Retarder Jacket: ASJ conforming to ASTM C 1136 Type I, or FSK or PSK conforming to ASTM C 1136 Type II.
   4. Securement: Secured in place using adhesive and mechanical fasteners spaced a minimum of 12” on center with a minimum of 2 rows per side of duct. Insulation shall be secured with speed washers and all joints, breaks and punctures sealed with appropriate pressure-sensitive foil tape, or glass fabric and vapor retarder mastic.
   5. Density and R-value:
      a. R-4.5: 1.0” of 6.0 lb./cu.ft.
      b. R-6.8: 1.5” of 6.0 lb./cu.ft.
      c. R-9.1: 2.0” of 6.0 lb./cu.ft.

D. Duct Insulation Protection:
   1. Aluminum Jacket: 0.016-inch (.045 mm) thick sheet, smooth/embossed finish, with longitudinal slip joints and 2-inch (50 mm) lamps.
   2. Manville Insulkote ET, a non-water-vapor retarder, non-burning, weatherproof coating for use over insulation where "breathing" is required.
   3. Manville Zeston 2000 jacketing, UV resistant polyvinyl chloride covering with joints secured and sealed with Manville Perma-Weld Adhesive.
   4. Canvas Jacket: UL listed fabric, 6 oz/sq. yd. (220 g/sq. m.), plain weave cotton treated with dilute fire-retardant lagging adhesive.
   5. Self-Adhering Jacketing: Material to be VentureClad [1579CW] with a white finish. Jacketing material is to have a maximum flame spread/smoke developed index of 25/20 per UL 723, 1 0.0000 water vapor permeance rating per ASTM E-96, mold inhibitors incorporated, and be UV stable.

2.03 DUCTWORK LINING

A. See Section 233113 - Steel Ductwork.

PART 3 EXECUTION

3.01 EXAMINATION AND PREPARATION

A. Verify that ductwork has been tested for leakage in accordance with SMACNA standards before applying insulation materials.

B. Verify that all surfaces are clean, dry, and free of foreign material.

C. External Ductwork Insulation:
   1. Provide insulated ductwork conveying air below ambient temperature with vapor retardant jacket. Seal all vapor retardant jacket seams and penetrations with UL listed tapes or vapor retardant adhesive.
   2. Provide insulated ductwork conveying air above ambient temperature with or without vapor retardant jacket. Where service access is required, bevel and seal ends of insulation.
   3. Continue insulation through walls, sleeves, hangers, and other duct penetrations except where prohibited by code.
   4. The underside of ductwork 24 inches or greater shall be secured with mechanical fasteners and speed clips spaced approximately 18 inches on center. The protruding ends of the fasteners should be cut off flush after the speed clips are installed, and then, when required, sealed with the same tape as specified above.
   5. For ductwork exposed to physical abuse in unfinished and exposed spaces, finish with duct insulation protection.
   6. For outdoor applications, provide insulation with a weather protection jacket. Manville Zeston 2000, VentureClad self-adhering or approved equal. Install per manufacturer’s instructions.

D. For installation of lining insulation, see Section 233113.

3.02 INSULATION SCHEDULE

A. Provide wrap insulation and duct liner for the duct systems indicated per the following table (R-value indicates the thickness to be provided as defined in Section 230713 for wrap insulation and Section 233113 for liner):

DUCT TYPE AND LOCATION	LINER	WRAP
Within the Building Envelope:		
- Supply Air	R - 3.3	Not Allowed
- Return Air	R - 3.3	Not Allowed
- Primary Supply Air	Not Allowed	R – 3.3[1]
- Primary Return Air	Not Allowed	R – 3.3[1]
- Relief Air	Not Allowed	R – 3.3[1,2]
- Transfer Air	R-3.3	Not Allowed
- Exhaust Air	R-3.3	Not Allowed [2]
- HRU/ERU Exhaust Air	Not Allowed	R – 7[1,2]
- HRU/ERU Return Air	R-3.3	Not Allowed
- Outside Air	Not Allowed	R - 7[1,2]
In cold attic, in cold ceiling space, in cold wall, in cold garage, in cold crawl space:		
- Supply Air	R – 6[3]	R – 6[3]
- Return Air	R – 6[3]	R – 6[3]
- Relief Air	Not Allowed	Not Allowed
- Transfer Air	Not Allowed	Not Allowed
- Exhaust Air	Not Allowed	Not Allowed
- Outside Air	Not Allowed	Not Allowed
On exterior of building, on roof:		
- Supply Air	R – 8[3]	R – 8[3]
- Return Air	R – 8[3]	R – 8[3]
- Relief Air	Not Allowed	Not Allowed
- Transfer Air	Not Allowed	Not Allowed
- Exhaust Air	Not Allowed	Not Allowed
- Outside Air	Not Allowed	Not Allowed

Table Footnotes:

1. Where duct is exposed to view, provide wrap with paintable duct insulation protection.
2. Building level insulation is required from backdraft/motorized damper to louver or roof hood. See plans for additional details. Coordinate with GC for insulation.
3. Use liner or rigid fiberglass board.

B. For purposes of the Insulation Schedule above, the following defines the duct systems:
   1. Supply Air: Air that has passed through mechanical conditioning device, such as a furnace, coil, evaporative section, heat recovery device, etc. that is distributed to the conditioned space.
   2. Return Air: Air from the conditioned space to an air handler.
   3. Primary Supply and/or Return Air: Any duct between an air handler and a terminal unit (capable of throttling the air with a motorized damper, capable of heating the air, and/or capable of cooling the air). Example of terminal unit is a variable air volume terminal (fan or throttle damper) or an induction/chilled beam terminal.
   4. Relief Air: Air from the conditioned space to the outdoors or to a large semi-conditioned or non-conditioned space.
   5. Transfer Air: Air from one conditioned space to another conditioned space.
   6. Exhaust air: Air from a space moved by a fan to directly outside. Also, air downstream of an energy recovery device to directly outside.
   7. HRU/ERU Return Air: Return air from a grille to a heat recovery device. or motorized damper.
   8. HRU/ERU Exhaust Air: Exhaust air from heat recovery device to directly outside.

9. Outside Air: Air from the outside to a mechanical conditioning device such as a furnace, coil, evaporative section, heat recovery device, etc.

END OF SECTION 230713

SECTION 230900
ENERGY MANAGEMENT & CONTROLS (DDC)

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. Conform to General Conditions and Supplemental Conditions for Washington State Facilities Construction.

B. The general Provisions of the Contract, including General, Supplementary, and Special Conditions, and Division 1- General Requirements, apply to work specified in this section. Subcontractor must familiarize himself with the terms of the above documents.

C. EMCS shall monitor electric power, water and natural gas usage as shown in the mechanical and electrical drawings. Control's contractor shall provide meters not provided by the associated utility. Control's contractor shall coordinate with power, water and natural gas utilities.

1.02 BASE AND ALTERNATE BIDS

A. Scope of Work:
   1. Furnish and install a direct digital control and energy management system per Section 230900 and related sections as required for control of all equipment indicated on the mechanical drawings and in the specifications, being furnished under this scope of work. The server platform (Niagara or approved equal) shall have Connection Points and at least two extra Connection points.

B. Base Bids: Under the base bids, the Controls as by the scope of work will be added as a separate bid line item on the bid form. The following manufacturers and systems are approved for use on this project. No substitutions of systems other than those listed will be considered. Systems approved for bidding are:
   1. Approved Controls Contractors:
      a. Andover Controls as provided by Schneider Electric
      b. Alerton as provided by ATS Automation

1.03 RELATED DOCUMENTS

A. All work of this Division shall be coordinated and provided by the single Energy Management and Controls System (EMCS) Contractor.

B. The work of this Division shall be scheduled, coordinated, and interfaced with the associated work of other trades. Reference the Division 23 Sections for details.

C. The work of this Division shall be as required by the Specifications, Point Schedules and Drawings.

D. If the EMCS Contractor believes there are conflicts or missing information in the project documents, the Contractor shall promptly request clarification and instruction from the design team.

1.04 DEFINITIONS

A. Analog: A continuously variable system or value not having discrete levels. Typically exists within a defined range of limiting values.

B. Binary: A two-state system where an "ON" condition is represented by one discrete signal level and an "OFF" condition is represented by a second discrete signal level each separated by a defined deadband. Digital Inputs and Digital Outputs are examples.

C. Energy Management and Controls System (EMCS): The total integrated system of fully operational and functional elements, including equipment, software, programming, and associated materials, to be provided by this Division EMCS Contractor and to be interfaced to the associated work of other related trades.

D. EMCS Contractor: The single Contractor to provide the work of this Division. This Contractor shall be the primary installer, commissioner and ongoing service provider for the EMCS work.

E. Control Sequence: An EMCS pre-programmed arrangement of software algorithms, logical computation, target values and limits as required to attain the defined operational control objectives.

F. Direct Digital Control: The digital algorithms and pre-defined arrangements included in the EMCS software to provide direct closed-loop control for the designated equipment and controlled variables. Inclusive of Proportional, Derivative and Integral control algorithms together with target values, limits, logical functions, arithmetic functions, constant values, timing considerations and the like.

G. EMCS Network: The total digital on-line real-time interconnected configuration of EMCS digital processing units, workstations, panels, sub-panels, controllers, devices and associated elements individually known as network nodes. May exist as one or more fully interfaced and integrated sub-networks, LAN, WAN or the like.

H. Node: A digitally programmable entity existing on the EMCS network.

I. EMCS Integration: The complete functional and operational interconnection and interfacing of all EMCS work elements and nodes in compliance with all applicable codes, standards and ordinances so as to provide a single coherent EMCS as required by this Division.

J. PC: Personal Computer from a recognized major manufacturer. PC “clones” assembled by a third-party Subcontractor is not acceptable. PC must also have documentation verifying that it has been tested and is completely compatible with all installed software and communicates with any peripherals such as modems, NEC cards, printers, hubs, zip drives, etc. that may be attached.

K. Wiring: The term “Wiring” and its derivatives when used in this Division shall mean provide the EMCS wiring and terminations.

L. Install: The term “Install” and its derivatives when used in this Division shall mean receive at the jobsite and mount.

M. Protocol: The term “protocol” and its derivatives when used in this Division shall mean a defined set of rules and standards governing the on-line exchange of data between EMCS network nodes.

N. Software: The term “software” and its derivatives when used in this Division shall mean all of programmed digital processor software, preprogrammed firmware and project specific digital process programming and database entries and definitions as generally understood in the EMCS industry for real-time, on-line, integrated EMCS configurations.

O. Operator Workstation: Personal Computer from a recognized major manufacturer installed with the software and hardware required to permit multiple, simultaneous (at least three) user access to the EMCS, either remotely or on site.

P. Floor Plans: CAD drawings showing the location of equipment, EMCS controllers, EMCS, remote devices and wiring including room temperature sensors and duct and building pressure sensors, and communications wiring. Controllers, equipment, remote devices and wiring, and communications wiring shall appear on the same drawing.

Q. The following abbreviations and acronyms may be used in describing the work of this Division:

ADC	-	Analog to Digital Converter
AI	-	Analog Input
ANSI	-	American National Standards Institute
AO	-	Analog Output
ASCII	-	American Standard Code for Information Interchange
ASP	-	Microsoft Active Server Page
AWG	-	American Wire Gauge
CFM	-	Cubic Feet Per Minute
CPU	-	Central Processing Unit
CRT	-	Cathode Ray Tube
DAC	-	Digital to Analog Converter

DDC - Direct Digital Control
DI - (Binary) Digital Input
DO - (Binary) Digital Output
EEPROM - Electronically Erasable Programmable Read Only Memory
EMCS - Energy Management Control System
EMI - Electromagnetic Interference
FAS - Fire Alarm Detection and Annunciation System
GUI - Graphical User Interface
HOA - Hand-Off-Auto
HTML - Hypertext Markup Language
HTTP - HyperText Transfer Protocol
ID - Identification
IEEE - Institute of Electrical and Electronics Engineers
I/O - Input/Output
IP - Internet Protocol
IT - Information Technology
LAN - Local Area Network
LCD - Liquid Crystal Display
LED - Light Emitting Diode
MCC - Motor Control Center
NC - Normally Closed
NIC - Not in Contract
NO - Normally Open
OWS - Operator Workstation
OAH - Outdoor Air Humidity
OAT - Outdoor Air Temperature
PC - Personal Computer
RAM - Random Access Memory
RF - Radio Frequency
RFI - Radio Frequency Interference
RH - Relative Humidity
ROM - Read Only Memory
SMTP - Simple Mail Transfer Protocol
SNMP - Simple Network Management Protocol
SNTP - Simple Network Time Protocol
SPDT - Single Pole Double Throw
SPST - Single Pole Single Throw
XVGA - Extended Video Graphics Adapter
TBA - To Be Advised
TCP/IP - Transmission Control Protocol/Internet Protocol
UPS - Uninterruptible Power Supply
VAC - Volts, Alternating Current
VAV - Variable Air Volume
VDC - Volts, Direct Current
WAN - Wide Area Network
XML - Extensible Markup Language

1.05 QUALITY ASSURANCE

A. General:
   1. The EMCS Contractor shall have a branch facility within a 100-mile radius of the job site supplying complete maintenance and support services on a 24 hour, 7-day-a-week basis. This branch facility shall provide the work for this project. This support facility shall have spare parts and all necessary test and diagnostic equipment required to install commission and service the specified EMCS.

2. As evidence and assurance of the Contractor's ability to support the Owner's system with service and parts, the Contractor must have been in the EMCS business for at least the last ten (10) years and have successfully completed three projects comparable to the value of this contract in the preceding five years
3. The EMCS architecture shall consist of products manufactured by companies regularly engaged in the production of EMCS, and shall be the manufacturer's latest standard of design at the time of bid.
4. The EMCS software residing in Nodes and servers shall be updated to the latest currently available revision at the start of Warranty. If updating any node affects an existing EMCS's ability to communicate to any other existing node on any part of the EMCS, then the contractor shall update any or all existing nodes and workstations to provide seamless communications throughout the entire existing and new system.

B. Quality Management Program:
1. Provide a competent and experienced EMCS Project Manager employed by the EMCS Contractor. The Project Manager shall be supported as necessary by other EMCS Contractor employees in order to provide professional management service for the work. The Project Manager shall attend scheduled Project Meetings as required and shall be empowered to make technical, scheduling and related decisions on behalf of the EMCS Contractor

1.06 REFERENCES

A. All work shall conform to the following Codes and Standards, as applicable:
1. National Fire Protection Association (NFPA) Standards.
2. National Electric Code (NEC) and applicable local Electric Code.
3. Underwriters Laboratories (UL) listing and labels.
4. UL 916 Energy Management
5. NFPA 70 - National Electrical Code.
6. NFPA 90A - Standard for The Installation of Air Conditioning and Ventilating Systems.
7. NFPA 92A and 92B Smoke Purge/Control Equipment.
8. Factory Mutual (FM).
9. American National Standards Institute (ANSI).
10. National Electric Manufacturer's Association (NEMA).
11. American Society of Mechanical Engineers (ASME).
12. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).
13. Air Movement and Control Association (AMCA).
14. Institute of Electrical and Electronic Engineers (IEEE).
15. American Standard Code for Information Interchange (ASCII).
16. Electronics Industries Association (EIA).
17. Occupational Safety and Health Administration (OSHA).
18. American Society for Testing and Materials (ASTM).
19. Federal Communications Commission (FCC) including Part 15, Radio Frequency Devices.
20. Americans Disability Act (ADA)

B. In the case of conflicts or discrepancies, the more stringent regulation shall apply.

C. All work shall meet the approval of the Authorities Having Jurisdiction at the project site.

1.07 SUBMITTALS

A. Control Drawings, Product Data, and Samples:
1. The EMCS Contractor shall submit a complete controls package divided in two sections. The first section shall be delivered within 30 days after the contract has been awarded and the second section shall be delivered within 60 days after the contract has been awarded.
2. Allow at least 15 working days for the review of each package by the Engineer.

3. Equipment and systems requiring approval of local authorities must comply with such regulations and be approved. Filing shall be at the expense of the EMCS Contractor where filing is necessary. Provide a copy of all related correspondence and permits to the Owner.

B. Submittal Section 1:
   1. Site Specific EMCS network architecture diagrams including all nodes and interconnections including controllers, Operator Workstations, modems and gateways.
   2. Product data sheets for all products including software.

C. Submittal Section 2:
   1. Drawing Index, floor plans, schematics, controller wiring diagrams and sequences. Control drawings shall be created on AUTOCAD software, version 14 or newer.
   2. Points schedule for each real point in the EMCS, including: Tag, Point Type, System Name, Display Units, Scale Range, Unique Address, and Reference Drawing.
   3. Samples of Graphic Display screen types and associated menu penetrations to show hierarchy and functional interrelationships.
   4. Detailed Bill of Material, identifying part number, quantity, description, and optional features.
   5. Room Schedule including a separate line for each terminal unit showing system name, minimum/maximum cfm, box area, and number of reheat stages.
   6. Details of all EMCS interfaces and connections to the work of other trades.
   7. Tier 1 Ethernet TCP/IP BACnet network criteria including controller IP addressing capabilities, PICS, BIBBS and BTL listings.

1.08 RECORD DOCUMENTATION

A. Operation and Maintenance Manuals:
   1. Three (3) copies of the Operation and Maintenance Manuals shall be provided to the Owner's Representative upon completion of the project. The entire Operation and Maintenance Manual shall be furnished on Compact Disc media, and include the following for the EMCS provided:
      a. Table of contents
      b. As-built Control Drawings using AutoCAD Version 14 or newer. Drawings shall represent the as-built condition of the system and incorporate all information supplied with the approved submittal. Include as-built floor plans.
      c. Manufacturer’s product data sheets for all products including software.
      d. System Operator’s manuals.
      e. Archive copy via a read/write CD-ROM all site-specific databases and sequences.
      f. EMCS network diagrams (use AutoCAD version 14 or newer).
      g. Wiring termination diagrams (use AutoCAD version 14 or newer).
      h. Interfaces to all third-party products and work by other trades.
      i. Points list
      j. Room Schedules
      k. Point to point checkout sheets with dates and checkout signatures
      l. Repair contact name and phone number.
   2. An Operation and Maintenance Manual CD that shall be a self-contained read/write CD-ROM that includes all of the information listed above and all the necessary viewer software required for access. Include a logically organized table of contents. Viewer software shall provide the ability to display, zoom, and search all documents.

1.09 WARRANTY

A. Standard Material and Labor Warranty:
   1. Provide a one-year labor warranty on the EMCS.

2. The EMCS components shall be free from defects in material and workmanship under normal use and service. If within one (1) year from the date of awarding of the Certificate of Occupancy any EMCS equipment is found to be defective, it will be replaced, repaired or adjusted by EMCS Contractor free of charge. The EMCS Contractor is not responsible for the removal or reinstallation of any components that were originally installed by others, such as valves, dampers, wells, air flow stations, etc.
3. Maintain an adequate supply of materials within 100 miles of the Project site such that replacement of key parts and labor support, including programming. Warranty work shall be done during EMCS Contractor's normal business hours unless there is an emergency.
4. Maintain an on-site record of all work done, all items removed from site, all items returned to site, all new replacement items installed and all remedial programming and database entry work undertaken including software revisions installed. Maintain a record of all re-calibrations required as a result of Warranty service.

1.10 OPERATION AND MAINTENANCE REQUIREMENTS OF THIS SECTION

A. Not Applicable

PART 2 products

2.01 APPROVED MANUFACTURERS

A. Not Applicable

2.02 EMCS DESCRIPTION

A. EMCS shall include a graphical interface that shall allow users to access the EMCS data via a remote Operator Workstation. Remote Operator Workstation access shall take place through a WAN IP address access program, a WEB based internet access, or modem dial-up. The WEB graphical user interface shall be setup as described in WEB BASED USER INTERFACE of this specification.

B. The EMCS shall be a complete system designed for use on a Tier 1 Ethernet TCP/IP BACnet network. This functionality shall extend into the equipment rooms. Application nodes located in equipment rooms and similar shall be fully IT compatible devices that mount and are capable of communicating directly on the IT infrastructure existing in the facility. If Owner's LAN is used contractor shall be responsible for coordination with the Owner's IT staff to ensure that the EMCS will perform in the Owner's environment without disruption to any of the other activities taking place on that LAN. Where necessary and as dictated elsewhere in these Specifications, Servers shall be used for the purpose of providing a location for archiving system configuration data, and historical data such as trend data and operator transactions.

C. The work of the single EMCS Contractor shall be as defined individually and collectively in all Sections of this Division specifications together with the associated Point Sheets and Drawings and the associated interfacing work as referenced in the related documents as are listed in Part 1 of this Section.

D. The EMCS work shall consist of the provision of all labor, materials, etc. as Specified in these Division documents which are required for the complete, fully functional and commissioned EMCS.

E. Provide a complete, neat and workmanlike installation. Use only employees who are skilled, experienced, trained, and familiar with the specific equipment, software and configurations to be provided for this Project.

F. Manage and coordinate the EMCS work in a timely manner in consideration of the Project schedules. Coordinate cooperatively with the associated work of other trades so as to assist the progress and not impede or delay the work of associated trades.

G. The EMCS as provided shall incorporate, at minimum, the following integrated features, functions and services:
   1. Operator information, alarm management and control functions at any Operator's Workstation without the need to purchase special software from the EMCS manufacturer for those consoles.

2. Software and hardware that allows third party access for the purpose of creating a combined graphical interface. The combined graphical interface shall have the ability to read, write and acknowledge actual hardware inputs and outputs, setpoints, off/on switches, schedules, alarms and trend logs.
3. Information management including monitoring, transmission, archiving, retrieval, and reporting functions.
4. Diagnostic monitoring and reporting of EMCS functions.
5. Offsite monitoring and management.
6. Energy management.
7. Fire Alarm System secondary monitoring.
8. Lighting Control System monitoring and control.
9. Irrigation System monitoring and control.

H. Graphic Displays:
1. Provide color graphics for each system with all points as indicated on the point list. All graphics shall be available for viewing on any Operator Workstation directly or remotely connected to the Tier 1 TCP/IP BACnet network.
2. Provide a color graphic display for each floor in the facility. Indicate each HVAC zone and temperature, Lighting Control System zone status, and zone occupancy status.
3. User shall access the various system schematics and floor plans via a graphical penetration scheme and menu selection.

2.03 EMCS ARCHITECTURE

A. Overall Conceptual Description:
1. The EMCS shall be designed entirely for use on intranets and internets. All networking technology used at the Tier 1 Ethernet TCP/IP level shall be off the shelf, industry standard technology fully compatible with other Owner provided networks in the facility.
2. The primary components of the system will be the Operator Workstations, Application Nodes and Servers located at the highest level of the network architecture. All will use the same graphical user interface and provide the same level of accessibility via the network. The only distinction between the user interface used on servers as compared to Application Nodes or Operator Workstations shall be select menu items used for accessing long term storage features on the servers or on their respective archive devices (CD/RW, etc.)

B. General:
1. The EMCS shall consist of a number of Nodes and associated equipment connected by industry standard network practices. All communication between Nodes shall be by digital means only.
2. The EMCS network shall at minimum comprise of the following:
a. Operator Workstations– fixed or portable.
b. Network processing, data storage and communication equipment.
c. Routers, bridges, switches, hubs, modems and like communications equipment.
d. Active processing Nodes including field panels.
e. Intelligent and addressable elements and end devices.
f. Third-party equipment interfaces.
g. Modem attached to EMCS so that dial-up communication from a remote Operator Workstation is available.
h. Other components required for a complete and working EMCS.
i. All EMCS features shall be accessible via a graphical interface. All programming shall be accessible by intranet Operator Workstations. Intranet access and Internet browser shall have equivalent EMCS access control for user access.
j. The EMCS shall support auto-dial/auto-answer communications to allow EMCS Nodes to communicate with other remote EMCS Nodes via standard analog telephone lines.

k. The Operator Workstations, File servers and principal network equipment shall be standard products of recognized major manufacturers and shall have documentation stating that have been tested and are fully functional using the EMCS software.
l. Provide licenses for all software residing in the EMCS system and transfer these licenses to the Owner prior to completion.

C. Network:
1. The EMCS shall incorporate a primary Tier 1 Ethernet TCP/IP network. At the Contractor's option, the EMCS may also incorporate integrated secondary Tier 2 and tertiary Tier 3 networks.
2. The EMCS Network shall utilize an open architecture capable of all of the following:
a. Utilizing standard Ethernet communications and operate at a minimum speed of 10/100 Mb/sec
b. Connecting via BACnet at the Tier 1 level in accordance with ANSI/ASHRAE Standard 135-2001.
c. All Tier 2 (subnet) level communications shall be via BACnet in accordance with ANSI/ASHRAE Standard 135-2001. Gateways may be employed to communicate with existing or third-party system controllers.
3. The EMCS network shall support both copper and optical fiber communication media.

D. Third-Party Equipment Interfaces:
1. EMCS Contractor shall integrate real-time data from systems supplied by other trades as required in Part 3.03 THIRD PART EQUIPMENT INTERFACE.
2. The EMCS system shall include necessary EMCS hardware equipment and software to allow data communications between the EMCS system and systems supplied by other trades.
3. The trade Contractor supplying other systems will provide their necessary hardware and software and will cooperate fully with the EMCS Contractor in a timely manner to ensure complete data integration.

E. Uninterruptible Power Supply (UPS):
1. Provide UPS for non-remote intranet Operator Workstations and servers, and any other equipment as indicated on the drawings.
2. UPS shall be sized to last 30 minutes.

F. Power Fail/Auto Restart:
1. Provide for the automatic orderly and predefined startup of parts or all of the EMCS following total loss of power to those parts or all of the EMCS. Archive and annunciate time and details of restoration.
2. Provide for the orderly and predefined scheduling of controlled return to normal, automatically time scheduled, operation of controlled equipment as a result of the auto restart processes.
3. Maintain the EMCS real-time clock operation during periods of power outage for a minimum of 72 hours.

G. Downloading and Uploading:
1. Provide the capability to generate EMCS software-based sequences, database items and associated operational definition information and user-required revisions at any intranet Operator Workstation, and provide the means to download any of the items listed above to its associated Application Node or Terminal Unit Node.
2. Provide the capability to upload EMCS operating software information, database items, sequences and alarms to the designated server.

H. All networking technology used at the Tier 1 level shall be off the shelf, industry standard technology fully compatible with other Owner provided networks in the facility. The Operator Workstations, File servers and principal network equipment shall be standard products of recognized major manufacturers available through normal vendor channels. “Clones” are not acceptable. All aspects of the user interface shall be via graphical interfaces. All other hardware, software, servers, firewalls, etc. shall be provided by the EMCS Contractor. The EMCS Contractor shall coordinate with the Owner and have approval from the Owner for all additions or modifications to the existing IT infrastructure.

2.04 OPERATOR WORKSTATIONS

A. The Operator Workstations shall provide the primary means of communication with the EMCS and shall be used for operations, engineering, management, audit, reporting and other related functions.

B. The Operator Workstations shall consist of fixed and portable units. The fixed units shall consist of installed PC-based configurations. The portable units shall consist of PC Laptops. Both units shall display the same graphics and data.

C. Each Operator Workstation shall, at minimum, consist of:
   1. PC processor with minimum 64-bit word structure.
   2. Hard drive sized to store several months of trend data for the entire EMCS.
   3. Removable high-speed data storage and export device(s) such as Read/Write CD ROM or equal.
   4. Full ASCII keyboard and digital Mouse or equal pointing device.
   5. Full color, flat screen VDU display unit, minimum 17 inches diagonal screen, minimum 1280 x 1024 resolution, 0.26 or better dot pitch and minimum 72 Hz refresh rate.
   6. RAM large enough to provide graphics data updated in 2 seconds or less.
   7. Network card capable of providing graphics updates in 2 seconds or less.

D. Printers shall be full color and designed for the functional requirements and duty of the application.

E. All software and hardware required to access the EMCS from the Tier 1 Ethernet TCP/IP BACnet network. Read and write functions for hardware inputs and outputs, alarms, schedules and trend logs along with application programming abilities shall be included. Also include hardware/software access for at least three simultaneous users.

F. Operator Workstations shall operate independently and concurrently without interference and under individual user password protection.

G. Operator Workstations shall have software that shall provide functional access level defined individual operator access.

2.05 OPERATOR WORKSTATION SOFTWARE

A. General:
   1. The EMCS Operator Workstation software shall be user friendly, readily understood and shall make maximum use of colors, graphics, icons, embedded images, animation, text-based information and data visualization techniques to enhance and simplify the use and understanding of the EMCS by authorized users at the OWS.
   2. User access to the Operator Workstation shall be protected by a flexible and Owner redefinable software-based password access protection. Password protection shall be multi-level and partitionable to accommodate the varied access requirements of the different user groups. Provide the means to define unique access privileges for each individual authorized user. Also provide the means to establish general password groups to which an individual will then be assigned. Once assigned to the group each individual will assume all the capabilities and restrictions of that group. Provide the means to on-line manage password access control under the control of a Master Password.
   3. The Operator Workstation software shall be able to combine data from any and all of the system components in a single graphic window. This shall include historical data stored on a server.

4. The Operator Interface shall incorporate comprehensive support for functions including, but not necessarily limited to, the following:
    a. User access for selective information retrieval and control command execution
    b. Monitoring and reporting
    c. Alarm, non-normal, and return to normal condition annunciation
    d. Selective operator override and other control actions
    e. Information archiving, manipulation, formatting, display and reporting
    f. EMCS internal performance supervision and diagnostics
    g. On-line access to user HELP menus
    h. On-line access to current EMCS as-built records and documentation
    i. Ability to re-program and re-configure all Application and Terminal Unit Nodes
5. Provide EMCS reports and displays making maximized use of simple English language descriptions and readily understood acronyms, abbreviations and the like to assist user understanding and interpretation. All text naming conventions shall be consistent in their use and application throughout the EMCS.
6. Shall operate on latest operating system.
7. Each fixed and portable Operator Workstation shall be on-line configurable for specific applications, functions and groups of EMCS points.
8. Any existing workstation software must be upgraded to most current manufacturers control software platform.

B. Navigation Trees:
1. The system will have the capability to display multiple navigation trees that will aid the operator in navigating throughout all systems and points connected. At minimum provide a tree that identifies all systems on the networks.
2. The navigation trees shall appear as part of the display, but can be detached and then minimized to the Windows task bar or closed altogether. A simple keystroke will reattach the navigation to the primary display of the user interface.

C. Dividable Display Panels:
1. It shall be possible for the operator to divide the display area within a single window into multiple display panels. The content of each display panel can be any of the standard summaries and graphics provided by the system.
2. Provide each display panel with minimize, maximize, and close icons.

D. Alarms:
1. Alarms shall be routed directly from Application Nodes to Operator Workstations and servers. It shall be possible for specific alarms from specific points to be routed to specific Operator Workstations and servers. The alarm management portion of the EMCS software shall, at the minimum, provide the following functions
    a. Log date and time of alarm occurrence.
    b. Generate a “Pop-Up” window, with audible alarm, informing a user that an alarm has been received.
    c. Allow a user, with the appropriate security level, to acknowledge, temporarily silence, or discard an alarm.
    d. Provide an audit trail on hard drive for alarms by recording user acknowledgment, deletion, or disabling of an alarm. The audit trail shall include the name of the user, the alarm, the action taken on the alarm, and a time/date stamp.
    e. Provide the ability to direct alarms to an e-mail address or alpha-numeric pager. This must be provided in addition to the pop-up window described above. Systems which use e-mail and pagers as the exclusive means of annunciating alarms are not acceptable.
    f. Any object in the system may be designated to report an alarm.
2. The EMCS shall annunciate diagnostic alarms indicating system failures and non-normal operating conditions

E. Reports:
   1. Reports shall be generated and directed to one or more of the following: User interface displays, printers, or archive at the user's option. As a minimum, the system shall provide the following reports:
      a. All points in the EMCS, especially those points connected to any metering equipment
      b. All points in each EMCS application
      c. All points in a specific Application or HVAC Node
      d. All points in a user-defined group of points
      e. All points currently in alarm in an EMCS application
      f. All points locked out in an EMCS application
      g. All EMCS schedules
      h. All user defined and adjustable variables, schedules, interlocks and the like
      i. EMCS diagnostic and system status reports
   2. Provide for the generation by the user of custom reports.

F. Dynamic Color Graphics:
   1. An unlimited number of graphic displays shall be able to be generated and executed.
   2. Values of real time attributes displayed on the graphics shall be dynamic and updated on the displays.
   3. The graphic displays shall be able to display and provide animation based on real-time EMCS data that is acquired, derived, or entered.
   4. The user shall be able to change values (setpoints) and states that affect the system-controlled equipment directly from the graphic display.
   5. Provide a graphic editing tool that allows for the creation and editing of graphic files. It shall be possible to edit the graphics directly while they are on line, or at an off-line location for later downloading.
   6. EMCS system shall be provided with a complete user expandable symbol library containing all of the basic symbols used to represent components of a typical EMCS system. Implementing these symbols in a graphic shall involve dragging and dropping them from the library to the graphic.
   7. All points on graphics shall be identified by their unique point addresses. Addresses may appear in "pop-up" screens associated with the point on the graphic.

G. Schedules:
   1. The system shall provide multiple schedule input forms for automatic EMCS time-of-day scheduling and override scheduling of EMCS operations. At a minimum, the following spreadsheet types shall be accommodated:
      a. Weekly schedules.
      b. Temporary override schedules.
      c. Special "Only Active If Today Is a Holiday" schedules.
      d. Monthly schedules.
   2. Schedules shall be provided for each system or sub-system in the EMCS. Each piece of equipment in each system may have a unique schedule of operation relative to the system use schedule, allowing for sequential starting and control of equipment within the system. Scheduling and rescheduling of points shall be accomplished easily via the system schedule graphics.
   3. Monthly calendars for a 12-month period shall be provided that allow for simplified scheduling of holidays and special days in advance. Holidays and special days shall be user-selected via schedule graphics, and shall automatically reschedule equipment operation as previously defined on the weekly schedules.

H. Historical Trending and Data Collection:
   1. Trend and store point history data for all EMCS points and values as selected by the user for five (5) years.
   2. The trend data shall be stored in a manner that allows custom queries and reports using industry-standard software tools.

3. At a minimum, provide the capability to perform statistical functions on the historical database:
    a. Average.
    b. Arithmetic mean.
    c. Maximum/minimum values.
    d. Range – difference between minimum and maximum values.
    e. Standard deviation.
    f. Sum of all values.
    g. Variance.

I. Paging:
1. Provide the means of automatic e-mail and/or telephone type paging of personnel for user-defined EMCS events.
    a. Users shall have the ability to modify the address identifier or message to be displayed on the e-mail or telephone type pager through the system software.
    b. Contractor shall be responsible for providing connection to the e-mail or telephone type paging service.

2.06 WEB BASED USER INTERFACE

A. The EMCS shall have the ability to provide a web based graphical interface that allows users to access the EMCS data, configure data, commission, archive data, monitor, command, edit and perform system diagnostics via the Internet. The interface shall us HTML based ASP pages or HTTP, IP, SNTP, SMTP, SNMP, and XML to send and receive data from the EMCS system to a web browser.

B. All information exchanged over Internet shall be encrypted and secure (all hardware and software provided by EMCS Contractor).

C. The Owner shall be able to access data in the EMCS, intranet or internet with any type of computer (desktop or laptop) that runs standard Web browser software. The Web browser shall be set up to access the EMCS system directly over the IP network or via the Internet or Public telephone service for remote operation and system fault diagnosis.

D. The EMCS system shall recognize legitimate users through the entry of a user ID and a password at the Web browser user interface. User access data shall be encrypted in the transmission and in the EMCS system database and user profiles and accounts are managed at a site or system level by the user's security administrator. The authorization levels range from configuring the complete system to only viewing one section of the system or site. The system administrator shall assign a user ID, password, and specific data access privileges in each user account.

E. Access to the Web interface shall be password protected. A user's rights and privileges to points and graphics will be the same as those assigned at the EMCS workstation. An option will exist to only allow users "read" access via the Web browser, while maintaining "command" privileges via the EMCS workstation.

F. The Web-based interface shall provide the following functionality to users, based on their access and privilege rights:
1. Logon Screen: allows user to enter their user name, password and Domain name for logging into the web server.
2. Alarm Display: a display of current EMCS alarms to which the user has access will be displayed. Users will be able to acknowledge and erase active alarms, and link to additional alarm information including alarm messages, and informational and memo text. Any alarm acknowledgements initiated through the Web interface will be written to the EMCS central workstation activity log.

3. Graphic Display: display of system graphics available in the EMCS workstation will be available for viewing over the web browser. A graphic selector list will allow users to select any graphics to which they have access. Graphic displays will automatically refresh with the latest change of values. Users will have the ability to command and override points from the graphic display as determined by their user accounts rights.
4. Point Details: users will have access to point detail information including operational status, operational priority, physical address, and alarm limits, for point objects to which they have access rights.
5. Point Commanding: users will be able to override and command points they have access to via the web browser interface. Any commands or overrides initiated via the web browser interface will be written to the EMCS central workstation activity log.
6. Programming Capabilities: shall be excluded for web browser application.

G. EMCS Contractor shall provide licenses for all software residing in the EMCS system. Provide EMCS software and web server site licenses allowing concurrent access by three (3) browser connections. Transfer these licenses to the Owner prior to completion.

H. Internet connections and ISP services shall be provided by the Owner as required to support the web access feature.

2.07 WEB BASED SERVER

A. Web access software shall be installed as described below shall support browser access via the most current version of Microsoft Internet Explorer, or Navigator Netscape. Include Server software using standard Client Access Licenses (CALs) with enabled Terminal Services software. Server software can be installed on an Operator's Workstation.

B. Provide standard Client Access Licenses (CALs) for every concurrent user that may access the server (minimum of 3 concurrent users). In addition to the standard CALs for the operating system, every remote computer that accesses the server shall be provided with a reciprocating operating system (minimum of 3 concurrent users). All licenses shall be purchased by the Contractor.

C. Equip servers with the same EMCS tool set for graphic and system configuration and custom logic definition. Access to all information on the server will be through the same graphical user interface software used to access the EMCS system. When logged onto a server the operator will be able to also interact with any of the controllers in the facility.

D. The hardware platform for the server will, at minimum, consist of
1. Processor capable of supporting graphic data updates for 3 concurrent users under 2 seconds.
2. RAM capable of supporting 3 concurrent users with graphics updates 2 seconds or less.
3. Operating Systems software consistent with the EMCS
4. Terminal system software consistent with the EMCS
5. Server software consistent with the EMCS
6. Network card capable of supporting graphic data updates for 3 concurrent users under 2 seconds.
7. CD-ROM drive
8. Hard drive sized to store 5 years of trended data for all points connected to the server.
9. Current version of Internet software consistent with the EMCS.

2.08 NODES

A. Application Nodes:
1. Application nodes shall perform the function of monitoring system variables, both from real hardware points, software variables, and controller parameters such as setpoints that are relevant to its operation.
2. Application Nodes shall be entirely solid-state devices. No rigid disk drives will be permitted in the equipment rooms.
3. The application nodes shall be capable of managing and directing all information traffic on the Tier 1 network, between the Tier 1 and Tier2 networks, and to servers.

4. Any node on the Tier 1 network shall be equipped with all software necessary to interface with a Tier 1 Operator Workstation via network or local port.
5. The operating system of the Application Node shall support multi-user access. At minimum three users shall be able to access the same application node simultaneously.
6. Communication between nodes shall be peer-to-peer via 10/100 Ethernet using the BACnet protocol.
7. The Application Node shall be capable of direct connection to a subnet. The subnet shall use BACnet communications per ANSI/ASHRAE Standard 135-2001.
8. Application Nodes shall be programmable and governed by the requirements of their applicable codes, approvals and regulations. Configurable nodes are not acceptable.
9. The Application Nodes shall be designed, packaged, installed, programmed and commissioned in consideration of their specific service and prevailing operating conditions. They shall be proven standard product of their original manufacturer and not a custom product for this Project.
10. A failure at an Application Node shall not cause failures or non-normal operation at any other Application Node or subnet node other than the possible loss of active real-time information from the failed Application Node.
11. Application Nodes shall comply with FCC Part 15 subpart J Class A emission requirements.
12. Each Application Node shall be equipped with battery back-up source.
13. Application Nodes shall be physically separate from server hardware and software, reside in the building, and be the only means of EMCS data transfer to the server. Application node shall be a complete off the shelf software/hardware package manufactured by a licensed Application node manufacturer.

B. HVAC Node:
1. HVAC Node shall provide both standalone and networked direct digital control of HVAC systems.
2. A dedicated HVAC Node shall be configured and provided for each primary HVAC system (air handler, chiller, boiler) and each terminal HVAC system (VAV Box, Unit Heater, Fan Coil Unit, Cabinet Heater, Heat Pump, Fan Powered Box, CV Box)
3. Each HVAC Node shall retain program, control algorithms, and setpoint information in non-volatile memory in the event of a power failure, and shall return to normal operation upon restoration of power.
4. Each HVAC Node shall report its communication status to the EMCS. The EMCS shall provide a system advisory upon communication failure and restoration.
5. The HVAC Node shall provide the ability to download and upload configuration data, both locally at the Node and via the EMCS communications network.
6. HVAC nodes connected directly to the Tier 1 network shall be subject to all of the conditions listed in Section 2.07.A Application Node.
7. Configurable rather than programmable nodes may be used, but must perform specified sequences. The configurable nodes shall be replaced at the Contractor's expense if during the design, checkout or warranty periods it is discovered that the configurable node cannot adequately perform the specified sequence.

2.09 NODE SOFTWARE

A. Application and HVAC Node Software:
1. Event Messaging: Provide for the automatic execution of user-defined messages on the occurrence of each predefined EMCS real-time event including equipment/point status change, approaching limit or alarm, time of day and the like. Direct messages to any number of operator PCs, e-mail destinations, and pagers.

2. Optimum Start/Stop: Provide software to start equipment on a sliding schedule based upon indoor and outdoor conditions, to determine the minimum time of HVAC system operation needed to satisfy the space environmental requirements. The program shall also determine the earliest possible time to stop the mechanical systems. The optimum start/stop program shall operate in conjunction with, and be coordinated with, the scheduled start/stop and night setback programs.
3. Auto Alarm Lockout: Provide for scheduled and automatic lockout of alarm annunciation from equipment during non-normal operating conditions including shutdown, emergency power operation, fire alarm and the like.
4. Energy Monitoring: Provide software to monitor and totalize consumption as measured by pulse meters.
5. Event Initiated Programs and Custom Logic: Provide software to define custom logic sequences that will reside in the nodes. The definition software will also reside in the node and be accessible via the network or direct connected workstation.
6. System Restart: Upon restoration of the AC power to an HVAC Node, automatically restart all equipment and restore all loads to the state as required by the EMCS. Provide appropriate time delays to prevent demand surges or overload trips.
7. Equipment Delays: The system shall provide protection against excessive demand situations during start-up periods by automatically introducing time delays between successive start commands.
8. Runtime Totalization: Automatically sample, calculate and store runtime hours for binary input and output points as listed in the point schedule of this specification.
9. Analog/Pulse Totalization: Sample, calculate and store consumption totals on a daily, weekly, or monthly basis for user-selected analog and binary pulse input-type points.
10. Setpoints and Setpoint Ranges: All setpoints and their ranges shall be accessible via an Operator's Workstation.

PART 3 PERFORMANCE/EXECUTION

3.01 EMCS SPECIFIC REQUIREMENTS

A. Temperature Sensors:
   1. Office temperature sensors shall have pushbutton interface capabilities that allow for occupied/unoccupied override and adjustable setpoint unless otherwise specified on drawings. Sensors shall be capable of displaying room temperature and setpoint and shall be capable of a 5-degree F deadband between cooling and heating.
   2. Room temperature sensors shall be mounted 48" ADA unless otherwise specified on drawings. Verify locations with customer representative.

B. Operator Workstation Schedule:
   1. One (1) desktop workstation and (1) laptop capable of displaying all system graphics and accessing the data and control code in all controllers. Confirm PC type with customer representative. Workstation count does not include separate servers, if separate servers are necessary for system operation.
   2. Supplied workstations shall have all software and hardware required for optional dial-up, website remote access, and multiple user access.
   3. Workstations shall be fully tested and certified compatible with all EMCS software

C. Actuation / Control Type:
   1. Primary Equipment:
      a. As a default, spring return is required in all equipment exposed to outside air and/or fail-safe situations.
      b. All air handling equipment damper and valve actuation shall be electric, spring return and proportionally controlled.
      c. Air handling equipment is defined as any unit with outside air intake.
      d. All valves associated with units directly processing outside air and the main hydronic system shall have mechanical override capabilities.

e. All 120 VAC driven actuators shall have disconnects in accordance with electrical standards.

D. Current Sensors and Current Switches:
1. Install on all fans including fan terminal boxes, heat pumps fans, and exhaust fans. Install on all hydronic pumps. Install on all compressors.
2. Use sensor types that provide detection of belt breakage when belt driven equipment is used.
3. As default, all variable speed motors shall have current sensors on their power input if manufacturer variable speed motor status is not available.

E. Extra HVAC Node Physical Hardware Points:
1. All HVAC nodes controlling major system elements such as outside air system units such as AHUs, HPs, Split-Systems, shall have one unused universal input, analog output, and digital output.

F. Adjust room numbers and floor plans on graphics as necessary to reflect actual conditions.

G. Meters:
1. Water Meters:
a. Install with built in strainers, locking nuts, gaskets and coupling pieces.
b. Installation by Division 23.
c. Totalizing pulse output type, accuracy shall be 2% of rate fluid.
d. Turbine style meter.
e. Maximum pressure drop shall be less than 3 psi at design flow rates or meter size to match pipe size.
2. Gas Meter:
a. Installation by Division 23.
b. Diaphragm meter with self-lubricating bearings.
c. Capacity and line pressure to match building requirements.
d. Include totalizing pulse option.
3. Power Meter:
a. Meter measures Accumulated Real Energy (kWh), Instantaneous Peak (kW); Current (amps), Maximum Peak (kW) for all phases and in total.
b. Meter shall communicate using BACnet MS/TP protocol and shall be compatible with EMCS.
c. Meter shall include all current transformers, fuses, resistors, power transformers and enclosures.
d. CT installation by Division 26. Coordinate CT type with EC. Solid core CT's preferred.
e. Default power reading every 15 minutes.

3.02 INSTALLATION PRACTICES

A. EMCS Wiring:
1. All conduit, wiring, accessories and wiring connections required for the installation of the Energy Management System, as herein specified, shall be provided by the EMCS Contractor unless specifically shown on the Electrical Drawings under Division 26.
2. The EMCS contractor is responsible for coordinating with the Electrical contractor (At EMCS Contractors' expense) to furnish and install any additional line voltage circuits, line voltage wiring, line voltage panels, and associated line voltage appurtenances not shown on the Electrical Drawings as required to provide a compete and functioning EMCS system, regardless of the quantity or presence of EMCS circuits shown on the Electrical Drawings.
3. All wiring shall comply with the requirements of applicable portions of Division 26 and all local and national electric codes, unless specified otherwise in this section.
4. All EMCS wiring materials and installation methods shall comply with EMCS manufacturer recommendations.

5. The sizing type and provision of cable, conduit, cable trays, and raceways shall be the design responsibility of the EMCS Contractor. If complications arise, however, due to the incorrect selection of cable, cable trays, raceways and/or conduit by the EMCS Contractor, the Contractor shall be responsible for all costs incurred in replacing the selected components.
6. Wire/conduit ratios shall follow the same wire/conduit ratios included in Division 26.
7. Class 2 Wiring:
    a. All Class 2 (24VAC or less) wiring shall be installed in conduit or be plenum rated and shall be installed in accordance with local code requirements.
    b. Conduit is not required for Class 2 wiring in concealed accessible locations. Inaccessible locations such as “hard lid” ceilings require conduit.
    c. Wire supports and be installed per local wiring code requirements. As a default, wire shall be supported every 5’ from the building structure utilizing metal hangers designed for this application.
    d. Where it is not possible to conceal raceways in finished locations, surface raceway (Wiremold) may be used as approved by the Engineer.
    e. All conduits and raceways shall be installed level, plumb, at right angles to the building lines and shall follow the contours of the surface to which they are attached.
    f. Provide firestopping for all penetrations used by dedicated EMCS conduits and raceways using approved fire resistive sealant. All other project firestopping to be by other trade.
    g. All wiring passing through penetrations, including walls or other structure, shall be in conduit or enclosed raceway.
    h. Penetrations of floor slabs shall be by core drilling. All penetrations shall be plumb, true, and square.
    i. No penetrations in structural elements shall be made before receipt of written approval from the Structural Engineer.
8. Class 2 signal wiring and 24VAC power can be run in the same conduit. Power wiring 120VAC and greater cannot share the same conduit with Class 2 signal wiring.
9. Perform circuit tests using qualified personnel only. Provide necessary instruments and equipment to demonstrate that:
    a. All circuits are continuous and free from short circuits and grounds.
    b. All circuits are free from unspecified grounds; that resistance to ground of all circuits is no less than 50 megaohms.
    c. All circuits are free from induced voltages.
10. Provide complete testing for all cables used under this Contract. Provide all equipment, tools, and personnel as necessary to conduct these tests.
11. Provide for complete grounding of all signal and communications cables, panels and equipment so as to ensure system integrity of operation. Ground cabling and conduit at the panel terminations. Avoid grounding loops.

B. EMCS Line Voltage Power Source:
1. 120-volt AC circuits used for the EMCS shall be taken from panelboards and circuit breakers provided by Division 26. Control contractor shall be responsible for installing, adding or adjusting all 120-volt AC circuits. Control’s contractor shall coordinate all 120-volt AC work with Division 26.
2. Circuits used for the EMCS shall be dedicated to the EMCS and shall not be used for any other purposes.
3. DDC terminal unit controllers may use 120-volt AC power from motor power circuits.

C. EMCS Identification Standards:
1. Node Identification: All nodes shall be identified by a permanent label fastened to the outside of the enclosure. Labels shall be suitable for the node location.
2. Cable and/or conduit shall be labeled at suitable intervals with the EMCS system manufacturer’s name. Labeling shall be sufficient to trace cable from device to device.

3. Specify a different wire color for analog, digital, power and communication wiring. Include wiring color on control drawings legends.
4. Raceway Identification: All the covers to junction and pull boxes of the EMCS raceways shall be labeled.
5. Wire Identification: All low and line voltage EMCS wiring shall be identified by a number, as referenced to the associated shop drawing and as-built drawing, at each end of the conductor or cable. Identification number shall be permanently secured to the conductor or cable and shall be typed.

D. EMCS Node Installation:
1. The EMCS panels and cabinets shall be mounted at shoulder height wherever possible. All panels shall be accessible. Each cabinet shall be anchored per the manufacturer's recommendations.
2. The EMCS Contractor shall be responsible for coordinating panel locations with other trades and Electrical and Mechanical Contractors.

E. Input Devices:
1. All Input devices shall be installed per the manufacturer recommendation and shall be of the type and accuracy suitable for this specific application.
2. Locate components of the EMCS in accessible local control panels wherever possible.
3. The Mechanical Contractor shall install all in-line devices such as temperature wells, pressure taps, airflow stations, etc.
4. Input Flow Measuring Devices shall be installed in strict compliance with ASME guidelines affecting non-standard approach conditions.
5. Outside Air Sensors:
   a. Sensors shall be mounted on the North wall to minimize solar radiant heat impact or located in a continuous intake flow adequate to monitor outside air conditions accurately.
   b. Sensors shall be installed with a rain proof, perforated cover.
6. Building Differential Air Pressure Applications (-0.25" to +0.25" w.c.):
   a. Transmitter's exterior sensing tip shall be installed with a shielded static air probe to reduce pressure fluctuations caused by wind.
   b. The interior tip shall be inconspicuous and located as shown on the drawings.
7. Duct Temperature Sensors:
   a. Duct mount sensors shall mount in an electrical box through a hole in the duct and be positioned so as to be easily accessible for repair or replacement.
   b. The sensors shall be insertion type and constructed as a complete assembly including lock nut and mounting plate.
   c. For ductwork greater in any dimension than 48 inches or where air temperature stratification exists such as a mixed air plenum, utilize an averaging sensor. Sensors shall be installed in a "Z" configuration as default.
   d. The sensor shall be mounted to suitable supports using factory approved element holders.
8. Low Temperature Limit Switches:
   a. Install on the discharge side of the first water or steam coil in the air stream.
   b. Mount element horizontally across coil in a serpentine pattern ensuring each square foot of coil is protected by 1 foot of sensor.
   c. For large duct areas where the sensing element does not provide full coverage of the air stream, provide additional switches as required to provide full protection of the air stream.
9. Air Differential Pressure Status Switches:
   a. Install with static pressure tips, tubing, fittings, and air filter.
   b. Room Temperature Sensor:
   c. Install sensor with insulation if mounted on an exterior wall.

10. CO2 sensor:
    a. Shall be factory calibrated and be self-calibrating when installed.
    b. Range: 0-2000 ppm.
    c. Accuracy: plus or minus 30 ppm plus 2% of reading.
    d. UL listed.
11. Refrigerant Sensors:
    a. Shall be factory calibrated and be self-calibrating when installed.
    b. Shall be maintenance free.
    c. Range: 0-1000 ppm
    d. Accuracy: plus or minus 25 ppm plus 20% of reading
    e. Ul listed
    f. Shall have audible alarm if levels above 50 ppm are detected.
    g. Shall be 24 VAC or 24 VDC.

F. HVAC Output Devices:
1. All output devices shall be installed per the manufacturer's recommendation and shall be suitable in type and accuracy for this specific application. The Mechanical Contractor shall install all in-line devices such as control valves, dampers, etc.
2. Actuators: All control actuators shall be sized capable of closing against the maximum system shut-off pressure. The actuator shall modulate in a smooth fashion through the entire stroke. When any pneumatic actuator is sequenced with another device, pilot positioners shall be installed to allow for proper sequencing.
3. Electronic Signal Isolation Transducers: Whenever an analog output signal from the EMCS is to be connected to an external control system as an input (such as a chiller control panel), or is to receive as an input a signal from a remote system, provide a signal isolation transducer. Signal isolation transducer shall provide ground plane isolation between systems. It is the Controls Contractor's responsibility to determine if isolation is necessary.
4. Relays: All relays used to start/stop any piece of mechanical equipment that does not have an HOA switch shall have a Closed-Open-Auto override switch located on the load side of the relay.

G. Provide a file that tracks all software changes along with associated login name and password. Start file at beginning of construction process.

3.03 THIRD PARTY EQUIPMENT INTERFACE

A. The EMCS shall utilize the following protocols to communicate with the third-party equipment described in this section:
1. Connecting via Ethernet TCP/IP BACnet at the Tier 1 level in accordance with ANSI/ASHRAE Standard 135-2001.
2. Tier 2 connection specifications shall be via BACnet in accordance with ASNI/AHSRAE Standard 135-2001. Gateways may be employed to communicate to existing or third-party controllers. Objects commonly used for HVAC control shall be accessible. Accessible is defined as the ability to read, write create and acknowledge objects. Objects are defined as input and output points, setpoints, on/off switches, alarms, schedules and trend logs.

B. Each of the following independent systems Contractor shall provide all material and field labor necessary to accomplish interfaces to the EMCS:
1. Fire Alarm System: Fire Alarm System Interface: Fire alarm system and air handling equipment smoke detectors shall be provided under Division 26. Coordinate EMCS requirements with Fire Alarm System Contractor to monitor the Fire Alarm System only. One fire alarm panel contact shall be monitored by the EMCS operator workstation.

2. Lighting Control System: The entire lighting control system shall be provided under Division 26. Coordinate all EMCS Point numbers and requirements with Electrical Contractor. All lighting control system points as shown on the drawings shall be monitored by the EMCS Workstation and shown on graphics as detailed in the EMCS Description Graphic Displays Section (Section 2.01.I). As default, assume all exterior lighting shall be controlled by EMCS.
   a. The Lighting Control Application shall be part of the EMCS System and fully accessible from any Workstation. Point inputs and outputs from the lighting control system shall have real-time interoperability with EMCS software features including circuit status, scheduling and independent overrides.
   b. Include graphical software programming utilizing floor plans and color to communicate information related to lighting zone status and scheduling. The graphical program shall enable operators to manage their lighting system on a day-to-day basis. The user shall navigate within the system to check on the conditions, schedules, etc. by using a 'point and click' interface based upon floor plans and area graphics.
3. Variable Frequency Drive Control Systems: Whenever possible, use Modbus, BACnet or another communications interface. Verify with manufacturer. If communications interface is unavailable, the Controls Contractor is expected to provide control relays and current sensors to enable/disable and record status and alarm conditions on the unit. Any analog (i.e., setpoint) terminal point interface shall be provided by manufacturer.

3.04 TRAINING

A. The EMCS Contractor shall provide the following training services:
   1. Provide two days of on-site orientation by a system technician who is fully knowledgeable of the specific installation details of the project. This orientation shall, at a minimum, consist of a review of the project as-built drawings, the EMCS software layout and naming conventions, and a walk through of the facility to identify panel and device locations. Training may be split into smaller sessions on different days if the Owner prefers.
   2. Supply a list of available factory training classes and contact information.

3.05 COMMISSIONING

A. Controls Contractor shall provide the Commissioning Agent with a completed Acceptance Verification document prior to beginning point-to-point activities. Final Acceptance Verification document shall be included in the Commissioning Field Notebook. The commissioning agent may be an independent agent, the customer, or the Design Engineer.

B. Acceptance Verification Document is defined as a series of check sheets that include all EMCS points and functions. Each point entry shall be signed and dated verifying that each point and function has been fully calibrated and tested.

C. The Controls Contractor shall provide qualified technician to support the commissioning requirements outlined in specification Sections 016500 and 230800. The Controls Contractor shall provide support to the commissioning agent during the performance testing and shall provide trends as needed for their review.

D. Conduct functional performance tests to demonstrate that controls systems maintain setpoints and operates through the full range of operations. The commissioning agent will provide functional tests that the Controls Contractor shall review and provide comments on the tests for incorporation into the final test documents.

E. Provide System Performance Trend Logs as specified by the Design Engineer or commissioning agent to verify that all systems are functioning satisfactorily.

F. Provide all necessary specialist labor, materials and tools to demonstrate to the Engineer that the EMCS has been commissioned and is operating in compliance with the contract. Prepare a list of noted deficiencies signed by both the Engineer and the EMCS Contractor.

G. Promptly rectify all listed deficiencies and submit to the Engineer that this has been done.

H. Final Commissioning:
   1. Upon successful completion of Owner-Witnessed Functional Tests, a Performance Period (15 consecutive calendar days) shall commence on the first day following the last performance test. This period shall be completed prior to final acceptance of the project. In event of failure to meet standard of performance during any initiated performance period, it is not required that one 15-calendar day period expire in order for another performance period to begin.
   2. If equipment or system operates so as to demonstrate continuing compliance with specified requirements for period of 15 consecutive calendar days from commencement date of performance period, it shall be deemed to have met standard of performance. In addition, equipment or systems shall operate in conformance with all Contract Specifications and with Contractor's bid and published Specifications in effect on date Contract is executed, provided such specifications are equal to or better than specifications submitted with Contractor's bid.
   3. Performance period shall be monitored through trend review of controls systems. The Controls Contractor shall be responsible for configuring the controls system to collect trends and shall provide trends to the commissioning agent for review. Typical trend data will be collected on approximately 8 points for each unit and as determined for other systems. Trend data for each unit shall be collected in a single file and all columns in each file shall have descriptive headers. Trend collection or points shall be provided in 15-minute increments.
   4. Provide a complete set of trend logs for all HVAC equipment for a 24-hour period on a normally occupied day. Trend points shall be in 15-minute increments and shall include setpoints.

I. Commissioning of the Web interface shall not require modification or creation of HTML or ASP pages. All dynamic graphics and real-time data available at the EMCS graphical workstation shall be available to users via a web browser.

END OF SECTION 230900

SECTION 232300
REFRIGERANT PIPING SYSTEM

PART 1 GENERAL

1.01 GENERAL

A. Includes, but not limited to, the furnishing and installation of piping for refrigeration systems. The general arrangement and location of piping is shown on the plans. The pipe sizing and exact arrangements shall be designed by this contractor. This contractor shall provide all labor, materials, equipment, refrigeration specialties, testing, evacuation, oil and refrigerant charging as required for a complete and operational system. The design and installation shall conform to the equipment manufacturer's recommendations and installation instructions and all local mechanical and environmental codes.

B. Single line indicated on plans designates the proposed routing for the refrigeration piping between the indoor and outdoor units. That single line represents all the required piping runs required for the system designed. Contractor to verify quantity of circuits, piping runs and sizing prior to bid and installation.

1.02 RELATED SECTIONS

A. General Conditions, Division 01

B. Section 200000 – General Mechanical Requirements

C. Section 221116 – Domestic Water Pipe and Fittings

D. Section 222000 – Excavation and Backfill For Mechanical Underground Utilities

E. Section 230529 – Hangers and Supports for HVAC Piping and Equipment

F. Section 230719 – HVAC Piping Insulation

1.03 QUALITY ASSURANCE

A. Refrigerant piping shall be installed by a refrigeration contractor licensed in the State of Washington, having a minimum of five (5) years' experience in refrigeration piping installation, and certification of technical training specifically in refrigeration from an industry recognized training program. Proof of license, experience and training shall be submitted as part of the Mechanical Submittals, see Section 200000. All technicians working on-site shall be certificated in the use and handling of refrigerants in accordance with federal EPA regulation 40 CFR Part 82, sub-paragraph F.

1.04 SUBMITTAL REQUIREMENTS OF THIS SECTION

A. Pipe

B. Fittings

C. Brazing Material

D. Isolation Valves

E. Shop Drawings and Calculations

F. Certified Installer Information

1.05 OPERATION AND MAINTENANCE REQUIREMENTS FOR THIS SECTION

A. Valve Diagram

B. Shop Drawings and Calculations

PART 2 PRODUCTS

2.01 APPROVED MANUFACTURERS

A. Not Applicable

2.02 REFRIGERANT PIPING

A. Meet the requirements of ASTM B 280-86, "Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service", ACR hard drawn straight lengths.

B. Use of pre-charged soft copper line sets is prohibited.

2.03 REFRIGERANT FITTINGS

A. General: 100% Wrot copper with long radius elbows

B. Approved Manufacturers: Mueller Streamline, Nibco

2.04 BRAZING MATERIAL

A. Brazing rods with a minimum of 5% silver content shall be utilized. Rods containing Cadmium will not be permitted.

2.05 ISOLATION VALVES

A. Line size, ball type isolation valves shall be provided on both vapor and liquid lines of all systems. Provide one vapor and 2 liquid line valves (for filter/drier isolation) at the outdoor unit.

B. Valves shall be suitable for use with HCFC and HFC refrigerants, forged brass body, seal cap and wrot copper fitting extensions. Temperature rating shall be -40°F to +325°F minimum.

C. Coordinate optimum location of valves with filter/dryer unit (a valve on each side of the filter) to facilitate replacement with minimal loss of refrigerant. At minimum, provide one set of Schrader valves located on the indoor coil side of the valves to facilitate evacuation and charging of the piping.

PART 3 EXECUTION

3.01 SHOP DRAWINGS AND CALCULATIONS

A. Provide shop drawings of each system in the project. Drawings are to be at 1/8th inch per foot minimum, and in sufficient detail to count fittings and devices with all vertical and horizontal runs fully dimensioned. Show sizes of all piping and type of fittings. Provide large scale details of indoor and outdoor equipment connections with all devices located, chases through the building components, refrigerant traps, and underground piping runs.

B. Provide calculations that support the shop drawings with an individual pipe sizing calculation for each piping system. These calculations are to be performed by the equipment manufacturer's technical support personnel and submitted to the Engineer. These calculations shall provide total system capacity loss due to piping, system vapor velocities and critical system operating temperatures.

C. **All piping systems shall be sized as required to prevent no more than 5% system capacity loss due to piping.**

D. Each piping system is to be individually sized accounting for that particular unit’s capacity, piping lengths, fittings and devices. Oil return is a major consideration and refrigerant vapor velocity must be sufficient to entrain oil. Minimum velocity must be 800 fpm in horizontal runs and 1500 fpm in vertical suction risers.

3.02 PIPING INSTALLATION

A. All vapor lines shall be sloped downward towards the compressor at a rate of one (1) inch per 10 lineal feet to facilitate oil return.

B. Provide oil traps at vertical risers where required to return oil to compressor and to prevent liquid migration back to the compressor in the off cycle.

C. Refrigeration system connections shall be copper-to-copper type properly cleaned and brazed. Use flux only where required for brazing brass components. Soft solder connections are prohibited. Only silver solder containing a minimum of 5% silver shall be utilized

D. Circulate dry nitrogen as a shield gas through piping while being brazed to eliminate formation of copper oxide during brazing operation.

E. All piping shall be secured using unistrut type channel with "Hydrosorb" type clamps. All clamps shall be specifically designed for use with refrigeration piping and shall contain internal plastic grommet for vibration and thermal isolation. The use of general-purpose clamps, conduit straps or plumbers' tape is strictly prohibited. Carefully plan routing and grouping of all piping to ensure a neat and professional installation.

F. Where necessary to offset piping around obstructions, utilize 45° elbows in lieu of 90° elbows to minimize pressure losses.

G. Where piping is installed underground, provide an utilidor or conduit type system in which all piping shall be routed and protected against physical damage and moisture. Refer to drawings for additional installation details.

H. A complete review of all installation recommendations produced by the equipment manufacturer is recommended prior to the installation of ACR piping. Conformance to all manufacturers' recommendations will be enforced.

I. All leak testing shall be performed and verified prior to covering any concealed or buried piping. See Field Leak Tests.

3.03 FIELD LEAK TESTS

A. All leak tests shall be witnessed and confirmed by the Engineer or Owner's representative. The purpose of all leak testing is to confirm the integrity of field installed piping. If equipment is provided with a factory provided refrigerant charge, the equipment may be isolated and excluded from the test. If shipped with only a "holding charge" or no charge, the isolation valves shall be opened, and the equipment shall be included in the pressure testing.

B. Following completion of the refrigeration piping systems, the following tests shall be performed.
   1. Connect test gauge with minimum of "2% accuracy to the piping system to be tested and pressurize piping system with dry nitrogen gas to 1.25 x design service pressure (minimum of 250 psi) or as recommended by the equipment manufacturer. Do not introduce any refrigerant into the system prior to pressure testing. The test gauge shall remain connected throughout the test period. Record actual test gauge pressure, date, time and ambient temperature. System shall remain under test for a period of one week. At the conclusion of the test period, record pressure, date, time and ambient temperature. If the test gauge is within 1% (2.5 PSIG) of the original test pressure as witnessed by the Engineer, (plus adjustment fluctuations in ambient temperatures) the system will be "Passed" and approved for evacuation and charging procedures.

3.04 OIL/REFRIGERANT CHARGING

A. Prior to commencing oil and refrigerant charging procedures, this Contractor shall refer to and closely follow the manufacturers' specific procedures for charging the system. As a minimum, the following procedures shall be followed:
   1. Calculate oil charge using manufacturer's recommended method and add oil to compressor crankcase as necessary for size of piping system. Affix permanent, weatherproof label to unit indicating date, type of oil, and amount added, signed by the technician performing the task.
   2. Draw a vacuum on each entire system with vacuum pump to 200 microns using vacuum gauge calibrated in microns. Break vacuum with refrigerant shipped with unit and re-establish a 200-micron vacuum (double evacuation). Calculate recommended charge and add the appropriate refrigerant charge by weight using a digital scale. Check and adjust charge as necessary to obtain manufacturer's specified operating pressures and superheat during start-up procedure.

3.05 SYSTEM START-UP

A. Perform a system start-up and check-out procedure as recommended by the equipment manufacturer, and as indicated on the enclosed system Start-up and Check-out Log. This start-up and check-out shall be performed in the presence of the Engineer or Owner's representative.

B. Provide one week’s written notice to the Engineer prior to start of equipment start-up and check-out.

C. Submit the following completed documentation including copies of the completed compressor warranty registration forms to the Engineer upon completion of system start-up.

3.06 START-UP LOG

(See attached.)

START-UP LOG

Date: _____ Project Title: _____

Contractor: _____ Tech. Name: _____

Refrigerant License #: _____

EQUIPMENT:

	Indoor	Outdoor	Accessories
Unit #:	_____	_____	_____
Make:	_____	_____	_____
Model:	_____	_____	_____
Serial#:	_____	_____	_____
Location:	_____	_____	_____

REFRIGERANT CHARGE: Type: _____ Amount: _____

OIL CHARGE: Type: _____ Amount: _____

TEMPERATURES:

Indoor: _____ Outdoor: _____

Return Air: _____ Supply Air: _____

COMPRESSOR(S):

	#1		#2	
		Cooling	Cooling	
Discharge Pressure:		_____	_____	
Suction Pressure:		_____	_____	
	Actual	Rated	Actual	Rated
Amps:	_____	_____	_____	_____

Volts(at disconnect): L1 - L2 _____ L2 - L3 _____ L1 - L3 _____

INDOOR MOTOR:

Direct Drive: _____ Belt Drive: _____ Belt Size: _____

Amps-Actual: _____ Amps-Rated: _____ Volts: _____

Rotation Verified? Yes ( ) No ( )

OUTDOOR MOTOR:

Amps-Actual: _____ Amps-Rated: _____ Volts: _____

HEAT:

Electric: _____KW _____Volts

None: _____(check if no heat)

THERMOSTAT OPERATION:

Type: _____ Fan On During Occupied? Yes ( ) No ( )

Setpoints: Occupied Cool _____ Unoccupied Cool_____

FILTERS: Type: _____ Size: _____ Quantity: _____

COMMENTS: _____

_____

_____

_____

_____

TECHNICIAN SIGNATURE: _____

END OF SECTION 232300

SECTION 233113
STEEL DUCTWORK

PART 1 GENERAL

1.01 GENERAL

A. Includes, but not limited to, furnishing and installing above-ground ductwork and related items specified below and shown on Drawings.

1.02 RELATED SECTIONS

A. General Conditions and Division 01 apply to this Section.

B. Section 200000 - General Mechanical Conditions

C. Section 230529 - Hangers and Supports for HVAC Piping & Equipment

D. Section 230713 - Equipment/Ductwork Insulation

E. Section 233300 - HVAC Specialties

1.03 SUBMITTAL REQUIREMENTS OF THIS SECTION

A. Duct liner

B. Acoustic duct

C. Access doors

D. Volume dampers

E. Motorized dampers

F. Duct Silencers

G. Duct Sealers

H. Duct Closure Collars

I. Turning vanes

1.04 OPERATION AND MAINTENANCE REQUIREMENTS OF THIS SECTION

A. Motorized dampers

1.05 EFINITIONS

A. Duct Sizes: All duct dimensions shown are inside clear dimensions. Where inside duct lining is specified or indicated, duct dimensions are to the inside face of lining.

B. Low Pressure System: Velocities less than 1,500 fpm and static pressure in duct 2 inches w.g. or less.

C. Medium Pressure System: Velocities less than 2,500 fpm or static pressure in duct up through 6 inches w.g.

D. Primary Duct System: See Section 230713-Equipment/Ductwork Insulation.

E. Gauges: Steel sheet and wire are U.S. Standard Gauge; aluminum sheet is Brown and Sharpe Gauge.

PART 2 PRODUCTS

2.01 APPROVED MANUFACTURERS

A. Not Applicable

2.02 DUCTS

A. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards - Metal, except as indicated. Fabricate of zinc-coated lock-forming quality steel sheets meeting requirements of ASTM A 527-85, "Specification for Sheet Steel Zinc Coated (Galvanized) by the Hot-Dip Process, Lock Forming Quality", with G 60 coating.

B. Construct T's, bends, and elbows with radius of 1-1/2 times width of duct on centerline. Where not possible, provide turning vanes.

C. Increase duct sizes gradually, not exceeding 30° divergence and 45° convergence.

D. Use crimp joints with or without bead for joining round duct sizes 8 inches (200 mm) and smaller with crimp in direction of airflow.

2.03 DUCT JOINTS

A. General: Duct with sides or diameter up to and including 36 inches shall be as scheduled below.

Max. Side Inches	Required Minimum Metal Gauges Steel, U.S. Standard Gauge	Type of Transverse Joint Connections	Bracing Required
Under 13"	26	S-drive, pocket or bar slips on 7 - 10" centers	None
13" to 24"	24	S-drive, pocket or bar slips on 7-10" centers	None
25" to 30"	24	S-drive, 1" pocket or 1" bar slips on 7'-10" centers	1"x1"x1/8" angles 4' from joints
31" to 36"	22	Drive 1"pocket or 1"bar slips on 7'-10" centers	1"x1"x1/8" angles 4' from joints

B. Ducts with sides over 36 inches to 48 inches, transverse duct joint system by Ductmate/25, Nexus, or WDCI (Lite) (SMACNA "E" or "G" Type connection).

C. Ducts 48 inches and larger, Ductmates/35, Nexus, or WDCI (Heavy) (SMACNA "J" Type connection).

D. Proprietary duct connections may be used on other sizes, Ductmate, WDCI, or equal.

2.04 ROUND DUCT

A. Fabricate of zinc-coated lock-forming quality steel sheets meeting requirements of ASTM A 527-85, "Specification for Sheet Steel Zinc Coated (Galvanized) by the Hot-Dip Process, Lock Forming Quality", with G 60 coating.

B. Gauge Selection Table:

Duct Diameter in Inches	Maximum 2" w.g. Static Positive		Maximum 2" w.g. Static Negative	
	Spiral Seam Gauge	Longitudinal Seam Gauge	Spiral Seam Gauge	Longitudinal Seam Gauge
3 thru 8	28	28	28	24
9 thru 14	28	26	26	24
15 thru 26	26	24	24	22
27 thru 36	24	22	22	20
37 thru 50	22	20	20	18
51 thru 60	20	18	18	16
61 thru 84	18	16	16	14

C. Provide insulation where required by the Insulation Schedule in Section 230713 - Equipment/Ductwork Insulation.

2.05 SPIRAL DUCT

A. The outer pressure sheet shall be manufactured from galvanized steel meeting ASTM A-527-67 in the following minimum gauges:

Nominal Size Range	Solid Spiral Wound Duct Outer Pressure Shell	Solid Welded Fitting Outer Pressure Shell
3"-12"	26 Ga.	20 Ga.
13"-24"	24 Ga.	20 Ga.
25"-34"	22 Ga.	20 Ga.
35"-48"	20 Ga.	18 Ga.
50"-58"	18 Ga.	16 Ga.

2.06 DUCT LINER

A. Densities and R-value:
   1. R-3.3: 1.0 inch of 1.5 to 3.0 lb/cu. Ft. duct liner
   2. R-5.3: 1.5 inches of 1.5 to 3.0 lb/cu. Ft. duct liner
   3. R-7: 2.0 inches of 1.5 to 3.0 lb/cu. Ft. duct liner

B. Duct Liner:
   1. 'K' ('ksi') Value: ASTM C518, 0.25 at 75°F (0.036 at 24°C)
   2. Noise Reduction Coefficient: 0.65 or higher based on "Type A mounting"
   3. Maximum Velocity on Mat or Coated Air Side: 5,000 ft/min (25.4 m/sec)
   4. Adhesive: UL listed waterproof type
   5. Fasteners: Duct liner galvanized steel pins, welded or mechanically fastened
   6. Approved Manufacturers:
      a. Manville Permacote Linacoustic (HP)

C. Spiral Duct Liner:
   1. For ductwork requiring 1-inch (25 mm) Spiracoustic Plus System Lining:
      a. The installed 1-inch lining shall have a Thermal Resistance (R-Value) of 4.3 (.76) at 75°F (24°C) mean temperature, and Noise Reduction Coefficients (NRC) per ASTM C 423, Type "A" mounting.
      b. Metal duct with inside diameters from 8 inches to 18 inches (203 to 457 mm) shall be lined with 1-inch Preformed Round Liner.
         1) Approved Manufacturers:
            (a) Permacote Spiracoustic Liner
      c. Metal duct with inside diameters from 18 inches to 32 inches (457 to 813 mm) shall be lined with 1-inch Round Liner Board.
         1) Approved Manufacturers
            (a) Spiracoustic Plus “SD” Liner
      d. Metal duct with inside diameters greater than or equal to 34 inches (364 mm) shall be lined with 1-inch Round Liner Board.
         1) Approved Manufacturers
            (a) Spiracoustic Plus “LD” Liner
   2. For ductwork requiring 1 1/2-inch (38 mm) Lining:
      a. The installed 1 1/2-inch lining shall have a Thermal Resistance (R-Value) of 6.3 (1.11) at 75°F (24°C) mean temperature, and a Noise Reduction Coefficient (NRC) of 0.95 per ASTM C 423, Type "A" mounting.
      b. Metal duct with inside diameters from 9 inches to 18 inches (229 to 457 mm) shall be lined with 1 1/2-inch Preformed Round Liner.
         1) Approved Manufacturers:
            (a) Permacote Spiracoustic Liner

c. Metal duct with inside diameters from 22 inches to 38 inches (559 to 965 mm), shall be lined with 1 1/2-inch Round Liner Board.
   1) Approved Manufacturers:
      (a) Spiracoustic Plus “SD” Liner
d. Metal duct with inside diameters greater than or equal to 40 inches (1.02 m), shall be lined with 1 1/2-inch Spiracoustic Plus LD Round Liner Board.

2.07 ACOUSTIC DUCT

A. Provide internally insulated, sound control duct and fittings to be acousti-k27 (perforated liner).
   1. Outer pressure shell per spiral duct above.
   2. The spiral wound inner liner duct (perforated or solid) is made from 28-gauge galvanized steel and is ribbed for diameters from 9 through 58 inches.
   3. The inner liner of the fitting is made from 26-gauge galvanized steel for fittings 3 through 28 inches in diameter, 24 gauge for fittings 29 through 40 inches in diameter, and 22 gauge for fittings 42 through 58 inches in diameter.
   4. The construction is to give specific acoustic impedance to conform to the noise reduction characteristics published by United Sheet Metal. The construction is to provide a thermal conductivity "K" factor of .27 BTU/hr./Sq.ft./in. deg. F. at 75 deg. mean temperature. The products shall conform to published performance test data for energy loss of duct and fittings. The construction shall have mechanical means to maintain positive concentricity of liner with shell and mechanical means to retain insulation against dislocation by assembly processes. Adhesives of any type are not permitted in construction unless the Flame Spread, Smoke Developed and Sound Attenuation tests were performed with the adhesives as used.
   5. Where indicated on drawings or Part 3 of the specifications, provide duct and fittings with construction to provide 100% mechanical separation and air stream. Construction to provide protection against any possibility of fiber entrainment.
      a. Joints 0"-20" diameter, interior slip coupling beaded at center, fastened to duct with sealing compound applied continuously around joint before assembling and after fastening. Wrap joints with 3-inch-wide duct tape.
      b. Joints 21"-72" diameter, use 3 piece, gasketed, flanged joints consisting of 2 internal flanges (with integral mastic sealant) split to accommodate minor differences in duct diameter, and one external closure bank designed to compress gasketing between internal flanges. Example: Ductmate Spiralmate or equal.
   6. Approved Manufacturer:
      a. McGill AirFlow

2.08 ACCESS DOORS IN DUCTS

A. At each backdraft damper and at each motorized damper, install factory built 1" insulated access door with hinges and sash locks. Locate doors within 6 inches of installed dampers. Construction shall be galvanized sheet metal, 22 ga. minimum frame and 24 ga. minimum door. Minimum door shall be 12x12. If duct is too small for 12" door, then maximum door size shall be installed in duct.

B. Access doors for fire damper shall have a minimum clear opening of 12"x12" or as specified on Drawings to easily service fire damper. Doors shall be within 6 inches of fire dampers.

C. Approved Manufacturers:
   1. Nailor - Hart Industries Inc.
   2. Cesco - Advanced Air
   3. AirBalance Fire/Seal
   4. Louvers & Dampers
   5. Kees Inc.
   6. Ductmate Industries Inc "Sandwich" Access Door
   7. National Controlled Air Inc.
   8. Greenheck

9. Elmdor

2.09 FLEXIBLE EQUIPMENT CONNECTIONS

A. Provide flexible equipment connections between ductwork and equipment. See Section 233300 - HVAC Specialties.

2.10 VOLUME DAMPERS

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.

B. Fabricate splitter dampers of same material and gage as duct to 24 inches (600 mm) size in either direction, and two gages heavier for larger sizes, secured with continuous hinge or rod, operated with minimum 1/4-inch (6 mm) diameter rod.

C. Fabricate single blade dampers for duct sizes to 9-1/2 x 30 inch (240 x 760 mm).

D. Fabricate multi-blade damper of opposed blade pattern with maximum blade sizes 12 x 72 inch (300 x 825 mm). Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.

E. Except in round ductwork 12 inches (300 mm) in diameter and smaller, provide end bearings.

F. Provide locking, indicating quadrant regulators on single and multi-blade dampers. Where width exceeds 30 inches (750 mm), provide regulator at both ends.

2.11 MOTORIZED DAMPERS

A. General:
   1. Coordinate actuator type with Controls Contractor.
   2. Damper actuators and actuator linkages shall be mounted in the airstream for all rooftop fans/roof hoods and mounted external of the airflow at all other locations, unless specifically indicated otherwise on plans.
   3. Multi section damper assemblies shall be provided with a factory installed common jackshaft.
   4. Provide with double flange duct connection.
   5. Shall be Class IA leakage rated.
   6. Provide parallel blade airfoil type for open/closed control and opposed blade airfoil type for modulating/throttling control.

B. Damper Blades:
   1. Extruded aluminum or galvanized steel air foils with replaceable rubber blade seals, 6-inches wide maximum.
   2. 304 stainless steel when installed in dishwasher hood ductwork.
   3. Jamb seals shall be flexible metal compression type.

C. Performance:
   1. Maximum leakage rate shall be 3 cfm/sq. ft. of damper area per 1.0-inch w.g. in accordance with AMCA Standard 500D.
   2. Maximum pressure drop for a 12”x12” damper shall be 0.08” w.g. at 1,000 fpm face velocity.

D. Approved Manufacturers:
   1. Ruskin (CD50/CD60)
   2. Greenheck (VCD-33/VCD-43)

2.12 DUCT HANGERS

A. See Section 230529 - Hangers and Supports for HVAC Piping & Equipment.

2.13 DUCT SILENCERS

A. Equal to:
   1. AIRSAN by Air Filter Corp
   2. Commercial Acoustics

2.14 DUCT SEALANT AND ADHESIVES

A. Duct Sealant technical makeup shall be water based, solvent-free and of the synthetic latex family. Sealants shall be UL 181 Listed, meet all SMACNA pressure and seal classes and be rated to ± 15 inches water gauge. Sealants shall have flame spread of 0 and smoke development of 0 when tested in accordance to ASTM E-84. They shall be formulated to withstand working temperatures of -25°F to +200°F. All sealants shall exceed 500 hours under ASTM C-732 (Artificial Weathering) and pass ASTM C-734 (Low Temperature Flexibility after Artificial Weathering). All sealants shall be of an elastomeric nature, have a minimum weight of 12 pounds and a minimum solids content by weight of 66% ± 2%. Sealants shall be resistant to cracking, peeling, mold and mildew. Sealants shall also have excellent water and UV resistance. Sealants shall meet FDA, USDA and EPA standards as well as meet NFPA 90A and 90B requirements. Sealant shall be Design Polymerics DP 1010 or DP 1020 duct sealant or equal.

B. Solvent based duct sealant VOC shall be less than or equal to 50 g/l and be UL 723 Classified with a flame spread of 0 and a smoke development of 0. Sealant shall have passed 1000 hours of QUV accelerated outdoor aging testing. Sealant shall be Design Polymerics DP 1090 duct sealant or equal.
   1. All traverse joints, longitudinal seams and penetrations in duct systems shall be sealed with duct sealant of the type specified. Spiral lockseams are not longitudinal seams and do not require duct sealant. All sealant shall be applied per the manufactures' recommendations. Joints that are not fully welded shall be sealed. For spiral and flat oval duct slip connections; coat both the female and male ends. The slip connections should then be brushed over with an additional coat 2 to 3 inches wide 20 to 40 mils thick.
   2. All conditioned air supply ducts, return ducts and fresh air intakes shall have all joints and seams sealed or welded, except spiral seams round and flat oval ducts, which are exempt.
   3. Seal sealants and joint sealants shall not be used as a substitute for good workmanship. No ductwork will be covered or installed until inspected and pressure tested if necessary.

C. Gaskets for TDC, TDF and applied flange connections shall meet all SMACNA pressure and seal classes. The gasket shall meet UL 723, ASTME E-84, NFPA 90A and 90B requirements as well as FDA, USDA and EPA standards. The tape shall be 5/8 inches by 3/16 inches and applied according to the manufactures' directions. Expanded or extruded foam gaskets are not acceptable. Gasket shall be Design Polymerics DP 1040 Butyl Gasket Tape or equal.

D. Exterior Ductwork: Sealant shall be Design Polymerics DP 1090, or equal.

2.15 DUCT CLOSURE COLLARS

A. General: Closure collars shall provide closure of opening between duct and opening in element penetrated and shall abut tight up to and overlap duct and shall consist of rolled angle material (for round ducts) and welded framed angles (for rectangular/round ducts).

B. Size: Closure collars shall be sized to match duct/opening applied to and shall have minimum 2-inch overlap on duct side and 2-inch overlap at opening/ penetrated element side but shall completely cover opening in element penetrated with minimum 1-inch overlap to undisturbed element (i.e., wall, floor, etc.).

C. Material: Closure collars shall be fabricated of 20-gauge galvanized steel for ducts 15 inches diameter and less and shall be fabricated of 18-gauge galvanized steel duct for all larger ducts and all square and rectangular ducts.

2.16 TURNING VANES

A. Turning vanes may be either Contractor or factory fabricated. Factory fabricated vanes shall be Barber Colman "Airturns" or approved.

B. Vanes and runners shall be fabricated of minimum 24 gauge galvanized.

C. Turning vanes shall comply with SMACNA HVAC Duct Construction Standards. For duct widths less than 19 inches, vanes may be single wall construction; for widths greater than 19 inches, vanes shall be double wall "airfoil" type.

D. Turning vanes shall be equally spaced, parallel to each other, and securely attached to runners.

E. For elbows where the inlet and outlet dimensions are not the same, modify vane shape or angle to provide optimum turning.

PART 3 EXECUTION

3.01 INSTALLATION

A. Ducts:
1. Straight and smooth on inside with joints neatly finished unless otherwise directed.
2. Duct panels through 48-inch dimension having acoustic duct liner need not be crossbroken or beaded.
3. Crossbreak unlined ducts and duct panels larger than 48 inch or bead 12 inches on center.
4. Securely anchor ducts to building structure with screws.
5. Brace and install ducts so they shall be free of vibration under all conditions of operation.
6. Round, horizontal ducts shall be hung with bands, which extend the entire perimeter of the duct.
7. Ducts shall be braced and guyed to prevent lateral or horizontal swing.
8. Ducts shall not bear on top of structural members.
9. Make duct take-offs to branches, registers, grilles, and diffusers as detailed on Drawings.
10. Ducts shall be large enough to accommodate inside duct liner. Dimension shown on Drawings are net clear inside dimensions after duct liner has been installed.
11. Properly flash where ducts protrude above roof.
12. Install internal ends of slip joints in direction of flow. Make joints airtight using specified duct sealer.
13. Cover horizontal and longitudinal joints on exterior ducts two layers of Hardcast tape installed with Hardcast HC-20 adhesive according to Manufacturer's recommendations.
14. Ducts installed on mechanical space floor or walkway where ducts may be subject to abuse shall have Ductmate/35 or (heavy) SMACNA "J" type connection on all joints.
15. Contractor shall obtain a signed statement from kitchen Contractor verifying ceiling height and hood configuration prior to hood ductwork fabrication.
16. Provide acoustic duct for first 15 feet downstream of all air handling unit supply and return ducts.
17. All exposed ducts shall be spiral.
18. Quick fit duct shall be used where called out on the plans or as called out in specialty exhaust specifications (i.e., 233513 Sawdust Collection System).
19. Provide duct transitions to equipment openings.

B. Duct Liner:
1. Adhere insulation to sheet metal with full coverage of a UL listed adhesive.
2. Secure insulation with mechanical liner fasteners as indicated by SMACNA or manufacturer. Pin length should be as recommended by the liner manufacturer.
3. All exposed edges of the fibrous type liner must be factory or field coated. For systems operating at 4000 fpm or higher, a metal nosing must be installed in all liner leading edges.
4. Repair fibrous type liner surface penetrations with UL listed adhesive.
5. Duct dimensions indicated are net inside dimensions required for air flow. Increase duct size to allow for insulation thickness.
6. Provide duct liner for all return air ducts unless specifically excluded in Section 230713.
7. Provide acoustic duct liner for duct indicated on plan and Section 230713.
8. Provide liner for all supply duct unless specifically excluded from Section 230713.
9. Provide ductliner for first 10’ in and out of all exhaust fans (excluding dishwasher, kitchen fume, and particulate fans).

C. Turning Vanes:
   1. Install turning vanes in all square duct turns, and at locations shown on drawings.
   2. Securely attach turning vane runners to ductwork.

D. Flexible Connections: See Section 233300 - HVAC Specialties.

E. Balancing Dampers:
   1. Provide each take-off with an adjustable volume damper to balance that branch.
   2. Anchor dampers securely to duct.
   3. Install dampers in main ducts within insulation.
   4. Dampers in branch ducts shall fit against sheet metal walls, bottom and top of duct, and be securely fastened. Cut duct liner to allow damper to fit against sheet metal.

F. Motorized Dampers:
   1. Motorized dampers shall be installed in all outside air intakes, exhaust outlets, and relief outlets per WSEC and as shown on drawings.

G. Grilles, Registers, and Diffusers: Install and anchor securely.

H. Adjustable Lock Splitter Dampers:
   1. Dampers in equipment rooms shall be complete with locking quadrant.
   2. Other dampers shall have concealed ceiling damper regulator with plate.

I. Painting of Ductwork: Paint ductwork visible through registers, grilles, and diffusers flat black.

J. Ductwork Leakage Criteria:
   1. All transverse joints and longitudinal seams shall conform to SMACNA's Class A sealing requirements as defined on page 1-6 of the 1985 SMACNA Manual, First Edition.
   2. Constant Volume Systems/Supply Ductwork:
      a. Allowable Leakage – per SMACNA
   3. Constant Volume Systems/Return Ductwork:
      a. Return Ductwork – per SMACNA
   4. Variable Air Volume Systems/Supply Ductwork:
      a. Fan to VAV Boxes -- 1% of design cfm
      b. VAV Boxes to Registers -- 2% of design cfm
   5. Variable Air Volume Systems/Return Ductwork:
      a. Return Ductwork -- 2% of design cfm

K. Ductwork Leakage Testing:
   1. Duct leakage testing is required for all duct systems constructed to a pressure class of 3” water column or greater per the 2015 Washington State Energy Code, Section C403.2.8.3.3.
   2. Installed ductwork shall be tested prior to installation of access doors, take-offs, insulation, etc.
   3. All leak testing shall be witnessed by the Engineer or representative of the Engineer. The Contractor shall give the Engineer 72 hours notice prior to testing. Any testing not witnessed by the Engineer or his/her representative, shall be considered invalid and will be redone.
   4. Ductwork shall be tested in accordance with the requirements outlined in the SMACNA HVAC Air Duct Leakage Test Manual and shown to have a (CL) less than or equal to 4.0.
   5. Duct leakage, in excess of SMACNA HVAC Air Duct Leakage Manual, shall be repaired and have the test re-performed until the leakage rate is within acceptable levels.
   6. Submit leakage test report identifying on a plan all the ducts tested and tested leakage rate.

L. Duct Cleanliness Criteria: Unless otherwise specified, the delivery, storage, and installation of all un-lined ductwork shall comply with the intermediate duct cleanliness level of SMACNA Duct Cleanliness for New Construction Guidelines. All lined and acoustic duct shall comply with the advanced level.

END OF SECTION 233113

SECTION 233300
HVAC SPECIALTIES

PART 1 GENERAL

1.01 SUMMARY

A. Includes, but not limited to, furnishing and installing specified material as described in Contract Documents.

B. Filters used in air handling units and heat pumps.

C. Flexible ductwork from supply air branch duct runouts to diffusers where indicated on drawings.

D. Furnishing and installing fire dampers, ceiling radiation, and fire/smoke dampers at penetrations of fire rated walls, floors, and ceiling membranes, at ducts, registers, grilles, or louvers as indicated on drawings. Installation shall be complete with sleeves, angles, and all other accessories as required by UL installation instructions, local codes, and reviewing authorities.

E. Section Includes:
   1. Backdraft dampers
   2. Filters and filter housing
   3. Flexible duct
   4. Flexible equipment connections
   5. Fire and fire/smoke dampers

1.02 RELATED SECTIONS

A. General Conditions

B. Division 01

C. Section 200000 - General Mechanical Requirements

D. Section 233113 - Steel Ductwork

1.03 SUBMITTAL REQUIREMENTS OF THIS SECTION

A. Backdraft dampers

B. Filters

C. Filter housing

D. Air filter gauge

E. Flexible ductwork

F. Flexible equipment connections

G. Fire and/or smoke dampers

H. Airflow station

I. Duct smoke detectors

J. Hoods

1.04 OPERATION AND MAINTENANCE REQUIREMENTS OF THIS SECTION

A. Backdraft dampers

B. Filters (Summarized list including equipment tag and size and quantity of filter per unit.)
   1. Provide dates or projected dates of extra filter replacement.

C. Air Filter gauge pressure drop

D. Fire and/or smoke dampers

E. Airflow station maintenance and calibration

F. Duct smoke detectors

G. Hoods

1.05 QUALITY ASSURANCES

A. Requirements of Regulatory Agencies:
   1. Bear the AMCA seal and UL label, NSF approved.
   2. Fire and fire/smoke dampers to conform to UL Standards 555, 5558, and 555C and NFPA requirements as required and bear the correct UL label for the damper's application.
   3. Fire and fire/smoke dampers shall be approved by State Fire Authorities where so required.
   4. Fabric duct shall be UL listed in accordance with the 25/50 flame spread/smoke developed requirements of NFPA-90-A.

1.06 SPARE PARTS

A. Deliver with O&M Manuals six fusible links of each type used on the project where replaceable link-type dampers are furnished.

PART 2 PRODUCTS

2.01 APPROVED MANUFACTURERS

A. Not Applicable

2.02 BACKDRAFT DAMPERS (COUNTER BALANCED)

A. General: 0.125 inches extruded aluminum frame, 0.07 inches aluminum blades with extruded vinyl edges, synthetic bearings, counterbalance, adjustable zinc plated bar on blades.

B. Backdraft dampers are to be factory set to open at 0.01" w.c. of building pressure and shall have a maximum static pressure drop of 0.05" w.c. at 700 fpm per AMCA Standard 500. Backdraft dampers shall have a leakage rate at no more than 20 CFM/sq. ft. at 1" w.c. of static pressure with a dimension of 24" or greater and 40 CFM/sq. ft. at 1” w.c. of static pressure with dimension smaller than 24” per AMCA Standard 500D.

C. Approved Manufacturer:
   1. Ruskin
   2. Greenheck

2.03 FILTERS

A. 2" MERV 8:
   1. General: 30% efficient filters as specified herein shall be medium efficiency, pleated panel type, disposable filters; Farr 30/30 or approved and shall have an average efficiency of 25-30% atmospheric and 90-92% arrestance by ASHRAE Standard 52-76 unless instructed otherwise.
   2. Filter Housings: Shall be sized to fit furnished unit or duct to be installed in and provide minimum filter sizes to obtain a maximum filter velocity of 300 fpm.
   3. Resistance: Initial resistance of a 24"x24"x2" filter handling 2000 CFM shall not exceed 0.31" w.g.
   4. Duct Holding Capacity: Shall be no less than 60 grams per square foot of face area at 1.0" w.g.
   5. Size: Filters shall be 2" deep (unless indicated otherwise), with number and sizes indicated, or as required to give minimum nominal face area as scheduled on drawings.
   6. Provide a filter pull strap for all multiple filter sets longer than 24 inches.
   7. Approved Manufacturers:
      a. Farr Co.
      b. Airguard
      c. Purolator
      d. Eco-Air

B. 2" or 4" MERV 13 Low Static:
   1. General: 80% efficient filters as specified herein shall be high efficiency, pleated panel type, disposable filters; Filtration Group MERV 13 Green Pleat or approved and shall have a Minimum Efficiency Reporting Value of MERV 13 when evaluated under the guidelines of ASHRAE Standard 52.2 2007.
   2. Filter Housings: Shall be sized to fit furnished unit or duct to be installed in and provide minimum filter sizes to obtain a maximum filter velocity of 300 fpm.
   3. Resistance: Initial resistance of a 24"x24"x2" filter handling 500 fpm shall not exceed 0.38" w.g. and 24"x24"x4" shall not exceed 0.23" w.g.
   4. Duct Holding Capacity: Shall be no less than 60 grams per square foot of face area at 1.0" w.g.
   5. Size: Filters shall be 2" deep (unless indicated otherwise), with number and sizes indicated, or as required to give minimum nominal face area as scheduled on drawings.
   6. Provide a filter pull strap for all multiple filter sets longer than 24 inches.
   7. Approved Manufacturers:
      a. Filtration Group

C. 2" or 4" MERV 13:
   1. General: 80% efficient filters as specified herein shall be high efficiency, pleated panel type, disposable filters and shall have a Minimum Efficiency Reporting Value of MERV 13 when evaluated under the guidelines of current ASHRAE Standard 52.2.
   2. Filter Housings: Shall be sized to fit furnished unit or duct to be installed in and provide minimum filter sizes to obtain a maximum filter velocity of 300 fpm.
   3. Resistance: Initial resistance of a 24"x24"x2" filter handling 500 CFM shall not exceed 0.41" w.g. and 24"x24"x4" shall not exceed 0.35" w.g.
   4. Duct Holding Capacity: Shall be no less than 60 grams per square foot of face area at 1.0" w.g.
   5. Size: Filters shall be 2" deep (unless indicated otherwise), with number and sizes indicated, or as required to give minimum nominal face area as scheduled on drawings.
   6. Provide a filter pull strap for all multiple filter sets longer than 24 inches.
   7. Approved Manufacturers:
      a. Farr
      b. Airguard
      c. Purolator
      d. Eco-Air

2.04 FILTER HOUSINGS - FAN COIL UNITS

A. Shall be fabricated and furnished as part of the fan coil units.

2.05 FILTER HOUSINGS - DUCT MOUNTED

A. Filter housings shall be factory or Contractor fabricated of not less than 20-gauge galvanized steel.

B. Housing shall have access doors on two sides, constructed of minimum 20-gauge galvanized steel and shall be hinged type with minimum of two heavy-duty latches (Ventlock or equal) and have neoprene sponge gasketing.

C. Holding frames shall be constructed of minimum 20-gauge galvanized steel, with U-type bearing channels, polyurethane gasketing on surfaces adjacent to filters.

2.06 TEMPORARY AIR INLET FILTERS

A. Type: Glass fiber or synthetic material blanket type filter media. Inlets and outlets shall be MERV 8 and unit shall be same as final.

B. Capacity: Shall have an average arrestance no less than 64%; dust holding capacity of 172 grams.

C. Size: Minimum 1" thick cut to size as required to cover inlets.

2.07 AIR FILTER GAUGE

A. An air filter gauge for measuring the resistance to air flow through the filters. The gauge shall be diaphragm actuated, shall have 3-7/8" diameter white dial with black figures and graduations, shall have pointer zero adjustment and shall be furnished complete with two static pressure tips, fittings for 1/4" metal tubing and means for mounting the gauge.

B. Gauge shall be Dwyer No. 2001-ASF reading to 3 times nominal operating pressure.

2.08 FLEXIBLE DUCTWORK

A. Formable, flexible, circular duct shall have a fiberglass scrim (or equivalent) and retain its cross-section, shape, rigidity, and shall not restrict air flow after bending.

B. Normal 1-1/2 inches thick, 3/4 lb./cu ft density fiberglass insulation with airtight, see-through polyethylene or polyester core, sheathed in seamless vapor barrier jacket factory installed over flexible assembly.

C. Assembly including insulation and vapor barrier, shall meet Class 1 requirements of NFPA 90A and be UL 181 rated, with flame spread of 25 or less and smoke developed rating of 50 or under.

D. Approved Manufacturers:
   1. Wiremold
   2. Flexible Air Movers Inc.
   3. J.P. Lamborn
   4. General Flex Corp.
   5. Young & Co. Mfg. 165
   6. Thermaflex 'GKM'
   7. Cleavaflex
   8. Hart & Cooley

2.09 FLEXIBLE EQUIPMENT CONNECTIONS (INDOOR)

A. General: 30 oz. closely woven UL approved glass fabric, double coated with neoprene. Fire retardant, waterproof, airtight, resistant to acids and grease, and withstand constant temperatures of 200°F.

B. Approved Manufacturers:
   1. Ventglas by Ventfabrics
   2. DuroDyne MFN

2.10 FLEXIBLE EQUIPMENT CONNECTIONS (OUTDOOR)

A. General: 26 oz. closely woven UL approved glass fabric, double coated with Hypalon. Fire retardant, waterproof, airtight, resistant to acids and grease, resistant to ozone and weathering, and withstand constant temperatures of 250°F.

B. Approved Manufacturers:
   1. Ventglas by Ventfabrics
   2. DuroDyne MFN

2.11 CEILING FIRE DAMPERS (RADIATION TYPE)

A. Must conform to and bear the UL 555C label.

B. Square and rectangular spring-loaded blades, STD. 165°F., links to fit steel ducts and or ceiling terminals, 3 - 4 hr. rating. Furnish with extended frame, thermal blankets for air terminals and square to round transitions as required.

C. For round neck diffusers, round butterfly dampers with STD. 165°F. links 3 - 4 hr. rating. Furnish with thermal blanket for air terminals at ceiling membrane.

2.12 VERTICAL & HORIZONTAL FIRE DAMPERS

A. Must conform to and bear the UL 555 label.

B. Out of airstream type "B" with standard 165-degree link. 1 ½ hour dampers for wall or floor construction of less than 3 hours. Three-hour dampers for wall or floor construction of 3 hours or greater.

C. In-air-stream type "A", dampers with standard 165-degree link for installation in existing duct (if any) and where "B" style dampers cannot be installed.

D. Fire dampers in round duct must be "C" style with both blades and frame located out-of-air-stream and standard 165-degree F. links.

2.13 COMBINATION FIRE/SMOKE DAMPERS

A. Furnish and install at location shown on plans combination fire/smoke dampers meeting or exceeding the following specifications:

1. Use 1 ½ hour dampers for wall or floor construction of less than 2 hours. Use 3-hour dampers for wall or floor construction of 2 hours or greater.
2. Frame shall be a minimum of 16-gauge galvanized steel formed into a structural hat channel shape with tabbed corners for reinforcement. The blades shall be single skin 16-gauge minimum galvanized with three longitudinal grooves for reinforcement. Bearing shall be stainless steel sleeve turning in an extruded hole in the frame. Blade edge seals shall be silicone rubber mechanically locked in blade edge (adhesive or clip fastened seals are not acceptable). Jamb seals shall be stainless steel flexible metal compression type.
3. Each combination fire/smoke damper shall be rated for 1.5 hours under UL Standard 555 and shall further be classified by UL as a leakage rated damper for use in smoke control systems under UL 555S and bear the UL labels for both UL 555 and UL 555S. Damper manufacturer shall have tested a range of damper sizes covering all dampers covered by the specification. Testing and qualifying a single damper size are not acceptable. The leakage rating under UL 555S shall be leakage Class II (10 cfm/sq.ft. at 1" W.G.)
4. Fire/smoke dampers may be round or square depending on the duct to which it is attached. Contractor must provide square-to-round adapters as required.
5. As part of the UL Qualification, dampers shall demonstrate a capacity to operate (open and close) under HVAC system operating conditions, with pressure of at least 4" W.G. in the closed position and 2000 fpm air velocity in the open position.
6. In addition to the leakage rating already specified herein, the dampers and their actuators shall be qualified under UL 555S to a minimum elevated temperature of 250°F. Appropriate 120-volt electric actuators shall be installed by the damper manufacturer at the time of damper fabrication. Damper and actuator shall be installed as a single entity which meets all applicable UL 555 and UL 555S qualifications for both dampers and actuators. Dampers must be open and close within 15 seconds of appropriate signal and dampers must close upon lack of power.
7. Manufacturer shall provide factory assembled sleeve of 17" minimum length (Contractor to verify requirement). Factory supplied caulked sleeve shall be minimum 20 gauge for dampers through 84" wide and 18 gauge above 84" wide if breakaway connections are provided, 16-gauge sleeves are required if other connection methods are provided. Damper and actuator assembly shall be factory cycled 10 times before shipment to assure operation.
8. Temperature Control Contractor shall provide all necessary switches and relays etc. to interface damper with smoke control system and building control system as described elsewhere in these specifications.
9. Fire/smoke dampers in tunnel corridor construction must bear UL 555 and UL 555S labels and meet all of the above criteria and have installation instructions showing UL approval for tunnel corridor construction.
10. Fire/smoke dampers shall be rated for no higher than Class II leakage and with an elevated temperature rating of not less than 250°F and shall bear both UL 555 and UL 555S labels.
11. In systems requiring a smoke control system, provide remote sensing of damper position and damper override of damper closure to permit controlled operation in a dynamic smoke management system. Device shall be Ruskin Model TS 150 Fire Stat or approved.

12. Approved Manufacturers:
    a. Ruskin
    b. Greenheck
    c. Air Balance
    d. National Controlled Air
    e. Prefco

2.14 AIRFLOW MEASUREMENT STATION

A. Provide airflow measurement systems for outside air. Airflow measuring stations shall be manufactured by Trane (TRAQ) or Ruskin (IAQ Damper). The airflow measurement stations shall be installed in strict accordance with the manufacturer's published requirements to achieve the accuracy listed below. The airflow measurement systems shall operate with a 24 VAC power supply and be capable of functioning accurately between -20°F and +158°F. The airflow measurement station shall transmit a 4-20 mA linear signal representative of velocity and be factory calibrated to provide accuracy of ±5 percent of actual flow down to 15 percent of the normal flow.

2.15 AIRFLOW MEASUREMENT SENSORS

A. Differential pressure airflow sensor shall traverse the duct using the equal cross-sectional area or log-linear traverse method along two perpendicular diameters. Single axis sensor shall not be acceptable for duct diameters 6” or larger. A minimum of 12 total pressure sensing points shall be utilized. The total pressure inputs shall be averaged using a pressure chamber located at the center of the senor. A sensor that delivers the differential pressure signal from one end of the sensor is not acceptable. The sensor shall output an amplified differential pressure signal that is at least 2.5 times the equivalent velocity pressure signal obtained from a conventional pitot tube. The sensor shall develop a differential pressure of 0.03” W.G. at an air velocity of < 450 FPM.

B. Approved Manufacturers:
    1. Enviro-Tec
    2. Titus
    3. Krueger

2.16 DUCT SMOKE DETECTORS

A. General: Smoke detectors shall be installed in supply duct within 4'-0" of each air handler of 2000 cfm and above.

B. Responsibility: This Contractor shall be responsible for control circuit from smoke detectors to fan starter and to remote test station.

C. Equipment: Detectors shall be "Notifier" DH400 series with sampling tube. Remote test station shall be "Notifier" RTS 451.

2.17 OVEN EXHAUST HOOD (TYPE II HEAT)

A. General: 18-gauge stainless steel hood deep. Furnish with two (2) vapor proof incandescent fixtures, and stainless-steel baffle in lieu of filters.

B. Approved Manufacturers:
    1. X-L Equipment
    2. Kees
    3. Air Masters
    4. Gaylord
    5. K-Tech
    6. Vent Master

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine areas for compliance with requirements for installation tolerances and for structural rigidity, strength, anchors, and other conditions affecting performance of heat exchangers.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Backdraft Dampers: Provide access doors to backdraft dampers.

B. Filters and Filter Housing:
   1. Contractor to install temporary filters to provide temporary sealing of all duct systems during the construction period to prevent the entry of dirt, dust and debris into the duct systems. These systems that are operated during the construction period shall have temporary filters installed over all inlets and filters installed in the air handling equipment. Filters installed in equipment shall be same type as final filters required for the units. Temporary air inlet type filters shall be taped over all inlets to completely filter all air drawn into the systems.
   2. Contractor to provide and install four (4) complete sets of all filters as scheduled below:
      a. At equipment start-up
      b. Prior to balancing system
      c. Three (3) months after building occupancy
      d. During the one-year warranty to be scheduled with Owner
   3. Construct and install filter housings to prevent passage of unfiltered air. Provide sheet metal blanks, felt, rubber, and/or neoprene seals as necessary.
   4. Provide air filter gauge on units over 2000 cfm. Connect sensing tips to gauge with copper or aluminum tubing. Locate gauge in easily read position, provide brightly colored tape marker to indicate clean filters pressure drop and change-out pressure drop (use clean pressure drop plus 0.15" unless instructed otherwise).
   5. Furnish Owner with schedule of filter sizes for each air handler, heat pump, furnace, and fan coil unit.

C. Flexible Equipment Connections:
   1. Provide insulated flexible equipment connections between ducts and vibrating equipment. Fans which are internally isolated with spring isolators do not require flexible connections, unless indicated on the plans.
   2. Install flexible connections with sufficient slack to permit 2 inches of horizontal or vertical movement of ducts or equipment at connection point without stretching the flexible material.
   3. Where installed exposed to weather, provide a galvanized "hat" channel protecting top and vertical stretches of flexible connector from sunlight and weather.

D. Flexible Ductwork:
   1. Install duct in fully extended condition free of sags and kinks, using ten-foot maximum lengths.
   2. Make duct connections by coating exterior of duct collar for 3 inches with duct sealer and securing duct in place over sheet metal collar with 1/2-inch-wide metal cinch bands and sheet metal screws. Tape exterior of flex to duct ahead of damper.

E. Fire and Fire/Smoke Dampers:
   1. Fire damper installation shall conform to details shown in the UL installation instructions for the particular damper.
   2. Each fire damper or fire/smoke damper shall have an access panel located not more than 6 inches from the fire damper served. Access panel shall not be less than 10" x 10" or equivalent size in smaller ducts.
   3. Ceiling radiation dampers must be installed in a UL rated ceiling assembly as explicitly described in the UL Fire Resistance Directory.

4. All dampers must be installed strictly in accordance with the UL installation instructions that must accompany the dampers and be available on site for the appropriate building inspector to view.

F. Install duct smoke detectors in air handling units over 2000 CFM.

G. Hoods:
   1. Anchor hood units securely to structure.
   2. Hood manufacturer shall obtain a signed statement from the Contractor verifying ceiling height at hood location prior to fabrication.

END OF SECTION 233300

SECTION 233423
EXHAUST FANS

PART 1 GENERAL

1.01 GENERAL

A. Includes, but not limited to, furnishing and installing specified material as described in Contract Documents.

1.02 RELATED SECTIONS

A. General Conditions and Division 1 apply to this Section.

B. Section 200000 - General Mechanical Conditions

C. Section 233113 – Steel Ductwork

1.03 QUALITY ASSURANCES (REQUIREMENTS OF REGULATORY AGENCIES)

A. Bear AMCA seal, UL 507 (for continuous operation), and UL 705 (volume control by speed control on direct drive units).

1.04 SUBMITTAL REQUIREMENTS OF THIS SECTION

A. Exhaust Fans

B. Exhaust Fan Curbs (Rooftop Fans)

C. Fan curves showing system curve, and a fan curve with the maximum operation point with maximum motor size (limited by maximum shaft speed of and/or surge point).

1.05 OPERATION AND MAINTENANCE OF THIS SECTION

A. Submittal Data including Curves

B. Exhaust Fan Operation and Maintenance Manual

PART 2 PRODUCTS

2.01 ROOF MOUNTED (DOWN BLAST) EXHAUST FANS

A. General:
   1. Direct drive or have adjustable pitch V-belt as noted on plans.
   2. Wheels shall be backward curved with aluminum housing.
   3. Isolate motor with vibration dampeners.
   4. Provide quiet type back-draft dampers where indicated on drawings.

B. Roof Curbs:
   1. Provide with prefabricated insulated roof curb.
   2. Curb shall be constructed of galvanized steel or aluminum with a solid metal interior liner, 1½” thick 3 lb. density insulation, include damper tray for a motorized damper, and rubber curb seal.
   3. Curb shall be provided with factory mounted hinged base.
   4. Curb shall be 14” tall (minimum).
   5. Furnish with cant strip where installed on roofs with insulation below the roof deck.
   6. Approved Manufacturers:
      a. Breidert
      b. Carnes
      c. Cook
      d. Greenheck
      e. Jenn
      f. Penn Barry
      g. Twin City Fans

2.02 IN-LINE FANS

A. General:
   1. Motors on V-belt units shall be supported on the exterior of the fan casing with bearings encased within the fan tube.
   2. All models shall incorporate a panel to permit access to interior.
   3. Centrex wheels shall be backwardly inclined, non-overloading and made of aluminum.
   4. Inlets shall be deep spun for non-turbulent entrance condition.
   5. Approved Manufacturers:
      a. Cook
      b. Greenheck
      c. Pace
      d. Penn Barry
      e. Twin City Fans

2.03 ROOF MOUNTED (UP BLAST) EXHAUST FANS

A. Description:
   1. Fan shall be spun aluminum, roof mounted, belt driven, up blast centrifugal exhaust ventilator.

B. Certifications:
   1. Fan shall be listed by Underwriters Laboratories (UL 762) and UL listed for Canada (UL 762). Fan shall bear the AMCA certified ratings seal for sound and air performance.

C. Construction:
   1. The fan shall be of bolted and welded construction utilizing corrosion resistant fasteners. The spun aluminum structural components shall be constructed of minimum 16-gauge marine alloy aluminum, bolted to a rigid aluminum support structure.
   2. The aluminum base shall have a one-piece inlet spinning and continuously welded curb cap corners for maximum leak protection.
   3. The motor, bearings and drives shall be mounted on a minimum 14-gauge steel power assembly, isolated from the unit structure with solid vibration isolators. The components shall be enclosed in a weather-tight compartment, separated from the exhaust airstream.
   4. Unit shall bear an engraved aluminum nameplate.

D. Wheel:
   1. Wheel shall be centrifugal backward inclined, constructed of 100 percent aluminum, including a precision machined cast aluminum hub. Wheel inlet shall overlap an aerodynamic aluminum inlet cone to provide maximum performance and efficiency. Wheel shall be balanced in accordance with AMCA standard 204-96, balance quality and vibration levels for fans.

E. Motor:
   1. Motor shall be heavy duty type with permanently lubricated sealed ball bearings and furnished at the specified voltage, phase and enclosure.
   2. Motor shall be explosion-proof, when indicated on drawings.

F. Bearings:
   1. Bearings shall be designed and individually tested specifically for use in air handling applications. Construction shall be heavy duty regreasable ball type in a cast iron housing selected for a minimum L50 life in excess of 200,00 hours at maximum cataloged operating speed.

G. Belts and Drives:
   1. Belts shall be oil and heat resistant, non-static type. Drives shall be precision machined cast iron type, keyed and securely attached to the wheel and motor shafts. Drives shall be sized for 150 percent of the installed motor horsepower. The variable pitch motor drive must be factory set to the specified fan RPM.

H. Roof Curbs:
   1. Provide with prefabricated insulated roof curb.

2. Curb shall be constructed of galvanized steel or aluminum with a solid metal interior liner cover, 1½" thick 3 lb. density insulation, include damper tray for a motorized damper, and rubber curb seal.
3. Curb shall be provided with a factory mounted hinged base.
4. Curb shall be 14" tall (minimum) for all non-grease fans.
5. Provide a vented curb extension for all grease fans to provide the required 40" minimum discharge height above the roof line.
6. Furnish with 2" wide flashing all around with cant strip.
7. Approved Manufacturers:
   a. Cook
   b. Carnes
   c. Penn Barry
   d. Greenheck
   e. Jenn
   f. Twin City Fans

2.04 IN-LINE CABINET FANS

A. General:
   1. Acoustically insulated housings
   2. True centrifugal wheels
   3. Suitable ground motors and mounts on rubber-in shear vibration isolators
   4. Motor and drive assembly shall be accessible through removable side panels

B. Approved Manufacturers:
   1. Carnes
   2. Cook
   3. Greenheck
   4. Jenn
   5. Penn Barry
   6. Twin City Fans

2.05 IN-LINE DRYER FANS

A. General: Supply, exhaust or return air inline fans shall be of the centrifugal, direct driven type.

B. Construction:
   1. Fan housing shall be constructed of heavy gauge galvanized sheet metal with powder coated finish. Internal air turning vanes shall be provided for maximum air performance. Fan shall be supplied with externally mounted electrical terminal strip connections. Integral disconnect switch shall be provided when specified.
   2. Motorized impeller shall be an external rotor type, class B insulation, totally enclosed with permanent split capacitor (except K4 and K5, shaded pole type). Motor shall be permanently sealed self lubricating ball bearing type. Motor shall be equipped with automatic reset thermal overload protection. Motor shall be provided to ensure long maintenance free operation over maximum load conditions.
   3. Fan wheel shall be of the backward inclined airfoil type with a well-designed inlet venturi for maximum performance. Motorized impeller shall be both statically and dynamically balanced as one integal unit to provide for vibration free performance.

C. Performance: Fan air flow and sound performance shall be certified by AMCA and licensed to bear the AMCA Certified Ratings seal.

D. Code Approval: Fan shall be tested and approved by UL and CSA (or equal) for safety.

E. Warranty: Fan shall be fully warranted for a period of no less than three years from the date of installation.

F. Approved Manufacturers:
   1. Kanalflakt

2.06 PROPELLER FANS

A. Propeller fans shall be direct drive type with wire basket rear guard. Blades shall be statically and dynamically balanced. Resilient mounted motor. Furnish with combination louver/shutter.
   1. Approved Manufacturer:
      a. Breidert
      b. Carnes
      c. Cook
      d. Greenheck
      e. Jenn
      f. Penn Barry
      g. Twin City Fans

2.07 CEILING MOUNTED EXHAUST FAN

A. General:
   1. Acoustically insulated housings.
   2. Include chatterproof integral back-draft damper with no metal contact.
   3. True centrifugal wheels.
   4. Entire fan, motor, and wheel assembly shall be easily removable without disturbing housing.
   5. Suitably ground motors and mount on rubber-in shear vibration isolators.
   6. Provide roof cap or wall cap as required.
   7. Provide “Architectural deluxe” metal grille.

B. Approved Manufacturers:
   1. Penn Barry
   2. Cook
   3. Greenheck
   4. Twin City Fans

2.08 SPEED CONTROL

A. Use manufacturer’s recommended speed control, which varies speed from 50 to 100% of full speed.

B. All fan motors 1/12 HP or greater and less than 1 HP shall be Electronically Commutated Motors (ECM) or shall have a minimum efficiency of 70 percent when rated in accordance with DOE 10 C.F.R. 431. These motor speeds shall be adjustable.

PART 3 EXECUTION

3.01 INSTALLATION

A. Anchor fan units securely to structure or curb.

B. Extend all internal wiring to box on exterior of unit.

C. Factory mount speed control on outside of case on in-line fans, including wall propeller fans, and underneath weather casing for rooftop fans.

D. Grease hood exhaust fan. Up-blast discharge shall be a minimum of 40" from top of fan to roof. Provide with vented curb and replaceable grease termination receptor.

END OF SECTION 233423

SECTION 233700
AIR TERMINALS

PART 1 GENERAL

1.01 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install complete, all air terminals described in Contract Documents.
   2. Ceiling diffusers with damper
   3. Louvers connected to ductwork
   4. Roof hoods

1.02 RELATED SECTIONS

A. General Conditions and Division 1 apply to this Section.

B. Section 200000 - General Mechanical Conditions

1.03 SUBMITTAL REQUIREMENTS OF THIS SECTION

A. Grilles, registers, and diffusers

B. Louvers

C. Wall caps

D. Roof hoods

1.04 OPERATION AND MAINTENANCE REQUIREMENTS OF THIS SECTION

A. Not Applicable

PART 2 PRODUCTS

2.01 GRILLES, REGISTERS AND DIFFUSERS (GRD)

A. Shall be as scheduled on drawings.

B. Provide the various grilles, registers and diffusers shown on the plans and of the various types herein before specified. All terminals with prime-coat finish shall be installed before the walls and ceiling is painted, in order that they may be finish painted by the General Contractor. Those with factory finish or aluminum construction shall be installed after the walls and ceilings are painted. All air terminals located in shower, toilet rooms, locker and dressing rooms shall be of aluminum construction w/baked off-white finish. All other Air Terminals shall be of a standard steel construction; wall-mounted terminals shall be prime coat finish; ceiling diffusers, exhaust and return air terminals shall have factory-applied baked enamel finish, color as selected by Architect.

C. Approved Manufacturers: (subject to submittal approval):
   1. Anemostat
   2. Nailor
   3. Kees
   4. Krueger
   5. Price
   6. Titus
   7. Tuttle & Bailey
   8. Shoemaker (except 700MA)

2.02 LOUVERS

A. Provide stationary type with 4” frame, drainable blades, and aluminum bird screen. Frame and blade shall be 6063-T-5 aluminum alloy. Blades shall be at 37.5° angle and supported by hidden mullions. Intermediate support mullions shall not interrupt blade exterior appearance. Louvers shall receive finish color coating of modified fluoropolymer baked enamel following cleaning and pretreatment of metal. A 50% Kynar resin shall provide approximately 0.3” total dry film thickness when baked at 450°F. Color shall be as selected by the Architect. Provide appropriate frame type for installation type.

B. Louvers shown are minimum sizes for airflow requirements. Refer to Architectural elevations for exact size and location of louvers. This contractor is to provide full size louver as shown on the plans or Architectural elevations (whichever is larger), including but not limited to: hidden mullions, louver extensions, and louver shapes. Any louver area not used for ductwork shall be blanked off with sheet metal. The General Contractor to provide insulation for blanked off sections.

C. Louver performance shall be as follows:
   1. Maximum S.P. drop of 0.15" at 800 ft./min.
   2. Minimum beginning point of water penetration at 0.01 oz/sq. ft. is 800 feet per minute (48”x48” size at 15-minute test period).
   3. Minimum AMCA rated free area of 54% (48”x48” size).
   4. Approved Manufacturers:
      a. Ruskin (ELF 375DX)
      b. American Warming
      c. Wonder Metals
      d. Greenheck
      e. Metal Form
      f. United Enertech

2.03 WALL CAPS

A. Wall caps shall be constructed of extruded aluminum, with bird screen, sizes and model numbers as indicated on plans.

B. Dryer vent caps shall be of aluminum construction with integral backdraft damper.

2.04 ROOF HOOD

A. Manufactured of extruded aluminum complete with roof curb to fit slope of roof and have minimum 12” height.
   1. ½ inch mesh 16-gauge aluminum bird screen
   2. Units shall be factory prime coated to be field painted. Coordinate with General Contractor to field paint; color selected by Architect.
   3. Size: Roof vents shall have throat size as shown on the drawings.
   4. Dampers: Dampers shall be gravity, counter-balanced, or motorized.
   5. Provide 4” wide flashing all around, with cant strip.
   6. Approved Manufacturers:
      a. Cook
      b. Penn Ventilator
      c. Greenheck
      d. Equals as approved by Architect

B. For Dryers and Residential Type Hoods:
   1. PennBarry WC
   2. Greenheck GRSR/GRSF

2.05 MISCELLANEOUS

A. Bird Screen: 1/2-inch mesh, constructed of either 0.051-inch aluminum wire or 19-gauge galvanized steel wire.

B. Insect Screen: 14 x 18, 0.009” galvanized steel mesh.

PART 3 EXECUTION

3.01 INSTALLATION

A. The interior of duct connection including opposed blade damper and all visible duct interiors at connection shall be painted matte black.

B. Each air terminal shall be installed with a spun rubber gasket between the flange and the frame or wall.

C. Each air terminal with flexible duct connection shall have a square-to-round transition adapter box.

D. Anchor securely into openings.

E. All air terminals that supply, return, and/or exhaust air, which are not required to have an OBD, shall be provided with a volume damper.

F. Provide round neck to flex duct reducers as required.

G. Provide bird screened openings (1/2" mesh) on all duct openings where indicated and where openings do not have grilles or registers.

H. All outlet and inlets exposed to the weather shall be adequately flashed and installed in a manner to assure complete weatherproofness.

I. Provide blank-off panels on louver portion not connected to a duct. Blank-off panels to be painted flat black.

J. Install louvers level and plumb.

K. Secure louver frames in openings with concealed fasteners.

L. Provide bird screen for all louvers, wall caps, and roof hoods.

M. Provide insect screen where indicated on drawings.

N. Install roof caps in accordance with manufacturer’s recommendations.

O. Provide louvers with motorized dampers on all ductless, through wall relief penetrations unless otherwise noted on the drawings.

END OF SECTION 233700

SECTION 237200
AIR-TO-AIR HEAT EXCHANGERS

PART 1 GENERAL

1.01 SUMMARY

A. Includes But Not Limited To: Furnish and install material as described in Contract Documents.

B. Related Sections:
   1. General Conditions, Division 1
   2. Section 200000 – General Mechanical Requirements

1.02 QUALITY ASSURANCE

A. Qualifications: Units shall be started, checked out, and adjusted by Unit Manufacturer's authorized factory trained service mechanic.

B. Requirements of Regulatory Agencies: Each unit shall be UL labeled.

1.03 SUBMITTAL REQUIREMENTS OF THIS SECTION

A. Equipment

B. Fan Curves

C. Sound Data

1.04 OPERATION AND MAINTENANCE REQUIREMENTS OF THIS SECTION

A. Submittal Information

B. Operation and Maintenance Manual

PART 2 PRODUCTS

2.01 APPROVED MANUFACTURERS

A. Innovent

B. Annexair

C. Extex

D. SystemAir

E. Oxygen8

2.02 AIR-TO-AIR HEAT EXCHANGER

A. Air-to-air heat exchanger shall be as manufactured as shown on equipment schedule. Substitutions, provided they meet all requirements of plans and specifications, shall have prior approval from Engineer/Owner. Contractor will be required to furnish plan and elevation details of units in the event of substitution. Any capacity increase in pumps, piping, cooling tower or boiler will be Contractor's responsibility. Any changes in electrical loads due to substitution of equipment other than that specified shall be coordinated with the Electrical Contractor and any additional costs for this work shall be borne by the Contractor and/or supplier.

B. Packaged Heat Recovery Unit:
   1. Packaged unit includes: Supply air inlet section, exhaust air inlet section, heat exchanger, supply fan(s) section, exhaust fan(s) section and control panel
   2. Unit is constructed of 18 gauge electro-galvanized and bonderized sheet metal with two (2) exterior coats of acrylic vinyl paint
   3. Unit reinforced with galvanized steel angles and channels to form a rigid assembly
   4. Entire casing insulated with 1" thick, 1.5lb. density glass-fiber acoustic insulation with aluminum face, meets NFPA 90
   5. Access doors for easy access to all serviceable interior components, hinged and gasketed with quick opening type door latches providing a tight closure

C. Supply Air Inlet Section:
   1. Filter section per Section 233300 – HVAC Specialties

2. Filter access door
3. Low leak face and bypass dampers are modulated by a frost and a temperature control thermostat: Defrost mode fresh air bypasses heat exchanger/temperature control mode dampers modulate to achieve set temperature

D. Exhaust Air Inlet Section:
1. Plenum access door
2. Water-tight condensate pan with bottom pitched to drain fitting to drain off condensate from heat exchanger

E. Heat Exchanger:
1. Arranged for counter flow air pattern
2. Aluminum plates with completely separated airstreams for use in 5 to 8 ph environments
3. Airtight sealant between adjacent airstreams of elastic synthetic resin adhesive suitable for temperature of -40°F to +212°F
4. Unit is reinforced to withstand 10" W.G. pressure differential across surfaces without leakage or deflection of plates
5. Casing constructed of aluminum with 3/4" I.P.S. condensate drain located in exhaust section
6. Heat exchanger is tested to ASHRAE Standard 84-78 for zero leakage, efficiency and pressure drop by an independent test lab

F. Supply Fan(s) Section:
1. Centrifugal type, forward-curved, Class I wheel, DWDI
2. Fans are statically and dynamically balanced, rated and tested in accordance with AMCA and ASHRAE Standards
3. Bearings are ball bearing type, grease lubricated with an average life of 200,000 hours
4. Solid steel shafts oversized to assure that any RPM encountered will not be greater than 75% of the first critical speed

G. Exhaust Fan(s) Section:
1. Centrifugal type, forward-curved, Class I wheel, DWDI
2. Fans are statically and dynamically balanced, rated and tested in accordance with AMCA and ASHRAE Standards
3. Bearings are ball bearing type, grease lubricated with an average life of 200,000 hours
4. Solid steel shafts oversized to assure that any RPM encountered will not be greater than 75% of the first critical speed

H. Motor and Drive:
1. Motors mounted on a NEMA standard adjustable sliding base for belt adjustment
2. Base mounted on spring isolators selected for 95% efficiency at required fan RPM, snubbers where required for seismic restraint
3. V-belt drive with variable pitch motor sheaves selected for 150% of the motors rated horsepower

I. Control Panel:
1. Magnetic starters with external motor overload protection
2. Low voltage control circuit
3. Low voltage damper actuators and controls
4. Factory mounted disconnect switch
5. Control box and controls are UL listed
6. Access door provided so electrical components can be serviced without opening airflow components

J. Electric Auxiliary Heat in Supply Fan Section:
1. Casing is galvanized steel with insulated frames
2. nickel and 20% chromium open resistance coils

3. Controls and interlocks: Differential airflow switch, disk type automatic reset thermal cutout for primary protection, manual reset thermal cutout for secondary protection de-mercury type contactors, over-current protection for each stage including dual element type fuses, unfused disconnect switch, control transformer with primary fusing, individual control contactor for each heating stage, and step controller.

K. Filters: As specified in Section 233300 – HVAC Specialties.

L. Controls: Unit shall be furnished with devices that are compatible with the Section 230900 - Control System. Unit shall have all necessary interconnections.

M. Hydronic Coils: See Section 232000 – Hydronic System

PART 3 EXECUTION

3.01 INSTALLATION

A. General: Install units in locations shown on plans and in accordance with manufacturer's instructions.

B. Piping: Provide condensate.

C. Unit Protection: Units shall be protected during construction to prevent debris from depositing on the unit.

D. Horizontal Units:
1. Pitch units towards condensate drain outlet to facilitate condensate drainage.
2. Hung Units: Support units with hangers, rods, and manufacturer furnished clips and vibration isolators.
3. Drain Pan: Provide drain pans below each unit; pipe drain pan to nearest point of drainage.

E. Vertical Units: Install units on isolator pad to minimize vibration transfer to structure. Large vertical units shall be installed on external rubber type vibration isolators.

3.02 START-UP

A. Initial Checks: Prior to operating units, checks shall be made to ensure that adequate voltage, duct connections, electrical connections, control connections, and other items as listed by the manufacturer are properly provided/connected and operating to insure safe and proper unit operation.

B. Testing and Adjustment: Operate unit in various modes of operation to test for proper operation, including fan rotation, proper damper travel (where applicable), correct interface to other controls.

C. Final Check: When testing and adjustment is complete, a final check of each unit shall be done by the manufacturer's authorized service representative to verify proper unit operation.

END OF SECTION 237200

SECTION 238126
DUCTLESS SPLIT SYSTEMS

PART 1 GENERAL

1.01 GENERAL

A. Includes, but not limited to, furnishing and installing material as described in Contract Documents.

B. Ductless split systems shall be separate from VRF systems.

1.02 RELATED SECTIONS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Divisions 01 Specification Sections, apply to this Section.

B. Section 200000 - General Mechanical Requirements

C. Section 232300 – Refrigerant Piping System

D. Section 233300 - HVAC Specialties

1.03 QUALITY ASSURANCE

A. Qualifications: Air-cooled condensing section shall be rated according to ARI standards.

B. Requirements of Regulatory Agencies: Each unit shall be UL labeled.

1.04 WARRANTY

A. This Contractor shall warrant the systems to be free from defects in material, equipment and workmanship under normal use and service and any time within one (1) year as defined in Section 200000, with repair or replacement without cost to the Owner, any material, equipment or workmanship found to be defective. The date of final acceptance shall be recorded on a warranty certificate for each unit. The certificate is to be included in Operation & Maintenance Manual.

B. At the end of the first year the contractor shall present a service contract to the owner which would cover the following warranty and filter replacement:

C. In addition to the above one-year warranty, all motor compressors furnished under this Contract shall be warranted to be free from defects in material and workmanship under normal use and service for an additional four (4) years.

1.05 REFERENCES

A. ARI 210/240 - Unitary Air-Conditioning and Air-Source Heat Pump Equipment

B. ARI 270 - Sound Rating of Outdoor Unitary Equipment

1.06 SUBMITTAL REQUIREMENTS OF THIS SECTION

A. Outdoor Units

B. Indoor Units

PART 2 PRODUCTS

2.01 APPROVED MANUFACTURERS

A. Mitsubishi

B. Daikin

2.02 MANUFACTURED UNITS

A. Cabinet to be 20-gauge galvanized steel.

B. Fans to be centrifugal type and dynamically balanced.

C. Coil is seamless, copper tubing with aluminum fins mechanically attached.

D. Compressor shall be of the hermetic design.

E. Wall sleeve shall be fully weatherproof for outdoor installation.

F. Refrigerant shall meet the latest EPA requirements.

G. Isolate moving parts from cabinets to reduce noise.

H. Single point electrical connection.

I. Accumulator as required per manufacturer.

J. Unit subbase which includes prewired receptacle, conceals power cord, attaches to wall sleeve, and has leveling legs.

K. Compressor heat shall operate down to 25°F.

2.03 CONTROLS

A. For heat pumps, thermostats to be installed integral to the unit by the equipment manufacturer. Heat pump microprocessor controls shall minimize supplemental electric resistance heat. Compressor heat shall always be first stage. Controls shall indicate the use of supplemental heat with LED indicators. Include all wiring.

PART 3 EXECUTION

3.01 INSTALLATION

A. General: Install units in locations shown on plans and in accordance with manufacturer's instructions.

B. Piping: Provide condensate piping from unit to outdoors.

C. Unit Protection: Units shall be protected during construction to prevent debris from depositing on the unit.

D. Installation of factory provided refrigerant pipe line sets is acceptable where the entire length of refrigerant pipe run is located above a ceiling unexposed to view. Locations where the refrigerant piping crosses through an exposed space (e.g., open to structure or below a ceiling) other than a mechanical, electrical, elevator machine, server, or telecommunications room, shall use piping, per Section 232300.

END OF SECTION 238126

SECTION 238143
SPLIT SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. Includes, but not limited to, furnishing and installing material as described in Contract Documents.

B. Related Sections:
   1. General Conditions and Division 1
   2. Section 200000 - Mechanical General Requirements
   3. Section 220719 - Piping Insulation
   4. Section 230529 - Hangers and Supports for HVAC Piping & Equipment
   5. Section 230719 – HVAC Piping Insulations
   6. Section 232300 - Refrigerant Piping System
   7. Section 233300 - HVAC Specialties

1.02 QUALITY ASSURANCE

A. Qualifications: Units shall be ARI certified and bear the certification symbol.
   1. Condensing units shall be started up, checked out, and adjusted by Condensing Unit Manufacturer's authorized factory trained service mechanic.
   2. Mechanic shall use check-out sheet provided by Manufacturer, complete and sign all items on sheet, and submit to Architect.

B. Requirements of Regulatory Agencies: Each unit shall be UL labeled.

1.03 WARRANTY

A. This Contractor shall warrant the systems to be free from defects in material, equipment, and workmanship under normal use and service and any time within one (1) year from date of final acceptance, with repair or replacement without cost to the Owner, any material, equipment, or workmanship found to be defective. The date of final acceptance shall be recorded on a warranty certificate for each unit. The certificate is to be included in Operation & Maintenance Manual. See Section 200000.

B. All systems and control equipment shall be inspected and serviced or adjusted as required for optimum and satisfactory performance a minimum of four (4) times during the next twelve (12) months after the date of final acceptance. The first inspection shall be made approximately thirty (30) days after final acceptance and the final inspection shall be made during the eleventh month thereafter.

C. At the end of the first year the Contractor shall present a service contract to the Owner which would cover filter replacement for an additional four (4) years.

1.04 REFERENCES

A. ARI 210/240 - Unitary Air-Conditioning and Air-Source Heat Pump Equipment

B. ARI 270 – Sound Rating of Outdoor Unitary Equipment

1.05 SUBMITTAL REQUIREMENTS OF THIS SECTION

A. Outdoor Units

B. Indoor Units

C. Fan Curve

1.06 OPERATION AND MAINTENANCE REQUIREMENTS OF THIS SECTION

A. Submittal Data

B. Operation and Maintenance Manual

PART 2 PRODUCTS

2.01 APPROVED MANUFACTURERS

A. Carrier
B. Lennox
C. Trane
D. Samsung
E. Daikin

2.02 MANUFACTURED UNITS

A. Indoor Units:
   1. Cabinets:
      a. Constructed of 18 gauge or heavier steel with protective enamel on zinc coated finish or galvanized steel, adequately braced and reinforced, and of sectionalized construction.
      b. Panels shall be side removable for easy access to interior of unit.
      c. With interior mounted motors, hinged access doors with ventlock style handle.
      d. Cabinet panels shall be internally insulated with 1" thick, 1-1/2 lb. density, vinyl coated glass fiber insulation.
   2. Drain Pan: Provide double sloped drain pan with condensate drain connection. Extend drain pan under coil headers and refrigerant distributors.
   3. Fans:
      a. Provide with a forward curved centrifugal type designed for Class I operation.
      b. Base fan ratings on test conducted in accordance with AMCA Code #210.
      c. Construct fan housings with streamline inlet and side sheets.
      d. Fans shall be statically and dynamically balanced and tested as an assembly at design RPM to meet design specifications. Maximum rated fan RPM shall be below first critical fan shaft speed.
      e. Flexible connection to unit cabinet.
      f. Fans serving units 5 tons or larger shall be internally isolated with 2" open spring isolations.
      g. Units without internal isolation must be externally isolated.
   4. Fan Shaft: Solid high carbon steel.
   5. Bearings:
      a. Self-aligning, grease lubricated, ball type, and shall perform to L50 200,000 hour average life.
      b. Provide lubrication fittings. Permanently lubricated bearings are not acceptable.
      c. Provide clear extended lubrication lines to accessible side of unit.
   6. Sheaves and Belts for Belt Driven Units:
      a. Rate V-belt drives at 150% of motor rating.
      b. Motor sheaves shall be of adjustable pitch type giving 30% speed variation.
   7. Motors:
      a. As scheduled in Contract Documents and mounted internal to unit with fan, motor, and drive assembly internally isolated. If unit is belt driven, mount motor on adjustable slide base to allow belt tightening.
      b. Locate motor on side of unit most accessible.
   8. Refrigerant Coils:
      a. Coils shall be mounted in the unit casing to be accessible for service and can be removed from the unit through the side. Capacities, pressure drops, and selection procedure shall be certified in accordance with ARI Standard 410 or as indicated on schedule.

b. All coils shall be enclosed in an insulated coil section. Coil headers and U-bends shall not be exposed. Suction and distributor headers shall be made of copper tubing and penetrate coil cover panel to allow for sweat connection of refrigerant lines.
c. Coils shall be proof tested to 425 psig and leak tested to 300 psig, air pressure under water. Coils shall be dried after testing and filled with a 10 psig holding charge of nitrogen.
d. Coils shall have an equalizing type vertical distributor to ensure that each coil circuit receives the same amount of refrigerant liquid.
e. Each refrigeration circuit is to be controlled by a factory-installed expansion valve.

9. Filter Boxes: See Section 233300 - HVAC Specialties.
10. Expansion Valves:
    a. Stainless steel diaphragm and same refrigerant in thermostatic elements as in system. Externally or internally equalized as required by evaporator/ condensing system.
    b. Size valves to provide full rated capacity of cooling coil served.
    c. Furnished by evaporator coil/condensing unit supplier and coordinated to provide bleed holes for system pressure equalization, if required.
    d. Electronic or thermal expansion valves shall be used to control refrigerant expansion. The expansion valves shall be adjusted to the manufacturer's superheat and sub-cooling levels. No capillary tube expansion type devices will be allowed.

B. Outdoor Units:
1. Condenser units having side inlets shall have coil guards.
2. Fans:
    a. Each fan shall have a safety guard.
    b. Fans shall be direct driven propeller upflow type.
    c. Fan motors shall be resiliently mounted and suitable for outside use. Provide with permanent lubricated ball bearing.
    d. Fans shall be constructed of aluminum.
3. Controls:
    a. Factory wired and located in separate enclosure as the main condensing unit.
    b. Safety devices shall consist of high and low pressure cutouts, and condenser fan motor overload devices.
4. Casing:
    a. Fully weatherproof for outdoor installation. Finish shall be weather resistant.
    b. Panels shall be removable for servicing.
    c. Provide openings for power and refrigerant connections.
    d. Constructed of 18 gauge or heavier steel with protective enamel on zinc coated finish or galvanized steel, adequately braced and reinforced, and of sectionalized construction.
5. Condensing Unit:
    a. All condensing units shall use the same refrigerant.
    b. Only one liquid line, one suction line, and one power connection shall be made to each compressor.
    c. Provide charging valves.
    d. Must have an EER, SEER, COP and IPLV, as defined by ARI, which complies with the most current Washington State Energy Code.
    e. Install each condensing unit on neoprene isolation pads located at each corner and having a minimum size of 4"x4"x3/4" high.
    f. Insulate refrigerant lines according to Section 230719 HVAC Piping Insulation.
6. Condenser coil shall have aluminum plate fins mechanically bonded to seamless copper or aluminum tubes.
7. Fan motor shall be single or two speed, thermostatically controlled and designed with permanent protection.

8. Compressor shall be of hermetic design with the following features.
    a. Externally mounted brass service valves with charging connections.
    b. Crankcase heater.
    c. Resilient rubber mounts.
    d. Compressor motor overload protection.
    e. Single speed

PART 3 EXECUTION

3.01 INSTALLATION

A. General: Install units in locations shown on plans and in accordance with manufacturer's instructions.

B. Piping: Insulate refrigerant piping according to Section 220719. Provide condensate piping to unit. Condensate line shall drain to the nearest drainage point or where indicated on plans.

C. Unit Protection: Units shall be protected during construction to prevent debris from depositing on the unit per Section 200000.

D. Horizontal Units:
    1. Pitch units towards condensate drain outlet to facilitate condensate drainage.
    2. Support hung units with hangers, rods, and manufacturer furnished clips and vibration isolators.

E. Vertical Units: Install units on isolator pad to minimize vibration transfer to structure. Large vertical units shall be installed on external rubber type vibration isolators.

3.02 START-UP

A. Initial Checks: Prior to operating units, checks shall be made to ensure that adequate voltage, duct connections, electrical connections, control connections, and other items as listed by the manufacturer are properly provided/connected and operating to ensure safe and proper unit operation.

B. Testing and Adjustment: Operate unit in various modes of operation to test for proper operation, including fan rotation, proper damper travel (where applicable), proper cooling/heating, correct interface to other controls (time clock, fans, etc.). Make necessary adjustments per manufacturer's directions.

C. Final Check: When testing and adjustment is complete, a final check of each unit shall be done by the manufacturer's authorized service representative to verify proper unit operation.

D. Start-Up Log: Provide a start-up log per Section 232300 - Refrigerant Piping System.

END OF SECTION 238143

SECTION 238239
ELECTRIC HEATERS

PART 1 GENERAL

1.01 SUMMARY

A. Includes but not limited to: Furnishing and installing specified material as described in the Contract Documents.

B. Related Sections:
   1. General Conditions and Division 1 apply to this section.
   2. Section 200000 – General Mechanical Requirements.

1.02 QUALITY ASSURANCE

A. Units to be UL listed.

B. Shall conform to NEC and NFPA requirements.

1.03 SUBMITTAL REQUIREMENTS OF THIS SECTION

A. Electric Heaters

1.04 OPERATION AND MAINTENANCE REQUIREMENTS OF THIS SECTION

A. Operation and Maintenance Manual

PART 2 PRODUCTS

2.01 APPROVED MANUFACTURERS

A. Not Applicable

2.02 FAN FORCED WALL HEATERS

A. Provide recess mounting in stud wall and surface mounting in block wall unless otherwise stated on plans.

B. 20-gauge minimum sheet metal casing.

C. Heating element shall be encased in steel finned casting and protected by thermal switch.

D. Fan motor shall be heavy duty enclosed and permanently lubricated.

E. Fan shall be precision balanced and fan motor assembly mounted to be vibration free.

F. Units shall be controlled automatically by integral thermostat when heater is in “ON” position unless otherwise stated on plans.

G. Heater shall have built-in fan delay.

H. Finish shall be baked-on enamel.

I. Bi-metallic limit turns the element off when an over temperature condition occurs. Automatically resets when the normal temperature returns.

J. Approved Manufacturers:
   1. Berko
   2. King
   3. Markel

2.03 UNIT HEATERS

A. Furnace shall be factory assembled unit, with blower, heaters, steel casing and completely wired.

B. Cabinet: 22-gauge minimum cold rolled steel with baked enamel finish. Interior of cabinet around electric heating elements shall be lined with ½ inch thick 1-1/2 lb density fiberglass insulation.

C. Blower:
   1. Propeller type, dynamically and statically balanced.
   2. Unit shall be direct drive.

D. Heaters:
   1. High mass, all steel finned and tubular heating element.
   2. Each set of heaters shall be equipped with limit control with fixed temperature “OFF” setting and automatic reset with supplemental thermal cut-off safety fuses.
   3. Provide fan time delay relay and circuit breakers.
   4. Furnaces shall have manually reset transformer.

E. Approved Manufacturers:
   1. Indeeco
   2. Lennox
   3. Markel
   4. Trane

2.04 DUCT HEATERS

A. Heaters:
   1. Eighty (80%) percent nickel, 20% chromium resistance coils insulated by floating ceramic bushings and supported in an aluminized steel frame.
   2. Bushing shall be recessed into embossed openings and staked into supporting brackets spaced 3-1/2 inches maximum center to center.
   3. Coils shall be machine crimped into stainless steel terminals and insulated with phenolic bushings.
   4. Heaters shall be listed by UL for zero clearance to combustible surfaces.
   5. Heater casings shall be of flanged type for attachment to external duct flanges and shall be made to accommodate internally insulated ducts with insulation thickness as specified.

B. Furnish disc-type thermal cutouts for primary and secondary protection.
   1. Automatic reset primary cutout shall be suitable for scheduled voltage operation.
   2. Manual reset secondary cutouts shall be factory wired directly in series with each circuit.
   3. Non-reusable thermal links are not acceptable.

C. Voltage, phase and number of heating stages to be furnished are shown on Drawings. Limit step controller to eight steps.
   1. Three phase heaters shall have equal, balanced circuits.
   2. Circuits shall be rated at 48-amps maximum.
   3. Heating elements shall be de-rated to 35-watts per sq. ft. of element surface.
   4. Test heaters di-electrically at 2,000 volts before shipments.

D. Each heater shall have following built-in components which shall be wired to terminal blocks for field connections. Internal wiring shall be suitable for 105°C.
   1. Mercury contactors shall disconnect circuits.
   2. Control transformer shall be dry industrial type, sized to carry full contactor holding coil load. Primary winding to be factory fused.
   3. Door mounted unfused disconnect switch, snap acting, industrial type to be built into access door. Hinged, latched disconnect switch and door cover shall lock in closed position when switch is on.
   4. Built-in fuses properly sized complete with fuse block.
   5. Air-flow switch wired in series with automatic reset thermal cutout.
   6. Provide heaters of 100 KW capacity or greater with recycling relay to prevent all steps from simultaneously energizing after power interception.

E. Approved Manufacturers:
   1. Indeeco
   2. Trane
   3. Markel

PART 3 EXECUTION

Not Applicable

END OF SECTION 238239

SECTION 239000
MECHANICAL DEMOLITION

PART 1 GENERAL

1.01 SUMMARY

A. Includes But Limited To: Demolition and maintaining existing systems.

B. Related Sections: General Conditions, Division 1 and Section 200000 apply to this Section.

1.02 OPERATION AND MAINTENANCE REQUIREMENTS OF THIS SECTION

Not applicable

PART 2 PRODUCTS

Not applicable

PART 3 EXECUTION

3.01 DEMOLITION

A. The Mechanical Contractor shall be responsible for the removal of all existing Mechanical equipment including, but not limited to piping, fixtures, HVAC equipment, ductwork in areas shown on the drawings and indicated thereon.

B. The Mechanical Contractor shall also be responsible for the removal and/or relocation of all Mechanical equipment that will interfere with installation and operation of any new construction indicated or required.

C. Any existing equipment to which modifications are made under this contract shall be painted and labeled in accordance with specifications for new materials.

D. All Mechanical equipment (other than piping) to be removed shall remain the property of and shall be transported, stored, or disposed as directed by the Owner. This will be at no cost to the Owner.

END OF SECTION 239000

SECTION 260000
ELECTRICAL GENERAL CONDITIONS

PART 1 GENERAL

1.01 WORK INCLUDED

A. It is the intention of this division of the specifications and the accompanying drawings to describe and provide for the furnishing, installing, testing and placing in satisfactory and successful operation all equipment, materials, devices, and necessary appurtenances to provide a complete electrical system, together with such other miscellaneous installations and equipment hereinafter specified and/or shown in the plans. The work shall include all materials, appliances and apparatus not specifically mentioned herein or noted on the plans, but which are necessary to make a complete working installation of all electrical systems shown on the plans or described herein. Equipment and devices furnished and installed under other divisions of this specification (or by the Owner) shall be connected under this division. The drawings and specifications are complementary and what is called for in either is binding as if called for in both.

B. By submitting a bid, the Contractor is acknowledging that he has made a thorough examination of the Contract Documents, existing site and building conditions, and has determined that these documents do sufficiently describe the scope of construction work required under this Contract.

C. Conform to the General Conditions, Supplementary Conditions, and related work in other Divisions for all work in Divisions 26, 27, and 28. See Division 01 for sequence of work

D. Included in Divisions 26, 27, and 28 is all work and related items necessary to provide all electrical installations except as specifically excluded. In general, this includes all labor, equipment, tools, etc., to complete the electrical work.

1.02 RELATED WORK

A. Temporary Power and Lighting - See Section 015100

B. Mechanical Control Wiring – See Division 23

C. Cutting and Patching - See Division 01

D. Trenching, backfill and asphalt work – See Division 33.

1.03 REFERENCE STANDARDS

A. The work shall comply with the latest edition of the applicable Standards and Codes of the following:

ASTM	American Society for Testing and Materials
NBFU	National Board of Fire Underwriters
NEC	National Electrical Code
---	State Electrical Code
NESC	National Electrical Safety Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
U.L.	Underwriters Laboratories Inc.
IPCEA	Insulated Power Cable Engineers Associated
CBM	Certified Ballasts Manufacturers
---	Federal, State and Local Building Codes
ETL	Electrical Testing Laboratories

B. If any conflict occurs between Government adopted Code Rules and this specification, the codes are to govern. Nothing in these drawings and specifications shall be construed to permit work not conforming with governing codes. Also, this shall not be construed as relieving the Contractor from complying with any requirements of the plans and specifications which may be in excess of, but not in conflict with, requirements of the Governing Codes.

1.04 SUBMITTALS

A. Shop Drawing Submittals
   1. This Contractor shall submit to the Architect as described in Section 01 60 00. When shop drawings are submitted electronically, they shall be submitted as described in Paragraph B below.
      a. Manufacturer's Catalog Data.
      b. Complete Physical and Technical Data.
      c. Wiring Diagrams.
      d. Detailed Reference (written or highlighted) noting compliance with the appropriate specification section and applicable item numbers within that section.
      e. Other Descriptive Data as required by the Architect/ Engineer.
   2. The Contractor shall submit to the Architect electronic shop drawings in PDF format. Electronic Shop Drawings that are submitted without following the format as outlined below will be returned for corrections without any further review.
      a. A separate PDF file shall be submitted for each Division including All submittal items for that Division as outlined below:
         1) Division 25 – Integrated Automation
         2) Division 26 – Electrical
         3) Division 27 – Telecommunications
         4) Division 28 – Electronic Safety and Security
      b. The contractor shall provide either a digital or hardware method of transporting the electronic submittal to the Architect. Files larger than 10Megabytes shall not be sent via email and shall be transferred via a file transfer protocol, PC compatible CD or PC compatible thumb drive. Divisions shall not be broken up into separate files for transfer via email.
      c. Each Specification PDF shall be submitted with the following format and salient attributes:
         1) Cover page including:
            (a) Project Title as indicated on the plans
            (b) Project Location including address, city, state, country
            (c) Prime Contractor name, phone number, and email address
            (d) Sub-Contractor name, phone number, and email address
            (e) Specification Division number and title
         2) Index Page outlining each specification section included in the submittal. This list shall be linked to a corresponding Specification Section Divider for each section. This link shall enable the reviewer to jump to a specification section by clicking the item in the list.
         3) Specification Section Divider: Shop Drawings shall be divided by specification section and each section shall begin with a divider page outlining the Specification number, title, and a list of submittal items for the section. In the upper right-hand corner of the divider page, a link shall be provided returning the reviewer to the Index Page.
         4) Each Submittal Item listed on the Specification Section Divider shall be linked to the specific item being submitted. Each Submittal Item shall be highlighted yellow with a note reference to the specific paragraph giving the submittal requirements.
         5) Each page of the submittal shall be numbered in the bottom right corner of the page. Page numbering shall be Roman numerals for all pages before the First Specification Section. Each Specification Section page shall be numbered with the Specification Section number, a dash, and the page number in the Specification Section.
         6) Specification items shall be specifically highlighted as they apply to the project rather than highlighting an entire product family. Items that do not apply to this project shall be crossed out with a red “X”.
         7) The PDF file shall not be protected to prevent printing, selecting of text within the document, or extracting of pages from the document.

3. Shop drawings shall be submitted complete, at one time, and with each item indexed with dividers and separated per specification section and shall include, at a minimum, the items of equipment listed in each specification shall be provided:
4. Within ten (10) working days after the date of the letter rejecting any items of equipment, lighting fixtures, or materials as not in accordance with the specifications, the Contractor shall submit a new list of items to furnish and install in place of those items rejected. If the Contractor fails to submit this new list within the above specified time, or if any items on this second list are rejected as not being in accordance with these specifications, the Engineer may select the items which the Contractor shall furnish and install without change in Contract price or time of completion.
5. The acceptance of a manufacturer's name or product by the Engineer does not relieve the Contractor of the responsibility for providing materials and equipment which comply in all details with the requirements of the Contract Documents. The Contractor shall be solely responsible for submitting materials at such a time to allow a minimum of two weeks for Engineer's review.
6. Electrical Drawings for the project have been developed by the Engineer using AutoCAD Revision 2013 software or newer. These drawing files will be made available to the Contractor for development of shop drawings and/or As-Builts with a signed waiver of responsibility.

B. As-Built Drawings
   1. The Contractor shall maintain, in addition to any reference drawings, an as-built set of prints, on which all deviations from the original design shall be drafted in a neat, legible manner with red colored pencil. This red-lined set shall identify all drawing revisions including addenda items, change orders, and Contractor revisions. The Contractor is responsible to revise panel schedules and load calculations as required.
   2. Drawings shall show locations of all concealed raceway runs larger than 1", giving the number of conductors and size of raceway. Underground ducts shall be shown with cross section elevations. All pipe, raceway, manholes or lines of other trades shall be included.
   3. The Contractor shall update all references to specific products to indicate products actually installed on project. This shall include, but not be limited to, lighting fixtures, baseboard heaters, etc.
   4. Upon completion of the Division 26 work, the Contractor shall deliver the red-lined drawings and one (1) set of neatly marked up as-built drawings to Architect.

D. Warranty
   1. Provide a written warranty that the Division 26, 27, and 28 work is free from mechanical and electrical defects. Contractor shall replace and repair, to the satisfaction of the Engineer, any parts of the installation which may fail within a period of 12 months after the certificate of final acceptance *or* date of substantial completion, provided that such failure is due to defects in material or workmanship, or failure to follow the specifications and drawings.
   2. See Section 270000 for additional requirements of low voltage systems.

E. Instructions and Manuals
   1. Operation and maintenance data shall be submitted in accordance with Section 017823.
   2. Manuals shall contain shop drawings, wiring diagrams, operating and maintenance instructions, replacement parts lists, and equipment nameplate data for all equipment and systems installed under the project. Signal equipment submittals shall contain step-by-step circuit description information designed to acquaint maintenance personnel with equipment operation in each mode of operation. Manuals shall contain original brochures supplied by manufacturers. Copies of originals will not be accepted.

3. Each type of device provided shall be identified in the O & M Manual using the same identification as shown on the drawings and specifications. The information included must be the exact equipment installed, not the complete "line" of the manufacturer. I Installed equipment shall be neatly and clearly identified on sheets where both installed equipment and other equipment are shown. Parts lists shall give full ordering information assigned by the original parts manufacturer. Relabeled and/or renumbered parts information as reassigned by equipment supplier are not acceptable. The following information shall be provided for each device:
   a. Manufacturer's name, address, and phone number.
   b. Local supplier's name, address, and phone number.
   c. Complete parts lists including quantities and manufacturer's part numbers.
   d. Installation instructions.
   e. Recommended maintenance items including maintenance procedure and recommended interval of maintenance listed in hours of operation, calendar unit or other similar time unit.
4. The O & M Manual shall be assembled as detailed in Section 017000. As a minimum, the following sections shall be broken out:

F. Wiring Diagrams for each system shall be complete for the specific system installed under the Contract. "Typical" line diagrams will not be acceptable unless properly marked to indicate the exact field installation.

1.05 PERMITS & FEES

A. The Contractor shall obtain and pay for all licenses, permits, and inspections required by laws, ordinances, and rules governing work specified herein. The Contractor shall arrange for inspection of work by the inspectors and shall give the inspectors all necessary assistance in their work of inspection.

B. The Contractor shall consult with and follow the requirements of the local fire, power, telephone, and television utilities serving the area and shall coordinate the work with them.

C. Utility connection and hook-up charges for power and telephone shall be paid by the Owner directly to the utility. The Electrical Contractor is required to provide any and all coordination necessary to support the utility connection, file for application of service (or assist the Owner in filing for application of service) and coordinate dates for service with the utilities.

1.06 DEFINITIONS

A. When "provide" is used, it shall be interpreted as "furnishing and installing complete in operating condition".

B. When "drawings" is used, it shall be interpreted as "all Contract Drawings for all disciplines".

C. When "Contractor" is used, it shall be interpreted as the Electrical Contractor.

1.07 INTENT OF DRAWINGS

A. The electrical drawings are intended to serve as working drawings for general layout. The equipment layout is diagrammatic and, unless specifically dimensioned or detailed, does not indicate all fittings, hardware, or appurtenances required for a complete operating installation.

B. Anything shown on the drawings but not covered in the specifications, or anything covered in the specifications but not shown on the drawings, shall be as if covered in both. In case of conflict between the drawings and specifications, the Engineer will select the method to be used. The Contractor shall be responsible for verifying all measurements before proceeding with the work.

C. Wiring diagrams are not intended to indicate the exact course of raceways or exact location of outlets. Raceway and outlet locations are approximately correct and are subject to revision as may be necessary or desirable at the time of installation. Precise location in every case shall be subject to the Engineer's approval.

1.08 PROTECTION

A. The Contractor shall store and guard all equipment before installation and shall protect same, and replace any equipment that has been damaged prior to final acceptance. See Division 01 for detailed requirements.

1.09 HOUSEKEEPING

A. All electrical materials shall be kept stored in an orderly fashion protected from heat, cold, and the weather.

B. All marred surfaces shall be refinished and painted after installation.

C. All debris shall be removed from premises during work, as directed, and at completion of job.

1.10 TEMPORARY USE

A. Temporary or interim use of any and all portions of the electrical system shall be under the supervision of the Electrical Contractor.

B. Temporary power and lighting for use during construction shall be provided per the requirements of the Division 01 specifications.

1.11 WORK NOT INCLUDED

A. Indicated motors, controls, and equipment as described in other divisions shall be furnished by other trades, but shall be moved, set, and wired to electrical controls and power supply by the Electrical Contractor.

B. Work to be included under this Contract shall be defined on drawings and in these specifications. Any details beyond these limits are meant only to give installation clarity to that portion which is a part of this Contract.

1.12 INSTRUCTION PERIODS

A. Upon completion of the work and after all tests and final inspection of the work by the authority(ies) having jurisdiction, the Contractor shall demonstrate and instruct the Owner's designated operation and maintenance personnel in the operation and maintenance of the various electrical systems. The Contractor shall arrange scheduled instruction periods with the Owner. The Contractor's representatives shall be superintendents or foremen knowledgeable in each system and suppliers' representatives when so specified.

B. Costs for time involved by Contractor shall be included in the bid.

1.13 COMPLETION OF WORK

A. Upon completion of the Division 26, 27, and 28 work, the Contractor shall comply with requirements of Section 017000 for project closeout.

B. Arrange for and obtain all required inspections and certificates pertaining to the Division 26, 27, and 28 work and deliver the certificates to the Engineer in triplicate.

C. Prior to or at the time of final inspection, the Contractor shall, as outlined in detail in the specifications, complete the delivery of all the following items:

1.	Completion Letter	
2.	Certificate of Final Inspection. Electrical Inspector Fire Department	COMPLETION OF WORK 260000 – 1.17
3.	Warranty to Owner (with copy for Engineer	SUPPLEMENTARY GENERAL CONDITIONS 260000 - 1.13
4.	Marked Set of As-Built Electrical Drawings	GENERAL AS-BUILT DRAWINGS 260000 – 1.12
5.	Certificate of Completion and Document Requirements for Protective Device Study	ELECTRICAL SYSTEM PROTECTIVE DEVICE STUDY - 260573

6.	Motor Current Readings	GENERAL, TESTS 260519 – 3.03(D)
7.	Phase Current Readings	GENERAL, TESTS 260519 – 3.03 (E)
8.	OHMIC Test Readings	GENERAL, TESTS 260519 – 3.03 (B)
9.	Ground Fault Settings	
10.	Panelboard and Special Equipment Shop Drawings and Final Approved List of Materials Installed	MATERIALS, GENERAL 260000 – 2.03
11.	Certificate of Feeders Torque Results	WIRES AND CABLES - 260519
12.	Wiring diagrams, Maintenance Manuals, Operation Instructions, and Brochures (5 sets minimum)	GENERAL, INSTRUCTIONS & MANUALS – 260000 – 1.14

* Secure delivery instructions from Architect for delivery to Owner.

1.14 SCHEDULE OF VALUES

A. Provide Schedule of Values per Division 01 and related project requirements.

B. Divisions 26, 27, and 28 Breakdown: Provide schedule of values for the following categories (as a minimum):

1. Electrical Mobilization
2. Electrical Submittals
3. Electrical General Project Management, General Design, General Coordination
4. Branch Circuit Materials Rough-in
5. Branch Circuit Materials Rough in – Labor
6. Branch Circuit Trim – Materials
7. Branch Circuit Trim – Labor
8. Service Materials
9. Service Materials – Labor
10. Feeder Materials
11. Feeder Materials - Labor
12. Panelgear, Disconnects, Starters
13. Panelgear, Disconnects, Starters – Labor
14. Light Fixtures
15. Light Fixtures – Labor
16. *Intercom/Clock System
17. *Distributed Audio-Video Communication System
18. *Classroom Audio-Visual Systems
19. *Closed Circuit Television System (CCTV)
20. *Sound Systems – Break out per space
21. *Fire Alarm/Emergency Communication System
22. *Security System
23. *Data System
24. Generator and Transfer Switches
25. Electrical System Protective Device Study
26. Commissioning
27. Electrical Punchlist, Closeout, and Owner Training

*Provide engineering/shop drawings, material, and labor for each system. Engineering/shop drawings shall be 10% of the labor and material value.

C. The dollar value for “Electrical Punchlist, Closeout, and Owner Training” shall in no case be less than 2% of the total dollar value of the Division 26, 27, and 28 work (or as indicated in Division 01, whichever is higher). The dollar value for “Commissioning” shall in no case be less than 3% of the total dollar value of the Division 26 work (or as indicated in Division 01, whichever is higher).

D. The Contractor is advised that in addition to payments held out for retainage and project final completion (i.e., “Electrical Punchlist, Closeout, and Owner Training”), as specified above and in Division 01, the Owner reserves the right to withhold 10% of the funds for any of the above categories until the systems (of that category) have been proven to operate as specified and have been completely tested and adjusted.

PART 2 PRODUCTS

2.01 COMPETITIVE PRODUCTS

A. Any reference in the specifications to any article, device, product, material, fixture, form, or type of construction by name, make, or catalog number shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition. The Contractor, in such cases, may use any article, device, product, material, fixture, form, or type of construction which in the judgment of the Engineer, expressed in writing, is equal to that specified. However, any manufacturer not listed as an accepted bidder for a specific item must be submitted for acceptance in writing in accordance with
Section 016000.

2.02 MANUFACTURER/EQUIPMENT PRIOR APPROVALS

A. Any manufacturer/equipment not listed as an approved substitute for a specified item must be submitted for acceptance in accordance with Section 016000, in writing, with detailed information to include:
   1. Manufacturer's Catalog Data
   2. Complete Physical and Technical Data
   3. Wiring Diagrams
   4. Detailed reference (written or highlighted) noting compliance with the appropriate Specification Section and all applicable Specification item numbers within that Section
   5. Complete type written index cross referencing all proposed substitutes and specified items
   6. Detailed reference to specified items (written or highlighted) noting equal quality and performance of proposed substitute equipment
   7. Other descriptive data, as required by the Engineer

B. If substitute material is determined to be acceptable by the Engineer, it will be included in a subsequent Addenda prior to bidding. The acceptance of a manufacturer’s name or product by the Engineer does not relieve the Contractor of the responsibility for providing materials and equipment which comply in all details with the requirements of the Contract Documents.

C. Only materials which are specified or published in addenda as acceptable shall be used.

2.03 MATERIALS

A. All materials must be of the quality herein specified. All materials shall be new, of the best quality, and free from defects. They shall be designed to ensure satisfactory operation and operational life in the environmental conditions which will prevail where they are being installed.

B. Each type of material shall be of the same make and quality. The materials furnished shall be standard products of the manufacturers regularly engaged in the production of such equipment and shall be the manufacturer's latest standard design.

C. All materials shall be U.L. or E.T.L. listed for the purpose for which they are used.

D. Equipment in compliance with U.L. standards but not bearing their label is not acceptable. If the manufacturer cannot arrange for labeling of an assembled unit at the factory the unit shall be field evaluated per the Washington State Administrative Code (WAC) and the electrical inspector’s requirements.

2.04 COMPLETE SYSTEM

A. All the systems mentioned shall be complete and operational in every detail except where specifically noted otherwise. Mention of certain materials in these specifications shall not be construed as releasing the Contractor from furnishing such additional materials and performing all labor required to provide a complete and operable system.

2.05 NAMEPLATES

A. Provide nameplates constructed of plastic (black on white) laminated material engraved through black surface material to white sublayer (attach with screws on NEMA 1 enclosures). EXCEPTION (1): Emergency distribution system component labeling - white letters on red background. Exception (2): Series rated systems shall be yellow background with white letters.
   1. Service Entrance Label: Refer to Section 2624 3.
   2. Panelboard Labels: Refer to Section 262416.
   3. Switch and Receptacle Labels: Refer to Section 262726.
   4. Motor Starter and Disconnect Labels: Refer to Section 262816.
   5. Special Equipment/Outlet Labels: Refer to Appropriate Sections.
   6. Medium Voltage Feeder Tags: Refer to Section 260573.
   7. Under 600 Volt Feeder Tags: Refer to Section 260519.

PART 3 EXECUTION

3.01 GENERAL

A. Careful consideration shall be given to clearances under and over beams, pipes and ducts, to provide proper headroom in all cases. Check drawings to determine heights of all suspended ceilings and size of pipe shafts where raceway and wire-ways shall run. Coordinate installation of Divisions 26, 27, and 28 wiring and equipment with Division 23 and other trades. Where insufficient room for proper installation appears, obtain clarification from Engineer before any installation begins.

B. Cutting and Patching:
   1. Obtain permission from the Architect and/or Owner’s Representative prior to cutting. Locate cuttings so they will not weaken structural components. Cut carefully and only the minimum amount necessary. Cut concrete with diamond core drills except where space limitations prevent the use of such drills.
   2. All construction materials damaged or cut into during the installation of this work must be repaired or replaced with materials of like kind and quality as original materials by skilled labor experienced in that particular building trade.

3.02 COORDINATION

A. The Contractor is responsible for accomplishing work contained within Divisions 26, 27, and 28. The work shall coordinate with that of the other Contractors and/or other trades doing work in the building. The contractor shall examine all drawings, including the several divisions of mechanical, structural, civil and architectural, for construction details and necessary coordination. Specific locations of construction features and equipment shall be obtained from the Contract Documents, field measurements, and/or from the trade providing the material or equipment. No extra costs will be allowed for failure to obtain this information.

B. All conflicts shall be reported to the Engineer in writing before installation for decision and correction. Special attention is called to the following items:
   1. Door swings to the end that switches will be located on "Strike" side of the door.
   2. Location of grilles, pipes, sprinkler heads, ducts, and other mechanical equipment so that all electrical outlets, lighting fixtures, and other electrical outlets and equipment are clear from and in proper relation to these items.
   3. Location of cabinets, counters, and doors so that electrical outlets, lighting fixtures, and equipment are clear from and in proper relation to these items.
   4. Type and height of ceiling.

5. All device measurements referenced on drawings or specifications are to be centered of device unless noted otherwise.

C. The Contractor will not be paid for work requiring reinstallation due to lack of coordination or interference with other Contractors or trades. This includes, but is not limited to, removing, replacing, relocating, cutting, patching, and finishing.

D. The Contractor shall review the installation manual for each device to be installed. If a conflict appears to occur between the manufacturer's recommended installation practices and the plans or specifications, notify the Engineer immediately. Final determination shall be by the Engineer. The Contractor will not be paid for reinstallation due to failure to comply with manufacturer instructions or design documents.

E. Device and fixture locations may be changed within 15 feet without extra charge if so desired by the Engineer, before installation.

3.03 REQUESTS FOR INFORMATION (RFI)

A. It is our intent to provide a timely response for RFIs regarding Division 26, 27, and 28 Work. To further expedite this process, where a suggestion can be determined or derived at by the initiator of the RFI, it is required this suggestion be supplied with the submitted RFI. If no suggestion is given where one is possible, the RFI will be returned as incomplete.

3.04 CLEANING AND PAINTING

A. All equipment, whether exposed to the weather or stored indoors shall be covered to protect it from water, dust and dirt.

B. After installing, all metal finishes shall be cleaned and polished, cleaned of all dirt, rust, cement, plaster, grease, and paint.

C. All equipment with a primer coat of paint shall be given two (2) or more coats of a finish enamel and scratched surfaces be refinished to look like new. Markings, identification, and nameplates shall be replaced.

3.05 EQUIPMENT IDENTIFICATION

A. Provide identifying engraved Bakelite nameplate on all equipment, including pull boxes, to clearly indicate its use, area served, circuit identification, voltage, and any other useful data.

B. Each auxiliary system, including communications, shall be clearly labeled to indicate its function.

3.06 DEVIATION

A. Deviation from the shop drawings in construction or installation of equipment shall not be made unless Shop Drawings showing proposed deviations are submitted to and approved by the Engineer. If any equipment is furnished under this or other divisions with current, voltage, or phase ratings that differ from those shown on the drawings, the Contractor shall notify the Engineer in writing immediately and shall not connect said equipment until instructed as to required changes by the Architect. No extension of time will be granted as a result of such changes.

3.07 EXCAVATIONS

A. All excavations are to be conducted so that no walls or footings shall be disturbed in any way.

B. Remove all surplus earth not needed for backfilling and dispose of same as directed.

3.08 WIRING METHODS

A. All low voltage wiring shall be in raceway with junction boxes and fittings where concealed in walls, in inaccessible ceiling space, or where exposed in finished or unfinished areas.

B. Provide conduit sleeves through all walls to accommodate all low voltage cabling. Conduit sleeves shall be sized to allow for 40% future spare capacity.

C. All branch circuit wiring shall be installed in raceway with junction boxes and fittings.

D. Provide access panels as needed for pull boxes and equipment located above ceiling or behind walls.

E. All emergency systems outlet and junction boxes shall have a red plastic tag inside marked critical or life safety as applicable.

F. Multiple feeder runs shall be rod hung, using a strut type channel with individual one-hole clamps, back plates, and machine screws.

G. Any low voltage cables that are not terminated at both ends shall be tagged and labeled per code.

H. See Section 270000 for additional requirements of low voltage systems.

3.09 PENETRATIONS OF FIRE RATED ELEMENTS

A. Penetrations of fire rated elements must be made such as to retain that rating. See architectural sheets for specific fire rated locations.

3.10 HANGERS AND SUPPORTS

A. Provide hangers, brackets, and suspension rods and supplementary steel to support equipment.

B. Hangers provided under other divisions shall not be used for support of Division 26, 27, or 28 equipment unless permitted by Architect/Engineer.

3.11 CHASES AND OPENINGS

A. Provide to the masonry and concrete trades all templates and details of chases, openings in floors, and walls as required for Division 26, 27, and equipment installation.

3.12 PAINTING

A. Painting in general will be covered under another division of this specification, except items furnished under Divisions 26, 27, and 28 that are scratched or marred in shipment or installation and shall be refinished by the Division 26 Contractor.

3.13 WORKMANSHIP AND OBSERVATION

A. Workmanship shall be of the best quality and none but competent workers shall be employed under the supervision of a competent foreman. All completed work shall represent a neat, professional appearance.

B. All work and materials shall be subject to observation at any and all times by representatives of the Engineer.

3.14 MISCELLANEOUS

A. Provide complete seismic anchorage and bracing for the lateral and vertical support of conduit and electrical equipment, as required by the International Building Code.

B. Conduits that cross seismic separations shall be installed with flexible connection suitable to accommodate conditions. Secure raceways on each side of a separation and provide a minimum of 36” length of flexible conduit to span separation.

3.15 CABLE AND WIRING ROUTED UNDERGROUND OR UNDERSLAB

A. All cables and conductors, both line voltage and low voltage, routed underground or underslab shall be U.L. listed for installation in wet locations per NEC and WAC codes.

3.16 TRAINING

A. Scheduled Instruction periods shall be as indicated in each specification section:

1.	Access Control System	1/2 day
2.	CCTV System	1/2 day
3.	Data Network	1/2 day
4.	Daylighting Control Systems	1/2 day
5.	Fire Alarm System	1/2 day
6.	Low Voltage Lighting Control Systems	1/2 day
7.	Security System	1/2 day

END OF SECTION 260000

SECTION 260005
ELECTRICAL – EXISTING SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Portions of the existing electrical lighting, power and signal systems are to be removed as detailed on the drawings.

1.02 RELATED DOCUMENTS

A. Section 260000 – Electrical General Conditions

1.03 REFERENCE STANDARDS

Not applicable

1.04 SUBMITTALS

Not applicable

PART 2 PRODUCTS

2.01 EXISTING MATERIALS

A. Existing materials which are a part of the building shall remain the property of the Owner, unless directed by the Owner to be removed.

B. It is the Contractor's responsibility to include in the bid all costs associated with necessary demolition to allow new construction shown in the Contract Documents, unless specifically noted otherwise. The Contractor shall remove all existing receptacles, lighting fixtures, low voltage devices, backboxes, abandoned raceways, conductors, and any auxiliary items to allow for new construction and finish work to occur as complimented by the Contract Documents.

C. Contractor is responsible for removal of electrical connections, disconnect switches, and starters for all mechanical equipment scheduled to be demolished. The Contractor shall check all demolition plans and actual field conditions for unit locations.

D. Areas not included in the scope of work or not included as part of the phasing schedule shall remain fully operational.

2.02 EXISTING MATERIALS NOT TO BE RE-INSTALLED

A. In coordination with the Architect/Engineer, these materials shall be made available for his inspection and decision as to whether the Owner will retain possession. Items selected for retention shall be delivered to a location on the premises selected by the Owner and turned over to him. Take reasonable care to avoid damage to this material. If the Contractor fails to conform to this requirement, he shall purchase and turn over to the Owner replacement materials of like kind and quality.

B. All material not selected for retention by the Owner and debris shall be disposed of by the Contractor. This shall include, but not be limited to, removal of PCB type ballasts and fluorescent lamps which shall be disposed of in accordance with EPA requirements.

C. Electrical Contractor shall coordinate with the Hazardous Abatement Contractor on panelboards that may be identified by them as needing abatement and assist them in disconnecting power and notifying them when the abatement can occur.

PART 3 EXECUTION

3.01 EXISTING CONDITIONS

A. Examine the structure, building, and conditions under which Division 26 work is to be installed for conditions detrimental to proper and timely completion of the work. Do not proceed with work until deficiencies encountered in installation have been corrected. Report any delay or difficulties encountered in installation of Divisions 26, 27 and 28 work which might be unsuitable to connect with work by other divisions of this specification. Failure to report conditions shall constitute acceptance of other work as being fit and proper for the installation of Divisions 26, 27 and 28 work.

B. Electrical Contractor to provide circuit tracing of all existing circuits in all areas that are to remain, be reused and/or relocated to new panels.

C. Maintain continuity of existing circuits of equipment to remain. Existing circuits of equipment shall remain energized. Circuits which are to remain but were disturbed during demolition shall have circuits, wiring, and power restored back to original condition.

D. This is a multiple phased occupied facility. The Electrical Contractor is responsible to maintain full operation of all systems in the occupied portions of the facility. Failure to do so will result in liquidated damages.

3.02 DEMOLITION

A. Switchboards, panelboards, signaling systems, other electrical equipment free standing (or surface mounted), raceway (exposed) and conductors no longer in service as a result of this Contract shall be removed. Unused raceways or sleeves shall be cut flush at ceiling, floor or wall and filled with grout.

B. At the completion of the project, the end product shall have a finished appearance. All abandoned or temporarily utilized material shall be removed.

3.03 NEW DEVICES IN REMODEL AREAS

A. Provide surface mounting for devices on existing walls. Where existing boxes are indicated to be reused, extend box as necessary and provide new devices and plates.

3.04 EXISTING PANELBOARD

A. Any modifications made to existing panels must be incorporated into the existing circuit index on the panel. If more than three circuits are modified a new typewritten index incorporating the changes to the existing index shall be installed in the existing panel.

B. Listing shall match circuit breaker arrangements, typically with odd numbers on the left and even numbers on the right. Room numbers used shall be final room numbers used in the building as verified with the Owner.

END OF SECTION 260005

SECTION 260010
EXCAVATION AND BACKFILL FOR ELECTRICAL UNDERGROUND UTILITIES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Excavation and Associated Grading

B. Trenching and Trench Protection

C. Backfilling and Compaction

D. Verification of Existing Utilities

E. Protection of Utilities

1.02 RELATED SECTIONS

A. Section 260000 – Electrical General Conditions

B. Section 260533 – Raceways

C. Section 260519 – Wires and Cables

D. Section 265000 – Lighting

E. Section 270000 – Low Voltage System General Requirements

F. Section 272000 – Data and Voice Infrastructure

G. Section 281600 – Intrusion Alarm System

H. Section 283100 – Fire Alarm System

1.03 REFERENCE STANDARDS

A. The publications listed below form a part of this specification to the extent referenced.

B. American Society of Testing and Materials (ASTM) Publications:

1.	D 422-63	Particle Size Analysis of Soils.
2.	D 423-66	Liquid Limit of Soils.
3.	D 424-59	Plastic Limit and Plasticity Index of Soils.
4.	D 1557-78	Moisture Density Relations of Soils using a 10 lb. (4.54kg) Rammer and 18 inches (457 mm) Drop.
5.	D 2167-66	Density of Soil In-Place by the Rubber Balloon Method.
6.	D 2217-66	Wet preparation of Soil Samples for Particle-Size Analysis and Determination of Soil Contents.
7.	D 2487-69	Classification of Soils for Engineering Purposes.
8.	D 2922-81	Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
9.	E 548-79	Generic Criteria for Use in the Evaluation of Testing and Inspection Agencies.

1.04 SUBMITTALS

A. Gravelly Sand Barrow Material

B. Drainage Gravel

C. Special Bedding and Initial Backfill Material

D. O&M Manuals
   1. All Product Data

1.05 PRODUCT DATA

A. The contractor shall include product data identifying compliance with all pertinent items of Part 2 of this specification. All pertinent options shall be identified in the product data submittal. If options have not been identified clearly, the submittal will be rejected.

1.06 QUALITY ASSURANCE

A. Inspection of Job Conditions: Prior to starting work and during work, the installer shall examine the work by others, site and job conditions under which excavation, trenching, and backfilling for underground utilities work will be performed, and notify the General Contractor in writing of unsatisfactory conditions or work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

B. Codes and Standards: Comply with requirements of the following codes and standards (Latest Edition) except as modified herein:
   1. International Conference of Building Officials, "International Building Code".
   2. Local requirements for all utility work.
   3. OSHA and WISHA regulations.
   4. APWA Standard Specifications.
   5. National Electrical Code – NFPA 70.

1.07 RESPONSIBILITY

A. The Contractor is solely responsible for compliance with the requirements of the drawings, specifications, local codes and standards, proper construction coordination with work of other trades, and protection and worker's safety. Contractor shall advise Engineer of any discrepancy in, or disagreement with the specifications and/or drawings prior to starting work and not proceed until issue is resolved. Commencement of work shall indicate Contractor's acknowledgement of his expertise in this type of work. Any delay resulting from failure to comply with this procedure will not be basis for an extension of the completion date.

PART 2 MATERIALS

2.01 SATISFACTORY MATERIALS

A. Materials classified as ASTM D2487, Unified Soil Classification System as SW, SP, GW, and GP are satisfactory for backfill use. Materials classified as SP-SM, GP-GM, GM, GC and ML are also satisfactory for backfill use provided that they contain moisture contents suitable for the intended use and are reasonably free of organic matter. Native material, not considered unsatisfactory as specified below, may comply. Except that no material shall have any object with a dimension exceeding 2 inches and no object shall be sharply angular.

2.02 UNSATISFACTORY MATERIALS

A. Materials classified in ASTM D2487, Unified Soil Classification System as PT, OH, and OL are unsatisfactory. Unsatisfactory materials also include man-made fills, refuse and all materials containing excessive organic matter or having moisture contents which are not suitable for the intended use, or having objects with dimensions exceeding 2 inches (boulders, etc.).

2.03 UNSTABLE MATERIAL

A. Unstable material shall consist of material too wet to properly support the utility conduit or appurtenance structure, and material identified as unsuitable in the National Electrical Code 300-5(F).

2.04 GRAVELLY SAND BORROW MATERIAL

A. Gravelly sand borrow material to provide backfill, or replace unsuitable soil, shall meet the requirements of SW, SP, GW, and GP materials, except that the maximum percentage passing the No. 200 sieve shall not exceed 5% based on the soil fraction passing the U.S. No. 4 sieve, and not contain discrete particles greater than 2 inches in diameter.

2.05 DEGREE OF COMPACTION

A. Degree of compaction shall be expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D1557, Method D. Minimum compaction requirements shall be as specified in PART 3.

2.06 DRAINAGE GRAVEL

A. Shall be 3/4-inch washed gravel with no more than 2% passing 1/2-inch sieve opening.

2.07 SPECIAL BEDDING AND INITIAL BACKFILL MATERIAL

A. Minus 3/8-inch washed pea gravel.

PART 3 EXECUTION

3.01 EXCAVATION

A. If workers enter any trench or other excavation four or more feet in depth that does not meet the open pit requirements of WSDOT Section 2.09.3(3)B, it shall be shored and cribbed. The Contractor alone shall be responsible for worker safety. All trench safety systems shall meet the requirements of the Washington Industrial Safety and Health Act, Chapter 49.17 RCW.

B. Excavation of every description and of whatever substances encountered shall be performed to allow the installation of all utilities at the lines and grades as required. During excavation, material satisfactory for backfilling shall be stockpiled in an orderly manner at a distance from the banks of the trench sufficient to avoid overloading and to prevent slides or cave-ins. Adequate drainage shall be provided for the stockpiles and surrounding areas by means of ditches, dikes, or other approved methods. The stockpiles shall also be protected from contamination with unsatisfactory excavated material or other material that may destroy the quality and fitness of the suitable stockpiled material.

C. If the Contractor fails to protect the stockpiles and any material becomes unsatisfactory as a result, such material shall be removed and replaced with satisfactory on-site or imported material from approved sources at no additional cost to the Owner.

D. Excavated material not required or not satisfactory for backfill shall be removed from the site and shall be disposed of off site, at the Contractor's expense, at the Contractor's waste area. Any excess satisfactory excavated materials shall not be mixed with unsatisfactory materials. Unsatisfactory materials shall not cover available suitable materials, or be disposed of in such a manner as to interfere with subsequent borrow operations.

E. Grading shall be done as may be necessary to prevent surface water from flowing into the excavation, and any water accumulating therein shall be removed so that the stability of the bottom and sides of the excavation is maintained. Unauthorized over-excavation shall be backfilled in accordance with paragraph 3.05 BACKFILLIING at no additional cost to the Owner.

F. The Contractor shall provide dewatering as required for installation of underground work.

3.02 TRENCH EXCAVATION

A. The trench excavation shall meet the requirements of the National Electrical Code and local utility standards.

B. Bottom Preparation: The bottoms of trenches shall be accurately graded to provide uniform bearing and support for the bottom quadrant of each section of the conduit and for bedding. Stones of 2 inches or greater in any dimension, or as recommended by the conduit manufacturer, whichever is smaller, shall be removed to avoid point bearing.

C. Removal of Unsuitable Material: Where unsuitable material is encountered in the bottom of the trench, such material shall be removed to the depth directed and replaced to the proper grade with select granular material as provided in paragraph 3.05 BACKFILLING. When removal of unsuitable material is required due to the fault or neglect of the Contractor in his performance of the work, the resulting material shall be excavated and replaced by the Contractor without additional cost to the Owner.

D. Bedding: The bedding surface for the conduit shall provide a firm foundation of uniform density throughout the entire length of the conduit. The conduit shall be bedded carefully in a soil foundation accurately shaped and rounded to conform to the lowest one-fourth of the outside portion of circular conduit or to the lower curved portion of conduit arch for the entire length of pipe or arch. When necessary, the bedding shall be taped. Provide bedding using pea gravel where noted on the drawings.

3.03 EXCAVATION FOR APPURTENANCES

A. Excavation for manholes, handholes or similar structures below grade shall be sufficient to leave at least 12 inches clear between the outer structure surfaces and the face of the excavation or support members. When concrete or masonry is to be placed in an excavated area, special care shall be taken not to disturb the bottom of the excavation. Excavation to the final grade level shall not be made until just before the concrete or masonry is to be placed.

3.04 JACKING, BORING, AND TUNNELING

A. Unless otherwise indicated, excavation shall be by open cut, except that sections of a trench may be jacked, bored, or tunneled if the raceway, cable or duct can be safely and properly installed and backfill can be properly tamped in such sections.

3.05 BACKFILLING

A. Backfill material shall be compacted to 6" layers and as specified in Paragraph 3.06 - Compaction.
   1. Trench Backfill: Trenches shall be backfilled to finish grade.
   2. Replacement of Unstable Material: Unstable material removed from the bottom of the trench of excavation shall be replaced with select granular material or gravel borrow placed in layers not exceeding 6 inches loose thickness.
   3. Bedding and Initial Backfill: Bedding shall consist of satisfactory materials. Initial backfill shall be in 6-inch lift.

3.06 COMPACTION

A. Each layer of fill, or the excavated subgrade, shall be compacted to at least 95%, per ASTM D1557, of laboratory maximum density. Compaction shall be accomplished by approved tamping rollers, pneumatic-tired rollers, three-wheel power rollers, or other approved compaction equipment.

3.07 PROTECTION

A. Newly graded excavated or bedded areas shall be protected from traffic and from erosion, and any settlement or washing away that may occur from any cause, prior to acceptance, shall be repaired and grades reestablished to the required elevations and slopes.

END OF SECTION 260010

SECTION 260519
WIRES AND CABLES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide all wire, cable, and terminations complete.

1.02 RELATED DOCUMENTS

A. Section 260000 – Electrical General Conditions

B. Section 260532 – Outlet and Pull Boxes

C. Section 260533 – Raceway

1.03 REFERENCE STANDARDS

A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013 (Reapproved 2018).

B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2011 (Reapproved 2017).

C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010, with Editorial Revision (2020).

D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2020).

E. ASTM B800 - Standard Specification for 8000 Series Aluminum Alloy Wire for Electrical Purposes - Annealed and Intermediate Tempers; 2005 (Reapproved 2021).

F. ASTM B801 - Standard Specification for Concentric-Lay-Stranded Conductors of 8000 Series Aluminum Alloy Wire for Subsequent Covering of Insulation; 2018.

G. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2017.

H. ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes; 2013.

I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2021a.

J. FM 3971 - Fire Protective Coatings and Wraps for Grouped Cables; 2019.

K. FS A-A-59544 - Cable and Wire, Electrical (Power, Fixed Installation); Federal Specification; 2008a (Validated 2019).

L. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

M. NECA 104 - Recommended Practice for Installing Aluminum Building Wire and Cable; 2012.

N. NECA 120 - Standard for Installing Armored Cable (AC) and Metal-Clad Cable (MC); 2012.

O. NECA 121 - Standard for Installing Nonmetallic-Sheathed Cable (Type NM-B) and Underground Feeder and Branch-Circuit Cable (Type UF); 2007.

P. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2009.

Q. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.

R. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

S. UL 4 - Armored Cable; Current Edition, Including All Revisions.

T. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.

U. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.

V. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.

W. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.

X. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.

Y. UL 493 - Thermoplastic-Insulated Underground Feeder and Branch-Circuit Cables; Current Edition, Including All Revisions.

Z. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.

AA. UL 854 - Service-Entrance Cables; Current Edition, Including All Revisions.

BB. UL 1569 - Metal-Clad Cables; Current Edition, Including All Revisions.

CC. UL 2277 - Outline of Investigation for Flexible Motor Supply Cable and Wind Turbine Tray Cable; Current Edition, Including All Revisions.

DD. UL 4703 - Standard for Photovoltaic Wire; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data
   1. Copper Wire
   2. Aluminum Wire
   3. Splices and Connections
   4. Cable Tag Type(s)

B. Testing – See Part 3
   1. Megger Test
   2. Torque Certifications

C. O&M Manuals
   1. Megger Test
   2. Torque Certifications

1.05 PRODUCT DATA

A. The contractor shall include product data identifying compliance with all pertinent items of Part 2 of this specification. All pertinent options shall be identified in the product data submittal. If options have not been identified clearly, the submittal will be rejected.

PART 2 PRODUCTS

2.01 WIRE AND CABLE (COPPER, 600-VOLT)

A. Interior and Above Grade: All wires to be Type THW or RHW. Type THWN/THHN or XHHW wire may be utilized at Contractors option, subject to code requirements. Wire and cables shall be brought to project in original containers bearing the underwriters label. Provide Type AVA wire where conductors are subject to temperature above 167 Degrees F.

B. Underground: All conductors to be type USE. Increase Raceway size when necessary to accommodate conductors per code. Exception: Underground conductors completely contained in code recognized Raceway and boxes may be Type THW, THWN or XHHW.

2.02 WIRE AND CABLE (ALUMINUM, 600-VOLT)

A. May be used at Contractor's option (except for ground cable) subject to the following requirements:
   1. Increased size for same current capacity (increased raceway size may be necessary).
   2. No aluminum conductors smaller than #4 AWG shall be used.
   3. Insulation requirements are the same as for copper conductor wires and cables.
   4. Aluminum conductors shall be made of an AA-8000 series electrical grade aluminum alloy conductor material.

2.03 SPLICES

A. Above Grade: Solderless type only. Preinsulated "twist-on" type (limited to size #10 and smaller). Bolt on compression type with application of preformed insulated cover, heat shrinkable tubing or plastic insulated tape acceptable for all sizes.

B. Below Grade: Splices below grade shall be in handholes and shall be made watertight with epoxy resin type splicing kits similar to Scotchcast.

2.04 TERMINATIONS

A. Compression set, bolted or screw terminal.

B. Conductors #12 and smaller shall utilize eye or forked tongue type compression set terminator when termination is to a bolted or screw set type terminal block or terminal cabinet.

2.05 PLASTIC CABLE TIES

A. Nylon or Equivalent, locking type.

2.06 CABLE TAGS

A. Cable tags shall be installed on all three phase feeder cables. Tags shall be embossed with feeder power source and circuit number, i.e., panel A-26. Use tag part No. FT201 for cables up to 1-1/2 inch, use FT-205 for over 1-1/2 inch.

PART 3 EXECUTION

3.01 GENERAL

A. Install all wiring in Raceway unless shown or specifically authorized otherwise.

3.02 WIRE SIZE

A. No. 12 AWG minimum for power and lighting circuits.

B. Provide solid wire for No. 14 AWG and smaller, and stranded conductors for No. 12 AWG and larger (600) volts.

3.03 TESTS

A. In addition to the factory testing of all equipment and cable, the Contractor shall test all wiring connections for continuity and ground before any fixtures or other loads are connected. Tests shall be made with a 500V minimum DC "Megger" type tester. If tests indicate faulty insulation (less than 2 megohms), such defects shall be corrected and tested again. Contractor shall provide all apparatus to make tests and shall bear all expenses of required testing. Routine operation tests shall be made on all pieces of equipment to demonstrate that working parts are in operating condition. Results of all tests shall be recorded and submitted to the Architect. The Contractor shall immediately replace all parts, which fail to pass the test.

B. All circuits both in and out of the building shall test out free of grounds, short circuits and other defects.

C. Check and record catalog number and ampere size of controller overload heaters installed, nameplate full-load amperes, and actual operating amperes of each motor. **IMPORTANT**: Submit recorded data in triplicate to the Engineer. Check proper load balance on the electrical system, direction of rotation, lubrication, and overload protection of all motors before placing in operation.

D. Provide a log of ampere reading for all panels from phase to neutral for 4 wire panels and from phase to phase for 3 wire panels. These readings shall be taken with all loads activated.

E. The final test of all equipment shall be made on dates designated by the Architect/Engineer and all readings shall be made in his presence.

F. Feeders shall be checked to ensure all phases are energized before connecting to their respective motors. Each motor shall rotate in the proper direction for its respective load. Prior to rotation test, all bearings shall be inspected for proper lubrication.

G. Minimum megger test for equipment shall be as follows:

Equipment Maximum Voltage Rating	Minimum Test Resistance
1,000-Volts or less	2 Megohms

H. Provide certification of torque values for feeder and service entrance conductors per equipment manufacturer's recommendation.

3.04 CONDUCTOR SIZES, REFERENCED ON PLANS

A. Copper, type THW or RHW unless noted.

3.05 ALUMINUM CONDUCTORS

A. Aluminum conductors serving switchboards and service entrance rated panelboard shall be terminated using compression type oxide inhibiting compound filled aluminum lugs only.

B. Compression fittings shall be sized for the conductor used and shall be set with a tool, which assures a preset deformation before release.

C. Aluminum lugs, where in contact with copper studs, bolts or bus, shall be plated.

D. Bolted aluminum lugs shall be installed with a Belleville washer under nut unless specifically permitted otherwise.

E. Branch panelboards with bolted pressure lugs shall use aluminum conductors designed to minimize creep; i.e., Stabiloy by ALCAN. Oxide inhibiting joint compound shall be applied to both the conductor and terminal lug. Manufacturer's torque specifications shall be used to prevent creep.

3.06 PULLING

A. Use no mechanical means for pulling No. 8 AWG conductors and smaller. Powdered soap stone or approved spray cream shall be the only lubricant used.

3.07 STRIPPING INSULATION

A. Do not ring the cable, always pare or pencil.

3.08 TAPING

A. If used shall be half lapped synthetic tape.

3.09 CONDUCTORS IN PANELS AND SWITCHBOARDS

A. Conductors in panels, switchboards, and terminal cabinets shall be neatly grouped and formed in a manner to "Fan" into terminals with regular spacing.

3.10 CABLE SUPPORTS

A. Provide conductor support devices as required by code in vertical cable runs.

3.11 RACEWAY SIZES REFERENCED ON DRAWINGS

A. Raceways are sized for copper, type THW, unless otherwise noted. Size all Raceways per code unless specifically noted to be larger on the drawings.

END OF SECTION 260519

SECTION 260526
GROUNDING

PART 1 GENERAL

1.01 WORK INCLUDED

A. A grounding system shall be provided for neutral ground and equipment ground as required by code.

B. An isolated grounding system shall be provided for all isolated ground receptacles as allowed by Code (NEC 250-146, paragraph d).

C. Provide all grounding of other systems as indicated in Divisions 26, 27, and 28.

1.02 RELATED SECTIONS

A. All Division 26 Specifications

B. All Division 27 Specifications

C. All Division 28 Specifications

1.03 REFERENCE STANDARDS

A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System; 2012.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings; 2017.

D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. NFPA 99 - Health Care Facilities Code; 2018.

G. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data
   1. Grounding Conductors
   2. Grounding Appurtenances
      a. Ground Rods
      b. Ground Busses (Electrodes)
   3. Grounding Conductors

B. Test Results
   1. Ground Resistance

C. O&M Manuals
   1. All Product Data and Test Results

1.05 PRODUCT DATA

A. The contractor shall include product data identifying compliance with all pertinent items of Part 2 of this specification. All pertinent options shall be identified in the product data submittal. If options have not been identified clearly, the submittal will be rejected.

1.06 BRANCH CIRCUIT GROUNDING CONDUCTORS

A. This facility is required by NEC 517-11 to be provided with branch circuit ground wires. (Do not provide ground wires in rooms and spaces exempted by NEC 517-30).

PART 2 PRODUCTS

2.01 GROUNDING CONDUCTORS

A. Copper, code size, with physical protection where subject to damage. Bare or green insulated.

2.02 GROUND RODS

A. 3/4" x 8'-0" copper clad steel.

2.03 ISOLATED GROUND BARS

A. Provide in all panels containing isolated ground circuits.

PART 3 EXECUTION

3.01 GENERAL

A. Provide all grounding for electrical systems and equipment as required by codes and as specified herein.

3.02 SIZE OF GROUND WIRE

A. As required by code. Where ground wire is exposed to physical damage or is used outside of the building, protect with conduit.

3.03 GROUND RODS

A. Provide as shown and/or required. Connect the ground conductor to each rod.

3.04 CONCRETE-ENCASED ELECTRODE

A. Provide in accordance with NEC, Article 250.52 (A)(3) and Article 250.68 (C)(3).

3.05 GROUND CONNECTION OF WATER PIPING

A. Metal internal piping shall be grounded, as part of this Contract. This includes jumpers for dielectric fittings.

3.06 CONNECTION TO THE GROUND BUS

A. Provide connections in accordance with the codes; including but not limited to conduit system, switchboard frame, service neutral and electrically operated equipment and devices. No device or equipment shall be connected for electrical service which has a neutral conductor connected to a grounding conductor or to the frame within the device or equipment.

3.07 METHOD OF CONNECTION

A. Make all underground ground connections and ground cable splices by thermal welding. Aboveground ground connections and ground cable splices may be by permanent compression connector. Grounding lugs, where provided as standard Manufacturer's items on equipment furnished, may be used.

3.08 FLEXIBLE RACEWAY

A. Shall not be used for grounding. Install separate ground conductor in all flexible raceway.

3.09 PVC RACEWAY

A. Install separate ground conductor in all PVC raceway as required per code.

3.10 DROP CORDS

A. Shall have a grounding wire and be connected with a grounding type plug and receptacle.

3.11 TESTING REQUIREMENTS (*UTILIZE IF THE SERVICE IS 600 AMPS AND OVER, LIGHTNING PROTECTION IS REQUIRED OR COMM REQUIREMENT)

A. Measure the OHMIC value of the Electric Service Entrance metallic "System Ground" with reference to "Earth Ground" using the "Multiple Ground Rod Fall-In-Potential" method and suitable instruments. Maximum resistance to ground shall be less than
25 ohms. If this resistance cannot be obtained with the ground system shown, notify the Architect immediately for further instructions. Provide OHMIC test results to Engineer.

END OF SECTION 260526

SECTION 260532
OUTLET AND PULL BOXES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide outlet and pull boxes to enclose devices, permit the pulling of conductors and for wire splices and branches.

1.02 RELATED SECTIONS

A. Section 260000 – Electrical General Conditions

B. Section 260519 – Wires and Cables

C. Section 262726 – Switches and Receptacles

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.

C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

D. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.

E. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. SCTE 77 - Specification for Underground Enclosure Integrity; 2017.

H. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

I. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

J. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

K. UL 1203 - Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data
   1. Outlet and Pull Boxes (Interior & Exterior)
   2. Nameplate Types
   3. Sound Attenuation Products

B. O&M Manuals
   1. All Product Data

1.05 PRODUCT DATA

A. The contractor shall include product data identifying compliance with all pertinent items of Part 2 of this specification. All pertinent options shall be identified in the product data submittal. If options have not been identified clearly, the submittal will be rejected.

PART 2 PRODUCTS

2.01 INTERIOR WIRING

A. General: Outlet and pull boxes shall be welded, 4-11/16” square, 3” deep. Provide with extension rings and plaster rings where required to meet the finished surface of the wall and/or ceiling. Large pull boxes shall be fabricated sheet steel, zinc coated or baked enamel finish, with return flange and screw retained cover.

B. Surface Metal Raceway: Boxes of same Manufacture and to match Raceway. Boxes to accommodate standard devices and device plate.

C. Concrete and Masonry: Boxes for casting in concrete or mounting in masonry walls shall be the type specifically designed for that purpose.

D. Install pull boxes so as to be accessible after completion of building construction.

E. Ceiling outlet boxes shall be galvanized octagonal 4 inch, 1-1/2-inch-deep (without fixture stud), 2-1/8 inches deep (with fixture stud).

2.02 EXTERIOR WIRING

A. Above Grade: Outlet and junction boxes shall be cast or malleable iron or shall be cast of corrosion resistant alloy compatible with Raceway to which it is connected. Pull boxes shall be fabricated of heavy gauge steel and hot dipped galvanized. All boxes shall have gasketed covers.
   1. Exterior outlet boxes shall be weather resistant and rain tight, with appropriate covers, gaskets, and screws.

B. Below Grade: Unless otherwise noted or as required by Code, and where exposed to earth, handholes and vaults shall be constructed of precast concrete with base, and shall include lid with galvanized, diamond plate, slip-resistant door with locking hatch. Door shall be spring-assisted with full 180-degree swing, where available, and shall be H-20 rated where installed in traffic areas. Where not exposed to earth, box shall comply with Paragraph 2.02A above. Provide with configuration, cover, grates and reinforcing as required by the particular installation.
   1. For systems rated 600V and under, minimum box size shall be equivalent to H^2 Pre-cast Type 2 junction box.
   2. For systems rated over 600V, minimum box size shall be equivalent to Oldcastle Precast 444LA.

PART 3 EXECUTION

3.01 ANCHORING

A. All boxes shall be firmly anchored directly or with concealed bracing to building studs or joints. Boxes must be so attached so that they will not "Rock" or "Shift" when devices are operated.

3.02 FLUSH MOUNTING

A. Except for surface mounted boxes or boxes above accessible ceilings, all boxes shall have front edge (box or plaster ring) even with the finished surface of the wall or ceiling.

3.03 ELECTRICAL OUTLETS

A. General: Coordinate the work of this section with the work of other sections and trades. Study all Drawings that form a part of this Contract and confer with various trades involved to eliminate conflicts between the work of this section and the work of other trades. Check and verify outlet locations indicated on Architectural Drawings, door swings, installation details, layouts of suspended ceilings and locations of all plumbing, heating and ventilating equipment.

B. Centered on Built-In Work: In the case of doors, cabinets, recessed or similar features, or where outlets are centered between such features, such as between a door jamb and a cabinet, make these outlet locations exact. Relocate any outlets which are located off center.

C. Above Counter: Locate device outlet just above backsplash or 6” above counter if there is no backsplash. Review casework shop drawings prior to final rough-in.

D. Vertical and Horizontal Relationships: Where more than one outlet is shown or specified to be at the same elevation or one above the other, align them exactly on centerlines horizontally or vertically. Relocate as directed all such outlets (including lighting, receptacle, power signal and thermostat outlets) which are not so installed, at no additional cost to Owner.

E. Device Outlet Height: Measure from the finished floor.

*Switches	4 Feet, Set Vertically, to Top of Box
*Receptacles, Telecommunications	18 Inches, Set Vertically to Centerline
Other	As Noted or as Directed by Architect
* *Heights may vary.*	*See Drawings for additional information*

F. Ceiling Location: For acoustical material locate outlet either at the corner joint or in the center of a panel, whichever is closer to the normal spacing. Locate all outlets in the same room in the same panel location.

G. Installed In Sound Walls: Boxes installed in sound walls shall not be installed back-to-back. All boxes shall be separated by one stud space and shall be interconnected with flex conduit with a 90° loop. Where stud space separation is not possible, utilize sound attenuating mastic around each box. 3M Fire Barrier Moldable Putty Pads MPP+ (2.54 mm minimum) or similar.

3.04 ELECTRICAL WORK IN COUNTERBACKS, MILLWORK AND CASEWORK

A. Provide as shown and/or specified. Provide templates, where required, to other trades for drilling and cutting to ensure accurate location of electrical fixtures (outlets and devices) as verified with the Architect. Provide all wiring, devices, plates and connections required by said fixture.

3.05 CONNECTION TO EQUIPMENT

A. For equipment furnished under this or other Divisions of the Specifications, or by others. Provide outlet boxes of sizes and at locations necessary to serve such equipment. An outlet box is required if the equipment has pigtail wires for external connection, does not have space to accommodate circuit wiring used. Study equipment details to assure proper coordination.

3.06 BLANK COVERS

A. Provide blank covers or plates over all boxes not covered by equipment.

3.07 JUNCTION OR PULL BOXES

A. Pull and junction boxes shall be installed as shown, and to facilitate pulling of wire and to limit the number of bends within code requirements. Boxes shall be permanently accessible and shall be placed only at locations approved by the Architect.

B. In suspended ceiling spaces, boxes shall be supported from the structure independently from ceiling suspension system.

C. The Drawings do not necessarily show every pull or Junction Box required. The Contractor is permitted to provide boxes deemed necessary by him for his work when installed in accordance with these Specifications.

3.08 ELECTRIC WATER COOLER

A. Conceal the Electrical Outlet behind the unit housing as provided for by the Manufacturer.

3.09 BOXES CONTAINING MULTIPLE DEVICES

A. Boxes containing emergency and normal devices are permitted only with steel barriers Manufactured especially for the purpose of dividing the box into two completely separate compartments.

B. Device Boxes Containing Multiple Devices and Wiring Rated Over 150 Volts to Ground and Over 300 Volts Between Conductors are permitted only with steel barrier manufactured especially for the purpose of dividing the box into separate compartments for each device having exposed live parts.

3.10 BOXES IN EARTH

A. Provide for all wire splices and as required to pull conductors. Boxes (handholes) shall be set in place on a 3" sand bed. Coverplates shall be flush to, and match the slope of, the final surface grade.

3.11 COLOR CODING

A. All Junction Boxes installed in accessible spaces and exposed in unfinished areas shall be color coded using spray paint or tape on the box and cover as applicable in the following manner:
277/480-Volt ..... Sand
120/208-Volt ..... Gray
Emergency Power ..... Orange
Fire Alarm ..... Red
Clock & Program ..... Green
Intrusion Alarm ..... Yellow
Telephone ..... Dark Blue
Nurse Call ..... Light Blue
Public Address ..... Silver
Television ..... Rust

B. The colors shall match the colors used on the Raceway - See Section 260533.

3.12 NAMEPLATES

A. For all line voltage junction boxes, provide black legible writing indicating panel & circuit numbering of all wiring in junction box.

END OF SECTION 260532

SECTION 260533
RACEWAY

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide Raceway System complete.

1.02 RELATED SECTIONS

A. Section 260000 – Electrical General Conditions

B. Section 260519 – Wires and Cables

C. Section 260532 – Outlet and Pull Boxes

1.03 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2020.

B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S); 2020.

C. ANSI C80.5 - American National Standard for Electrical Rigid Metal Conduit -- Aluminum (ERMC-A); 2020.

D. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit; 2018.

E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

F. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2013.

G. NECA 102 - Standard for Installing Aluminum Rigid Metal Conduit; 2004.

H. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); 2017.

I. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.

J. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2020.

K. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2021.

L. NEMA TC 14 (SERIES) - Reinforced Thermosetting Resin Conduit and Fittings Series; 2015.

M. NEMA TC 14.AG - Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings; 2015.

N. NEMA TC 14.BG - Belowground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings; 2015.

O. NEMA TC 14.XW - Extra Heavy Wall Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings; 2015.

P. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

Q. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.

R. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.

S. UL 6A - Electrical Rigid Metal Conduit-Aluminum, Red Brass, and Stainless Steel; Current Edition, Including All Revisions.

T. UL 360 - Liquid-Tight Flexible Metal Conduit; Current Edition, Including All Revisions.

U. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

V. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.

W. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.

X. UL 651A - Schedule 40 and 80 High Density Polyethylene (HDPE) Conduit; Current Edition, Including All Revisions.

Y. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.

Z. UL 797A - Electrical Metallic Tubing - Aluminum and Stainless Steel; Current Edition, Including All Revisions.

AA. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.

BB. UL 2419 - Outline of Investigation for Electrically Conductive Corrosion Resistant Compounds; Current Edition, Including All Revisions.

CC. UL 2420 - Belowground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings; Current Edition, Including All Revisions.

DD. UL 2515 - Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings; Current Edition, Including All Revisions.

EE. UL 2515A - Standard for Supplemental Requirements for Extra Heavy Wall Reinforced Thermosetting Resin Conduit (RTRC) and Fittings; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data
   1. Raceways
   2. Raceway Fittings
   3. Sealants & Penetrations
   4. Nylon Pull Cord
   5. Spacers & Stand-Offs

B. O&M Manuals
   1. All Product Data

1.05 PRODUCT DATA

A. The contractor shall include product data identifying compliance with all pertinent items of Part 2 of this specification. All pertinent options shall be identified in the product data submittal. If options have not been identified clearly, the submittal will be rejected.

PART 2 PRODUCTS

2.01 GALVANIZED RIGID STEEL CONDUIT (GRS)

A. General: Hot dipped galvanized.

B. Fittings: Galvanized malleable iron or noncorrosive alloy compatible with galvanized conduit. Erickson couplings, watertight split couplings (O.Z. type or equivalent) permitted. Running thread or set screw type fittings not approved.

2.02 INTERMEDIATE METAL CONDUIT (IMC)

A. General: Hot Dipped galvanized.

B. Fittings: Galvanized malleable iron or noncorrosive alloy compatible with galvanized conduit. Erickson couplings, watertight split couplings (O.Z. type or equivalent) permitted. Running thread or set screw type fittings not approved.

2.03 ELECTRICAL METALLIC TUBING (EMT)

A. General: Hot dipped galvanized.

B. Fittings: Raintight; steel or malleable iron type using a split corrugated compression ring and tightening nut or stainless-steel locking disc. Steel set screw fittings are acceptable for dry locations. Indenter, drive-on and pressure cast or die cast type set screw are not acceptable.

2.04 FLEXIBLE METAL CONDUIT (FMC, LFMC)

A. Dry Locations:
   1. General: Galvanized flexible steel for dry locations only.
   2. Fittings: Malleable iron or steel, Thomas and Betts "squeeze" type or equal.

B. Damp and Wet Locations:
   1. Liquid Tight: Polyvinyl chloride (PVC) weatherproof cover over flexible steel conduit.
   2. Fittings: Thomas and Betts "liquid tight" or equal.

2.05 SURFACE METAL RACEWAY

A. Formed steel or aluminum type. Standard factory finish. Where color choice is available, consult Architect/Engineer for selection prior to ordering.

2.06 RIGID NON-METALLIC CONDUIT (PVC)

A. Schedule 40 rigid polyvinyl chloride type unless otherwise noted.

2.07 RIGID ALUMINUM CONDUIT

A. Permitted only in specified locations.

B. Fittings copper free cast aluminum.

2.08 REINFORCED THERMOSETTING RESIN CONDUIT (RTRC)

A. Above Ground:
   1. General: RTRC suitable for above ground locations only. For use in marine and corrosive environments.
   2. Fittings: Compatible with conduit type and suitable for the environment installed.

B. Below Ground:
   1. General: RTRC suitable for underground locations only. For use in marine and corrosive environments.
   2. Fittings: Compatible with conduit type and suitable for the environment installed.

C. Exposed Subject to Extreme Conditions:
   1. General: RTRC which is installed under piers, exposed to extreme conditions, or in areas subject to vandalism shall be extra heavy wall RTRC and suitable for the environment where installed.
   2. Fittings: Compatible with the conduit type and suitable for the environment where installed.

PART 3 EXECUTION

3.01 GENERAL

A. Install Raceway concealed in construction unless noted otherwise on the Drawings or specifically approved in writing by the Architect/Engineer.

B. Cut Raceway ends square, ream and extend maximum distance into all couplings and connectors.

C. Provide and install manufactured end caps on all Raceway ends during construction to prevent the entrance of water or dirt. Tape, as a cover, not permitted.

D. Swab out all Raceways before pulling wires.

E. All elbows for GRS and PVC Raceway shall be factory radius bends. For all other Raceway, use factory radius bends of 1-1/4" and larger diameter.

F. Raceway shall not penetrate sheet metal ducts unless permission is granted by Architect/Engineer. All sleeves shall be provided for Raceway installation.

G. Provide 2 - 3/4" C.O. stub into accessible ceiling space from all recessed panelboards or systems terminal boxes.

H. Minimum size of conduit shall be ¾” in diameter for branch circuit wiring.

3.02 GALVANIZED RIGID STEEL CONDUIT

A. All Connections shall be watertight. Install for all Raceways in concrete or where subject to damage.

3.03 INTERMEDIATE METAL CONDUIT

A. Intermediate metal conduit is permitted as a substitute for galvanized rigid steel conduit except where GRS is required by code.

3.04 ELECTRICAL METALLIC TUBING

A. Install for wiring in masonry, frame construction, furred ceilings and above suspended ceilings. May be used for exposed work in unfinished areas where not subject to damage. Where construction involves masonry work, surface cut masonry units wherever such masonry units are to remain unplastered or uncovered in complete construction.

3.05 RIGID ALUMINUM CONDUIT

A. May be used in lieu of galvanized rigid steel conduit where Raceway is run above grade or inside of buildings; rigid aluminum conduit not permitted where Raceways are encased in or attached to concrete or are below grade.

3.06 RACEWAYS UNDERGROUND

A. Galvanized rigid steel conduit - painted with two coats of bitumastic paint - or galvanized rigid steel conduit with 15 mil. polyvinyl chloride (PVC) jacket (repair abrasions with PVC base paint or PVC).

B. PVC Raceways may be used for underground runs when permitted by code. Field bends, when necessary, shall be formed only with factory recommended heater. Penetrations through floor and walls shall be galvanized rigid steel (GRS) conduit. PVC, if used, shall be increased in size from that shown to include code required ground wire.

C. All underground bends in excess of 10 degrees and all elbows shall be GRS.

D. Arrange and slope Raceways entering building to drain away from building.

E. Ground wires shall be provided in all PVC Raceway.

3.07 INSERTS, SHIELDS AND SLEEVES

A. Furnish and set in place, in advance of pouring slabs and walls, all inserts and sleeves needed to execute Division 26 equipment installation.

B. Where supports in slabs are required after wall has been poured, use a drilled-in threaded insert, installed as recommended by Manufacturer.

C. Sleeves shall be provided for all wall penetrations.

3.08 RACEWAYS THAT STUB UP THROUGH FLOOR

A. Install at such depth that the exposed Raceway is vertical and no curved section of the elbow is visible.

B. PVC Raceway shall not be stubbed through floors.

3.09 SEALING OF RACEWAY PENETRATIONS

A. Exterior Wall Surfaces Above Grade: Seal around all penetrations with caulking approved by Engineer. For concrete construction above ground level, cast Raceway in wall or core drill wall and hard pack with a mixture of equal parts of sand and cement.

B. Exterior Surfaces Below Grade: Cast Raceway into wall (or floor) or use manufactured seal assembly (such as O.Z. type "FSK") cast in place.

C. Roofs: Provide mopped, lead, roof jack where Raceway penetrates roof membrane.

D. Fire Rated Floors, Walls, Ceiling/Roofs: Concrete or masonry, seal around Raceway penetration with Dow Corning 3-6548 silicone RTV foam or approved equal. Plaster or gypsum wallboard, seal around Raceway penetration with plaster, fire tape per local Fire Marshal's requirements.

3.10 SEALING OF RACEWAYS

A. Seal interior of all Raceways which pass through buildings roofs, floors or through outside walls of the building, above or below grade. Seal on the end inside the building using duct sealing mastic, non-hardening compound type, specially designed for such service to maintain the integrity of the seal of the wall, floor or roof. Pack around the wires in the Raceways.

3.11 HANGERS FOR RACEWAYS

A. In suspended ceiling spaces Contractor may, at his option, attach 1/2" or 3/4" EMT Raceways to the ceiling suspension system where such system is structurally suitable on independent wire secured at both ends; in which case, provide clips manufactured for the purpose.

B. When more than two Raceways will use the same routing, group together on a patented channel support system (such as Unistrut).

3.12 SURFACE METAL RACEWAY

A. Install parallel to building surface (i.e., wall, ceiling, floor). Fasten to surface as recommended by Manufacturer. Mount so Raceway is in the least obvious location. Shall be used in lieu of conduit in finished areas.

3.13 FLEXIBLE CONDUIT

A. Flexible conduit shall be used **only** for connection to motors and equipment subject to vibration with 90 degrees loop minimum to allow for isolation and for lay-in fluorescent fixtures above T-Bar ceilings. For fixture installations, one end of flex must terminate in rough-in junction box. Flex conduit shall not be installed over 6' long or used to connect from fixture to fixture. Use liquid tight for pumps, equipment which is regularly washed down, and equipment in damp locations. Provide ground wire.

3.14 COLOR CODING

A. General: Provide color bands of tape or paint one inch (25 mm) wide for Raceways up to two inches (51 mm) in diameter and one-half the Raceway diameter for larger Raceways, applied at panel and pullbox locations within each room, and 50 ft. (15.25 m) on centers within an area.

B. Color Banding:

120/208 Volt	Gray
277/480 Volt	Sand
Clock and Program	Green
Emergency Power	Orange
Fire Alarm	Red
Intrusion Alarm	Yellow
Low Voltage Switching	Black
Nurse Call	Light Blue
Public Address	Silver
Telephone	Dark Blue
Television	Rust

C. The colors shall match the colors used on the boxes - See Section 260532.

3.15 PULL CORDS

A. Nylon type shall be included in all installed empty Raceway.

END OF SECTION 260533

SECTION 260534
METAL CLAD CABLE (TYPE MC) AND FITTINGS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide Metal Clad (Type MC) Cable for power, control and lighting systems.

B. Provide wiring connections and terminations.

1.02 RELATED SECTIONS

A. Section 260000 – Electrical General Conditions

B. Section 260532 – Outlet and Pull Boxes

1.03 REFERENCE STANDARDS

A. UL 1569. Products shall be tested, approved and labeled/listed by Underwriters Laboratories, Inc.

1.04 SUBMITTALS

A. Product Data
   1. AC Cable & Fittings

B. Testing
   1. Megger

C. O&M Manuals
   1. All Product Data

1.05 PRODUCT DATA

A. The contractor shall include product data identifying compliance with all pertinent items of Part 2 of this specification. All pertinent options shall be identified in the product data submittal. If options have not been identified clearly, the submittal will be rejected.

1.06 USES PERMITTED

A. MC Cable is permitted to be used for 20amp lighting and power circuits where routing is above grade, concealed and the installation meets the requirements of NEC 330.

B. MC Cable shall NOT be used for homerun circuits from the fixture, receptacle, or equipment to the panelboard. Hard conduit must be used from the panelboard to the nearest accessible ceiling space to the panelboard.

C. MC Cable shall not be used for HVAC equipment.

PART 2 PRODUCTS

2.01 CABLE ASSEMBLY

A. Metal clad cable assemblies shall consist of 2, 3 or 4 current carrying conductors and an equipment ground conductor.

B. Conductors: Solid Copper conductor, No. 12 AWG minimum or No. 10 AWG maximum. Installation methods shall be as specified under Part 3 - Execution.

C. Insulation: Conductor insulation shall be rated 600-volt, Type THHN, 90°C dry.

D. Fillers: Fillers shall be non-hygroscopic and non-wicking.

E. Binder: Core binder shall be corrugated polyester.

F. Sheath: The metal sheath shall be galvanized steel or aluminum. The metal sheath shall be extruded onto the cable or applied longitudinally, then wrapped and welded. The sheath shall then be corrugated for greater flexibility.

G. Jacketing: When PVC jacketing is required, the jacket shall be flame-retardant PVC with a temperature range of -40°C to 90°C.

H. Equipment Grounding Conductor: The equipment ground wire shall be of the same construction as specified in 2.02.A and 2.02.B and be at a minimum the same size as the current carrying conductors. The insulation color shall be green.

2.02 FITTINGS

A. Fittings shall be UL listed and identified for such use with metal clad continuous corrugated sheath cable, with or without PVC jacketing, as is appropriate for the installation.

B. Connectors shall be of steel or malleable iron and shall be a squeeze type clamp connector with a locknut for non-jacketed metal clad cable. Compression gland type connectors shall be used for jacketed metal clad cable.

PART 3 EXECUTION

3.01 INSTALLATION – POWER AND LIGHTING SYSTEMS WIRING

A. All wiring shall be installed in compliance with the latest version of the National Electrical Code and all other applicable codes and standards as indicated elsewhere in these specifications.

B. Use of metal clad cable shall be permitted only for lighting, equipment and receptacle branch circuits. Metal clad cable shall not be permitted in locations designated to be hazardous Class I, II or III.

C. Metal clad cable shall be permitted only for motor circuits where the motor being served is less than ½ HP and rated for 120V, single phase. Metal clad cable is not permitted for HVAC equipment and controls.

D. Metal clad cable shall only be installed concealed within walls and above ceiling interstitial spaces. Where there is no ceiling interstitial space, metal clad cable may not be used.

E. Metal clad cable shall not be installed between floor levels. Provide hard pipe (i.e., EMT, RGS, IMC) when routing between floors levels.

F. Bends in corrugated sheath metal clad cable shall be made so that the cable will not be damaged. The radius of the curve of the inner edge of any bend shall not be less than seven (7) times the diameter of the metallic sheath.

G. Metal clad cable is not permitted to connect branch circuits to fumehoods, gas storage cabinets, or chemical storage cabinets.

H. No metal clad cable shall be installed in ventilation ducts or plenums.

I. Conductors in Enclosures: Provide neat and workmanlike installation with conductors tied with T&B Ty-Rap, Virginia Plastics, or equal, nylon wire ties in terminal cabinets, gutters and similar locations.

J. MC cable shall only be installed in dry locations.

3.02 FITTINGS

A. Fittings used for connecting metal clad cable to boxes, light fixtures or other equipment shall be UL listed and identified for such use.

B. Cable preparation for installation of fittings shall follow manufacturer’s instructions. The manufacturer’s specialized tools shall be used for preparing cable ends for installation of fittings.

C. The cable end shall be cut square to ensure flush seating of the cable into the fitting. Fitting securement screws shall be properly torqued. Cable ends shall be fitted with insulating bushings intended for the type of metal clad cable being installed.

D. For jacketed metal clad cable, the outer jacket shall be removed to the length specified by the fitting manufacturer’s instructions. Remove oils or solvent by-products from the outer jacket of the cable. The cable end shall be cut square to ensure flush seating of the cable into the fitting. The fitting gland nut shall be properly torqued to the manufacturer’s specifications.

3.03 ARRANGEMENT AND SUPPORT

A. Metal clad cables shall be run parallel with walls or structural elements. Vertical runs shall be plumb; horizontal runs level and parallel with structure, as appropriate. Groups shall be racked together neatly with both straight runs and bends parallel and uniformly spaced.

B. Metal clad cables shall be securely fastened in place at intervals of not more than six feet, with suitable clamps or fasteners of approved type, and all vertical conduits shall be properly supported to present a mechanically rigid and secure installation.

C. Metal clad cable installed parallel to framing members, such as studs, joist, or rafters, shall be supported so that the nearest outside surface of the cable is not less than 1-1/4 inches from the nearest edge of the framing member. Where this distance cannot be maintained, the cable shall be protected by a steel plate, sleeve, or equivalent that is at least 1/16-inch thick.

D. Maintain at least 6-inch clearance between metal clad cables and other piping systems. Maintain 12-inch clearance between metal clad cables and heat sources such as flues, steam pipes, and heating appliances.

E. No metal clad cable shall be fastened to other conduits or pipes or installed so as to prevent the ready removal of other pipes or ducts for repairs.

F. Individual metal clad cables hung from roof structure or structural ceiling shall be supported by split-ring hangers and wrought-iron hanger rods. Where three (3) or more metal clad cables are suspended from the ceiling in parallel runs, use steel channels, Kindorf, Unistrut or equal, hung from 1/2-inch rods to support the conduits. The conduit on these channels shall be held in place with metal clad cable clamps designed for the particular channel that is used.

G. Secure metal clad cable support racks to concrete walls and ceilings by means of cast-in-place anchors; die-cast, rustproof alloy expansion shields; or cast flush anchors. Wooden plugs, plastic inserts, or gunpowder driven inserts shall not be used as a base to secure conduit supports.

H. Metal clad cable shall be supported immediately on each side of a bend and not more that one (1) foot from an enclosure where a run of metal clad cable ends.

I. Use of Cable Tray:
   1. The sum of the cross-sectional areas of all cables shall not exceed the maximum allowable cable fill area allowed by NEC Tables 392.9, 392.9(E) and 392.9(F).
   2. Cables shall be installed in a single layer with a maintained spacing of not less than one cable diameter between cables.
   3. Ampacity of cables installed in cable tray shall meet the requirements of NEC 392.11.

3.04 INSPECTION AND TESTS

A. General: The electrical installation shall be inspected and tested to ensure safety to building occupants and operating personnel and conformity to Code

B. Measure and record insulation resistance of all power and control wiring including insulation resistance of all equipment:
   1. The insulation resistance of each circuit phase-to-phase and phase-to-ground shall be measured. For circuits rated less than 600 volts, the resistance shall not be less than 2 megohms.
   2. Systems rated above 240 volts shall be tested with a 1000-volt Megohmeter. Circuits rated 240 volts and below shall be tested with a 500-volt Megohmeter. The D.C. potential shall be applied for thirty (30) seconds.

C. The contractor shall record test readings and submit certified test to the Engineer for review and acceptance approval before energizing respective circuits.

END OF SECTION 260534

SECTION 260536
CABLE TRAY

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide Cable Tray System complete.

1.02 RELATED SECTIONS

A. Section 260000 – Electrical General Conditions

B. Section 260526 – Grounding

C. Section 270528 – Pathways for Communications Systems

1.03 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.

C. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; 2020.

D. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2019.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2021a.

F. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

G. NEMA VE 1 - Metal Cable Tray Systems; 2017.

H. NEMA VE 2 - Cable Tray Installation Guidelines; 2018.

I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

A. Product Data
   1. Cable Tray
   2. Cable Tray Fittings
   3. Cable Tray Supports

B. Shop Drawings
   1. Cable Tray
   2. Cable Tray Fittings
   3. Cable Tray Supports
   4. Cable Tray Grounding

C. O&M Manuals
   1. All Product Data

1.05 PRODUCT DATA

A. The contractor shall include product data identifying compliance with all pertinent items of Part 2 of this specification. All pertinent options shall be identified in the product data submittal. If options have not been identified clearly, the submittal will be rejected.

1.06 SHOP DRAWINGS

A. The contractor shall provide equipment dimension drawings for cable tray, cable tray fittings, and cable tray supports.

B. The contractor shall provide manufacturers recommended details for properly grounding cable trays for a continuously grounded cable tray system.

PART 2 PRODUCTS

2.01 PRODUCT NAME

A. Flextray Cable Management System or approved equal. Approved flexible site configurable wire mesh basket tray – 5mm minimum wire gauge thickness.

2.02 MANUFACTURER

A. GS Metals Corp. Manufacturer must have US production facilities; tray must be produced and finished in the United States with full domestic content.

B. Tray specified shall be UL classified and listed. Tray shall have T-weld on top rail in order to avoid sharp surfaces or protrusions on tray surface.

2.03 CABLE MANAGEMENT SYSTEM

A. Product Description: Tray must be a welded wire mesh cable management system. The open mesh permits easy access to the tray and provides continuous ventilation of cables installed in the tray. A continuous ground conductor fixing system shall be accomplished by the use of approved splices and bonding jumper or a continuous rigid welded steel wire mesh cable management system. Continuous safety edge wire shall be welded to the top of tray. Wire mesh shall be welded at all intersections.

B. Composition & Materials:
   1. Cable tray shall be produced from high mechanical strength steel wire, which is first welded into a net, then formed into channels to carry the cables. Covers and inserts shall be available to protect cables. There shall be a minimum of (5) five splicing options to effectively connect trays end to end.

C. Mesh size shall be 2” x 4”. The channel depth shall be 4” and the width 12”.

D. Cable tray supports shall be wall mounted and support the cable tray from below to allow full access to the cable tray from above. Optionally, the contractor may support the cable tray using another method with approval from the engineer. Cable tray supports shall be designed to accommodate the weight of the cable tray at 100% cable fill.

PART 3 EXECUTION

3.01 GENERAL

A. Install cable tray in configuration as indicated on the drawings.

B. Connect all tray sections together with approved splicing methods suggested by the manufacturer to maintain an effective ground bond.

C. Cable tray supports shall be wall mounted and support the cable tray system from below to allow full access to the cable tray from above. Optionally, the contractor may support the cable tray using another method with approval from the engineer. Cable tray supports shall be designed to accommodate the weight of the cable tray at 100% cable fill.

D. Install cable tray at a minimum height of 6” above the ceiling tile.

E. Maintain a 12” clearance above the cable tray, free from all obstructions.

F. Cable tray shall be installed at the same elevation, unless obvious obstructions prevent this.

G. Where cable tray is indicated to pass through a wall, the Contractor shall stop the tray on either side of the wall and provide sleeves through the wall. The sleeves shall be sized to accommodate the fill area and capacity of the cable tray.

H. Cable tray shall be bonded to all conduit sleeves and data racks.

END OF SECTION 260536

SECTION 260539
FLOOR OUTLET DEVICES – FLUSH

PART 1 GENERAL

1.01 WORK INCLUDED

A. The floor box provides the interface between power and communication cabling in an on grade or above grade concrete floor where power and/or communication services are required.

1.02 RELATED SECTIONS

A. Section 260000 – Electrical General Conditions

1.03 SUBMITTALS

A. Product Data: provide catalog cuts of specified floor boxes and accessories upon request.

B. The manufacture's catalog numbers specified represent the minimum standard required. If product alternate manufactures are selected from the approved manufacture list, they must be equal to or exceed the standards and quality criteria set forth by listed Hubbell Inc. catalog numbers. Alternative manufactures must submit catalog cuts and samples for approval 10 days prior to bid date.

C. In general, all floor boxes shall be of size and type indicated on drawings herein specified. All floor boxes shall be located as directed by architect or as dimensioned on the architectural drawings. If drawings are not dimensioned, coordinate exact location prior to rough-in.

D. O&M Manuals

1.04 CLASSIFICATION AND USE

A. Floor boxes, covers, above floor fittings and accessories shall be of same manufacturer and be designed, manufactured, tested and installed to comply with UL514A, UL514C and NCE/NFPA 370-17(b), covers are suitable for tile, terrazzo, wood, and carpet covered floors.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Following are acceptable:
   1. Hubbell Inc. Wiring Device-Kellems or approved equal.

2.02 MATERIALS

A. Stamped Steel – For Installation Above Grade:
   1. Concealed 4-gang Capacity Deep Floor Box – Carpet or Tile Floor Applications:
      a. The recessed floor box shall allow for the activation of power, data and communication in a single box. All connections shall be made below the surface of the floor, recessed inside the box. When the box is in use, only the cords exiting the unit will be visible. The depth of the box shall be 4", with total dimensions of 10" square. Conduit connections shall be made through knockouts sized ½", ¾", 1", 1¼". Four individual wiring chambers shall include barriers to provide separation between power and low voltage conductors. Internal chamber plugs allow for various wire routing methods. Four #12 A.W.G. green grounding lead wire assemblies are included to assure a proper grounding path. The deep floor box shall be exterior coated with fusion bonded epoxy paint for on grade use. Covers with no flange for tile floor applications must be available. Non-metallic service plates must be furnished separately to enclose each of four individual wiring chambers. When installed, these plates will enclose four wiring chambers. Service plate options include blank, duplex, Style Line and 20A single Twist-Lock receptacle openings. Provide appropriate plates and blank plates for application.

2.03 MATERIALS – COVERS

A. Covers for Concealed Large Capacity Stamped Steel*:* Cover/flange assemblies re-enforced with metal cover plate shall be mounted to the box previously mentioned. Cover shall be made of die-cast aluminum. Flanges and cable doors shall be made of thermoplastic (ABS) or die-cast aluminum. The die-cast aluminum covers shall be brushed aluminum. All covers shall be UL listed for either tile floors or carpet floors. A die-cast aluminum cover shall also be available with no flange and a solid surface (no-insert required) for tile floor applications. This cover shall be hinged to allow for access to connections inside the box. When the box is in use, cable(s) will exit through two cable doors located on opposite ends of the cover. When the box is not in use, the cover will lay flush with the floor. This cover is 180 degrees reversible and will accept a carpet insert.

1. ScrubShield gasketing technology and pass 2003 UL 514A scrub-water exclusion test requirements for carpet applications.

PART 3 EXECUTION

3.01 GENERAL

A. Cast metal watertight floor boxes shall be used in slabs, on grade level or below.

B. Steel concrete tight floor boxes shall be used in slabs above grade level.

C. After positioning the box, conduit is installed in accordance with local codes.

D. Box shall be secured and pre-pour adjustments made.

E. Grease shall be applied to outside of cement cover and exposed portion of adjustable collar.

F. Cover shall be duct taped prior to pour.

G. Locate boxes after pour and cement cover shall be removed.

H. Wires shall be pulled and receptacles installed per local and national codes.

I. Provide all service plates required to complete installation to include required plates for receptacles, low voltage devices and blank plates.

J. Coordinate cover orientation with architect prior to installation.

END OF SECTION 260539

SECTION 260573
ELECTRICAL SYSTEM STUDIES

PART 1 GENERAL

1.01 WORK INCLUDED

A. This section includes the requirements for the contractor to perform electrical system studies based on the selected electrical equipment.

B. The required studies include but are not limited to a Coordination Study and an Arc Flash Assessment Study.

C. Each of the studies performed shall be based on the actual equipment to be installed. Any revisions of the selected equipment shall result in an updated study with the revised equipment submitted for review and approval prior to ordering equipment.

D. If the contractor installs different equipment than was included in the approved electrical system studies, the owner reserves the right to require the contractor to replace the non-approved electrical equipment at no additional cost to the owner.

E. The contractor shall provide all studies in agreement with all applicable codes and standards. If a specific code is applicable to the electrical system being modeled, the code shall be referenced and the portion of the electrical system impacted shall be noted.

1.02 RELATED SECTIONS

A. Conform to the General Conditions, Supplementary Conditions, and related work in other Divisions for all work in Division 26. See Division 01 for sequence of work.

B. Section 260000 – Electrical General Conditions

C. Section 262413 – Switchboards

D. Section 262416 – Panelboards

E. Section 262419 – Motor Controllers

F. Section 262813 – Fuses

G. Section 262816 – Disconnects and Fused Switches

H. reference standards

I. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2011 (Reaffirmed 2017).

J. IEEE 141 - IEEE Recommended Practice for Electrical Power Distribution for Industrial Plants; 1993 (Reaffirmed 1999).

K. IEEE 242 - IEEE Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems; 2001, with Errata (2003).

L. IEEE 399 - IEEE Recommended Practice for Industrial and Commercial Power Systems Analysis; 1997.

M. IEEE 551 - IEEE Recommended Practice for Calculating Short-Circuit Currents in Industrial and Commercial Power Systems; 2006.

N. IEEE 1584 - IEEE Guide for Performing Arc-Flash Hazard Calculations; 2018, with Errata (2019).

O. NEMA MG 1 - Motors and Generators; 2018.

P. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.

Q. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

R. NFPA 70E - Standard for Electrical Safety in the Workplace; 2021.

1.03 SUBMITTALS

A. Qualifications
   1. Contractor Qualifications

B. Report
   1. Overcurrent Protective Device Coordination Study – To be submitted with associated electrical equipment product data submittals prior to ordering equipment.
   2. Arc Flash Assessment Study – To be submitted a minimum of two months prior to electrical inspection with the intent that label installation can occur prior to final electrical inspection by the AHJ.

C. O&M Manuals
   1. Qualifications
   2. Arc Flash Assessment Study
   3. Digital Copy of Arc Flash Assessment Study (PDF)
   4. Electrical System Model (Native Format)
   5. Test Results

1.04 QUALIFICATIONS

A. All Studies shall be prepared by a qualified professional electrical engineer who is independent of the equipment manufacturer.

1.05 REPORTS

A. During the Shop Drawing process and prior to ordering electrical equipment, the contractor shall submit an **Electrical System Overcurrent Protective Device Coordination Study**. The Coordination study shall be submitted with the product data for all devices included in the coordination study and shall be formatted as indicated in Paragraph 2.01.

B. After the electrical system has been installed and is ready for energization, the Contractor shall provide an **Arc Flash Assessment Study**. The Arc Flash Assessment shall be submitted for approval prior to substantial completion. Once the Arc Flash Assessment Study is approved, the Contractor shall print and install the approved Arc Flash notification labels on all equipment containing overcurrent protective devices. Labels installed outdoors shall be suitable for outdoor installation. The Arc Flash Assessment Study shall be assembled as outlined in Paragraph 2.02.

C. The contractor shall provide to the owner the following information to be included in the Operation and Maintenance Manual:
   1. Final Arc Flash Assessment Study submitted in accordance with the requirements outlined in Specification 260000 Electrical General Conditions.
   2. The electronic copy shall also include a sub-folder with the software model used to perform the calculations. The model shall include all files necessary to access and review the model electronically. The Contractor shall include a Text File in the directory labeled “MODEL_INFORMATION.TXT” which includes the following:
      a. Project Name
      b. Electrical Contractor Name
      c. Software used to model the system including version
      d. Date the model was last updated
      e. Contact information for the individual/organization who prepared the model.

1.06 DEFINITIONS

A. For the purposes of this section, the following definitions shall apply:
   1. Coordinated: Full coordination outside of the instantaneous region of the overcurrent devices.
   2. Selectively Coordinated: Full coordination including the instantaneous region of the overcurrent devices.
   3. Instantaneous Region: Operating time during a fault of several milliseconds or less
   4. Short Time Region: Operating time during a fault from tenths of a second to several seconds. Region between the instantaneous and long time regions.
   5. Long Time Region: Operating time during a fault of minutes to hours.

PART 2 PRODUCTS

2.01 PROTECTIVE DEVICE COORDINATION STUDY

A. Protective Device Coordination Study shall be provided showing how overcurrent devices coordinate in the electrical distribution system. A Coordination Study shall be provided with the Product Data submittals for equipment containing overcurrent protective devices to ensure overcurrent devices are properly coordinated prior to ordering equipment and after the equipment has been installed to provide settings and Arc Flash Labels for all electrical equipment as recommended by the National Electrical Safety Code.

B. The contractor shall submit an Electrical System Overcurrent Protective Device Coordination Study during the Shop Drawing submittal phase of the project prior to ordering equipment with overcurrent protective devices. The Coordination study shall be submitted with the product data for all devices included in the coordination study. For modifications/additions to existing electrical systems, at a minimum the Coordination Study at this phase shall include:
   1. All new electrical equipment containing overcurrent devices
   2. The existing overcurrent protective devices immediately downstream of the new electrical equipment
   3. All existing overcurrent protective devices upstream of the new electrical equipment to the main electrical utility service entrance.

C. The contractor shall submit an Electrical System Overcurrent Protective Device Coordination Study during the Arc Flash Assessment Study phase of the project which includes all electrical equipment which will be provided with an Arc Flash Label.

D. All overcurrent protection devices shall be provided as a coordinated system by the manufacturer. Any cases where the selected manufacturer is unable to coordinate two overcurrent devices in series due to the sizes indicated in the design, the engineer shall be notified and a recommended coordination solution provided by the manufacturer prior to or during the submittal phase. For overcurrent protection devices 400A and larger where the manufacturer is unable to provide a coordinated system, the overcurrent protection devices shall include Long-Time/Short-Time/Instantaneous (LSI) time delay and ampacity settings minimum.

E. Unless noted otherwise, when a main service overcurrent device with adjustable Ground Fault trip has been specified, the next level feeder overcurrent devices shall also include adjustable Ground Fault trip. The Coordination Study shall also provide recommended settings for all adjustable Ground Fault trip devices.

F. All emergency system overcurrent protection devices shall be selectively coordinated as defined by applicable codes and standards (2017 NEC 700.32 and WAC 296-46B-700). The scope of the selectively coordinated system shall be as defined by applicable local, state, and federal codes.

G. The Protective Device Coordination Study shall present the following information in an organized report:
   1. Coordination Study Title Page shall include:
      a. Project Name
      b. Electrical Contractor name
      c. Date Study was performed
      d. Study Type (ie Overcurrent Device Coordination Study)
      e. Name/Company/Contact information for organization performing the study
      f. Analysis software used to perform the study including version
   2. Coordination Study Executive Summary shall include a brief project description, an overall description of the electrical system, and a listing of any items that may need resolution. If specific Code requirements exist for any portion of the electrical system, they shall be noted in addition to how the requirement was implemented.

3. Coordination Study Analysis shall include a detailed outline of the overcurrent device coordination analysis. Time Current Curves shall be provided for each unique coordination path in the electrical system from the Main service protective device to the largest branch circuit breaker. Each Time Current Curve shall be uniquely labeled. The report shall include a list of the overcurrent devices included in each Time Current Curve and a description of any potential un-coordinated devices with the potential impact on the electrical system due to the lack of coordination.
4. Conclusion shall include a summary of overall protective device coordination for the electrical system being modeled. The Conclusion shall also include a table listing all devices with adjustable settings and the recommended settings based on the coordination study. Any uncoordinated electrical devices that include recommended revisions shall be listed with the proposed system revision.
5. As an Appendix, the Coordination Study shall include a one-line diagram of the modeled system with each bus and overcurrent device identified. The naming of the devices in the one-line diagram shall exactly match the device names in the report and time-current curves.

2.02 ARC FLASH ASSESSMENT STUDY

A. After the electrical system has been installed and is ready for energization, the Contractor shall provide an Arc Flash Assessment Study. The Arc Flash Assessment Study shall be submitted for approval prior to substantial completion. Once the Arc Flash Assessment Study is approved, the Contractor shall print and install the approved Arc Flash notification labels on [all] [new] equipment containing overcurrent protective devices.

B. The Arc Flash Assessment Study shall include the following at a minimum:
   1. Study Title Page shall include the following information
      a. Project Name
      b. Date Study was performed
      c. Name/Company/Contact information for organization performing the study
      d. Analysis software used to perform the study including version
   2. An Index shall be provided listing each Section included in the Arc Flash Assessment Report.
   3. Study Executive Summary shall a brief overview of each section of the Study including any recommended revisions to the electrical system based on the results of the Study. The overview shall include at a minimum, any pieces of equipment with a calculated fault current that exceeds the equipment rating, a listing of any overcurrent devices with revised settings, a brief listing of un-coordinated equipment that necessitate revisions, and a listing of each piece of equipment with a Dangerous level of Arc Flash energy.

C. Each of the following sections and appendices shall include a dedicated Cover Page outlining the contents of the Section.

D. Section #1 Fault Analysis shall include an updated Fault Current Analysis of the [entire] [revised] electrical system. The Fault Analysis shall include as a minimum the following information:
   1. The available fault current at the Utility for the fault analysis shall be based on the actual Utility fault current and not an assumption. For electrical distribution systems that are primary metered, the study shall include the primary electrical system back to the point of service including but not limited to actual cable lengths/sizes/types and any overcurrent protective devices. The study shall include correspondence from the utility showing the available fault current at the utility service point in the appendices.
   2. Updated cable size/type/length shall be included in the report based on the installed conditions.
   3. Updated transformer information based on the installed transformer nameplates
   4. Current limiting fuses shall be indicated where applicable based on the actual equipment installed.
   5. Large motors (>50hp) shall be included in the analysis. Smaller motors shall be grouped together at each panel/switchboard.

6. A Table shall be provided with a comparison of calculated fault current to equipment fault rating for each piece of equipment containing overcurrent protective devices. The calculated fault current shall be adjusted as necessary based on the calculated X/R ratio.
7. Any equipment that is found to have a rating less than the calculated/adjusted fault current shall be specifically indicated along with recommended corrective action.
8. The Fault Analysis shall include the system model one-line diagram with the following information indicated:
    a. Utility connection point with available fault current and X/R ratio.
    b. Cables with conductor size, length, parallel count, raceway type.
    c. Transformers with impedance, kva, X/R ratio.
    d. Large motors (>50hp). Smaller motors shall be grouped together at each panel/switchboard.
    e. Electrical equipment with overcurrent protective devices showing calculated fault current.

E. Section #2 Protective Device Coordination Study shall include an updated Coordination Study for the [entire] [revised] distribution system as outlined in Paragraph 2.01. The updated coordination study shall optimize settings to provide coordination while reducing the Arc Flash energy present.

F. Section #3 Arc Flash Assessment Study shall analyze the [entire] [revised] electrical distribution system to determine the incident energy and recommendations for safety at electrical equipment as recommended by the National Electrical Safety Code. The Arc Flash Assessment Study shall include a description of the method used to calculate the Arc Flash energy present and the assumptions of the study. The following additional items shall be included in the study as a minimum:
    1. Table summarizing the Arc flash energy present at each pieces of equipment and the conditions under which the incident energy occurred. The table shall also include the arcing time, fault current, upstream overcurrent device, and any notes for different conditions present.
    2. A template Arc Flash label with each piece of information included on the label explained.
    3. Sample Arc Flash Labels for each piece of equipment in the model showing the code required information.

G. Appendix A shall include that correspondence from the electric utility providing the available fault current used in the analysis.

H. Appendix B shall include cut sheets for all electrical equipment included in the Arc Flash Assessment study.

PART 3 EXECUTION

3.01 TESTING/VERIFICATION

A. The contractor shall implement the settings revisions indicated in the Arc Flash Assessment Study and provide testing of each piece of electrical equipment with adjustable overcurrent protective devices to verify proper operation in accordance with the manufacturer’s recommendations. The test reports shall indicate the following at a minimum:
    1. Equipment name.
    2. Date of the test.
    3. Name and organization of the individual performing the testing
    4. Test results. Any equipment failing the testing shall be replaced at no additional cost to the owner.
    5. As-Left settings. These settings shall be as indicated in the Arc Flash Assessment Study. Any settings that vary from the Study shall be either updated in the Study including a revised submittal package or shall be corrected in the field and an updated test report provided.

3.02 FIELD APPLIED ARC FLASH LABELS

A. After the Arc Flash Assessment Study is approved, the recommended settings have been implemented, and the electrical equipment has been successfully tested, the Contractor shall provide Arc Flash and Shock Hazard warning labels on all electrical devices containing overcurrent protection stating the following information at a minimum:
    1. PPE level of protection

2. Incident energy (cal/cm^2) at 24” from switchboards and 18” for all other electrical equipment unless specified otherwise by the Owner/Engineer
3. Flash hazard boundary
4. Glove class
5. Limited approach distance
6. Restricted approach distance
7. Prohibited approach distance

B. Labels shall be permanently affixed to the equipment or wiring method and shall not be hand written.

C. The label shall be of sufficient durability to withstand the installed environment. Labels installed outdoors shall be suitable for outdoor installation with no degradation due to sun light or precipitation.

D. The label shall meet ANSI Z535 guidelines and requirements.

END OF SECTION 260573

SECTION 260924
NETWORKED LOW VOLTAGE LIGHTING CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Single space wireless lighting control systems and associated components:
   1. Wireless occupancy/vacancy sensors.
   2. Wireless daylight sensors.
   3. Wired load control modules with wireless communication inputs.
      a. Includes fixture control modules with wired occupancy/vacancy/daylight sensors.
   4. Wired receptacles with wireless communication inputs.
   5. Wireless fixture control components factory-installed in luminaires not specified in this section.
   6. Wired wall dimmers and switches with wireless communication inputs.
   7. Wired wallbox occupancy sensors with wireless communication inputs.
   8. Wireless control stations.
   9. LED Drivers.
   10. Power interfaces.
   11. Digital dimming ballast modules.

B. Wireless hub(s) for centralized control, monitoring, and system integration.

C. Software data and analytics dashboard, including server requirements.

1.02 RELATED REQUIREMENTS

A. Section **230900**: Building Energy Management Control system, for interface with lighting control system.

B. Section **26*2726 – Switches & Receptacles***:

C. Finish requirements for wall controls specified in this section.

D. Accessory receptacles and wallplates, to match lighting controls specified in this section.

E. Section **26*5000 - Lighting***

1.03 REFERENCE STANDARDS

A. 47 CFR 15 - Radio Frequency Devices; current edition.

B. ANSI C82.11 - American National Standard for Lamp Ballasts - High Frequency Fluorescent Lamp Ballasts - Supplements; 2011.

C. ANSI/ESD S20.20 - Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding Electrically Initiated Explosive Devices); 2014.

D. ASTM D4674 - Standard Practice for Accelerated Testing for Color Stability of Plastics Exposed to Indoor Office Environments; 2002a (Reapproved 2010).

E. CAL TITLE 24 P6 – California Code of Regulations, Title 24, Part 6 (California Energy Code); 2013.

F. CSA C22.2 No. 223 – Power Supplies with Extra-low-voltage Class 2 Outputs; 2015.

G. IEC 60929 - AC and/or DC-Supplied Electronic Control Gear for Tubular Fluorescent Lamps - Performance Requirements; 2015.

H. IEC 61000-4-2 - Electromagnetic Compatibility (EMC) - Part 4-2: Testing and Measurement Techniques - Electrostatic Discharge Immunity Test; 2008.

I. IEC 61347-2-3 - Lamp Control Gear - Part 2-3: Particular Requirements for A.C. and/or D.C. Supplied Electronic Control Gear for Fluorescent Lamps; 2011, with Amendments, 2016.

J. IEEE 1789 - Recommended Practice for Modulating Current in High-Brightness LEDs for Mitigating Health Risks to Viewers; 2015.

K. IEEE C62.41.2 - Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (Cor 1, 2012).

L. ISO 9001 - Quality Management Systems-Requirements; 2008.

M. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

N. NECA 130 - Standard for Installing and Maintaining Wiring Devices; National Electrical Contractors Association; 2010.

O. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; National Electrical Manufacturers Association; 2015.

P. NEMA SSL 7A – Phase Cut Dimming for Solid State Lighting: Basic Compatibility; National Electrical Manufacturers Association; 2015.

Q. NEMA WD 1 - General Color Requirements for Wiring Devices; National Electrical Manufacturers Association; 1999 (R 2015).

R. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

S. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.

T. UL 508 - Industrial Control Equipment; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

U. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.

V. UL 935 - Fluorescent-Lamp Ballasts; Current Edition, Including All Revisions.

W. UL 1310 – Class 2 Power Units; Current Edition, Including All Revisions.

X. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.

Y. UL 1598C - Light-Emitting Diode (LED) Retrofit Luminaire Conversion Kits; Current Edition, Including All Revisions.

Z. UL 2043 - Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces; Current Edition, Including All Revisions.

AA. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the placement of sensors and wall controls with millwork, furniture, equipment, etc.
   2. Coordinate the placement of wall controls with actual installed door swings.
   3. Coordinate the placement of daylight sensors with windows, skylights, and luminaires to achieve optimum operation. Coordinate placement with ductwork, piping, equipment, or other potential obstructions to light level measurement installed under other sections or by others.
   4. Coordinate the work to provide luminaires and lamps compatible with the lighting controls to be installed.
   5. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

B. Pre-Wire Meeting***;*** Include **as part of the base bid the** additional costs for Lighting Control Manufacturer to conduct on-site meeting prior to commencing work. Manufacturer to review with installer:
   1. Low voltage wiring requirements.
   2. Separation of power and low voltage/data wiring.
   3. Wire labeling.
   4. Wireless hub locations and installation.
   5. Lighting Control Manufacturer Sensor Layout and Tuning service may be specified in Part 2 under "LIGHTING CONTROLS - GENERAL REQUIREMENTS".
   6. Where Lighting Control Manufacturer Sensor Layout and Tuning service is specified in Part 2 under "LIGHTING CONTROLS - GENERAL REQUIREMENTS", sensor locations to be reviewed in accordance with layout provided by Lighting Control Manufacturer. Lighting

Control Manufacturer may direct Contractor regarding sensor relocation should conditions require a deviation from locations indicated.

7. Control locations.
8. Computer jack locations.
9. Load circuit wiring.
10. Network wiring requirements.
11. Connections to other equipment.
12. Installer responsibilities.

C. Sequencing:
   1. Do not install sensors and wall controls until final surface finishes **and painting** are complete.

1.05 SUBMITTALS

A. See Section **260000** ***Electrical General Conditions*** for submittal procedures.

B. Lighting Control Manufacturer Sensor Layout and Tuning service may be specified in Part 2 under "LIGHTING CONTROLS - GENERAL REQUIREMENTS".

C. Design Documents: Where Lighting Control Manufacturer Sensor Layout and Tuning service is specified in Part 2 under "LIGHTING CONTROLS - GENERAL REQUIREMENTS", Lighting Control Manufacturer to provide plans indicating occupancy/vacancy and/or daylight sensor locations.

D. Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.
   1. Occupancy/Vacancy Sensors: Include detailed basic motion detection coverage range diagrams.
   2. Wall Dimmers: Include derating information for ganged multiple devices.

E. Manufacturer's Installation Instructions: Include application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

F. Use the following paragraph to specify system performance-verification documentation at an additional cost (requires On-Site Full-Scope Start-Up Service to be specified under “FIELD QUALITY CONTROL” in Part 3). System Performance-Verification Documentation is often required for LEED projects, projects which involve a commissioning agent, or Title 24 (California) projects. Edit the second choice to have this additional cost included as an alternate or as part of the base bid.

G. This documentation will be completed by a Lutron Services Company Representative during the startup of the Lutron lighting control system. This documentation defines the functional test procedures to be used and the results of the onsite testing of the Lutron equipment. A copy of this documentation will be delivered after startup completion.

H. System Performance-Verification Documentation***;*** Include **as part of the base bid** additional costs for manufacturer's enhanced documentation detailing start-up performance-verification procedures and functional tests performed along with test results.

I. Include the following paragraph if lighting control acceptance testing required by California Title 24, Part 6 (California Energy Code) is specified in Part 3 under "COMMISSIONING".

J. Project Record Documents: Record actual installed locations and settings for lighting control system components.

K. Operation and Maintenance Data: Include detailed information on lighting control system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.

L. Warranty: Submit sample of manufacturer's Warranty or Enhanced Warranty as specified in Part 1 under “WARRANTY”. Submit documentation of final executed warranty completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications:
   1. With the proliferation of wireless devices, experience working with RF controls is critical to understanding good design for reliability.
   2. Company with not less than ten years of experience manufacturing lighting control products using wireless communication between devices.
   3. Registered to ISO 9001, including in-house engineering for product design activities.
   4. If there is a problem on the job site, the manufacturer must be reachable 24 hours per day, 7 days per week to resolve any lighting control issues. If this service is not provided, project cost overruns and delays can occur. Additionally, answering services can add to frustration and delays.
   5. Provides factory direct technical support hotline available 24 hours per day, 7 days per week.
   6. Qualified to supply specified products and to honor claims against product presented in accordance with warranty.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store products in a clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

1.08 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

A. Manufacturer's Standard Warranty, Without Manufacturer Full-Scope Start-Up:
   1. Manufacturer Lighting Control System Components, Except Wireless Sensors, Ballasts/Drivers and Ballast Modules: One year 100 percent parts coverage, no manufacturer labor coverage.
   2. Wireless Sensors: Five years 100 percent parts coverage, no manufacturer labor coverage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Lutron Vive

B. Acuity nLight AIR

C. Substitutions:
   1. No other Manufacturers are allowed.

D. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

2.02 LIGHTING CONTROLS - GENERAL REQUIREMENTS

A. Sensor Layout and Tuning: Include **as part of the base bid** additional costs for Lighting Control Manufacturer's Sensor Layout and Tuning service:
   1. Lighting Control Manufacturer to take full responsibility for wired or wireless occupancy/vacancy and daylight sensor layout and performance for sensors provided by Lighting Control Manufacturer.
   2. Lighting Control Manufacturer to analyze the reflected ceiling plans, via supplied electronic AutoCAD format, and design a detailed sensor layout that provides adequate occupancy sensor coverage and ensures occupancy and daylight sensor performance per agreed upon sequence of operations. Contractor to utilize the layouts for sensor placement.
   3. During startup, Lighting Control Manufacturer to direct Contractor regarding sensor relocation, as required, should conditions require a deviation from locations specified in the drawings.

4. Lighting Control Manufacturer to provide up to two additional post-startup on-site service visits, within one calendar year from Date of Substantial Completion to fine-tune sensor calibration per the agreed upon sequence of operations.

B. Provide products listed, classified, and labeled by Underwriter's Laboratories Inc. (UL) as suitable for the purpose indicated.

C. Unless specifically indicated to be excluded, provide all required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, programming, etc. as necessary for a complete operating system that provides the control intent indicated.

D. Typical dimming equipment is rated for 40 degrees C (104 degrees F). This is the maximum ambient temperature that can exist while the dimming equipment is operating at full load conditions. Include the following paragraph to ensure that the operating equipment is designed to operate at worst case environmental conditions without affecting product life.

E. Design lighting control equipment for 10-year operational life while operating continually at any temperature in an ambient temperature range of 32 degrees F (0 degrees C) to 104 degrees F (40 degrees C) and 90 percent non-condensing relative humidity.

F. Electrostatic Discharge Tolerance: Design and test equipment to withstand electrostatic discharges without impairment when tested according to IEC 61000-4-2.

G. Power dropouts occur frequently. The momentary interruption of power should not cause extended periods without lighting or require some manual intervention to reset the lighting system. Some manufacturers may define power failure memory as a feature that handles momentary power outages on the order of 20 seconds. This does not account for power outages that occur for a longer period of time.

H. Power Failure Recovery: When power is interrupted for any period of time and subsequently restored, lights to automatically return to same levels (dimmed setting, full on, or full off) as prior to power interruption.

I. Wireless Devices:
   1. Wireless device family includes area or fixture level sensors, area or fixture level load controls for dimming or switching, and load controls that can be mounted in a wallbox, on a junction box, or at the fixture.
   2. Wireless devices including sensors, load controls, and wireless remotes or wall stations, can be set up using simple button press programming without needing any other equipment (e.g., central hub, processor, computer, or other smart device).
   3. Wireless hub adds the ability to set up the system using any smart device with a web browser (e.g., smartphone, tablet, PC, or laptop).
   4. System does not require a factory technician to set up or program the system.
   5. Capable of diagnosing system communications.
   6. Capable of having addresses automatically assigned to them.
   7. Receives signals from other wireless devices and provides feedback to user.
   8. Capable of determining which devices have been addressed.
   9. RF Range: 60 feet (18 m) line-of-sight or 30 feet (9 m) through typical construction materials between RF transmitting devices and compatible RF receiving devices.
   10. The FCC sets limits on EMI/RFI for both non-consumer (commercial and industrial) and consumer (residential) applications. The class B, consumer limits are more stringent than the class A, non-consumer limits.
   11. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of CFR, Title 47, Part 15, for Class B application.

J. Wireless Network:
   1. RF Frequency: 434 MHz; operate in FCC governed frequency spectrum for periodic operation; continuous transmission spectrum is not permitted.
      a. Wireless sensors, wireless wall stations and wireless load control devices do not operate in the noisy 2.4 GHz frequency band where high potential for RF interference exists.
      b. Wireless devices operate in an uncongested frequency band providing reliable operation.

c. Fixed network architecture ensures all associated lights and load controls respond in a simultaneous and coordinated fashion from a button press, sensor signal, or command from the wireless hub (i.e. no popcorning).

2. Distributed Architecture: Local room devices communicate directly with each other. If the wireless hub is removed or damaged, local control, sensing, and operation continues to function without interruption.
3. Local room devices communicate directly with each other (and not through a central hub or processor) to ensure:
   a. Reliability of system performance.
   b. Fast response time to events in the space (e.g. button presses or sensor signals).
   c. Independent operation in the event of the wireless hub being removed or damaged.

K. Device Finishes:
1. Wall Controls: **White**
2. Standard Colors: Comply with NEMA WD1 where applicable.
3. Daylight or fluorescent lighting generate ultraviolet light which can cause parts that do not meet ASTM D4674 to discolor/yellow over time.
4. Visible Parts: Exhibit ultraviolet color stability when tested with multiple actinic light sources as defined in ASTM D4674. Provide proof of testing upon request.

L. Use the following paragraph if interface with building automation system will be required. Any specific requirements can be added as subparagraphs below.

M. Interface with building automation system*.*

2.03 WIRELESS SENSORS

A. General Requirements:
1. Operational life of 10 years without the need to replace batteries when installed per manufacturer's instructions.
2. Communicates directly to compatible RF receiving devices through use of a radio frequency communications link.
3. Does not require external power packs, power wiring, or communication wiring.
4. Capable of being placed in test mode to verify correct operation from the face of the unit.

B. Lutron's occupancy/vacancy sensors are wireless, battery-powered passive infrared (PIR) sensors that automatically control lights via RF communication to compatible dimming and switching devices. These sensors detect the heat from people moving within an area to determine when the space is occupied. The sensors then wirelessly transmit the appropriate commands to the associated dimming and switching devices to turn the lights on or off automatically. They combine both convenience and exceptional energy savings along with ease of installation.

C. Wireless Occupancy/Vacancy Sensors:
1. General Requirements:
   a. Provides a clearly visible method of indication to verify that motion is being detected during testing and that the unit is communicating to compatible RF receiving devices.
   b. Include the following paragraph to ensure that the line-of-sight is not obstructed due to dust and other contaminants.
   c. Utilize multiple segmented lens, with internal grooves to eliminate dust and residue build-up.
   d. Lutron's XCT signal processing technology greatly enhances the performance of PIR sensors, enabling them to "see" fine motions that other sensors couldn't previously detect. Plus, the user-replaceable batteries are designed to last up to 10 years.
   e. Sensing Mechanism: Passive infrared coupled with technology for sensing fine motions. Signal processing technology detects fine-motion passive infrared (PIR) signals without the need to change the sensor's sensitivity threshold.
   f. Provide optional, readily accessible, user-adjustable controls for timeout, automatic/manual-on, and sensitivity.

g. Turns off lighting after reasonable and adjustable time delay once the last person to occupy the space vacates a room or area. Provide adjustable timeout settings of 1, 5, 15, and 30 minutes.
h. Capable of turning dimmer's lighting load on to an optional locked preset level selectable by the user. Locked preset range to be selectable on the dimmer from 1 percent to 100 percent.
i. Color: White.
j. Provide all necessary mounting hardware and instructions for both temporary and permanent mounting.
k. Provide temporary mounting means for drop ceilings to allow user to check proper performance and relocate as needed before permanently mounting sensor. Temporary mounting method to be design for easy, damage-free removal.
l. Sensor lens to illuminate during test mode when motion is detected to allow installer to place sensor in ideal location and to verify coverage prior to permanent mounting.
m. Ceiling-Mounted Sensors:
    1) Provide surface mounting bracket compatible with drywall, plaster, wood, concrete, and compressed fiber ceilings.
    2) Provide recessed mounting bracket compatible with drywall and compressed fiber ceilings.
n. Wall-Mounted Sensors: Provide wall or corner mounting brackets compatible with drywall and plaster walls.

2. Wireless Combination Occupancy/Vacancy Sensors:
    a. Wireless occupancy sensor has three settings available: Auto-On/Auto-Off, Auto-On Low-Light/Auto-Off, and Manual-On/Auto-Off
    b. Auto-On Low-Light feature will only turn lights on automatically if there is less than approximately 1 fc (10 lux) of ambient light
    c. Simple and intuitive adjustments available for Timeout, Auto-On, and Activity settings
    d. Supports advanced occupancy features, such as dependent occupancy groups and customizable occupied/unoccupied presets in some systems
    e. Refer to product specification submittal of receiving device to determine system limits.
    f. Ceiling-Mounted Sensors: Programmable to operate as an occupancy sensor (automatic-on and automatic-off), an occupancy sensor with low light feature (automatic-on when less than one footcandle of ambient light available and automatic-off), or a vacancy sensor (manual-on and automatic-off).
    g. Wireless occupancy sensor has two settings available: Auto-On/Auto-Off, and Manual-On/Auto-Off
    h. Simple and intuitive adjustments available for Timeout, Activity, and Auto-On settings
    i. Supports advanced occupancy features, such as dependent occupancy groups and customizable occupied/unoccupied presets in some systems
    j. Refer to product specification submittal of receiving device to determine system limits
    k. Wall-Mounted Sensors: Programmable to operate as an occupancy sensor (automatic-on and automatic-off), or a vacancy sensor (manual-on and automatic-off).
    l. If more than one model is required, the optional choice can be used to assign type designations. Make sure that designations indicated on the drawings are consistent with those specified here.
    m. Product(s):
        1) Wireless ceiling-mounted occupancy/vacancy sensor using infrared technology for sensing occupancy coupled with Lutron XCT Technology for sensing fine motion. Sensor can be auto-on/auto-off, auto-on low light/auto-off, or manual on/auto-off. Ceiling-mounted sensors are recommended for spaces with ceilings less than 12 feet high.
        2) Ceiling-Mounted Occupancy/Vacancy Sensor
            (a) Coverage from 324 square feet to 676 square feet depending on ceiling height from 8 to 12 feet; 360-degree field of view.

3) Wireless 180 degree coverage wall-mount occupancy/vacancy sensor using infrared technology for sensing occupancy coupled with Lutron XCT Technology. Sensor can be auto-on/auto-off or manual on/auto-off.
4) Wall-Mounted Occupancy/Vacancy Sensor
   (a) Minor motion coverage of 1500 square feet and major motion coverage of 3000 square feet with mounting height of 6 to 8 feet; 180-degree field of view.
5) Wireless 90 degree coverage corner-mount occupancy/vacancy sensor using infrared technology for sensing occupancy coupled with Lutron XCT Technology. Sensor can be auto-on/auto-off or manual on/auto-off.
6) Corner-Mounted Occupancy/Vacancy Sensor
   (a) Minor motion coverage of 1225 square feet and major motion coverage of 2500 square feet with mounting height of 6 to 8 feet; 90-degree field of view.
7) Wireless hallway occupancy/vacancy sensor using infrared technology for sensing occupancy coupled with Lutron XCT Technology. Sensor can be auto-on/auto-off or manual on/auto-off.
8) Hallway Occupancy/Vacancy Sensor
   (a) Major motion coverage of up to 150 feet with mounting height of 6 to 8 feet; narrow field of view.

3. Wireless Vacancy-Only Sensors:
   a. Visit www.lutron.com for more information on California Title 24 requirements.
   b. Operates only as a vacancy sensor (manual-on and automatic-off.
   c. Product(s):
      1) Wireless ceiling-mounted vacancy sensor using infrared technology for sensing occupancy coupled with Lutron XCT Technology for sensing fine motion. Sensor is manual on/auto-off (meets California Title 24 requirements). Ceiling-mounted sensors are recommended for spaces with ceilings less than 12 feet high.
      2) Ceiling-Mounted Vacancy-Only Sensor
         (a) Coverage from 324 square feet to 676 square feet depending on ceiling height from 8 to 12 feet; 360-degree field of view.
      3) Wireless 180-degree coverage wall-mount vacancy-only sensor using infrared technology for sensing occupancy coupled with Lutron XCT Technology. Sensor is manual-on/auto-off (meets California Title 24 requirements).
      4) Wall-Mounted Vacancy-Only Sensor
         (a) Minor motion coverage of 1500 square feet and major motion coverage of 3000 square feet with mounting height of 6 to 8 feet; 180-degree field of view.
      5) Wireless 90-degree coverage corner-mount vacancy-only sensor using infrared technology for sensing occupancy coupled with Lutron XCT Technology. Sensor is manual-on/auto-off (meets California Title 24 requirements).
      6) Corner-Mounted Vacancy-Only Sensor
         (a) Minor motion coverage of 1225 square feet and major motion coverage of 2500 square feet with mounting height of 6 to 8 feet; 90-degree field of view.
      7) Hallway Vacancy-Only Sensor
         (a) Major motion coverage of up to 150 feet with mounting height of 6 to 8 feet; narrow field of view.

D. Wireless Daylight Sensors:
   1. Lutron's wireless daylight sensor is a battery-powered sensor that automatically controls lights via RF communication to compatible dimming or switching devices. This sensor mounts to the ceiling and measures light in the space. The sensor then wirelessly transmits the light level to the associated dimming or switching devices that automatically control the lights to balance light level in the space. The sensor combines both convenience and exceptional energy savings along with ease of installation.
   2. Open-loop basis for daylight sensor control scheme.
   3. Stable output over temperature from 32 degrees F (0 degrees C) to 104 degrees F (40 degrees C).

4. Partially shielded for accurate detection of available daylight to prevent fixture lighting and horizontal light component from skewing sensor detection.
5. Provide linear response from 2 to 150 footcandles.
6. Color: White.
7. Mounting:
    a. Provide surface mounting bracket compatible with drywall, plaster, wood, concrete, and compressed fiber ceilings.
    b. Provide all necessary mounting hardware and instructions for both temporary and permanent mounting.
    c. Provide temporary mounting means for drop ceilings to allow user to check proper performance and relocate as needed before permanently mounting sensor. Temporary mounting method to be design for easy, damage-free removal.

2.04 LOAD CONTROL MODULES

A. Provide wireless load control modules as indicated or as required to control the loads as indicated.

B. Junction Box-Mounted Modules:
    1. Plenum rated.
    2. 0-10 V Dimming Modules:
        a. Product(s):
            1) 8 A dimming module with 0-10V control, without emergency mode
            2) 8 A dimming module with 0-10V control, with emergency mode
        b. Communicates via radio frequency with up to ten compatible occupancy/vacancy sensors, ten wireless control stations, and one daylight sensor.
        c. IEC 60929 is a standard for electronic fluorescent ballasts, and is used by other lighting equipment controlled by low voltage signals including LED drivers and low voltage controlled neon. It defines specific methods for 0-10V, pulse width modulation (PWM), and Digitally Addressable Lighting Interface (DALI).
        d. Single low voltage dimming module with Class 1 or Class 2 isolated 0-10V output signal conforming to IEC 60929 Annex E.2; source or sink automatically configures.
        e. Certain applications, such as hallways, may require that the lights never turn off. For these areas, select the minimum light level option and the load will lower to programmed low-end level. Default operation lowers to OFF.
        f. Selectable minimum light level.
        g. Configurable high- and low-end trim.
        h. Relay: Rated for 0-10 V ballasts, LED drivers, or fixtures that conform with NEMA 410.
        i. Dimming Modules with Emergency Mode:
            1) Operation With Wireless Hub: Upon loss of power, dimming module enters and remains in emergency mode as long as wireless hub is de-energized; upon restoration of power to wireless hub, dimming module returns to normal mode and lights automatically return to same levels (dimmed setting, full on, or full off) as prior to power interruption.
            2) Operation Without Wireless Hub: Upon loss of power, dimming module enters and remains in emergency mode for 90 minutes, during which time local unit buttons and wireless controls are disabled.
            3) Used with emergency lighting interface to achieve total system UL 924 listing.
    3. Phase Selectable Dimming Modules:
        a. Lutron's Vive Phase Select PowPak® dimming module is a radio frequency (RF) control that operates phase control fluorescent ballasts or LED drivers based on input from Pico® remote controls and Radio Powr Savr™ sensors. The dimming module is ideal for small areas (e.g., classrooms, conference rooms, private offices). Communication with RF input devices (e.g. Pico® remote controls, Radio Powr Savr™ sensors) is accomplished by using Lutron Clear Connect® RF Technology. Visit www.lutron.com for data sheets and other information.

b. Product(s):
   1) Phase selectable dimming module, without emergency mode
   2) Phase selectable dimming module, with emergency mode
c. Communicates via radio frequency with up to ten compatible occupancy/vacancy sensors, ten wireless control stations, and one daylight sensor.
d. Dimming
   1) UL listed for LED control in forward or reverse phase modes. Provide published LED performance testing on both forward and reverse phase dimming.
   2) UL listed for fluorescent, electronic low voltage, and magnetic low voltage control.
e. Provides leading-edge or trailing-edge dimming; manual configuration.
f. Certain applications, such as hallways, may require that the lights never turn off. For these areas, select the minimum light level option and the load will lower to programmed low-end level. Default operation lowers to OFF.
g. Selectable minimum light level.
h. Configurable high- and low-end trim.
i. Provide cycle-by-cycle compensation for incoming variations, including changes in frequency, harmonics, and line noise; accommodate up to plus/minus two percent change in frequency per second.
j. Comply with NEMA SSL 7A.
k. Rated Load: Electronic low voltage (reverse phase, 450 W, 120/277 V), dimmable LED (reverse phase, 450 VA, 120/277 V; forward phase, 200 W, 120 V), incandescent/halogen (450 W, 120/277 V), magnetic low voltage (400 VA/320 W, 120/277 V), LED Driver (3 A, 120 V - maximum of 13 drivers), fluorescent (forward phase, 400 VA, 120/277 V).
l. Dimming Modules with Emergency Mode:
   1) Operation With Wireless Hub: Upon loss of power, dimming module enters and remains in emergency mode as long as wireless hub is de-energized; upon restoration of power to wireless hub, dimming module returns to normal mode and lights automatically return to same levels (dimmed setting, full on, or full off) as prior to power interruption.
   2) Operation Without Wireless Hub: Upon loss of power, dimming module enters and remains in emergency mode for 90 minutes, during which time local unit buttons and wireless controls are disabled.
   3) Used with emergency lighting interface to achieve total system UL 924 listing.

4. Digital Ballast/LED Driver Dimming Modules:
   a. The PowPak Single Zone Control Module with EcoSystem is a radio frequency (RF) control that operates up to 32 EcoSystem LED drivers or fluorescent ballasts for the purpose of high performance dimming and control in a Vive system or with Vive standalone products. This control is based on input from Pico remote controls and Radio Powr Savr sensors. The control module is ideal for small areas (e.g., classrooms, conference rooms, private offices). Communication with RF input devices (e.g., Pico remote controls, Radio Powr Savr sensors) is accomplished by using Lutron Clear Connect RF technology.
   b. Single dimming module with Class 1 or Class 2 isolated digital output signal conforming to IEC 60929; capable of direct control without interface.
   c. Provides direct low-voltage control of up to 32 compatible digital ballasts/LED drivers as a single zone (multiple ballasts/LED drivers connected to same module will be at same light level).
      1) Electronically links a digital ballast/LED driver to a zone for both dimming and turning on/off.
      2) Electronically assigns occupancy/vacancy sensors for manual on/auto off and auto on/auto off control.
      3) Electronically assigns wireless control stations for manual local control.
      4) Electronically assigns daylight sensor for automatic daylight dimming.

d. Communicates via radio frequency with up to ten compatible occupancy/vacancy sensors, ten wireless control stations, and one daylight sensor.
e. Selectable minimum light level.
f. Configurable high- and low-end trim.

5. Relay Modules:
   a. Product(s):
      1) 16 A relay module, without emergency mode, without contact closure output
      2) 16 A relay module, with emergency mode, without contact closure output
      3) 16 A relay module, without emergency mode, with contact closure output
      4) 5 A relay module, without emergency mode, without contact closure output
      5) 5 A relay module, without emergency mode, with contact closure output
   b. Communicates via radio frequency with up to ten compatible occupancy/vacancy sensors, ten wireless control stations, and one daylight sensor.
   c. Lutron Softswitch circuitry prevents arcing at the relay contacts for all three load types, and extends the relay life in excess of one million cycles. Switching high inrush loads can damage relay controls over time. The arcing of these relays, depending on load, typically will limit relay life to 10,000 or 50,000 cycles.
   d. Relay:
      1) Rated Life of Relay: Typical of 1,000,000 cycles at fully rated 16 A for all lighting loads.
      2) Load switched in manner that prevents arcing at mechanical contacts when power is applied to and removed from load circuits.
      3) Fully rated output continuous duty for inductive, capacitive, and resistive loads.
   e. Contact Closure Output:
      1) Single contact closure output with normally open and normally closed dry- maintained contacts suitable for connection to third party equipment (e.g., building management system, HVAC system, etc.).
      2) Contact Ratings: Resistive load; 1 A at 0-24 VDC, 0.5 A at 0-24 VAC.
      3) Controlled by associated occupancy/vacancy sensors and wall controls.
      4) Provide in all classrooms and offices.
   f. Relay Modules With Emergency Mode:
      1) Operation With Wireless Hub: Upon loss of power, relay module enters and remains in emergency mode as long as wireless hub is de-energized; upon restoration of power to wireless hub, relay module returns to normal mode and lights automatically return to same levels (dimmed setting, full on, or full off) as prior to power interruption.
      2) Operation Without Wireless Hub: Upon loss of power, relay module enters and remains in emergency mode for 90 minutes, during which time local unit buttons and wireless controls are disabled.
      3) Used with emergency lighting interface to achieve total system UL 924 listing.

6. 20 A Receptacle Modules:
   a. Product(s):
      1) 20 A receptacle module, without contact closure output
      2) 20 A receptacle module, with contact closure output
   b. Communicates via radio frequency with up to ten compatible occupancy/vacancy sensors, and ten wireless control stations.
   c. Relay:
      1) Load switched in manner that prevents arcing at mechanical contacts when power is applied to and removed from load circuits.
      2) Motor rating of 1 HP at 120 V, 2 HP at 277 V.
   d. Contact Closure Output:
      1) Single contact closure output with normally open and normally closed dry-maintained contacts suitable for connection to third party equipment (e.g. building management system, HVAC system, etc.).

2) Contact Ratings: Resistive load; 1 A at 0-24 VDC, 0.5 A at 0-24 VAC.
3) Controlled by associated occupancy/vacancy sensors and wall controls.

7. Contact Closure Output Modules:
   a. Lutron's PowPak® CCO Module is a radio frequency (RF) device that provides a single dry contact closure output based on input from Pico® wireless controls and Radio Powr Savr™ wireless occupancy/vacancy sensors and wireless daylight sensors. It can be powered by up to 24 VAC or 24 VDC for easy connection and integration into building management, HVAC, VAV, and other third party systems. PowPak® modules communicate with compatible Lutron sensors using Clear Connect® RF Technology, which ensures smooth, consistent performance.
   b. Communicates via radio frequency with up to ten compatible occupancy/vacancy sensors, ten wireless control stations, and one daylight sensor.
   c. Contact Closure Output:
      1) Single contact closure output with normally open and normally closed dry-maintained contacts suitable for connection to third party equipment (e.g. building management system, HVAC system, etc.).
      2) Contact Ratings: Resistive load; 1 A at 0-24 VDC, 0.5 A at 0-24 VAC.
      3) Operation affected by associated occupancy/vacancy sensors and wall controls.

C. Fixture Control Modules/Sensors:
   1. Fixture Control Modules:
      a. Communicates via radio frequency with up to ten compatible occupancy/vacancy sensors, ten wireless control stations, and one daylight sensor.
      b. Communicates via wired input with one combination occupancy/daylight or vacancy/daylight fixture sensor.
      c. Coordination between Wired and Wireless Sensors:
         1) Occupancy/Vacancy Sensing: Wired and wireless sensors work in conjunction (occupancy detected by either sensor turns lights on and vacancy detected by both sensors turns lights off).
         2) Daylight Sensing: Wireless sensor takes precedence over wired sensor.
      d. Certain applications, such as hallways, may require that the lights never turn off. For these areas, select the minimum light level option and the load will lower to programmed low-end level. Default operation lowers to OFF.
      e. Selectable minimum light level.
      f. Configurable high- and low-end trim.
      g. Plenum rated.
      h. Mounts to fixture or junction box through ½ inch (16 mm) trade size knockout.
      i. Digital Ballast/LED Driver Fixture Control Modules:
         1) Product(s):
            (a) Digital ballast/LED driver fixture control module, without emergency mode
            (b) Digital ballast/LED driver fixture control module, with emergency mode
         2) Supports reporting of energy measurement to wireless hub at accuracy of plus/minus 2 percent or 0.5 W (whichever is higher).
         3) IEC 60929 is a standard for electronic fluorescent ballasts, and is used by other lighting equipment controlled by low voltage signals including LED drivers and low voltage controlled neon. It defines a specific method for digital control.
         4) Single integral controller with Class 1 or Class 2 isolated digital output signal conforming to IEC 60929; capable of direct control without interface.
         5) Control of digital dimming ballasts/drivers requires the ability to address, program, and assign zone and sensor control to the digital lighting loads. Doing so can be achieved directly from the integral power and control module. Direct control of 120V and/or 277V lighting usually requires a power interface that couples both power and control. With the integral digital ballast control output, no additional interfaces are required.

6) Provides direct low-voltage control of up to 3 compatible digital ballasts/LED drivers.
   (a) Electronically links a digital ballast/LED driver to a zone for both dimming and turning on/off.
   (b) Electronically assigns occupancy/vacancy sensors for manual on/auto off and auto on/auto off control.
   (c) Electronically assigns wireless control stations for manual local control.
   (d) Electronically assigns daylight sensor for automatic daylight dimming.
7) Fixture Control Modules With Emergency Mode:
   (a) Operation With Wireless Hub: Upon loss of power, fixture control module enters and remains in emergency mode as long as wireless hub is de-energized; upon restoration of power to wireless hub, fixture control module returns to normal mode and lights automatically return to same levels (dimmed setting, full on, or full off) as prior to power interruption.
   (b) Operation Without Wireless Hub: Upon loss of power, fixture control module enters and remains in emergency mode for 90 minutes, during which time local unit buttons and wireless controls are disabled.
   (c) Used with emergency lighting interface to achieve total system UL 924 listing.

j. 0-10 V Dimming Fixture Control Modules:
1) Lutron's PowPak® wireless fixture control is a radio frequency (RF) device that controls either the Lutron EcoSystem® or 0-10 V ballasts/drivers (depending on model) based on RF input from Pico® wireless controls and Radio Powr Savr™ wireless occupancy/vacancy sensors or wired inputs from the PowPak® fixture sensor. The control module mounts to a fixture or junction box. Communication with RF input devices is accomplished using Lutron Clear Connect® RF Technology, which ensures smooth, consistent performance.
2) Product(s):
   (a) 0-10 V dimming fixture control module, without emergency mode;
   (b) 0-10 V dimming fixture control module, with emergency mode
3) Supports reporting of energy measurement to wireless hub at accuracy of plus/minus 2 percent or 0.5 W (whichever is higher).
4) IEC 60929 is a standard for electronic fluorescent ballasts, and is used by other lighting equipment controlled by low voltage signals including LED drivers and low voltage controlled neon. It defines specific methods for 0-10V, pulse width modulation (PWM), and Digitally Addressable Lighting Interface (DALI).
5) Single low voltage dimming module with Class 1 or Class 2 isolated 0-10V output signal conforming to IEC 60929 Annex E.2; source or sink automatically configures.
6) Provides 0-10 V control for up to 3 ballasts/LED drivers (1 A load at 120-277 V, 6 mA max control current).
7) Rated for switching 0-10 V ballasts, LED drivers, or fixtures that conform with NEMA 410.
8) Fixture Control Modules With Emergency Mode:
   (a) Operation With Wireless Hub: Upon loss of power, fixture control module enters and remains in emergency mode as long as wireless hub is de-energized; upon restoration of power to wireless hub, fixture control module returns to normal mode and lights automatically return to same levels (dimmed setting, full on, or full off) as prior to power interruption.
   (b) Operation Without Wireless Hub: Upon loss of power, fixture control module enters and remains in emergency mode for 90 minutes, during which time local unit buttons and wireless controls are disabled.
   (c) Used with emergency lighting interface to achieve total system UL 924 listing.

2. Wired Fixture Sensors:
    a. Occupancy/Vacancy Sensing:
        1) Lutron's XCT signal processing technology greatly enhances the performance of PIR sensors, enabling them to "see" fine motions that other sensors couldn't previously detect.
        2) Passive infrared coupled with technology for sensing fine motions. Signal processing technology detects fine-motion passive infrared (PIR) signals without the need to change the sensor's sensitivity threshold.
        3) Coverage: 300 square feet with mounting height of 8 to 12 feet; 360-degree field of view.
        4) Sensor Timeout: 15 minutes.
            (a) Sensor timeout adjustable via wireless hub when connected to compatible fixture control module.
    b. Daylight Sensing:
        1) Automatic calibration.
        2) Provide linear response to changes in perceived light level.
            (a) Response adjustable via wireless hub when connected to compatible fixture control module.
        3) Closed loop proportional control scheme.
        4) Sensor Range: 0 to 150 footcandles (0 to 1600 lux).
    c. Mounts to fixture or ceiling.

2.05 LUMINAIRE COMPONENTS (FACTORY-INSTALLED)

A. Luminaires specified on the drawings to be provided with factory-installed wireless fixture control components as specified below

B. Wireless Fixture Control Dongle:
1. Product(s):
    a. RF only (no integral sensing capability)
    b. RF with occupancy/vacancy and daylight sensing
2. Communicates via radio frequency with up to ten compatible occupancy/vacancy sensors, ten wireless control stations, and one daylight sensor.
3. Certain applications, such as hallways, may require that the lights never turn off. For these areas, select the minimum light level option and the load will lower to programmed low-end level. Default operation lowers to OFF.
4. Selectable minimum light level.
5. Supports configurable high- and low-end trim.
6. Plenum rated in accordance with UL 2043.
7. Mounts to fixture through hole.
8. Wireless Fixture Control Dongle with Integral Sensing Capabilities:
    a. Occupancy/Vacancy Sensing:
        1) Lutron's XCT signal processing technology greatly enhances the performance of PIR sensors, enabling them to "see" fine motions that other sensors couldn't previously detect.
        2) Passive infrared coupled with technology for sensing fine motions. Signal processing technology detects fine-motion passive infrared (PIR) signals without the need to change the sensor's sensitivity threshold.
        3) Coverage: 300 square feet with mounting height of 8 to 12 feet; 360 degree field of view.
        4) Sensor Timeout: 15 minutes.
            (a) Sensor timeout adjustable via wireless hub.
    b. Daylight Sensing:
        1) Automatic calibration.
        2) Provide linear response to changes in perceived light level.
            (a) Response adjustable via wireless hub.

3) Closed loop proportional control scheme.
4) Sensor Range: 0 to 150 footcandles (0 to 1600 lux).

c. Coordination between Integral and Wireless Sensors:
1) Occupancy/Vacancy Sensing: Integral and wireless sensors work in conjunction (occupancy detected by either sensor turns lights on and vacancy detected by both sensors turns lights off).
2) Daylight Sensing: Wireless sensor takes precedence over integral sensor.

C. Digital Bus Interface:
1. Provides power for wireless fixture control dongle and up to four LED drivers (60mA at 17-19 VDC).
2. DALI compliant.
3. UL listed.

2.06 WIRELESS CONTROL STATIONS

A. The Pico Wireless Control is a flexible and easy to use device that allows the user to control dimmers and switches. The Pico wireless control can function as a tabletop control on a pedestal, a lightweight handheld remote, or it can be wall-mounted with or without a Lutron Claro faceplate, to mimic a traditional keypad. The battery-operated control requires no external power or communication wiring. Models are available with integral night light. Visit www.lutron.com for data sheets and other information.

B. Product(s):
1. 2-Button with Raise/Lower Control
a. Button Marking: **Light (icons).**
2. Screw Mounting Kit
3. Wallbox Adapter

C. Quantity: As indicated on the drawings;

D. Communicates directly to compatible RF receiving devices through use of a radio frequency communications link.

E. Does not require external power packs, power or communication wiring.

F. Controls can be programmed with different functionality through system software without any hardware changes.

G. Allows for easy reprogramming without replacing unit.

H. Button Programming:
1. Single action.

I. Includes LED to indicate button press or programming mode status.

J. Mounting:
1. Capable of being mounted directly to a wall under a faceplate.
2. Faceplates: Provide stainless steel.

K. Power: Battery-operated with minimum ten-year battery life (3-year battery life for night light models).

L. Finish: **White**

2.07 WIRELESS HUBS

A. Product(s):
1. Wireless hub without BACnet***; Lutron Vive Hub***.
a. Flush-mount wireless hub; supports up to 70 total paired devices.
b. Flush-mount wireless hub; supports up to 700 total paired devices.
c. Surface-mount wireless hub; supports up to 700 total paired devices.

B. Integrated multicolor LED provides feedback on what mode the hub is in for simple identification and diagnosis.

C. Integrated processor and web server allows hub to set up and operate the system without any external connections to outside processors, servers, or the internet.

D. Utilizes Ethernet connection for:
   1. Networking up to 64 hubs together to create a larger system.
   2. Integration with Building Management System (BMS) via native BACnet
   3. Remote connectivity capabilities, including maintaining system date/time and receiving periodic firmware updates (requires internet connection).

E. A single hub or network of hubs can operate on either a dedicated lighting control only network or can be integrated with an existing building network as a VLAN.

F. Communicates directly to compatible RF devices through use of radio frequency communications link; does not require communication wiring; RF range of 71 feet through walls to cover an area of 15836 square feet. Make sure the device and hub is on the same floor.

G. Communicates directly to mobile device (smartphone or tablet) or computer using built-in Wi-Fi, 2.4 GHz 802.11b/g; wireless range of 71 feet through walls. Make sure the device and hub is on the same floor).
   1. Does not require external Wi-Fi router for connecting to the hub.

H. Allows for system setup, control, and monitoring from mobile device or computer using web-based software:
   1. Any given load device can be controlled by 10 occupancy sensors, 10 Pico remote controls or 1 daylight sensor (Pico remote controls and sensors must be located within 30 ft (9 m) of the load device they are controlling.
   2. Supports paired devices up to maximum number indicated including compatible wireless sensors, wireless control stations, and wireless load devices.
   3. Allows for timeclock scheduling of events, both time of day and astronomic (sunrise and sunset).
      a. Timeclock is integrated into the unit and does not require a constant internet connection.
      b. Retains time and programming information after a power loss.
      c. 365-day schedulable timeclock allows for:
         1) Scheduling of events years in advance.
         2) Setting of recurring events with exceptions on holidays.
      d. Time clock events can be scheduled to:
         1) Send lights to a desired level and select the fade rate desired to reach that level.
         2) Adjust level lights go to when occupied.
         3) Adjust level lights go to when unoccupied.
         4) Enable/disable occupancy.
         5) Adjust timeout of sensors
         6) Control individual devices, areas, or groups of areas. When connected to server, only areas or groups of areas can be controlled with timeclock events.
   4. Daylighting:
      a. Daylighting can be enabled/disabled. Can be used to override the control currently taking place in the space.
      b. The following is particularly useful when new departments move into a space.
      c. Daylight set point can be adjusted with the software to increase or decrease the electric light level in the room based on the same amount of natural light.
   5. Uses RF signal strength detection to find nearby devices for quick association and programming without having to climb ladders.
      a. Association and setup does not require a factory technician to perform.
   6. System using wireless hub(s) can operate with or without connection to the internet.
   7. Supports automatic demand response for load shedding via:
      a. Local contact closure without need for separate interface.
      b. OpenADR® 2.0b compliant utility command.
      c. BACnet

8. Support automatic generation of alerts in web-based application for designated events/triggers, including:
    a. Low-battery condition in battery-operated sensors and controls; alert cleared when battery is replaced.
    b. Missing device (e.g., control or sensor); alert cleared when device is detected by system.
9. Wireless hub can be firmware upgraded to provide new software features and system updates.
    a. Firmware update can be done either locally using a wired Ethernet connection or Wi-Fi connection, or remotely if the wireless hub is connected to the internet.

I. Web-Based Application:
1. Accessibility and Platform Support:
    a. Web-based; runs on most HTML5 compatible browsers (including Safari and Chrome).
    b. Supports multiple platforms and devices; runs from a tablet, desktop, laptop, or smartphone.
    c. User interface supports multi-touch gestures such as pinch to zoom, drag to pan, etc.
    d. Utilizes HTTPS (industry-standard certificate-based encryption and authentication for security).
    e. Multi-level Password Protected Access: Individual password protection on both the integrated Wi-Fi network and web-based software.
    f. WPA2 security for Wi-Fi communication with wireless hub.
2. System Navigation and Status Reporting:
    a. Area Tree View: Easy navigation by area name to view status and make programing adjustments through the software.
    b. Area and device names can be changed in real time.
3. Setup app available for iOS and Android that allows for:
    a. Job registration to extend product warranty.
    b. Management of setup for multiple projects in different locations.
    c. Creation of handoff documents that are sent directly to a facility manager via email once setup is complete.
    d. Backup of wireless hub database to cloud for hub replacement.
    e. Access to native help and instructions to assist user with system setup.

J. BACnet Integration:
1. Provide ability to communicate by means of native BACnet IP communication (does not require interface) to lighting control system from a user-supplied 10BASE-T or 100BASE-T Ethernet network.
2. Requires only one network connection per hub.
3. BACnet Integrator Capabilities:
    a. The BACnet integrator can command:
        1) Area light output.
        2) Enable/Disable:
            (a) Area occupancy sensors.
            (b) Area daylighting.
        3) Daylighting level.
        4) Area occupied and unoccupied level
        5) Occupancy sensor timeouts (for fixture sensors).
    b. The BACnet integrator can monitor:
        1) Area on/off status.
        2) Area occupancy status.
        3) Enable/Disable:
            (a) Area occupancy sensors.
            (b) Daylighting.
            (c) Timeclocks.
        4) Daylighting level.

5) Light levels from photo sensors.
6) Area occupied and unoccupied level.
7) Occupancy sensor timeouts.

K. Scenes:
1. Support programmable scenes to control individual devices, areas, or groups of areas on demand.
2. Scenes may be activated via:
a. Contact closure input.
b. API integration.
c. Manual activation in app.

L. Emergency Mode:
1. Support emergency mode to, when triggered, send lights to defined levels and lock out controls for load control modules equipped with emergency mode.
2. Emergency mode may be activated via:
a. Contact closure input.
b. API integration.
c. Manual activation in app.

M. Contact closure inputs provide integration with devices by others including devices for Title 24 Automatic Demand Response

N. Contact closure inputs on multiple hubs can be wired in parallel. DO NOT wire inputs in parallel with other equipment as it can cause the inputs on either of the devices to falsely trigger.

O. To ensure proper operation of contact closure inputs, a PS-J-20W-UNV power supply may not be used to provide power to more than one hub.

P. Contact Closure Interface: Provide two contact closure inputs; accepts both momentary and maintained contact closures that can be used for automatic demand response.

Q. Rated for use in air-handling spaces as defined in UL 2043.

R. Visit www.lutron.com for more information on California Title 24 requirements.

S. Meets CAL TITLE 24 P6 requirements.

T. Wiring distance for any single inter-hub wiring link segment is 330 ft (100 m) max; use Lutron-provided Ethernet switches for longer distances

U. Provide Ethernet switch(es) as required for inter-hub network wiring per manufacturer’s instructions; do not exceed manufacturer’s required maximum wiring segment lengths.

2.08 ACCESSORIES

A. Emergency Lighting Interface:
1. Lutron's Application Note #106 contains more information on emergency lighting systems.
2. Provides total system listing to UL 924 when used with lighting control system.
3. Senses all three phases of building power.
4. If power on any phase fails provides output to send lights controlled to defined levels. Lights to return to their previous intensities when normal power is restored.
5. Accepts contact closure input from fire alarm control panel.

2.09 SOURCE QUALITY CONTROL

A. Factory Testing
1. To ensure that 100 percent of the lighting control products work at installation, the manufacturer should test 100 percent of all assemblies at full rated load in the factory. This testing will assure that every product has been tested and guaranteed to work. Sampling would only prove that the samples work and should not be acceptable.
2. Perform full-function factory testing on all completed assemblies. Statistical sampling is not acceptable.

3. To ensure that 100 percent of the lighting control products work at installation, the manufacturer should test 100 percent of all ballasts at the factory.
4. Perform full-function factory testing on 100 percent of all ballasts and LED drivers.
5. Sample burn-in is used to verify the consistency of quality for the supplied devices and manufacturing processes so that they meet the design intent.
6. Perform factory burn-in of 100 percent of all ballasts at 104 degrees F (40 degrees C).

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that ratings and configurations of system components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive system components.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Use the following paragraph to specify an optional visit for system and network integration consultation. Edit the choice to have this additional value included as an alternate or as part of the base bid.

B. **A System and Network Integration Consultation is required for a job that will integrate with a third party BMS system.**

C. System and Network Integration Consultation: Include **as part of the base bid** additional costs for Lighting Control Manufacturer to conduct meeting with facility representative and other related equipment manufacturers to discuss equipment and integration procedures.
   1. Coordinate scheduling of visit with Lighting Control Manufacturer. Manufacturer recommends that this visit be scheduled early in construction phase, after system purchase but prior to system installation.

3.03 INSTALLATION

A. Perform work in a neat and workmanlike manner in accordance with NECA 1 and, where applicable, NECA 130.

B. Install products in accordance with manufacturer's instructions.

C. Sensor Locations:
   1. Lighting Control Manufacturer Sensor Layout and Tuning service may be specified in Part 2 under "LIGHTING CONTROLS - GENERAL REQUIREMENTS".
   2. Where Lighting Control Manufacturer Sensor Layout and Tuning service is specified in Part 2 under "LIGHTING CONTROLS - GENERAL REQUIREMENTS", locate sensors in accordance with layout provided by Lighting Control Manufacturer. Lighting Control Manufacturer may direct Contractor regarding sensor relocation should conditions require a deviation from locations indicated. Where Lighting Control Manufacturer Sensor Layout and Tuning service is not specified, locate sensors in accordance with Drawings.
   3. Sensor locations indicated are diagrammatic. Within the design intent, reasonably minor adjustments to locations may be made in order to optimize coverage and avoid conflicts or problems affecting coverage, in accordance with manufacturer's recommendations.

D. Interior sensors work mainly with diffused light, as such, they have a much higher lighting gain than exterior sensors. Electric light sources can affect these sensors unless the sensors are shielded from the light given off by electric light sources.

E. Ensure that daylight sensor placement minimizes sensor view of electric light sources. Locate ceiling-mounted and luminaire-mounted daylight sensors to avoid direct view of luminaires.

F. Many lamp manufacturers recommend seasoning fluorescent lamps prior to dimming in order to ensure full rated life.

G. Lamp Burn-In: Operate lamps at full output for prescribed period per manufacturer's recommendations prior to use with any dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.

H. If the lamp leads exceed the specification, premature lamp failure and/or trouble starting the lamps may result.

I. If the lamp leads exceed the specification, trouble starting the lamps may result.

J. LED Light Engine/Array Lead Length: Do not exceed 100 feet (31 m).

3.04 FIELD QUALITY CONTROL

A. Edit the choice in the following paragraph to indicate whether or not Lutron Full-Scope Start-Up Service will be required. Keep in mind however that without Lutron Start-Up Service, Standard Warranty coverage is significantly reduced. Coordinate with warranty requirements specified in Part 1 under "WARRANTY".

B. Manufacturer's Full-Scope Start-Up Service **is required.**

C. If Lutron Full-Scope Start-Up Service is not specified in the paragraph above, the following paragraph may be used to specify optional manufacturer programming services, available for purchase in blocks of time for either on-site or remote programming.

D. Manufacturer’s Programming Service:
   1. Product(s):
      a. On-site programming, 8-hour block
   2. Also include **as part of the base bid** additional costs for manufacturer to perform **remote** programming tasks for another **8 hours**.

E. Manufacturer's Full-Scope Start-Up Service:
   1. On-Site Full-Scope Start-Up Service: Manufacturer's authorized Service Representative to conduct site visit upon completion of lighting control system installation to perform system startup and verify proper operation:
      a. Lighting Control Manufacturer Sensor Layout and Tuning service may be specified in Part 2 under "LIGHTING CONTROLS - GENERAL REQUIREMENTS".
      b. Authorized Service Representative to verify sensor locations, in accordance with layout provided by Lighting Control Manufacturer; Lighting Control Manufacturer may direct Contractor regarding sensor relocation should conditions require a deviation from locations indicated.
      c. Verify connection of power wiring and load circuits.
      d. Verify connection and location of controls.
      e. Energize wireless hubs.
      f. Associate occupancy/vacancy sensors, daylight sensors, wireless remotes, and wall stations to load control devices.
      g. Provide initial rough calibration of sensors; fine-tuning of sensors is responsibility of Contractor unless provided by Lighting Control Manufacturer as part of Sensor Layout and Tuning service.
      h. Program timeclock schedules per approved sequence of operations.
      i. Configure load shed parameters per approved sequence of operations.
      j. Verify system operation control by control.
      k. Obtain sign-off on system functions.
      l. Train Owner's representative on system capabilities, operation, and maintenance.

F. Use the following paragraph to specify startup of lighting control system outside normal business hours (at an additional cost). Edit the choice to have this additional cost included as an alternate or as part of the base bid.

G. Correct defective work, adjust for proper operation, and retest until entire system complies with contract documents.

3.05 ADJUSTING

A. Use the following paragraph to specify an optional on-site meeting with the Lighting Control Manufacturer to make adjustments to the lighting control system, after all equipment and room furnishings have been installed (at an additional cost). Edit the first choice to have this additional cost included as an alternate or as part of the base bid.

B. This meeting may be desired in order to meet the lighting designer's original design intent. These adjustments may include light level, fade time and delay in lighting scenes.

C. On-Site Scene and Level Tuning: Include **as part of the base bid** additional costs for Lighting Control Manufacturer to visit site to conduct meeting with **Engineer** to make required lighting adjustments to the system for conformance with original design intent.

D. Lighting Control Manufacturer Sensor Layout and Tuning service may be specified in Part 2 under "LIGHTING CONTROLS - GENERAL REQUIREMENTS".

E. Sensor Fine-Tuning: Lighting Control Manufacturer to provide up to two additional post-startup on-site service visits for fine-tuning of sensor calibration. Where Lighting Control Manufacturer Sensor Layout and Tuning service is not specified, Contractor to provide fine-tuning of sensor calibration.

3.06 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.07 COMMISSIONING

A. See Electrical Commissioning Specification for commissioning requirements.

B. Use the following paragraph to specify that lighting control acceptance testing required by California Title 24, Part 6 (California Energy Code) be performed by Lighting Control Manufacturer (requires on-site start-up to be specified under “FIELD QUALITY CONTROL” in Part 3). Edit the second choice to have this additional cost included as an alternate or as part of the base bid.

C. Required documentation associated with this service is also specified in Part 1 under “SUBMITTALS”.

D. Include **as part of the base bid** costs for Lighting Control Manufacturer to perform lighting control acceptance testing in accordance with Washington State Energy Code, latest edition. Submit required documentation.

3.08 CLOSEOUT ACTIVITIES

A. Demonstration:
   1. Demonstrate proper operation of lighting control devices to **Engineer** and correct deficiencies or make adjustments as directed.
   2. Use the following paragraph to specify an optional on-site walkthrough to demonstrate system functionality (at an additional cost). Edit the first choice to have this additional cost included as an alternate or as part of the base bid.
   3. **An on-site walkthrough to demonstrate system functionality to a commissioning agent is often required for LEED projects, other projects which involve a commissioning agent, or Title 24 (California) projects.** During this visit, the manufacturer's authorized Service Representative will perform tasks, at the request of the facility representative or commissioning agent, such as to demonstrate wall control functions, explain timeclock schedules or describe occupancy or daylight sensor functionality.
   4. On-Site Performance-Verification Walkthrough: Include **as part of the base bid** additional costs for lighting control manufacturer to provide on-site demonstration of system functionality to **facility representative**.

B. Training:
   1. Lutron's standard on-site full-scope start-up procedure for Vive system includes training of customer representatives. Include the paragraph below to specify additional training visits.

2. Include services of manufacturer's certified service representative to perform on-site training of Owner's personnel on operation, adjustment, and maintenance of lighting control system as part of on-site system start-up services.

3.09 PROTECTION

A. Protect installed products from subsequent construction operations.

END OF SECTION 260924

SECTION 262213
DRY TYPE TRANSFORMERS

PART 1 GENERAL

1.01 WORK INCLUDED

A. When shown on drawings, provide dry type transformers complete. Transformers shall be UL listed and comply with NEMA Standard ST-20.

1.02 RELATED SECTIONS

A. Section 260000 – Electrical General Conditions

B. Section 260526 – Grounding

1.03 REFERENCE STANDARDS

A. 10 CFR 431, Subpart K - Energy Efficiency Program for Certain Commercial and Industrial Equipment - Distribution Transformers; Current Edition.

B. ANSI C57.12.01/NEMA ST-20: General Requirements for Distribution, Power, and Regulating Transformers.

C. ANSI/NETA MTS-2019 Standard for Maintenance Testing Specifications for Electrical Power Equipment and Systems.

D. IEEE C57.94 - IEEE Recommended Practice for Installation, Application, Operation, and Maintenance of Dry-Type Distribution and Power Transformers; 2015.

E. IEEE C57.96 - IEEE Standard Guide for Loading Dry-Type Distribution and Power Transformers; 2013.

F. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

G. NECA 409 - Standard for Installing and Maintaining Dry-Type Transformers; 2015.

H. NEMA ST-20: Dry-Type Transformers for General Applications.

I. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

J. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.

K. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

L. Transformers shall be NEMA TP-22016 Energy Efficient compliant and meet the requirements of the Department of Energy, 10 CFR Energy Conservation Standards for Distribution Transformers.

M. UL 506 - Standard for Specialty Transformers; Current Edition, Including All Revisions.

N. UL 1561 - Standard for Dry-Type General Purpose and Power Transformers; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data
   1. Transformers (Dry Type)

B. Shop Drawings
   1. Transformers (Dry Type)

C. Testing
   1. Transformers (Dry Type)

D. O&M Manuals
   1. All Information from Previous Submittals
   2. Mfg. Maintenance Manual
   3. Recommended Maintenance Procedures

1.05 PRODUCT DATA

A. The contractor shall include product data identifying compliance with all pertinent items of Part 2 of this specification. All pertinent options shall be identified in the product data submittal. If options have not been identified clearly, the submittal will be rejected.

B. Provide transformer specifications with included options and manufacturers product data sheets for the submitted transformer. The selected features and options for each transformer shall be clearly identified. Optional items which are not applicable shall be clearly identified for each transformer (e.g., crossed out). Optional items that are not crossed out may be required at no additional cost regardless of whether they are identified in the specifications.

1.06 SHOP DRAWINGS

A. Prepare and submit for review prior to manufacture; include dimensioned front plan and section views, wiring and connection diagrams and bolting template. Contractor shall indicate on the drawings, mounting methods and connection lugs required.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Tierney.

B. Sorgel Quiet Quality.

C. General Electric QL.

D. Federal Pacific.

E. Similar units by Cutler-Hammer, Acme or Hevi-Duty may be utilized if the core and coil assembly is mounted on rubber isolation pads.

2.02 CABINET

A. Steel panel enclosure over core, coil, and terminal chamber with louvered openings for convection cooling. Cooling and terminal access shall be possible with both sides and rear of enclosure obstructed.

B. Provide weatherproof or special enclosure when required for environment in which it is located.

2.03 WINDINGS

A. Separate primary and secondary. Windings shall have Class H insulation and shall be rated for continuous operation at rated KVA with temperature rise of not over 150 degrees C above a 40 degree C ambient, with a maximum hot spot temperature of 220 degrees C. Windings and core and coil assembly shall be treated and built to resist the effects of dirt and moisture.

B. Core coil shall be mounted on rubber isolation mounting pads. Cores shall have a common core construction having low hysterisis and eddy current losses grounded to the transformer core. The neutral bus shall be sized and configured for at least 200% of the secondary full load current. Transformer impedance shall be a minimum of 3 and a maximum of 5%. The transformer shall be UL listed and suitable for non-sinusoidal loads with a K factor of 4.

C. Shall contain grounded electrostatic shield.

D. When transformers are Y-Y construction the core shall be a five-legged type. Tertiary winding is not permitted.

2.04 PRIMARY TAPS

A. Four full capacity taps, minimum of two 2-1/2 percent above and two 2-1/2 percent below normal (rated) primary voltage.

2.05 CONNECTIONS

A. Unless noted otherwise, three phase transformers shall have a 480-volt delta connected primary and 208Y/120-volt, three phase, four wire connected secondary, single-phase transformers shall be 480-volt primary, 120/240 volt secondary. Provisions for external connections shall be made by means of a terminal board employing lugs conforming which are compatible with the external conductors installed. (Note: aluminum conductors require special lugs.) All connections shall be accessible for front and top of cabinet.

2.06 NOISE LEVEL

A. Noise level shall not exceed ANSI Standard C89.2 sound levels of 45 db for sizes less than 51 KVA, 50 db for 51-150 KVA, 55 db for 151-300 and 60 db for greater than 300 as measured by NEMA ST20.

B. When shown, transformers shall be ultra-quiet type. Noise level shall not exceed 35 db for all sizes through 300 KVA. Shall be similar to Tierney Quietran. All ultra-quiet transformers shall be factory certified to have noise levels not exceeding those specified. Forward certification to Engineer and include copy in the O&M Manual.

2.07 EFFECIENCY

A. Dry transformers shall have a minimum efficiency that complies with NEMA TP-2-2016.

2.08 VIBRATION ISOLATORS

A. The following are options that the Contractor may utilize for the vibration isolators:
   1. **Vibration pads** shall be cork, neoprene, and steel construction, B-Line model CNNK or equal.
   2. **Neoprene pad spacers** shall be B-Line model NNP or equal.

PART 3 EXECUTION

3.01 MOUNTING

A. Transformers shall be attached to the building structure to prevent overturning in the event of earthquake. All attachment nuts to have washer and rubber pad spacer under them. Provide neoprene pad spacers under mounting rails. Transformers shall be mounted on floor, wall or suspended from ceiling as noted in the contract documents or as required. Remove all shipping blocks prior to installation.

B. Transformers with enclosures designed for floor mounting where suspended from ceiling shall be suspended on a trapeze constructed of a minimum of two horizontal structural channels hung from threaded rods attached to structural members or inserts in structural slab. Channel, rod, and inserts shall be sized for not less than 400% load safety factor.

C. Transformers shall be installed with four spring vibration isolators, one at each corner, when any of the following conditions are present. Size each isolator for the full transformer weight.
   1. Transformer is 45 KVA or larger.
   2. Transformer is located higher than one floor above grade.
   3. Transformer is noted "SIM" in the contract documents.

D. All transformers mounted directly on a wall shall be mounted with vibration pads sized to give 400% safety factor.

3.02 CONNECTIONS

A. 208/120-volt three phase secondary transformers shall be considered "grounded neutral separately derived systems" and be grounded per code accordingly.

B. Transformer raceway connections shall be flexible metal raceway. See Specification Section 260533.

C. Voltage Tap Connection: Connect all transformers at "normal" tap. After facility is completely energized, measure secondary voltages at all transformers and service switchboard. Forward a list to the Architect/Engineer for evaluation. Include copy in O&M Manuals. Reconnect taps as subsequently directed. All costs associated with this work shall be included in base bid.

3.03 TESTING

A. Visual and Mechanical Inspection: Verification of transformer connections including proper bonding and grounding in compliance with the design documents and applicable codes and standards, proper mounting including vibration isolators, and that manufacturer recommended installation procedures have been completed.

B. The following transformer tests and measurements shall be performed, and the results submitted for review:
   1. Separate-source voltage withstand test.
   2. Induced voltage test.
   3. Voltage ratio measurement and check of polarity connections.
   4. No-load current and no-load loss measurement.
   5. Primary and secondary winding resistance measurement.
   6. Short-circuit impedance and load-loss measurement.
   7. Partial discharge measurement.

END OF SECTION 262213

SECTION 262413
SWITCHBOARDS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide all service entrance and main distribution switchgear with equipment as shown and described, with continuous full load ampacities as indicated.

1.02 RELATED SECTIONS

A. Section 260000 – Electrical General Conditions

B. Section 260573 – Electrical System Studies

C. Section 264300 – Surge Protective Devices

1.03 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e (Amended 2017).

B. IEEE C57.13 - IEEE Standard Requirements for Instrument Transformers; 2016.

C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

D. NECA 400 - Standard for Installing and Maintaining Switchboards; 2007.

E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

F. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013.

G. NEMA PB 2 - Deadfront Distribution Switchboards; 2011.

H. NEMA PB 2.1 - General Instructions for Proper Handling, Installation, Operation, and Maintenance of Deadfront Distribution Switchboards Rated 600 Volts or Less; 2013.

I. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.

J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

K. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.

L. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

M. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

N. UL 891 - Switchboards; Current Edition, Including All Revisions.

O. UL 1053 - Ground-Fault Sensing and Relaying Equipment; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data
   1. Switchboards
   2. Integral Meter

B. Shop Drawings
   1. Switchboards

C. Testing
   1. Visual and Mechanical Assessment
   2. Torquing (>=1000A)
   3. Adjustable Trip Testing

D. O&M Manuals
   1. All Information from Previous Submittals
   2. Mfg. Maintenance Manual
   3. Recommended Maintenance Procedures

1.05 PRODUCT DATA

A. The contractor shall include product data identifying compliance with all pertinent items of Part 2 of this specification. All pertinent options shall be identified in the product data submittal. If options have not been identified clearly, the submittal will be rejected.

B. Provide switchboard specifications including all main and feeder breaker sizes ad ratings, metering components including CTs and PTs, surge protective devices and any other equipment included within the switchboard assembly. All features to be included with each switchboard shall be clearly indicated. Any optional features not crossed out may be required.

1.06 SHOP DRAWINGS

A. Provide switchboard one-line drawing showing each switchboard section

B. Provide switchboard dimension drawings including but not limited to horizontal and vertical bussing, breaker sizes and locations, bus ratings, conduit entry windows, enclosure information and associated equipment information.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Square-D

B. ABB

C. Cutler-Hammer

D. Siemens

2.02 ENCLOSURES

A. Shall be freestanding, steel with steel angle or channel framework of adequate strength and rigidity necessary to resist all conditions of use to which it may be subjected and to support all equipment, devices and appurtenances contained therein. Front plates shall be installed in sections so that all parts of the board are front accessible without disturbing other parts. A removable lifting angle shall be provided at the top and bottom of each shipping section(s).

B. Minimum 12-gauge steel, except front panels and doors may be minimum 14 gauge.

C. Shall be front access only unless noted otherwise.

D. Provide on 3-inch housekeeping concrete pad with minimum 3-inch lip on front and sides.

E. Finish shall be factory applied; standard gray color for all exterior and interior painted surfaces. Other colors may be considered.

F. Outdoor installation shall be NEMA 3R.

2.03 SWITCHBOARD DIMENSIONS

A. Overall height of switchboards shall not exceed 90 inches (not including base channels). Length and depth shall not exceed dimensions as scaled or noted in contract documents. Manufacturers whose equipment dimensions exceed those indicated shall notify the Engineer in writing 10 days prior to bid date. These Manufacturers may not bid as "Not Conforming to Contract Documents". Contractor shall base bid only on equipment which fully complies with contract documents. Cost of building modifications or switchboard relocations, if permitted, or other additional work required to fit larger size switchboard(s) than shown on drawings shall be borne totally by the Contractor.

2.04 SWITCHBOARD BUSBARS

A. Aluminum or copper at manufacturer's option, factory fabricated; carried to terminals for connection to service cables or busway. Brace switchboard components for symmetrical fault current shown plus a symmetrical offset (50,000-amp bracing minimum). Aluminum bus shall be tin plated over its full length.

B. Busbar Joints:
   1. Busbar to busbar shall be bolted, lapped and silver or tin plated, having low contact resistance and low temperature rise. For aluminum bus bolt using Grade 5 bolts with Belleville washers.

2. Overcurrent devices shall be bolted to busbars using Grade 5 bolts and Belleville washers. Exception: Square-D I-line and 30-200A fused switches

C. Conductor connectors shall be bolted to busbars using Grade 5 bolts and Belleville washers. Where aluminum conductors are utilized for feeders the connectors shall conform with Section 260519.

D. System of Bussing: Three phase, 4 wire, full size neutral unless otherwise noted.

E. Ground Bus: Full length ground bus bonded to frame conforming to U.L. 891 for minimum size except larger as required by the code for grounding neutral conductor.

2.05 SWITCHBOARD COMPONENTS

A. Switchboards shall include (but not limited to) the following components:
1. Shall be full-fault current rated, series rating of devices is not allowed.
2. Switches and fuses or breakers as shown. If fuses are used, provide all necessary fuses and spares per Section 262813.
3. Space for future switches or breakers as shown including complete bussing and required hardware for mounting devices. Space for metering and instrumentation components, and current limiters (when required).
4. Miscellaneous appurtenances as required for a complete installation.
5. Cleats for securing all conductors.

B. When Serving as Service Entrance Equipment:
1. Shall conform to UL 869 and have a Service Entrance Type UL label
2. Shall be full-fault current rated, series rating of devices is not allowed. See drawings.
3. Where utility company metering equipment is shown, provide current transformer space, meter base(s), metering conductors and miscellaneous appurtenances as required by serving utility.
4. Shall contain surge arrestors on all phases for voltage surge protection on secondary (under 600V) electrical wiring systems. Similar to Square-D, J9200.

C. Digital Line Meter/Monitor **(Spec Writer) this may add size to the switchboard, please verify)**
1. Provide a digital line Meter / Monitor device equal to Cutler-Hammer type IQ DP-4000 Series having the features and functions specified below. The Meter / Monitor device shall consist of a single microprocessor-based unit capable of monitoring and displaying the functions listed below with the accuracy indicated; the MM4 shall auto range between units, kilounits and megaunits. The Meter / Monitor device shall provide the adjustable protection functions indicated and the capability to communicate data via twisted pair network. The MM4 shall be UL listed, CUL and CE certified and also meet ANSI standard C37.90.1 for surge withstand.

METERED VALUES	ALARM FUNCTIONS (ACCURACY % FULL SCALE)
AC Phase Amperes +/- (0.3%)	Voltage Phase Loss
AC Phase Voltage +/- (0.3%)	(less than 50% rms)
Watts +/- (0.6%)	Current Phase Loss
VA +/- (0.6%)	(1/16 largest phase)
vars +/- (0.6%)	Phase Voltage Unbalance
Power Factor 1.0% (+/- 1 digit)	(5 to 40% – 5% steps)
Frequency +/- (0.1 Hz)	Phase Voltage Reversal
Watthours +/- (0.6%)	Overvoltage
varhours +/- (0.6%)	(105 to 140% – 5% steps)
VA hours +/- (0.6%)	Undervoltage (95 to 60% – 5% steps)
Watt Demand with	Time Delay for Overvoltage,
10-, 15-, 20-, 25-, 30-,	Undervoltage, and Phase
45-, 60-minute interval)	Unbalance (0 to 20 seconds –
%THD (through 31st harmonic)	1-sec. steps)
Voltage – minimum/maximum	

METERED VALUES	ALARM FUNCTIONS (ACCURACY % FULL SCALE)
Current – minimum/maximum	
Power – minimum/maximum	
Power Factor – minimum/maximum	
Frequency – minimum/maximum	
Peak % THD	
Peak Demand	

2. Input ranges of the Meter / Monitor device shall accommodate external current transformers with ranges from 5/5 through 12,800/5 amperes. Provide external current transformers sized for incoming service. Potential transformers shall be self-included and fused up to 600 volts. Above 600 volts, provide fused external potential transformers.
3. Control power shall be capable of being supplied from the monitored incoming AC line without the need for a separate AC supply control circuit or separate remote power source (96 to 264V AC or 100 to 350V DC) where shown on the drawings.
4. Provide the following features:
   a. Synchronizing pulse input shall be provided, and when activated, shall override the preset watt demand interval and let the utility control the demand window.
   b. Load shed feature, which activates the pulse initiation relay when a user selected parameter exceeds a pre-programmed range.
   c. Outputs shall have separate Form C (NO/NC) trip and alarm contacts with ratings of 10 amperes at 115/240V AC or 30V DC resistive. In addition, provide a separate Form C (NO/NC) contact to provide a programmable kilowatt-hour pulse output. The pulse shall be KYZ type.
5. Provide an addressable communication card capable of transmitting all data, including trip data over a compatible two-wire local area network to a central personal computer for storage and/or printout. The network shall also be capable of transmitting data in RS-232c format via a translator module.

D. Ground Fault Protection: Provide the following ground fault protection equipment on breakers (switches) rated 1000 amps or more, and as indicated.
1. A current transformer (also called a sensor or current monitor) installed and connected to indicate the sum of all phase and neutral currents. (Zero sequence method). A current transformer on the grounding conductor is not acceptable.
2. A current transformer (also called a ground break relay) operated by the current transformer. Trip point shall be adjustable (calibrated scale indication) from 20% to 60% of the breaker or switch rating (or 1200 amps whichever is lower). The sensor shall also include an adjustable time delay (calibrated scale indication) from .1 second to .4 second (approximately).
3. A monitor or test panel whose functions shall furnish a means to test the ground fault system; monitor to control voltage; indicate when the sensor has tripped the breaker (switch); and reset the system.
4. A trip device on the breaker or switch operated by the ground fault sensor.

E. Ground current meter and current transformer similar to Square-D #EA1GG/GF1 with current transformer on the neutral bonding jumper.

2.06 NAMEPLATES

A. Nameplates shall be installed on all switchboards. Each individual switch shall be identified with a nameplate adjacent to the switch, describing the load connected.

B. Provide a service entrance label nameplate on the main switchboard which includes the following:
1. Architect
2. Electrical Consultant
3. Electrical Contractor
4. Date of Installation
5. Service Voltage & Bus Amperage Rating

6. Symmetrical Short Circuit Current Rating
7. Year of Manufacture

C. Lettering size shall be suitable for the size of plate and information contained. Nameplates shall be engraved plastic (3/8-inch high minimum letters). Attach with stainless steel screws.

D. Nameplate color shall be: Emergency System - white on red, normal System - white on black.

E. Provide a riser diagram drawing using non-fading ink and mylar installed under glass and attached to the exterior of the main switchboard showing feeder runs, panels, transformers and raceway sizes.

2.07 SINGLE PHASING SENSORS

A. Provide single phasing sensors to trip the main switches in the event of a single-phase failure.

2.08 CLEATS

A. Provide for securing all feeder cables within the switchboard.

PART 3 EXECUTION

3.01 MOUNTING

A. Shall be bolted to floor using 1/2" x 8" (minimum) black mild steel foundation anchor J-bolts and anchored similarly to building structure to prevent overturning in the event of earthquake. Provide 3" thick structural concrete "housekeeping pad". J-Bolts in the floor shall be set in the structural floor and extend through the housekeeping pad with sufficient threads to attach the switchboard.

3.02 WIRING

A. Shall conform to applicable Sections of these specifications.

B. Shall be secured to switchboard enclosure with cleats. Maximum spacing shall not exceed 24 inches.

3.03 SPACE

A. Verify space available with equipment sizes and code required working clearances prior to submittals of shop drawings

3.04 GROUNDING

A. Provide pursuant to Section 260526.

3.05 UTILITY REQUIREMENTS

A. When service switchboard includes utility company metering equipment, provide all devices and wiring to meet serving utility requirements.

3.06 PULSE OUTPUT FOR REMOTE METERING, SINGLE PHASE, UNDER/OVER VOLTAGE OUTPUT

A. Provide programming of the digital meter assembly and provide all necessary components to supply a calibrated pulse output signal and a single phase, under/over voltage signal to interface with the EMCS system. Programming shall be provided by a factory authorized representative. Coordinate with the EMCS Contractor as required for complete operation.

3.07 TESTING

A. Perform visual and mechanical assessment including but not limited to verification of manufacturers installation instructions, verification of grounding in agreement with the contract documents and applicable codes and standards, and proper mounting of equipment to the floor or pad.

B. Torquing requirements and installation of all terminations 1,000 amps and above shall be certified by an independent testing agency.

C. All breakers with adjustable trip settings shall be set as recommended by the coordination study. These settings shall be verified and tested by an independent testing agency.

END OF SECTION 262413

SECTION 262416
PANELBOARDS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide all panelboard equipment, complete; dead front type.

1.02 RELATED SECTIONS

A. Section 260000 – Electrical General Conditions

B. Section 260573 – Electrical System Studies

C. Section 264300 – Surge Protective Devices

1.03 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e (Amended 2017).

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C. NECA 407 - Standard for Installing and Maintaining Panelboards; 2015.

D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

E. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2000, with Errata (2008).

F. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013.

G. NEMA PB 1 - Panelboards; 2011.

H. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less; 2013.

I. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.

J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

K. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

L. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

M. UL 67 - Panelboards; Current Edition, Including All Revisions.

N. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.

O. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

P. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

Q. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

R. UL 1053 - Ground-Fault Sensing and Relaying Equipment; Current Edition, Including All Revisions.

S. UL 1699 - Arc-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data
   1. Panelboards

B. Shop Drawings
   1. Panelboards

C. Testing
   1. Visual and Mechanical Assessment
   2. Torquing (>=1000A)

3. Adjustable Trip Testing

D. O&M Manuals
   1. All Information from Previous Submittals
   2. Mfg. Maintenance Manual
   3. Recommended Maintenance Procedures

1.05 PRODUCT DATA

A. The contractor shall include product data identifying compliance with all pertinent items of Part 2 of this specification. All pertinent options shall be identified in the product data submittal. If options have not been identified clearly, the submittal will be rejected.

B. Provide panelboard specifications including all main and branch breaker sizes and ratings, metering components including CTs and PTs, surge protective devices and any other equipment included within the panelboard assembly. All features to be included with each panelboard shall be clearly indicated. If selected features are not indicated, the submittal will be rejected.

1.06 SHOP DRAWINGS

A. Provide panelboard one-line drawing showing main connection and bussing

B. Provide panelboard dimension drawings including but not limited to bussing, breaker sizes and locations, bus ratings, enclosure information and associated equipment information.

PART 2 PRODUCTS

2.01 PANELBOARD TYPE

A. Panelboards shall be rated at proper voltage and current for intended use with busbars of copper or aluminum. Panels shall be 3-phase, 4-wire, 100% neutral, unless noted otherwise. Where aluminum is utilized, all lugs shall be of an approved compression type. Provide multiple lugs where conductors in parallel or "feed through" are shown on the Drawings.

B. Conductor Connectors shall be bolted to busbars using Grade 5 bolts and Belleville washers. Feeder conductor connectors shall be rated for 75 Degree C. wire when 75 Degree C. wire is indicated. Where aluminum conductors are utilized for feeders or branch circuits the connectors shall conform with Section 260519.

C. Panelboards shall have a separate ground bus bonded to the panelboard frame.

D. Where 120-Volt, 15- or 20-Amp breakers are intended for switching loads they shall be of type rated for switching duty labeled "SWD."

2.02 ACCEPTABLE MANUFACTURERS

A. ABB

B. Square-D

C. Siemens

D. Cutler-Hammer

2.03 CIRCUIT BREAKERS

A. The following interrupting capacity, 10,000 AIC Symmetrical shall be considered minimum. Other ratings shall be as specified on panel schedules shown on the Drawings. Series rating of breakers is not allowed.

B. Mount breakers in all panelboards so that breaker handles operate in a horizontal plane. Bolt in type only. Provide common trip on all multiple pole breakers.

C. Where noted, provide spare breakers, complete for future connection of wiring circuits. Where "Space" is indicated for breakers, provide all bussing and breaker mounting hardware in the panelboard, provide steel knockouts in dead front metal closure of unused part of panel. If any steel knockouts are removed, provide breakers in such spaces or approved cover plates. Open spaces are not permitted.

D. For multi-wire branch circuits, provide approved breaker handle ties where required by NEC 210.4.

E. An Arc-fault circuit interrupter shall be provided for all receptacles, lighting fixtures, and smoke detector in bedrooms/living units.

2.04 CABINET FOR EACH PANELBOARD

A. Flush or surface, as indicated; tight closing doors without play, when latched. Where two cabinets are located adjacent to each other in finished areas, provide matching trim of the same height. Where a remote-controlled switch or contactor is mounted in any panelboard, mount on same frame as panelboard interior with screw retained access door in dead front shield; common door over circuit breakers and remote-controlled device. Where flush mounted, provide (2) 3/4" conduits to accessible ceiling space for future expansion.

B. All conduits for future expansion shall stub into a junction box, where located above grade, and shall be sealed in the panel.

C. Provide cabinets of sufficient dimensions to allow for future expansion and addition of circuit breakers within the panelboards as indicated on panel schedules.

D. Provide cabinet front with full-height hinged door. One door over the interior and an additional hinged dead front cover over interior and wireway (door-in-door). Full-height front cover hinged to box with concealed trim clamps. Provide flush door locks.

E. Provide lock for each cabinet door. All Electrical Distribution Equipment Locks shall be keyed identically. Key system shall match existing. Supply Owner with minimum six keys.

F. Fasten panelboard front with machine screws with oval counter-sunk heads, finish hardware quality, with escutcheons or approved trim clamps. Clamps accessible only when dead front door is open are acceptable. Surface mounted panelboards with fronts greater than 48 inches vertical dimension shall be hinged at right side in addition to hinged door over dead front.

G. Finish: Provide factory prime coat for cabinets to be located in finished areas. Where cabinets are located in unfinished areas, standard lacquer or enamel finish, gray or blue-gray color, shall be substituted for factory prime coat.

2.05 SYSTEM OF NUMBERING AND BUS ARRANGEMENT

A. Shall be as shown on the Panel Schedules on the Drawings.

2.06 PANELBOARD NAMEPLATE

A. Provide engraved and filled (or color layer - engraved through outer layer) plastic nameplate with ½-inch high characters (for panel name); attached with screws to each NEMA 1 panelboard front. White on black, include voltage, phases, wires and minimum A.I.C. Rating in 3/8-inch characters.

B. Nameplate color shall be:
   1. Emergency System: White letters on red
   2. Normal System: White letters on black

C. Provide a service entrance label nameplate on the main panelboard which includes the following:
   1. Architect
   2. Electrical Consultant
   3. Electrical Contractor
   4. Date of Installation
   5. Service Voltage & Bus Amperage Rating
   6. Symmetrical Short Circuit Current Rating
   7. Year of Manufacture

D. Provide a riser diagram drawing using non-fading ink and mylar installed under glass and attached to the exterior of the main panelboard showing feeder runs, panels, transformers and raceway sizes.

PART 3 EXECUTION

3.01 MOUNTING

A. Secure in place with top of cabinet at 6'-0", unless otherwise noted. Top of cabinet and trim shall be level. Firmly anchor cabinets directly or with concealed bracing to Building Structure. When panels are not located in or directly on a wall, provide a support frame of formed steel channel which is anchored to the floor and Ceiling Structure. Interiors shall not be installed until Structure is totally enclosed. Where panels are mounted adjacent to each other, the top edges shall be at the same height.

3.02 CIRCUIT INDEX

A. For each branch circuit panelboard provide a typewritten index listing each circuit in the panelboard by number with its proper load designation. Mount with a transparent protective cover inside cabinet door. Listing shall match circuit breaker arrangements, typically with odd numbers on the left and even numbers on the right. Room numbers used shall be final room numbers used in the building as verified with the Owner, and not room number assigned on Plans.

3.03 CABINET PAINTING

A. Cabinets furnished as prime painting shall be field painted to match color of adjacent wall. (See Division - Painting).

3.04 SPACE

A. Verify space available with equipment sizes and Code Required Working Clearances prior to Submittal of Shop Drawings.

3.05 GROUNDING

A. Provide separate ground busbar for all panels supplying isolated ground circuits.

3.06 FEED THROUGH AND DOUBLE LUGS

A. Provide feed through or double lugs with amperage equal to the incoming feeder amperage unless shown as larger.

3.07 TESTING

A. Perform visual and mechanical assessment including but not limited to verification of manufacturers installation instructions, verification of grounding in agreement with the contract documents and applicable codes and standards, and proper mounting of equipment to the floor or pad.

B. Torquing requirements and installation of all terminations 1,000 amps and above shall be certified by an independent testing agency.

C. All breakers with adjustable trip settings shall be set as recommended by the coordination study. These settings shall be verified and tested by an independent testing agency.

END OF SECTION 262416

SECTION 262419
MOTOR CONTROLLERS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Work under this section includes all requirements for motor controls to be furnished under the electrical portion of the work on all electrical motor driven equipment. Individually mounted starters shall be provided by Division 26 Contractor. Motor controls shall conform to NEMA Standards for each specific purpose.

B. The Division 26 Contractor shall furnish all motor controllers not included with equipment furnished under other divisions of these specifications or by Owner. The Division 26 Contractor shall install all motor controllers including all controllers not factory assembled into equipment furnished under other divisions of these specifications or by Owner.

1.02 RELATED SECTIONS

A. Section 260000 – Electrical General Conditions

1.03 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e (Amended 2017).

B. IEEE C37.20.7 - IEEE Guide for Testing Metal-Enclosed Switchgear Rated up to 38 kV for Internal Arcing Faults; 2007 (Corrigendum 2010).

C. IEEE C57.13 - IEEE Standard Requirements for Instrument Transformers; 2016.

D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

E. NECA 402 - Standard for Installing and Maintaining Motor Control Centers; 2014.

F. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

G. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2000, with Errata (2008).

H. NEMA ICS 2.3 - Instructions for the Handling, Installation, Operation, and Maintenance of Motor Control Centers; 2019.

I. NEMA ICS 5 - Industrial Control and Systems: Control Circuit and Pilot Devices; 2017.

J. NEMA ICS 6 - Industrial Control and Systems: Enclosures; 1993 (Reaffirmed 2016).

K. NEMA ICS 18 - Motor Control Centers; 2001 (Reaffirmed 2007).

L. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013.

M. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.

N. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

O. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.

P. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

Q. UL 845 - Motor Control Centers; Current Edition, Including All Revisions.

R. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

S. UL 977 - Fused Power-Circuit Devices; Current Edition, Including All Revisions.

T. UL 1053 - Ground-Fault Sensing and Relaying Equipment; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data
   1. Motor Controllers

B. Shop Drawings
   1. Motor Controllers

C. Testing
   1. Visual and Mechanical Assessment
   2. Test Procedure
   3. Test Results

D. O&M Manuals
   1. All Information from Previous Submittals
   2. Mfg. Maintenance Manual
   3. Recommended Maintenance Procedures

1.05 PRODUCT DATA

A. The contractor shall include product data identifying compliance with all pertinent items of Part 2 of this specification. All pertinent options shall be identified in the product data submittal. If options have not been identified clearly, the submittal will be rejected.

B. Provide motor controller product data for all types and sizes utilized for this project including but not limited to specifications and features, manufacturers product data, withstand rating, and any other pertinent product details. All features to be included with each motor controller shall be clearly indicated. If selected features are not indicated, the submittal will be rejected.

1.06 SHOP DRAWINGS

A. Provide dimension drawings for each type and size of motor controller utilized for this project including but not limited to enclosure dimensions, enclosure front view showing lights, pushbuttons, switches, labeling, and any other devices to be installed for motor control and monitoring.

B. Provide schematic drawings for each type and size of motor controller utilized for this project including but not limited to one-line drawings, control schematics, and any other devices to be installed for motor control and monitoring. Schematic drawings shall clearly indicate interfaces to I/O external to the motor controller with a brief description of the I/O function.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Square D

B. Allen Bradley

C. General Electric

D. Cutler-Hammer

E. Siemens

2.02 MOTOR VOLTAGE INFORMATION

A. Voltages available are 480 Volt, 3 phase or 208 Volt, 3 Phase, and 115 Volt Single Phase.

B. Circuits are designed (in general) for motors as follows:
   1. Smaller than 1/2 H.P. - 115 Volts, Single Phase 1/2 H.P. and larger - 460 or 200 Volts, 3 Phase

C. Verify motor sizes and voltages provided under other divisions and notify General Contractor immediately if any discrepancies are noted.

2.03 MOTOR STARTERS

A. Magnetic Motor Starters: Unless noted otherwise, shall be full voltage non-reversing with three overloads sized to suit nameplate amperes of motor served, motor "On" and "Off" pilot lights, "Hands-Off-Auto" switch, and auxiliary contacts for interlocking.

B. Combination Motor Starter/Disconnect: Shall be fused switch type with all features of Paragraph A above. In addition, provide disconnect switch auxiliary contacts for disconnection of externally powered control circuits where applicable. Fuses shall be sized in accordance with motor manufacturer's requirements.

C. Manual Starters: Shall be toggle switch or push-button type, lockable in the "Off" position, with overload relays, pilot light and enclosure pursuant to Paragraph D below. Manual starters shall only be used where specifically shown or called out on the drawings and only for single phase, fractional horsepower motors.

D. Enclosures: All motor controllers shall be contained in an enclosure suitable for the environment in which the controller is mounted, and shall be weatherproof when exposed to weather.

E. Overload Devices: Shall be melting alloy or bimetallic type. One overload shall be provided for each phase. Provisions shall be made for resetting the overload devices from outside the starter enclosure. Provide ambient compensated overload devices only when the motor is at a constant temperature and the controller is subject to a separate, varying temperature. Automatic reset overload devices are not permitted.

2.04 MOTOR CONTROL CENTERS

A. Motor Control Centers shall consist of one or more enclosed vertical sections jointed together to form a rigid, free-standing assembly. The construction of the Motor Control Center shall meet the requirements set forth by U.L. 845, NEMA number ECS-2-322 and the N.E.C. The enclosure shall in accordance with NEMA standards type 12. Wiring shall be Class II Type B. Terminal blocks shall be conventional track mounted.

2.05 NAMEPLATES

A. Pursuant to Section 260000, Paragraph 2.05, provide nameplates permanently attach (with screws on NEMA 1 enclosures) on each controller, nameplates with the following information: Load served, voltage, phase, short circuit rating, panel/circuit number and where applicable fuse size and type.

2.06 FAN SHUTDOWN RELAYS

A. Contractor shall provide relay(s) with sufficient contacts to shutdown all fans over 2000 cfm upon receipt of Fire Alarm. See Section 283100. Coordinate coil voltage with Fire Alarm System Supplier.

2.07 POWER FACTOR CORRECTION

A. Provide power factor correction capacitors for all motors 25 horsepower and above. Capacitor size when indicated on the drawings is an approximation only. Final size shall be determined by the Contractor based on the recommendations of the motor manufacturer to bring the power factor to between 0.9 and 0.95. All capacitors are to be fused, with blown fuse indicators mounted on the front of the unit. Provide discharge resistors when required by code.

PART 3 EXECUTION

3.01 FINISHED AREAS

A. In finished areas, mount motor protection switches flush and install suitable coverplates.

3.02 HEATERS

A. Install heaters co-related with full-load current of motors provided.

3.03 OVERLOADS

A. Set overload devices to suit motors provided.

3.04 SUPPORTS

A. Securely mount to equipment, wall or acceptable mounting frame.

3.05 FAN SHUTDOWN WIRING

A. Provide wiring interlock connections for all (over 2000 cfm) fan starter control circuits via Division 23 furnished fan shutdown relay to shutdown fans upon receipt of Fire Alarm.

3.06 FAN SHUTDOWN WIRING

A. Provide wiring interlock connections for all (over 2000 cfm) fan starter control circuits via a relay to shutdown fans upon receipt of Fire Alarm.

3.07 CONNECTION TO MECHANICAL EQUIPMENT ON ROOFS

A. The Contractor shall coordinate all roofing penetrations with the general contractor and roofing contractor to assure that the roofing warranty is maintained.

B. Attachment of conduits to the roof to serve mechanical equipment and devices shall comply with Section 260533.

3.08 MECHANICAL EQUIPMENT NAMEPLATE RATINGS

A. The Division 26 Contractor shall verify that the nameplate ratings of the mechanical equipment, when they arrive on site, are consistent with the ampacity called out on the drawings. The Contractor shall bring any discrepancies to the Engineers attention prior to installation of conduit and wiring.

3.09 TESTING

A. Provide visual and mechanical assessment of each motor controller showing that they have been installed per the manufacturers recommendations, are accessible, installation is complete and is in agreement with the contract documents.

B. Provide testing procedure for each type of motor controller for review and approval by the engineer. Test procedure shall include testing of each control feature for each motor controller. Test procedure shall be submitted to the engineer a minimum of two weeks prior to the date of schedule testing.

C. Provide operational testing of each motor controller showing that the motor controller has been properly wired and that all features are operating in agreement with the contract documents. Submit results of operational testing to the engineer for review and approval within two weeks of motor controller testing.

END OF SECTION 262419

SECTION 262726
SWITCHES AND RECEPTACLES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide all wiring devices and plates.

1.02 RELATED SECTIONS

A. Section 260000 – Electrical General Conditions

B. Section 260532 – Outlet and Pull Boxes

C. Section 272000 – Data and Voice Infrastructure

1.03 REFERENCE STANDARDS

A. FS W-C-596 - Connector, Electrical, Power, General Specification for; 2017h.

B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush-mounted (General Specification); 2017g.

C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

D. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.

E. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2015).

F. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2016.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.

I. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.

J. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.

K. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

L. UL 1310 - Class 2 Power Units; Current Edition, Including All Revisions.

M. UL 1449 - Standard for Surge Protective Devices; Current Edition, Including All Revisions.

N. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.

O. UL 1917 - Solid-State Fan Speed Controls; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data
   1. Switches and Receptacles
   2. Device Plates
   3. Labels

B. O&M Manuals
   1. All Information from Previous Submittals

1.05 PRODUCT DATA

A. The contractor shall include product data identifying compliance with all pertinent items of Part 2 of this specification. All pertinent options shall be identified in the product data submittal. If options have not been identified clearly, the submittal will be rejected.

B. Provide product data for each switch and receptacle utilized on the project. The product data shall be provided for each type and include but not be limited to device ratings, color, and suitable uses.

C. Provide product data for each device plate utilized on the project. The product data shall be provided for each type and include but not be limited to color and suitable uses.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Hubbell

B. Pass & Seymour

C. Leviton

D. Cooper

2.02 GENERAL REQUIREMENTS

A. Push-in terminals are not allowed.

B. All devices color shall be white, unless otherwise noted.

2.03 SWITCHES

A. Emergency Push-Button Switches: Provide a red emergency push-button, momentary contact, yellow enclosure with clear plastic cover. Reset shall be by twisting the push-button.
   1. For Shut-Down of Boilers: Switch shall be connected through an auxiliary contact tied to the boiler power supply. Label shall read: “Boiler shut-down”. The switch shall be located adjacent to an exit door.
   2. Approved Manufacturer: STI – Safety Technology International.

B. "Industrial Specification Grade", quiet type, rated 277-volt, 20 amp, unless noted, with plastic handle. Single pole, double pole, 3-way, or locking type as required. Meets Fed. Spec. WS-896 Provide matching styles and colors in other devices as required for the conditions of installation. Hubbell CSB120, Eaton CSB120, Leviton 1221, and P&S 20AC1

C. Interchangeable type shall be rated same as above.

D. LED Dimmer: LED 0-10V dimmer switch shall be compatible with supplied LED board and driver. Dimmer switch shall have vertical slide with a positive “on/off” button. Dimmer shall have high and low end, field adjustable trim setting. Provide with associated power pack for control. Lutron Diva or approved equal.

E. Momentary Contact Line Voltage Switches: Single pole, double throw, 3-wire, normally open. Rating same as above.

F. Magnetic Low-Voltage Dimmer: Dimmer switch shall be listed for use with magnetic low-voltage light fixtures. Dimmer switch shall have a vertical slide with a positive “off” button. The dimmer shall be rated for a minimum of 1500VA. Dimmer shall have a radio/TV interference filter. Leviton ‘Renoir’ series.

G. Incandescent Dimmer: Incandescent dimmer switch shall be rated at 2000 watts, 120-volt, 60 hertz. Dimmer switch shall have a vertical slide with a positive “off” button. Dimmer shall have a radio/TV interference filter. Leviton ‘Renoir’ series.

H. Fluorescent Dimmer: Fluorescent dimmer switch shall be rated at 1200VA (900 Watts maximum loading), 120V or 277V, 60 hertz. Dimmer switch shall have a vertical slide with positive “off” button. Suitable for single-pole and 3-way. Dimmer shall have a radio/TV interference filter. Dimmer shall be matched with electronic dimming ballast. See specification section 16500. Leviton ‘Renoir’ series.

I. Key Operated: Hubbell HBL1221L (or equal) with 1209 Key. Provide 24 spare Keys.

J. Timer Switch: Provide electronic light timer switch where indicated on drawings. The timer switch shall be connected to the room lighting and fan. The timer switch shall be programmable for time-out from 5 minutes to 2 hours. Set timer for standard 20 minutes time-out period, time scrolls up, flash off, beeper on. Manufacturer: Watt Stopper – Inteli-switch Digital Time Switch.

K. Motor rated switches: Switches serving as motor disconnecting means shall be horsepower rated with overload relays and meet requirements as stated above. See manual starters in Section 262419, ‘Manual Starters’.

L. Combination AFCI/Switch: 15 amp rated, 20-amp feed-through, 125 Volt outlet branch circuit combination AFCI/Switch; back and side wired. Leviton AFSW1.

M. Device plates shall be Hubbell and Cooper Type 302 stainless steel.

2.04 RECEPTACLES

A. In All Unfinished Areas & Non-Occupy Able Spaces: Provide "Industrial Specification Grade", Duplex NEMA 5-20R configuration (20-Amp, 120-Volt) unless shown otherwise. Must have “rivetless ground” contact manufactured as an integral component of the external ground screw terminal. Meets Fed Spec. WC-596 Hubbell HBL5362, Cooper 5362, P&S 5362A, and Leviton 5362.

B. In All Finished Areas: Provide heavy duty specification grade; general purpose 20 amp. 125-volt, Nema 5-20R, 2P, 3W decora plus duplex receptacle, straight blade, commercial grade, self-grounding, back & side wired. Leviton 16352

C. Self-Testing Ground-Fault Circuit-Interrupter (GFCI) Duplex Receptacles: 20A. 125V AC; 2-pole, 3 wire grounding; 10,000 amps current interrupting; green light indicator when power is ‘on’; red light indicator when device is in the tripped position; Red “EOL” (end of life) indicator with rapid flash when the unit has reached end of life and/or cannot provide GFCI protection. Provide GFI receptacles where required by code.

D. Faceless Self-Testing Ground-Fault Circuit-Interrupter Device: 20A. 125V AC; 2-pole, 3 wire grounding; 10,000 amps current interrupting; green light indicator when power is ‘on’; red light indicator when device is in the tripped position; Red “EOL” (end of life) indicator with rapid flash when the unit has reached end of life and/or cannot provide GFCI protection. Provide faceless self-testing ground fault device ahead of switched receptacles that require GFI protection per code. Mount device in same backbox as the device it is protecting.

E. Dedicated Computer Receptacle: Duplex NEMA 5-20R configuration, grey in color. Leviton 5362G, and Cooper IG5362.

F. Tamper resistant receptacle & USB charger: Duplex 20 Amp; 125V; 3.6-amp USB charging capability. Leviton T5832

G. Switched Receptacles: Switched Receptacles: Switched receptacles shall be ‘green’ in color, smooth nylon face, with permanently marked for use with automatic control systems, back and side wired, decora style. Hubbell DR20C2GN or Hubbell DR20C2GNTR (Tamper Resistant) or Leviton G5362-2TN (GFCI)

H. "Hospital Grade", Duplex NEMA 5-20R configuration (20-Amp, 120-Volt) unless shown otherwise. Hubbell 8300-I, and Cooper 8300.

I. Tamper resistant, Duplex NEMA 5-20R Configuration: Hubbell BR20ITR, Leviton 5362-SGI, and Cooper TR8300, or Leviton TDR20 to match decora style installed in finished spaces per paragraph B above.

J. AFCI Tamper-Resistant Duplex Receptacles: 15 Amp. 125 volt; 20-amp feed-through, tamper resistant, AFCI; back and side wired. Leviton AFTR1.

K. Operating Room Ceiling Drop - NEMA L5-20R configuration (20 amp, 125V) receptacle U.L. listed for hospital use. Locking type Hubbell 23000-HG, and Cooper 23000. Provide ten (10) matching plugs.

L. X-Ray Receptacles - 50-amp, 2 pole, 3 wire, 250 Volt. A.C. grounding type with stainless steel coverplate assembly. Hubbell No. 25505, and Cooper 25505. Provide two (2) matching plugs.

M. Weather Resistant (WR) / Ground Fault Circuit-Interrupter (GFCI) Outdoor Duplex Receptacles: NEMA 5-20R. Hubbell GFTR201 or equal, for 20 Amp, 125-Volt AC.

N. Special Purpose Receptacles: For special purpose receptacles, see drawings for voltage, amperage, and phase. Provide with matching plug delivered to the Owner.

2.05 OCCUPANCY SENSORS

A. Provide self-adjusting occupancy sensor light switching devices for control of lighting in all rooms and offices shown on drawings. Sensors shall be ceiling or wall mounted to provide adequate coverage. Occupancy sensors shall be “Leviton”, Model OSC20-M0W for ceiling mounting, OSW12-M0W for wall mounting, complete with OSP20-RD0 power pack and associated mounting hardware. Provide “Leviton” ODSOD-ID wall switch sensors where shown. Sensors shall be wired to maintain switching and circuits shown on drawings.

2.06 OCCUPANCY SENSORS

A. Provide occupancy sensor switch(es) for control of lighting in all rooms and offices shown on the drawings. Sensors shall be ceiling or wall mounted to provide adequate coverage. Occupancy sensors shall be “Watt Stopper”, or approved equal. Wall mounted sensors shall be Model DT-300, complete with power pack and associated mounting hardware. Wall mounted sensors shall be model DT-200 complete with power pack and associated mounting hardware. Combination occupancy sensor/switch shall be WA200. Combination occupancy sensor/switch, dual circuit shall be WA300. Sensors shall be wired to maintain switching and circuits shown on drawings.

2.07 OCCUPANCY SENSORS

A. Provide occupancy sensor switches for control of lighting in classrooms as shown on the drawings. Sensors shall be ceiling mounted to provide adequate coverage. Occupancy sensor shall be “Sensor Switch” Model CM-PDT-R, complete with power pack PP-20-20P, Auxiliary Relay SP-20-20P and associated mounting hardware. Sensors shall be wired and installed per manufacturer’s direction to maintain switching and circuits shown on drawings. Where multiple sensors are located in an individual room, sensors shall be wired parallel with the relays such that either sensor will provide input to turn all lights on and reset time delay. Where occupancy sensors are shown on the drawings to be wall mounted, provide WSD or approved equal.

2.08 DEVICE PLATES

A. Interior: Plates for recessed boxes shall be Hubbell and Cooper Type 302 stainless steel. Attachment screws shall match finish of plate. Plates for surface mounted boxes shall be of pressed stainless steel with size to fit exactly the box used.
   1. Where a duplex receptacle is indicated next to a USB receptacle, provide a dual-gang faceplate and mount both devices in the same backbox under the same faceplate.

B. Exterior: Intermatic # WP1010MC, for vertical mount and # WP1010HMC for horizontal mount, or equivalent for receptacles. Metal cover shall be raintight while-in-use.

2.09 LABELING

A. For NEMA 5-20r receptacles, each device shall be identified with a clear label with black typing stating the panel & circuit number.

B. For receptacles other than NEMA 5-20R, the coverplate shall have ampere rating, voltage and phase engraved on a phenolic label and attached to the cover plate.

2.10 MULTIOUTLET ASSEMBLY (WHEN SHOWN)

A. Provide assemblies complete, including necessary fittings and hardware with circuits as indicated on Plans and outlet spacing as indicated. All assemblies shall contain ground wire. Wiremold or equal.

2.11 SPARE DEVICES

A. Provide the following spare devices:

Device	Quantity
Single-pole switch	3
Duplex receptacle	5
Dedicated duplex receptacle	3
Isolated ground receptacle	4
GFI receptacle	3
20A, single-phase equipment connection	5
20A, three-phase equipment connection	3

B. Each spare device shall include 100 feet of conduit, wire, faceplate and labor; all as required for a complete installation. Location of these units to be determined by the Owner's representative at the site. Unused devices shall be turned over to the Owner.

PART 3 EXECUTION

3.01 MOUNTING

A. Rigidly fasten each device to the outlet box at proper position with the wall to bring receptacle flush with plate or switch handle the proper distance through the plate.

B. Occupancy sensors that are ceiling mounted shall be located a minimum of 4'-0" away from a mechanical equipment diffuser.

3.02 ORIENTATION

A. Set Switches vertical with handle operating vertically, up position "ON" at +48" above finished floor.

B. Set Receptacles vertical with ground slot down at +18" above finished floor.

C. Set Exterior Receptacles horizontal at +18" above finished grade.

3.03 DEVICE PLATES

A. Shall be stainless steel for each new wiring device and for each telephone and signal equipment outlet, except where equipment mounted thereon covers the outlet box completely.

B. Provide new covers on existing outlet boxes being reused.

3.04 DIMMER SWITCHES

A. Provide a separate neutral for each phase.

B. Fluorescent dimmer switches require a 4 square backbox per switch.

3.05 RECEPTACLE GROUNDING

A. Provide bare bonding wire between receptacle grounding terminal and box. Plaster ear screws connecting frame to the box will not be acceptable for grounding.

B. Provide green insulated grounding conductor in all branch circuits supplying isolated ground and ground-fault circuit-interrupter type receptacles.

3.06 HANDICAPPED ACCESS

A. Comply with requirements of Washington State Handicapped Access Code.

END OF SECTION 262726

SECTION 262813
FUSES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide all fuses as required. Provide three (3) spare of each size and type required. Fuses shall not be installed until equipment is ready to be energized. This measure prevents fuse damage during shipment of the equipment from the manufacturer to the jobsite or from water that may contact the fuse before the equipment is installed. Final tests and inspections shall be made prior to energization of the equipment. This shall include a thorough cleaning, tightening, and review of all electrical connections and inspection of all grounding conductors. All fuses shall be furnished by the Electrical Contractor. All fuses shall be of the same manufacturer.

1.02 RELATED DOCUMENTS

A. Section 26 00 00 – Electrical General Conditions

1.03 REFERENCE STANDARDS

A. NEMA FU 1 - Low Voltage Cartridge Fuses; 2012.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. UL 248-1 - Low-Voltage Fuses - Part 1: General Requirements; Current Edition, Including All Revisions.

D. UL 248-4 - Low-Voltage Fuses - Part 4: Class CC Fuses; Current Edition, Including All Revisions.

E. UL 248-8 - Low-Voltage Fuses - Part 8: Class J Fuses; Current Edition, Including All Revisions.

F. UL 248-10 - Low-Voltage Fuses - Part 10: Class L Fuses; Current Edition, Including All Revisions.

G. UL 248-12 - Low-Voltage Fuses - Part 12: Class R Fuses; Current Edition, Including All Revisions.

H. UL 248-15 - Low-Voltage Fuses - Part 15: Class T Fuses; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data
   1. Fuses
   2. Spare Fuse Cabinet

B. O&M Manuals
   1. All Information from Previous Submittals
   2. Mfg. Maintenance Manual
   3. Recommended Maintenance Procedures

1.05 PRODUCT DATA

A. The contractor shall include product data identifying compliance with all pertinent items of Part 2 of this specification. All pertinent options shall be identified in the product data submittal. If options have not been identified clearly, the submittal will be rejected.

PART 2 PRODUCTS

2.01 MAINS, FEEDERS, AND BRANCH CIRCUITS

A. Circuits 601 to 6000 amperes shall be protected by current limiting BUSSMANN Low-Peak Time-Delay Fuses KRP-C. Fuse links shall be pure silver links (99.9% pure), delay and must hold 500% of rated current for a minimum of 4 seconds, clear 20 times rated current in .01 seconds or less and be listed by Underwriters Laboratories Inc., with an interrupting rating of 200,000 amperes r.m.s.

B. Circuits 0 to 600 amperes shall be protected by current limiting BUSSMANN LOW-PEAK Dual-Element Fuses LPN-RK (250 volts) or LPS-RK (600 volts). All dual-element fuses shall have separate overload and short-circuit elements. Fuse shall incorporate a spring activated thermal overload element having a 284°F. melting point alloy and shall be independent of the short-circuit clearing chamber. The fuse must hold 500% of rated current for a minimum of 10 seconds and be listed by Underwriters Laboratories, Inc., with an interrupting rating of 200,000 amperes r.m.s. symmetrical. The fuses shall be UL Class RK1 to maintain the Engineered protection of the system components.

C. Motor Circuits: All individual motor circuits with full load amperes ratings (FLA) of 480 amperes or less shall be protected by BUSSMANN LOW-PEAK Dual-Element Fuses LPN-RK (250 volts) or LPS-RK (600 volts). Larger H.P. motors shall be protected by BUSSMANN Type KRP-C Low-Peak Time-Delay Fuses of the ratings shown on the drawings. All other motors, (such as 1.0 service factor motors) shall be protected by BUSSMANN LOW-PEAK Dual-Element Fuses LPN-RK (250 volts) or LPS-RK (600 volts) installed in ratings of approximately 115% of the motor full load current except as noted above. The fuses shall be UL Class RK1 Dual Element Time Delay or Class L.

D. Fluorescent fixtures shall be protected by BUSSMANN Fuses GLR or GMF installed in HLR Holder. They shall have individual protection on the line side of the ballast. A fuse and holder shall be mounted within or as part of the fixture. Size and type of fuse to be recommended by the ballast manufacturer.

2.02 SPARE FUSES

A. Spare fuses shall be provided with a minimum of three of each ampere rating. See Section 265000 for quantities of spare fusing required for ballasted light fixtures.

2.03 ACCEPTABLE MANUFACTURERS

A. Bussman

B. Little Fuse

2.04 SPARE FUSE CABINET

A. Provide a spare fuse cabinet for the above-required spare fuses. Cabinet front and lock shall match panelboard equipment specified in Section 262416.

2.05 NAMEPLATE

A. Provide Nameplate "Spare Fuse Cabinet." Construct and attach in accordance with Section 262416, Paragraph 2.06.

PART 3 EXECUTION

3.01 FUSES

A. Install in all fusible devices provided under this Contract.

3.02 SPARE FUSE CABINET

A. Locate in Main Distribution Switchboard Room or as shown on drawings.

END OF SECTION 262813

SECTION 262816
DISCONNECTS AND FUSED SWITCHES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provided all disconnects, fused and unfused, required by code for equipment furnished under this and other divisions of these specifications and as shown on the drawings.

1.02 RELATED SECTIONS

A. Section 260000 – Electrical General Conditions

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

C. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013.

D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

H. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.

I. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data
   1. Disconnect Switches

B. Shop Drawings
   1. Disconnect Switches

C. O&M Manuals
   1. All Information from Previous Submittals
   2. Mfg. Maintenance Manual
   3. Recommended Maintenance Procedures

1.05 PRODUCT DATA

A. The contractor shall include product data identifying compliance with all pertinent items of Part 2 of this specification. All pertinent options shall be identified in the product data submittal. If options have not been identified clearly, the submittal will be rejected.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. General Electric

B. Square-D

C. Siemens

D. Cutler-Hammer

2.02 DISCONNECTS

A. Switch shall be heavy-duty type, shall be quick-break and shall be horsepower rated. Switch shall have blades as required to open all ungrounded conductors and shall be single throw unless noted.

B. Enclosure shall have interlocking cover to prevent opening door when switch is closed. Door interlock shall include a defeating scheme, shall be padlockable in the "Off" position.

C. Enclosure shall be suitable for environment in which mounted. All exterior enclosures shall have a minimum raintight rating.

2.03 FUSED SWITCHES (OR FUSED DISCONNECTS)

A. Shall be as above with addition of fuse space and clips to accept only fuses as noted in Section 262813.

B. Fuses shall be provided in all fused disconnects.

C. Fuses shall be sized in accordance with manufacturer's requirements of protected equipment.

2.04 ELEVATOR POWER MODULE SWITCH

A. Provide Elevator Control Switch in a single NEMA enclosure with all necessary relay(s), control transformer and other options (as listed below), and as shown on drawings. The Elevator Control Switch shall have an ampere rating to accommodate the inrush current associated with the rated horsepower and include a fusible switch with shunt trip capabilities. The switch shall utilize Class J Fuses (provided separately under
section 262813). The following shall be included in the switch:
   1. 100 VA control power transformer with primary and secondary fuses.
   2. Isolation relay (3PDT, 10 amp, and 120V). The coil of the isolation relay shall be 120 Vac or 24 Vdc.
   3. Normally open dry contact shall be provided for the Fire Alarm Safety System to energize the isolation relay and activate the shunt trip solenoid (140 VA inrush at 120V).
   4. The switch shall include a 120-volt key to test switch and a 1-NO/1-NC mechanically interlocked auxiliary contact rated 5A, 120 Vac as standard.
   5. “ON” Pilot Light (Green, Red or White).
   6. Isolated Full Capacity Neutral Lug.
   7. Fire Alarm Voltage Monitoring Relay (Needed to comply with NFPA 72).
   8. Main Switch Auxiliary Contacts (1 NO/1 NC).

B. The module shall have been successfully tested to a short circuit rating with Bussmann® Low-Peak® Class J fuses at 200,000 amps RMS Symmetrical.

C. All switches shall have shunt trip capabilities at 120 Vac from remote fire safety signal.

D. Branch feeders shall be selectively coordinated and fed with an upstream supply over-current protective device at a minimum of 2:1 size ratio utilizing LOW-PEAK® (Class J, RK1, or L) fuses.

E. Approved Manufacturers: Cooper – Bussman; Eaton

2.05 NAMEPLATES

A. Provide nameplates on all enclosures and include the following information: Load served, voltage, phase, panel and circuit number. Construct and attach in accordance with
Section 260000, Paragraph 2.05.

PART 3 EXECUTION

3.01 SUPPORTS

A. Secure solidly to wall or approved mounting frame. Disconnects supported only by Raceway are not acceptable.

3.02 SPLICES

A. Wiring space within enclosure shall not be used as a junction box.

3.03 INSTALLATION

A. All material installation shall be in accordance with manufacturers’ recommendations and the provisions of applicable codes.

B. Fuses shall not be installed until equipment is ready to be energized.

END OF SECTION 262816

SECTION 263613
3-WAY MANUAL TRANSFER SWITCH

PART 1 GENERAL

1.01 WORK INCLUDED

A. Contractor shall furnish, deliver, install and test the 3-way manual transfer switches as specified herein and in accordance with the drawings.

1.02 QUALITY ASSURANCE

A. 3-way manual transfer assembly switch shall be UL listed and labeled under the UL 1008 standard.

B. 3-way manual transfer switch manufacturer shall provide a complete factory assembled, wired and tested 3-way manual transfer switch.

C. 3-way manual transfer switch shall be factory Hi-pot tested for a period of not less than 60 seconds.

D. 3-way manual transfer switch installation shall meet all applicable NEC standards.

E. 2017 NEC 700.3 (F) compliant when used in conjunction with an ATS.

1.03 SUBMITTALS

A. Prepare and submit detailed shop drawings for review prior to manufacture. Include the following information (written or highlighted): wiring diagrams, dimensions, front view, catalog information indicating complete electrical and mechanical characteristics and compliance with all items of Section 263613.

B. Upon installation of 3-way manual transfer switches Contractor shall submit manufacturer's Operating & Maintenance Manual which shall include as a minimum:
   1. Certified as-built General Arrangement drawings and Wiring Diagram.
   2. Materials / Component List including part numbers.
   3. Maintenance and service requirements.
   4. Certificate of Compliance and hi-pot test data.

1.04 WARRANTY

A. 3-way manual transfer switches shall be covered by manufacturer's warranty for a minimum period of (1) one year after shipment from manufacturer.

1.05 DEFITIONS

A. Disconnect(s): 100% Rated Molded Case Circuit Breaker or Molded Case Switch as indicated on the drawings.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. ESL Power Systems Inc. 'Triple Switch' or equal as approved by the Engineer.

2.02 3-WAY MANUAL TRANSFER SWITCHES

A. 3-way manual transfer switch shall consist of (3) mechanically-interlocked disconnects, male cam-style inlet connectors, female cam-style outlet connectors, power distribution blocks and grounding terminals, all housed within a pad-lockable enclosure.

B. 3-way manual transfer switch enclosure shall be Type 3R, constructed of continuous seam-welded, powder coated galvanized steel. The main access shall be through an interlocked, hinged door that extends the full height of the enclosure. Access for both portable generator cables with female cam-style plugs and for load bank cables with male cam-style plugs shall be via drawn flange cable entry openings in the bottom of enclosure for wall mount units, or hinged lower door for pad mount units. A hinged flap door shall be provided to cover the cable openings when cables are not connected; the hinged flap door shall allow cable entry only after the main access door has been opened. Enclosure shall be powder coated after fabrication; color shall be wrinkle gray RAL 7035.

C. Cam-style male connectors (inlets) and cam-style female connectors (outlets) shall be UL Listed single-pole separable type and rated 400 amps at 600VAC. All cam-style connectors shall be color coded. Cam-style connectors shall be provided for each phase and for ground, and shall also be provided for neutral. Each of the phase cam-style connectors and the neutral cam-style connectors within the enclosure shall be factory-wired to a disconnect. The ground cam-style male connectors shall be bonded to the enclosure, and a ground lug shall be provided for connection of the facility ground conductor. None of the cam-style connectors shall be accessible unless all (3) disconnects are in the “OFF” position and the main access door is open.

D. A power distribution block shall be provided for load-side field wiring. The power distribution block shall be factory wired to the disconnects.

E. Disconnects shall be UL Listed 3-pole and the short circuit interrupt rating shall be a minimum of 10kAIC. Trip rating of the disconnects shall be as shown on the drawings. One disconnect shall control the connection between the permanent generator and the automatic transfer switch. The second circuit breaker shall control the connection between the permanent generator and the load bank female cam-style connectors. The third circuit breaker shall control the connection between the automatic transfer switch and the portable generator male cam-style connectors.
All (3) disconnects shall include UL Listed door-mounted operating mechanisms, preventing the opening of the main access door unless all (3) breakers are in the “OFF” position.
All (3) disconnects shall be mounted behind a dead-front panel. The load-side of the disconnects shall not be energizable unless the main access door is closed and one of the disconnects is in the “ON” position. The (3) disconnects shall be safety interlocked by mechanical means to ensure that only certain breakers can be closed at any given time.

2.03 RATING

A. Shall have voltage, amperage and ampere withstand ratings as indicated on the drawings.

PART 3 EXECUTION

3.01 MOUNTING

A. Wall mounted or free-standing assembly as per plans.

3.02 INSTALLATION

A. Prior to installation of 3-way manual transfer switches, Contractor shall examine the areas and conditions under which the 3-way manual transfer switch is to be installed and notify the Engineer in writing if unsatisfactory conditions exist.

B. 3-way manual transfer switch shall be installed as shown on the drawings and per the manufacturer’s written instructions. In addition, the installation shall meet the requirements of local codes, the National Electrical Code and National Electrical Contractors Association’s “Standard of Installation”.

C. Conduit entry into the 3-way manual transfer switch shall be by Contractor; Contractor shall furnish and install listed watertight conduit hubs, as manufactured by MYERS or T&B, for each conduit entry on the 3-way manual transfer switch. The incoming hub size shall match the conduit size for feeders and ground as shown on the drawings. The outgoing hub size shall match the conduit size for loads and ground as shown on the drawings. Hubs shall be properly installed and tightened to maintain Type 3R integrity of the 3-way manual transfer switch enclosure.

D. Contractor shall terminate feeder conductors, load conductors and ground per the manufacturer’s instructions. All field wiring terminations shall be torqued as required per the instructions on the 3-way manual transfer switch’s power distribution blocks, disconnects & ground lugs.

3.03 FIELD TESTING

A. Prior to energizing 3-way manual transfer switch, the Contractor shall perform the following checks and tests as a minimum:
   1. Verify mounting and connections are complete and secure.
   2. Verify internal components and wiring is secure.
   3. Perform continuity check of all circuits.

4. Perform 1,000 VDC megger test on feeder, load and ground cables.
5. Verify dead-front is secure.
6. With the 3-way manual transfer switch dead-front in place and the main access door closed and properly latched, actuate all (3) Operator Mechanisms; verify:
   a. With the disconnect controlling the connection between the permanent generator and the automatic transfer switch (ATS) in the “ON” position, neither of the other (2) disconnects can be turned to the “ON” position.
   b. With the disconnect controlling the connection between the permanent generator and the automatic transfer switch (ATS) in the “OFF” position, the other (2) diconnects can be turned “ON” or “OFF”, independent of each other.
   c. With the disconnect controlling the connection between the permanent generator and the automatic transfer switch (ATS) in the “OFF” position and with either or both of the other (2) disconnects in the “ON” position, the breaker controlling the connection between the permanent generator and the automatic transfer switch (ATS) cannot be turned “ON”.
7. Confirm operation of the 3-way manual transfer switch ground receptacle by attaching a plug to the 3-way manual transfer switch ground receptacle and then verify that the plug is grounded to the facility ground.
8. Once normal power has been applied, confirm operation of 3-way manual transfer switch by following directions on main access door.

3.04 OPERATIONS AND MAINTENANCE MANUALS

A. Provide pursuant to Specification Section 260000. Manuals shall in addition contain the following information:
   1. Operating Instructions
   2. Recommended maintenance.
   3. The first page of the manual shall contain the name, address and phone number of the local representative to be called for service and parts.

3.05 INSTRUCTION

A. The Contractor shall (after one week (minimum) written notification to Architect) conduct an instruction session during which all maintenance and operational aspects of the system will be described and demonstrated to personnel selected by the Owner in conjunction with instruction period for Generator System Equipment. The session shall be conducted by a Contractor's representative thoroughly familiar with the characteristics of the system. O & M Manual information regarding the system shall be turned over to the Architect prior to scheduling the instruction session.

END OF SECTION 263613

SECTION 264300
SURGE PROTECTIVE DEVICE (SPD)

PART 1 GENERAL

1.01 WORK INCLUDED

A. This Section describes the materials and installation requirements for transient voltage surge suppressors (TVSS), alternatively called Surge Protective Devices (SPD). TVSS/SPD devices are used for the protection of all AC electrical circuits from the effects of lightning induced currents, substation switching transients and internally generated transients resulting from inductive and/or capacitive load switching.

B. This specification also describes the mechanical and the electrical requirements for the TVSS devices. The TVSS shall be suitable for application in both category A, B and C environments as described in ANSI/IEEE C62.41- 2002.

C. The TVSS shall be of parallel design and provide individual protection components connected Line to Ground and Line to Line for Delta and High Resistance Grounded systems and Line to Ground, Line to Neutral and Neutral to Ground for Wye and Single-Phase distribution systems.

D. Systems not providing discreet protection components in the above configuration will be rejected. A schematic diagram showing the configuration and technology of all internal connected components must be provided with submittals.

E. The TVSS devices will be used both near electrical service entrance locations and at locations distant from service entrance locations (Panels, MCC's, Equipment Disconnects, etc.). For the purposes of this section, it should not be assumed that on Wye systems a neutral to ground bond will not be located electrically close to the suppressor location, thus discreet Neutral to Ground Suppression and Filter components are required.

F. The Manufacturer/Vendor shall furnish all of the necessary TVSS/SPD products and related hardware (i.e., flush mounting kits, mounting brackets, etc.) as required for the installation of the Transient Voltage Surge Suppression (TVSS) / Surge Protective Devices (SPD) System suitable for the application.

1.02 RELATED SECTIONS

A. Section 260000 – Electrical General Conditions

B. Section 260519 - Wire and Cable

C. Section 260526 - Grounding

D. Section 260532 – Outlet and Pull Boxes

E. Section 260533 – Raceways

F. Section 262413 - Switchboards

G. Section 262416 – Panelboards

1.03 REFERENCE STANDARDS

A. IEEE Standard C62.41.1, IEEE Standard C62.41.2 & IEEE Standard C62.45 (latest revisions)

B. MIL-STD-220 - Method of Insertion Loss Measurement; 2009c (Validated 2014).

C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

E. NEMA LS1 (latest revision)

F. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. TVSS device shall be designed to allow installation in accordance with latest adopted version of the National Electrical Code (NEC), National Electrical Safety Codes (NESC) and applicable OSHA 1910 requirements.

I. UL 1283 - Standard for Electromagnetic Interference Filters; Current Edition, Including All Revisions.

J. UL 1449 - Standard for Surge Protective Devices; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data
   1. Surge Protective Device (SPD)

B. Shop Drawings
   1. Surge Protective Device (SPD)

C. Qualifications
   1. Manufacturer Qualifications

D. Testing
   1. Performance and Durability Test Results

E. Warranty
   1. Manufacturer Warranty

F. O&M Manuals
   1. All Information from Previous Submittals
   2. Mfg. Maintenance Manual
   3. Recommended Maintenance Procedures

1.05 PRODUCT DATA

A. The contractor shall include product data identifying compliance with all pertinent items of Part 2 of this specification. All pertinent options shall be identified in the product data submittal. If options have not been identified clearly, the submittal will be rejected.

1.06 QUALIFICATIONS

A. Each complete suppression unit shall be UL1449 3rd Edition Listed as a Transient Voltage Surge Suppressor. UL 1449 test data for TVSS devices proposed, including UL let through voltage classification shall be provided with submittal. Units shall bear suppressed voltage rating issued by UL.

B. Engineer reserves the right to have an employee or a representative designated by firm witness any testing required by this document. Vendor/manufacturer shall provide written notice of intent to test and shall coordinate testing with Engineer, should Engineer desire to witness tests.

C. Performance & Durability Testing: Units shall be tested by an independent test agency in accordance with test procedures outlined in ANSI/IEEE C62.45, NEMA LS1 & UL1449. The following test data shall be provided:
   1. Provide Maximum Surge Current (Single Pulse Rated, 8/20µS, by mode, Amperes) as per NEMA LS1-1992 – 2.2.9 with submittals document. Maximum surge current rating shall not be less than 120kA (60kA per mode including N-G) for branch panel models in low exposure areas, high exposure areas and for IEEE C62.41.1-2002 - Category B Switchboard and Motor Control Center Locations. Maximum surge current rating (per phase in applicable modes other than Neutral to Ground) shall not be less than 240kA (120kA per mode including N-G) for IEEE C62.41.1-2002 - Category C Locations, including all Electrical Equipment located at Service Entrance location. Provide proof of completion of such tests and test data with submittal data. Provide surge current ratings for each applicable protection mode (L-L, L-N, L-G & N-G) with submittals.

2. Provide durability test data utilizing the ANSI/IEEE C62.41-1991, Category C3, 20kV/10kA, 1.2 x 50 S - 8x20S combination waveform. Provide test data with submittals. Let through voltages shall be provided for all applicable protection modes
(L-N, L-G & N-G) from zero reference. All TVSS/SPD devices (including branch panel) shall withstand a minimum of 5,000 hits delivered at a rate of one pulse per minute. Unit shall not fail or suffer let through voltage degradation of more than 7%. Lead length for testing and let through measurements shall be 6". Provide lead length used for testing with submittals.
3. Provide performance test data utilizing the ANSI/IEEEC62.41.2-2002, Exposure - High, 10kV/10kA, 1.2 x 50µS - 8x20µS combination waveform. Provide test data with submittals. Let through voltages shall be provided for all applicable protection modes (L-N, L-L & L-G) from zero reference. Lead length for testing and let through measurements shall be 6". Provide lead length used for testing with submittals.
4. Provide let through voltage test data and test waveforms used for (N-G) with the submittals for units intended for grounded Wye systems.
5. Provide let through voltage test data for the ANSI/IEEE C62.41.2-2002, Category B, 0.5µS-100 kHz 6kV/.5kA ring wave (L-L, L-N & L-G) with the submittals. Let through voltages shall be provided for all applicable protection modes and shall be measured from the zero reference.
6. Provide let through voltage test data for the ANSI/IEEE C62.41.2-2002, Neutral grounded at service entrance – Far Category, 0.5µS-100 kHz 3kV ring wave (N-G) with the submittals for units intended for grounded systems.
7. If available, test data shall be provided for the ANSI/IEEEC62.41.2-2002 level three category of the 5/50 nS EFT Burst waveform as a part of this submittal package. Let through voltages shall be provided for all applicable protection modes
(L-L, L-N, L-G & N-G).
8. All TVSS/SPD tests must provide let through voltages using a positive polarity pulse at the 90-degree phase angle location on the sine wave for Category B and C waveforms and 180-degree for Category A waveforms. Let through voltages must be measured from the zero-voltage reference line for the tests.
9. All let through voltage test results must be provided with a minimum of six inches of lead length as measured from the point where the wire would normally exit the TVSS enclosure (standard installation) to the point of termination. Wire used for test must be of the type of building wiring material recognized by the latest adopted version of the NEC and must be readily available for wiring commercial buildings, unless permanently attached to and supplied with suppressor. Conductors sizing used for test shall be based on manufacturer's installation instructions for the proposed product.
10. The above test results, including oscillographs, test conditions, identity of the testing lab and the test technicians and engineers shall be provided as part of the submittal package. The manufacturer shall provide the contact phone number for a readily available factory engineer responsible for answering questions about this product and the tests performed. Information shall be provided in a format that is easily to analyze and review.

11. Maximum Let Through Voltages based on above requirements:

Peak Voltage Let Through Table
Peak Let Through Voltages (measured from zero reference per NEMA LS-1) shall not exceed:

Voltage & Configuration	Test / Wave	L-L	L-N	L-G	N-G	Phase Angle
480/277 Wye - Grounded	C3 – 20 kV/10ka	2500	1600	1900	1700	90
480/277 Wye - Grounded	B3 – 6 kV/3kA	1700	1000	1100	1000	90
480/277 Wye - Grounded	A1 – 2kV – 67A	150	150	150	150	180
480/277 Wye - Grounded	UL1449 Rev2 Update	1500	800	800	800	----
480 Delta	C3 – 20 kV/10ka	2400	N/A	2400	N/A	90
480 Delta	B3 – 6 kV/3kA	2000	N/A	1900	N/A	90
480 Delta	A1 – 2kV – 67A	75	N/A	1200	N/A	180
120/208 Wye	C3 – 20 kV/10ka	1400	1100	1300	1150	90
120/208 Wye	B3 – 6 kV/3kA	950	550	600	550	90
120/208 Wye	A1 – 2kV – 67A	100	75	120	100	180
120/208 Wye	UL1449 Rev2 Update	800	400	400	400	-----
120/240 Split Phase	C3 – 20 kV/10ka	1400	1100	1250	1200	90
120/240 Split Phase	B3 – 6 kV/3kA	1000	600	600	600	90
120/240 Split Phase	A1 – 2kV – 67A	100	75	120	95	180

D. Manufacturers Qualifications: Only firms regularly engaged in the manufacture of TVSS products for category C locations (ANSI/IEEE C62.41.1-2002), and whose products have been providing satisfactory service for not less than five years, shall be considered. A customer reference list, with a minimum of five contact names and current phone numbers shall be provided with the submittals. All manufacturer qualifications shall be provided as part of the submittal.

E. The successful manufacturer/vendor shall assign a technical contact person for TVSS application, installation and warranty questions. This contact shall be available to provide a response to a technical question within a maximum of two business days.

F. The Engineer reserves the right to accept or reject any or all submittals, to request additional information as deemed necessary or to request submittals for a different unit that may be deemed more appropriate for this installation.

G. Engineer reserves the right to have an employee or a representative designated by firm witness any testing required by this document. Vendor/manufacturer shall provide written notice of intent to test and shall coordinate testing with Engineer, should Engineer desire to witness tests.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. The TVSS shall be compatible with the electrical system voltage, current, system configuration and intended applications.

B. The TVSS maximum continuous operation voltage (MCOV) shall be capable of sustaining 115% of the nominal RMS voltage (with the associated peak voltage of 1.414*RMS) continuously without degradation and heating.

C. The TVSS shall only use clamping components connected in parallel with the supply to limit the surge voltages.

D. Arc Discharge components, such as Gas Tube Arresters shall not be used as the sole protection component in any protection mode. Gas Tube Arresters may be used in conjunction with other components, such as MOV's and SAD's to provide protection. Where Gas Tube Arresters are installed, the circuit shall be specifically designed to prevent power follow current.

E. Internal Fusing – If provided, shall be component level style:
   1. Component Level Fusing:
      a. Each Metal Oxide Varistor, or other primary suppression component, shall be individually fused for safety and performance to allow the SPD to withstand the full rated single pulse peak surge capacity per mode without the operation or failure of the fuses. Overcurrent fusing that limits the listed peak surge current of the SPD is not acceptable. Replaceable cartridge type per phase or per mode overcurrent fusing is not acceptable.
      b. For arc quenching capability, minimization of smoke and contaminates in the event of a failure, and to ensure the safest possible design, all surge components, current carrying paths and fusing shall be packed in fuse grade silica sand.
      c. Fusing shall be present in every mode, including Neutral-to-Ground.
      d. The fusing shall be capable of interrupting up to a 200kA symmetrical fault current with 600VAC applied, providing a listed 200kAIC Short Circuit Current Rating (SCCR) without additional over-current protection.

F. Status Indication & Monitoring: The suppressor shall include individual Phase Status LEDs, a red Service Required LED, an integrated Audible Alarm with silence button and Form C dry contacts (N.O. or N.C.) for remote monitoring capability. The form C contacts must be rated a minimum of 65VDC/150VAC with a load of 30WDC/60VA AC, and must be isolated and insulated from the ground plane and the power system to prevent Surges from reaching the monitoring system. The system shall provide insulation and isolation against any impressed voltages. Contacts shall be designed to change state upon device failure or loss of power.

G. The protection should be housed in the appropriate NEMA rated, heavy duty powder coated steel enclosure. This enclosure must provide complete protection against personnel hazards and damage to equipment should a failure of the TVSS protection device occur. This enclosure shall also be designed to allow connection of the TVSS device without sharp bends in the conductors and lead lengths of less than 18" from the TVSS Lugs (or enclosure opening for devices with leads attached) to the final point of attachment to the power system for the application (assuming connection point is 12" from the exterior of the enclosure).

H. Manufacturer shall provide a comprehensive warranty that provides for unlimited full replacement of a suppressor that is damaged or that fails to meet manufacturers published specifications and specifications provided within, without pro-rating value. Warranty shall provide coverage for a minimum period of 20 years for individual units (standard warranty) and. Series SPDs shall be covered for 10 years. These Unlimited Replacement Warranties cannot exclude system overvoltages or direct lightning strike events. Warranty shall not require any factory or third-party testing. Warranty shall apply to installed unit(s) for the duration of the warranty period no matter who owns the facility or equipment. All warranty information and copies of warranty documents must be provided with this response.
   1. All replacements shall be of same make, model and configuration as original unit unless otherwise requested or approved by customer.
   2. The manufacturer/vendor shall provide a warranty replacement unit at the facility within 5 days of receipt of written notification that the TVSS unit has failed, at no cost to the customer.
   3. If the manufacturer/vendor requires inspection of the installed unit to validate warranty claim, the manufacturer/vendor must visit the site where the failed TVSS device(s) are located within 3 days of notification. This visit will be performed at no cost to customer. This section does not modify the requirement for the TVSS replacement to be within 5 days of written notification as described in section G, above.
   4. The replacement unit shall be sent to the facility without shipping, handling, examination or other fees.

I. Complete, comprehensive installation instructions shall be provided for the TVSS systems proposed. Installation instructions must provide for compliance with latest adopted NEC requirements and UL listing requirements, while not degrading performance of TVSS device as tested. Provide copies of installation instructions for the models proposed with the specification response. Successful vendors/manufacturer shall provide a complete, comprehensive installation checklist.

J. If manufacturer claims TVSS device to have filtering capabilities, provide complete information on filtering performance of TVSS device with specification response. This information must include attenuation across a stated frequency range. If the TVSS is a UL 1283 listed device, the manufacturer shall provide all performance specifications for filter attenuation.

K. Provide complete enclosure dimensions (H*W*D) and cutsheets indicating dimensions including locations of terminations and wire entry locations with specification response.

L. Provide UL Short Circuit Current Ratings (SCCR). Minimum ratings shall be 200kAIC without additional/external over-current protection.

M. Manufacturer shall make available metal flush plates for distribution and branch panel SPDs. The flush plate shall provide for a clean architectural finish and be utilized where the attached panel is mounted flush.

N. Manufacturer must have knowledgeable local representation and distribution within 100 miles of the project location and must be willing to provide technical support, warranty claim support, and installation support for the project.

O. Successful manufacturer/vendor must be capable of supplying TVSS for project within 20 days of receipt of order for orders of 25 units and less for models submitted in response to this specification.

2.02 SERVICE ENTRANCE

A. Transient Voltage Surge Suppressors shall be installed at all service entrances of each building and as shown on the riser / one-line diagram. Suppressors shall be listed in accordance with UL 1449 3rd Edition, Standard for Safety, Transient Voltage Surge Suppressors.

B. For 3-phase, 4-wire plus ground configurations, suppressors shall provide suppression and filter elements between each phase conductor and the system neutral, each phase conductor and the system ground and between the neutral conductor and ground.

C. Suppressors shall include a passive circuit that allows the suppressor to actively follow the voltage waveform and provide a clamping envelope that follows the sine wave to limit low level IEEE C62.41 A1 ring waves (of either polarity) at all locations on the sine wave. This circuit shall also perform in the Neutral to Ground Mode where a sine wave does not exist. Details of circuit used to provide this function and information detailing and quantifying the performance of this circuit (in all modes with Category A1 ring wave) shall be provided with specification response. All Let Through Voltage (LTV) values shall not exceed those stated in section 1.04.C.11.

D. Indication of proper suppressor connection and operation shall be provided, consisting of status LEDs for each phase, a Red Service Required LED and an internal Audible Alarm with silence/mute button. Dry contacts (NO/NC) are required for external monitoring.

E. SPD shall exhibit fully redundant protection for each phase.

F. The surge suppressor shall be of parallel design and shall be capable of being removed and replaced without disrupting electrical service to the facility.

G. Suppressors shall consist of solid-state components and shall operate bi-directionally.

H. All surge protective devices shall be of the same manufacturer.

I. The minimum single impulse current rating (as per NEMA LS-1) shall not be less than 240,000 amperes per phase (120KA per mode). Provide proof of compliance by supplying certified test results from independent test lab with submittals.

J. Maximum size of TVSS/SPD units for Primary, Service Entrance applications is 15.5”x12.3”x8.25”.

2.03 SECONDARY SUPPRESSORS FOR MCC, DISTRIBUTION & BRANCH PANELS

A. Transient Voltage Surge Suppressors shall be installed at all service entrances of each building and as shown on the riser / one-line diagram. Suppressors shall be listed in accordance with UL 1449 3rd Edition, Standard for Safety, Transient Voltage Surge Suppressors.

B. For 3-phase, 4-wire plus ground configurations, suppressors shall provide suppression and filter elements between each phase conductor and the system neutral, each phase conductor and the system ground and between the neutral conductor and ground.

C. Suppressors shall include a passive circuit that allows the suppressor to actively follow the voltage waveform and provide a clamping envelope that follows the sine wave to limit low level IEEE C62.41 A1 ring waves (of either polarity) at all locations on the sine wave. This circuit shall also perform in the Neutral to Ground Mode where a sine wave does not exist. Details of circuit used to provide this function and information detailing and quantifying the performance of this circuit (in all modes with Category A1 ring wave) shall be provided with specification response. All Let Through Voltage (LTV) values shall not exceed those stated in section 1.04.C.11.

D. Indication of proper suppressor connection and operation shall be provided, consisting of status LEDs for each phase, a Red Service Required LED and an internal Audible Alarm with silence/mute button. Dry contacts (NO/NC) are required for external monitoring.

E. SPD shall exhibit fully redundant protection for each phase.

F. The surge suppressor shall be of parallel design and shall be capable of being removed and replaced without disrupting electrical service to the facility.

G. Suppressors shall consist of solid-state components and shall operate bi-directionally.

H. All surge protective devices shall be of the same manufacturer.

I. The minimum single impulse current rating (as per NEMA LS-1) shall not be less than 120,000 amperes per phase (60KA per mode). Provide proof of compliance by supplying certified test results from independent test lab with submittals.

J. Maximum size of TVSS/SPD units for Secondary Suppressors for MCC, Distribution & Branch Panel applications is 15.5”x12.3”x8.25”.

2.04 PRIOR APPROVALS

A. The following manufacturer(s) have submitted the required information and have been reviewed and approved for this project:

Total Protection Solutions SPD/TVSS by Thomas & Betts Power Solutions						
Voltage / Location	**480Y277v 3 Phase Bonded Wye**	**480v 3 Phase Delta**	**208Y120v 3 Phase Bonded Wye**	**208v 3 Phase Delta**	**120/240v Single / Split Phase**	**120v Fire Alarm, Security, PLC, etc.**
Main Services	**ST240-3Y480-FL**	ST240-480NN-FL	**ST240-3Y208-FL**	ST240-240NN-FL	ST240-1S240-FL	N/A
Distribution MCC & Branch Panels	**LP120-3Y480-FL**	ST120-480NN-FL	**LP120-3Y208-FL**	ST120-240NN-FL	LP120-1S240-FL	N/A
Dedicated Equipment	N/A	N/A	N/A	N/A	N/A	**LTE120-30A**

TVSS/SPD Applications Notes:
1. Use 60 Amp Circuit Breakers for Service Entrances and 30 Amp Circuit Breakers for Distribution, MCC & Branch Panel applications.
2. Use Delta units for unbonded/ungrounded and high resistance ground Wye applications.

Innovative Technology Protector by Eaton/Cutler Hammer						
Voltage / Location	**480Y277v 3 Phase Bonded Wye**	**480v 3 Phase Delta**	**208Y120v 3 Phase Bonded Wye**	**208v 3 Phase Delta**	**120/240v Single / Split Phase**	**120v Fire alarm Security, PLC, etc.**
Main Services	**PTE240-3Y201-L-SD**	PTE240-NN400-L-SD	**PTE240-3Y101-L-SD**	PTE240-NN201-L-SD	PTE240-1S101-L-SD	N/A
Distribution MCC & Branch Panels	**PTE120-3Y201-L-SD**	PTE120-NN400-L-SD	**PTE120-3Y101-L-SD**	PTE120-NN201-L-SD	PTE120-1S101-L-SD	N/A
Dedicated Equipment	N/A	N/A	N/A	N/A	N/A	**LTE120-30A**

PART 3 EXECUTION

3.01 GENERAL

A. Suppressors shall be installed per the manufacturer's installation instructions and the requirements of: the NEC, the local authority having jurisdiction and the project engineer.

B. Size overcurrent protective device and conductors per manufacturer's recommendations and NEC requirements.

C. Project Engineer or their appointed representative may perform inspection of the installed suppressors and reserves the right to require corrections to the installation to comply with manufacturer’s installation requirements and project specifications.

D. The SPD/TVSS supplier must provide on-site installation training for the electrical contractor.

3.02 SERVICE ENTRANCE

A. Install one primary suppressor at each utility service entrance to the facility as indicated on the drawings.

B. Suppressor shall be installed on the load side of the service entrance disconnecting means in accordance with NEC requirements.

C. Provide a 60 Amp circuit breaker (with a safety clip to ensure the circuit breaker cannot be inadvertently turned off) in the switchboard as over-current protection for the wire and as a disconnecting means for the SPD (or as specified by the manufacture).

D. Use minimum #6 AWG wire for connecting the SPD.

E. Conductors between suppressor and point of attachment shall be kept as short and straight as possible. Lead length of connecting conductor shall not exceed two (2) feet without written permission of the specifying Engineer. If length is exceeded, Contractor may be required to relocate SPD at no cost to the Owner.

F. Over-length SPD leads (greater than 24”) must be twisted together (1 twist/foot) and securely tie-wrapped once per foot to reduce impedance of the leads.

G. SPD leads may not be spliced.

H. Suppressor's ground shall be bonded to enclosure frame and the service entrance ground bus, and conduit between the TVSS/SPD and the switchboard must provide secure electrical/mechanical connections.

3.03 SECONDARY SUPPRESSORS FOR MCC, DISTRIBUTION & BRANCH PANELS

A. Install one secondary suppressor at each MCC, Distribution Panel, Branch Panel & Sub-Panel location as indicated on the drawings.

B. Provide a 30 Amp circuit breaker (with a safety clip to ensure the circuit breaker cannot be inadvertently turned off) in the panel being protected as over-current protection for the wire and as a disconnecting means for the SPD (or as specified by the manufacture).

C. Conductors between suppressor and point of attachment to the panelboard shall be kept as short and straight as possible. Mount the TVSS directly adjacent to the circuit breaker closest to the neutral bus, such that the maximum length of connecting wiring is kept as short as possible, not exceed 18 inches for all phase and neutral leads (24" for ground lead on IG panels). If length is exceeded, Contractor may be required to relocate SPD at no cost to the Owner.

D. Over-length SPD leads (greater than 18") must be twisted together (2 twists/foot) and securely tie-wrapped once per foot to reduce impedance of the leads. Quality compression butt-splice connections are required when extending SPD leads (wire nuts are not acceptable).

E. Grounding for all non-IG installations: Suppressor's ground lead shall be bonded to the panel enclosure with a small ground lug as close as possible to the TVSS mounting point. Conduit between the TVSS/SPD and the switchboard must provide secure electrical/mechanical connections.

F. Multiple "Feed-Through" Panels with shared SPD/TVSS units must be immediately adjacent to each other (side by side) with short tie cables not to exceed 36". Sub-panels must be feed from a primary panel with a "lug-out', lug-in" tie connection, and the tie connection lugs must be at the same end of the primary and sub-fed panel. i.e., bottom to bottom or top to top to ensure short tie "sub-feed" cables.
   1. Dual Panel Configurations: One SPD/TVSS per two panels
   2. Three and Four Panel Configurations: One SPD/TVSS installed on both outside panels of the multi-panel configuration, i.e., Install SPD on first (primary) and another one on the third or fourth sub-fed panel for a total of two SPDs.

END OF SECTION 264300

SECTION 265000
LIGHTING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide the lighting system complete and operational.

B. Recessed fixtures installed in fire-resistive ceiling construction shall have the same fire rating as the ceiling or shall be provided with fireproofing boxes having materials of the same fire rating as the ceiling.

1.02 RELATED SECTIONS

A. Section 260000 – Electrical General Conditions

1.03 REFERENCE STANDARDS

A. 47 CFR 15 - Radio Frequency Devices; current edition.

B. AASHTO LTS - Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signal; 2013 (Revised 2019).

C. ANSI C82.4 - American National Standard for Lamp Ballasts - Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps; 2017.

D. ANSI C82.11 - American National Standard for Lamp Ballasts - High Frequency Fluorescent Lamp Ballasts; 2017.

E. ANSI C136.10 - American National Standard for Roadway and Area Lighting Equipment - Locking-Type Photocontrol Devices and Mating Receptacles - Physical and Electrical Interchangeability and Testing; 2017.

F. ANSI O5.1 - American National Standard for Wood Poles - Specifications and Dimensions; 2017.

G. IEC 60529 - Degrees of Protection Provided by Enclosures (IP Code); 2013 (Corrigendum 2019).

H. IEEE C2 - National Electrical Safety Code; 2017.

I. IEEE C62.41.2 - IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (Corrigendum 2012).

J. IES LM-63 - IESNA Standard File Format for Electronic Transfer of Photometric Data and Related Information; 2002 (Reaffirmed 2008).

K. IES LM-79 - Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products; 2008.

L. IES LM-80 - Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays, and Modules; 2015, with Errata (2017).

M. IES RP-8 - Recommended Practice for Design and Maintenance of Roadway and Parking Facility Lighting; 2018.

N. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

O. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems; 2006.

P. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems; 2006.

Q. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; 2006.

R. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices; 2020.

S. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2012.

T. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

U. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

V. UL 844 - Luminaires for Use in Hazardous (Classified) Locations; Current Edition, Including All Revisions.

W. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.

X. UL 935 - Fluorescent-Lamp Ballasts; Current Edition, Including All Revisions.

Y. UL 1029 - High-Intensity-Discharge Lamp Ballasts; Current Edition, Including All Revisions.

Z. UL 1598 - Luminaires; Current Edition, Including All Revisions.

AA. UL 1598C - Light-Emitting Diode (LED) Retrofit Luminaire Conversion Kits; Current Edition, Including All Revisions.

BB. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data
   1. Lighting Fixtures
   2. Generator Transfer Device
   3. Light Poles & Foundations

B. Shop Drawings
   1. Lighting Fixtures
   2. Lighting Calculations for Substitutions

C. Warranty
   1. Lighting Fixtures

D. O&M Manuals
   1. All Information from Previous Submittals
   2. Mfg. Maintenance Manual
   3. Recommended Maintenance Procedures

1.05 PRODUCT DATA

A. The contractor shall include product data identifying compliance with all pertinent items of Part 2 of this specification. All pertinent options shall be identified in the product data submittal. If options have not been identified clearly, the submittal will be rejected.

B. When substitute fixtures are submitted (if permitted) the data shall clearly cross reference (written or highlighted) that the substitute fixture complies with every detail of the specified fixture. The substitute fixture must be supplied with an IES file for verification of the fixture performance and lumen output.
   1. The manufacturer’s representative will be required to provide the photometric reports for various areas with the substituted fixture to prove the foot-candle level is adequate and meets the design intent.
   2. The Engineer has the right to request a working sample of the substituted light fixture to verify quality and style meet the design intent.
   3. Fixtures not fully complying with the intent of the contract documents and design criteria will be rejected.

1.06 FIXTURE SCHEDULE MANUFACTURER'S SERIES NUMBERS

A. The design series reference does not necessarily represent the number, size, wattage, lumen output or special requirements as specified hereinafter.

B. Shall be neatly and clearly marked to indicate the fixtures, performance, efficiency, mounting methods comply with contract documents.

C. When substitute fixtures are submitted (if permitted) the data shall clearly cross reference (written or highlighted) that the substitute fixture complies with every detail of the specified fixture. The substitute fixture must be supplied with an IES file for verification of the fixture performance and lumen output.

D. The manufacturer's representative will be required to provide the photometric reports for various areas with the substituted fixture to prove the foot-candle level is adequate and meets the design intent.

E. The Engineer has the right to request a working sample of the substituted light fixture to verify quality and style meet the design intent.

F. Fixtures not fully complying with the intent of the contract documents and design criteria will be rejected.

PART 2 PRODUCTS

2.01 DLC COMPLIANCE

A. Light fixtures are required to be DLC 4.0 Compliance and be on a DLC Compliance listing to accommodate energy rebate.

2.02 METAL PARTS

A. Interior Fixtures: Steel or aluminum with manufacturer's standard color and finish as indicated on the Lighting Fixture Schedule, unless specified otherwise.

B. Exterior Fixtures: Corrosion resisting metal, a (non-ferrous, stainless steel or special finish) and in all cases suitable for outdoor service without tarnishing or other damage due to exposure; manufacturer's standard colors unless specified otherwise; cadmium plate all metal parts concealed by canopies, including screws, plates and brackets. All exposed fasteners shall be tamperproof.

2.03 LIGHT TRANSMITTING COMPONENTS

A. When not otherwise independently secured by other means the lens of any fixture shall be contained in a captive metal frame that remains attached to the fixture when door is in open position.

2.04 SPECIAL PARTS

A. Adapters, Plates, Brackets and Anchors: Provide where required by construction features of the building to suitably mount lighting fixture. All such appurtenances and mounting methods shall be approved by the Architect/Engineer prior to fabrication and installation.

B. Low Voltage Transformers: Provide and install where required to power individual or linear runs of low voltage light fixtures.

2.05 LAMPS

A. Solid-State Lighting: Fixtures shall have a lumen maintenance life expectancy (L_{70}) of > 50,000 hours, a CRI of > 80, and a CCT of 3500K or as shown on the light schedule. Each solid-state fixture model shall be tested in accordance with IES LM-79 & LM-80 requirements.

2.06 LED DRIVERS/POWER SUPPLIES

A. The LED drivers/power supplies shall meet the following criteria:
   1. Drive mode: Constant Current or Constant Voltage depending on the LED configuration for the light fixture.
   2. Output currents: 250 mA – 1000 mA
   3. Output voltages: 6VDC – 48VDC
   4. Input voltages: 110 to 277 VAC; 50/60 Hz.
   5. Power factor at >0.90 @ full load
   6. Line regulation accuracy: +/- 2%
   7. Load regulation accuracy: +/- 3%
   8. Greater than 85% efficient
   9. Output over-voltage, output over-current and output short circuit protection with auto recovery
   10. Provide each driver with onboard transient voltage suppression (TVS)
   11. Limited power source output to allow for class 2 wiring.
   12. Flicker Free 0-10V Dimmable to 10% light output.
   13. 5 Year Warranty.

2.07 GENERATOR TRANSFER DEVICE

A. Transfer device shall be installed integral to each light fixture and shall automatically transfer power from the normal power source to the emergency circuit upon loss of normal power. Bodine #GTD

B. Where the transfer device cannot be mounted in the light fixture and the transfer device is indicated to control more than (1) light fixture on the same switch leg, provide Bodine #GTD20A.

C. The device shall be capable of bypassing the local switching means when normal utility power has been lost. The device shall consist of a test switch, a normal power indicator light and an alternate power indicator light. The unit shall be contained within its own enclosure, suitable for mounting on the wall and above accessible ceilings. The device shall be able to accommodate up to 20 amps of lighting load.

2.08 EMERGENCY BATTERY BACK-UP IN FIXTURES

A. Emergency lighting shall be provided by using a LED fixture equipped with a Bodine BSL17C emergency driver. This emergency driver shall consist of a high-temperature, maintenance-free nickel-cadmium battery, charger and electronic circuitry contained in one 12” x 2 3/8” x 1 1/2” metal case.

B. Provide with an illuminated test switch (ITS) to monitor charger and battery and installation hardware.

C. The unit shall be suitable for indoor and damp locations and for sealed & gasketed fixtures, including fixtures rated for wet locations.

D. The emergency driver shall be capable of delivering up to 7.5 Watts to an LED load (30-130VDC) for a minimum of 90 minutes. The unit shall have a 15.0 Watt-hour battery capacity and shall comply with emergency standards set forth by the current NEC.

E. The emergency driver shall be UL Listed for field or factory installation.

F. Provide with 5-year manufacturer warranty.

2.09 HANGING FOR PENDANT FIXTURES

A. Rigid type, with not less than 5 thread engagement at each end, consisting of iron pipe, with brass or aluminum tubing casing, or painted tubing not less than 0.040 inches thick.

B. Aircraft cable, stainless steel, sized appropriately by manufacturer for weight and seismic zone.

C. Provide a canopy for each fixture hanger except where fixture conceals the outlet box directly without a canopy.

D. Provide a safety chain for all glass pendant fixtures and for all fixtures mounted in gymnasiums.

E. Provide Unistrut and mounting hardware above the ceiling to bridge structure, piping, and ductwork in order to mount the fixture centered in the space per the drawings.

2.10 OUTDOOR LIGHTING STANDARDS

A. Provide watertight insulating fuse in the base of lighting standards to individually protect each lighting fixture; buss Style "HEB" or approved, waterproof fuse holder with Buss fuse of appropriate capacity and voltage. Provide fuse for each hot circuit wire; do not fuse neutral.

B. Provide concrete preformed round poles with base plate for bolting to concrete foundation. Natural exposed aggregate finish. Height as noted on drawings.

C. Provide concrete foundations as shown on drawings. Field verify locations with Architect prior to installation of bases.

2.11 OUTDOOR GROUND MOUNTED LIGHTING FIXTURES

A. Provide concrete foundations for mounting of ground mounted lighting fixtures. Foundation shall be a minimum of 6” deeper than the light fixture and a minimum of 6” all around the base of the fixture. Provide #4 rebar with 3” minimum ring ties at 8” on center. The #4 rebar shall be vertically spaced approximately 6” apart. Field verify locations with Architect prior to installation of bases.

2.12 EXIT SIGNS

A. The signs shall be thermoplastic impact-resistant or as indicated on the panel schedule, scratch resist and corrosion proof. Faceplate and back cover shall be interchangeable on the housing.

B. Battery shall have a low-voltage disconnect to prevent excessively deep discharge.

C. LED – less than one watt of power consumption. The fixture shall operate in normal (AC mode) and emergency (DC input) modes.

2.13 INTEGRAL PHOTOCELLS

A. Where daylight harvesting photocells are mounted integral to light fixtures, the manufacturer shall provide a diode (or similar means) on the low voltage dimming control bus to ensure that the photocell dimming signal does not propagate to other light fixtures. If the manufacturer does not provide a means to keep the photocell dimming signal from propagating outside of the fixture, it is the responsibility of the Electrical Contractor to install the required diodes in a junction box outside of the fixture at no additional cost to the owner.

PART 3 EXECUTION

3.01 LIGHTING FIXTURES - GENERAL

A. Size and mounting height from finished floor to bottom of fixture as indicated on the drawings. Verify mounting provisions prior to the ordering of fixtures. Fixtures shall be UL listed for the location, and application in which they are installed.

B. Ceiling fixtures shall be coordinated with and suitable for installation in, on or from the ceiling as shown. Installation and support of fixtures shall be in accordance with NFPA 70 and manufacturer's recommendations.

C. Recessed fixtures installed in seismic areas shall be installed utilizing specially designed seismic clips.

D. Suspended fixtures installed in seismic areas shall have 45° swivel hangers and shall be located with no obstructions within the 45° range in all directions. The stem, canopy and fixture shall be capable of 45° swing.

3.02 DIFFUSERS AND ENCLOSURES

A. Install lighting fixture diffusers only after construction work, painting and clean up are completed. Prior to final acceptance, remove all lamps, reflectors and diffusers, wash, rinse and reinstall.

3.03 ADJUSTMENT OF FIXTURES

A. Make all final spotlight and adjustable light settings under the direction of the Architect/Engineer during a scheduled period of time prior to the completion of the project. Include costs for all equipment and personnel expenses required for adjustment.

B. For fixtures with indirect lighting, notify Engineer prior to installation of any circumstance where the fixture lamp source will be within 12" of ceiling.

3.04 SUPPORT OF FIXTURES

A. Recessed Troffer Type: For fixtures supported by the ceiling suspension system, provide integral tabs, which rotate into position after fixture is lifted into the ceiling cavity. Provide two safety chains secured to structural members above suspended ceiling. Circuit connection shall be through use of 60-inch flexible conduit from a rigidly supported junction box. For plaster or GWB ceilings, provide a plaster frame compatible with light fixture.

B. Recessed Downlight Type: Mount in frames suitable for the ceiling, with the recessed portion of the fixture securely supported from the ceiling framing. For fixtures supported by a ceiling suspension system, provide two safety chains secured to structural members above suspended ceiling.

C. Surface and Pendant Mounted Type:
   1. Where mounted on accessible ceilings, hang from structural members by means of hanger rods through ceiling or as approved.

2. Where ceiling is of insufficient strength to support weight of lighting fixture, provide additional framing to support as required. Fixtures shall be supported from structure with seismic bracing independent of ceiling.
3. For Pendant Mount Type: Provide a unistrut channel for mounting fixtures entire fixture length unless light fixture is designed specifically for supporting itself. Provide 3/8-inch thread rod secured to structural members for support of unistrut channel.
4. Continuous Runs of Fixtures: Straight when sighting from end to end, regardless of irregularities in the ceiling. Where fixtures are so installed, omit ornamental ends between sections.
5. Provide Unistrut and mounting hardware above the ceiling to bridge structure, piping and mechanical ductwork in order to mount the fixture per the Contract Documents.

D. Drivers/Power Supplies shall be accessible.

3.05 LOCATION

A. Mount to the dimensions shown on the drawings. Mount at quarter points where no dimensions appear. Architect shall specify mounting locations where no dimensions appear and quarter point mounting is impractical or not indicated on the drawings.

B. Refer to details, structural drawings, mechanical drawings, and coordinate with mechanical Contractor for equipment and ductwork mounted in ceilings to prevent conflict with light fixtures prior to installation. If conflicts cannot be resolved with the Mechanical Contractor, notify Architect/Engineer.

3.06 SPARE FIXTURES

A. Self-Luminous Exit Sign: Provide (2) two Self-Luminous Exit Signs Lithonia # DSW1X Green or Red to match EX1. Install at locations as directed by Architect.

3.07 CONCRETE FOUNDATIONS

A. Install at locations shown taking care to provide soil compaction same as required under paving to avoid settling and tilting of pole. Provide for all steel, concrete or aluminum poles shown. Concrete foundations shall have a minimum raceway sweeps of 90 degrees and anchor bolts shall be accurately set in foundations using a template supplied by the pole manufacturer. Concrete work and grouting; see Division 3 of the specifications. When concrete work has cured, base plates shall be leveled and grouted in place. Pole anchor bases shall then be set on base plates, leveled plumb on foundations, and secured with holding nuts.

3.08 FIXTURE TENTING

A. Contractor shall coordinate ceiling types with architectural drawings and specifications and provide equivalent fire rated enclosures above all light fixtures which penetrate rated ceilings.

B. Light fixtures that are not IC rated and are to be installed within 3” of insulation shall be provided with an EZ Barrier #EZB 16-24-9 protective cover designed for recessed light fixtures.

END OF SECTION 265000

SECTION 265600
EMERGENCY LIGHTING INVERTER

PART 1 GENERAL

1.01 WORK INCLUDED

A. This specification defines the electrical and mechanical characteristics and requirements for an uninterruptible stored emergency power supply system. The system as specified herein includes all the components required to deliver reliable, high quality uninterruptible power for emergency illumination and related life safety equipment. The system consists of a microprocessor controlled transistorized PWM inverter, high speed transfer devices, constant voltage regulating transformer, battery charging system, energy storage battery platform, a diagnostic monitoring display panel, and all the related hardware components and software to facilitate a functional centralized system. The emergency power supply system shall provide immunity from all line disturbances and power interruptions. The system includes an uninterrupted, normally on output power section and a normally off standby output power section, thus enabling compatibility with emergency lighting fixtures operating in normally on and standby operating modes. A self-diagnostic monitoring alarm system continuously advises of system status and battery condition.

1.02 RELATED SECTIONS

A. Section 260000 – Electrical General Conditions

1.03 REFERENCE STANDARDS

A. The systems shall be designed in accordance with applicable portions of the following standards:
   1. American National Standards Institute (ANSI C57.110).
   2. Institute of Electrical and Electronic Engineers (IEEE 519-1992) (C62.41-1991).
   3. National Electrical Manufacturers Association (NEMA PE-1).
   4. National Electric Code (NEC 2005) (NEC 2005, Article 700).
   5. National Fire Protection Association (NFPA 70) (NFPA 101) (NFPA 111).
   6. Underwriters Laboratories (U.L. 924).
   7. Federal Communications Commission (FCC Part 15, Sec. J, Class A).
   8. Federal Aviation Administration (FAA-G-201e).
   9. Listed U.L. Standards UL924 Emergency Lighting Equipment, UL924 Auxiliary Power Supplies, UL1778 and CUL1778 Standard for UPS Equipment.

1.04 SUBMITTALS

A. The manufacturer shall supply documentation for the installation of the system, including wiring diagrams and cabinet outlines showing dimensions, weights, BTUs, input/output current, input/output connection locations and required clearances.

B. The manufacturer shall be ISO9001 “Quality Assurance Certified” and shall upon request furnish certification documents.

C. The manufacturer shall be a United States based manufacturer with 5 years experience or greater in design and fabrication of centralized stored electrical energy emergency and standby power systems.

D. Factory test results shall be provided to show compliance with the requirements. The manufacturer shall include battery test documentation to validate the specified minimum emergency reserve with full rated KW load.

E. Submittals shall be specific for the equipment furnished and shall include as-built information.

F. O&M Manuals

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. The equipment specified shall be the eLITE - ELN Series centralized emergency lighting inverter system, manufactured by Controlled Power Company, or Lithonia Series ES or prior approved equal.

2.02 MANUFACTURED UNITS

A. The system shall be designed and manufactured to assure maximum reliability, serviceability and performance. The system's microprocessor, transistorized PWM inverter, highly filtered current and voltage regulated 2 stage battery charger and high-speed transfer devices shall be provided as one single main PC board for rapid service or replacement. The main PC board, constant voltage regulating transformer and filtering components shall be installed into one single main control module for rapid module service or replacement. The diagnostic monitor panel display and display select push button shall be mounted on the front of the system for easy operation and viewing. The system is to be furnished with internally located AC input circuit breaker and AC output circuit breakers. The battery and DC conductors shall be DC fuse protected. All conductors and transformer windings shall be copper constructed. Cabinets are wall and/or floor mountable, constructed of steel, front accessible through a hinged, key lockable door and shall be NEMA 2 drip proof rated for indoor use.
   1. Systems shall operate in accordance with requirements as specified herein to support any combination of fluorescent ballast fixtures, incandescent lamps, electronic and high-power factor fluorescent ballasts, HID fixtures or other approved loads up to the rating of the system. "Normally on" and "Normally off" AC output bus shall be 100% rated and limited only by the system maximum KW output rating.
   2. Normal Operation: The load is supplied with voltage regulated & isolated power derived from the output regulating transformer. When utility AC power is present, the battery charger maintains a ripple free float charge on the batteries.
   3. Uninterrupted Emergency Operation: Upon the failure or unacceptable deviation of commercial AC power, battery power is converted by the PWM inverter and filtered through the on-line regulating output transformer. There shall be no break or interruption of power to the load upon failure or restoration of the commercial AC power. Any transfer time resulting in a break or loss of power is unacceptable with reference to the uninterrupted output.
   4. Standby Emergency Operation: Upon the failure or unacceptable deviation of commercial AC power or upon a remote input "zone command on signal", the standby, normally off AC output section of the system shall become energized thus providing emergency power for standby lighting fixtures which are required to illuminate only in the event of emergency. Field adjustable timers shall be be included for use with on and off delay transition requirements.
   5. Automatic Restart: In the case of a commercial power outage that exceeds the battery run time requirement, the output of the inverter shall shut off, but automatically restart once commercial AC power returns. Recharging of the batteries shall commence immediately.
   6. System Power Output Capability: The stored emergency power supply system output power rating shall be (1000 watts).
   7. Battery Time Reserve Capacity: Battery shall be capable of producing emergency power for (90) minutes at full rated Watts.
   8. Reliability: MTBF 100,000 hours. MTTR, 1 Hour.

2.03 PERFORMANCE SPECIFICATIONS

A. Input Specifications:
   1. Input Voltage: 120 VAC or 277 VAC.
   2. Input Voltage Operating Range: +10% to -15% at full load without battery usage.
   3. Extended Range: The unit shall incorporate the use of variable range logic in conjunction with the load percentage to extend the input range up to +10% to -40% without battery usage while maintaining a regulated, usable output voltage.
   4. Frequency Range: 57.5 Hz to 62.5 Hz.
   5. Power Factor: Self correcting to >0.95 (approaching unity).
   6. Input Harmonics: < 5% THD (total harmonic distortion).
   7. Spike Attenuation: 3000:1.

B. Output Specifications:
   1. Output Voltage: 120 VAC or 277 VAC.
   2. Sine Wave Voltage: Maximum 5% harmonic distortion under linear load.

3. Crest Factor: 3.0: 1.
4. Harmonic Attenuation: Reflected load generated harmonics shall be attenuated 23dB at the input.
5. Line Voltage Regulation: +/-3%.
6. Load Regulation: Typically better than +/-3%.
7. Output Power Rating: KVA at 1.0 power factor (unity). KVA = KW
8. Isolation: NEC article 250-5d, shall comply with this standard that specifies a separately derived power source.

C. Battery Specifications:
1. Battery time: 90 Minutes at full rated Kwatt output capability, U.L. 924 Compliant.
2. Battery Type: Integral, valve regulated, sealed lead calcium, maintenance free.
3. Charger: 3 Amp., full wave, two stage, filtered.
4. Recharge Time: U.L. 924, NFPA 101, NFPA 111 compliant.
5. Buss Voltage: 24 VDC, Float 2.27 VPC, final 1.75 VPC.
6. Projected Life: Batteries shall have a projected service life of 5 years, 15 year prorate.

D. Performance Specifications:
1. Overload Capability: 125% for ten minutes.
2. Surge Capability: 150% of rated output without need of static bypass.
3. Frequency Stability: +0.2 Hz.
4. Inner Winding Capacitance: 0.01 pF (primary to secondary coupling).
5. Common Mode: 120 dB (10^6 : 1 ground noise attenuation).
6. Transverse Mode: 70 dB (3160 : 1 line noise attenuation).
7. Reactive Power Correction: Load at .6 pf corrected to > 0.95 at input (automatically correcting).
8. Efficiency: 89% typical under full rated load.
9. Reliability: 100,000 hours MTBF.

E. Environmental Specifications:
1. Operating Temperature: 0 (32) to 40 (105) degrees Celsius (F).
2. Storage Temperature: -20 to 50 degrees Celsius.
3. Relative Humidity: 95% non-condensing.
4. Elevation: 5,000 feet, 1,500 meters.
5. Audible Noise Level: Not greater than 50 dba.
6. Enclosure: NEMA 2. Drip proof for indoor use. Sealed, prohibiting rodent entry.

2.04 DISPLAY AND DIAGNOSTICS

A. Display Monitor and Diagnostics:
1. Display Panel – Systems shall include a local, front mounted, sealed, alphanumeric LED display. Display shall indicate inverter input voltage, inverter output voltage, % load, % battery as selected using a display select push button. System display panel shall include automatic visual status indicators for system on, system on battery, low battery, general alarm. Include audible alarm for system on battery, low battery and general alarm condition(s).
2. Communications Port (RS232) – Include communications port for remote monitoring access to general alarm conditions and electrical measurements.
3. General Alarm Conditions – General alarm conditions shall include: Loss of AC input power, Low battery warning, frequency fault, check battery, shorted SCR, low battery shutdown, low output voltage, high output voltage, system overload, system over temperature warning.
4. Electrical Measurements – Electrical measurements shall include: AC Input voltage, AC output voltage, output amps, % load, % battery voltage, output watts, output va, power factor, input line frequency, number of power outages recorded from last clear function, number of overloads recorded from last clear function.
5. Battery Replacement Testing – Include provision for determining battery life and scheduled battery replacement.

6. Status / Alarm relay interface normally open contacts shall be provided for optional remote annunciator panel or automatic message dialer. Include contacts for inverter on, utility AC power failure (system using battery power), low battery warning, general alarm.

2.05 ACCESSORIES (OPTIONAL EQUIPMENT)

A. Include automatic message dialer for telephone messaging to inform maintenance personnel of system alarm conditions for system on emergency battery power, low battery warning, general alarm.

B. Include remote annunciator panel for remote status indication of system alarm conditions for system on emergency battery power, low battery warning, general alarm.

C. Include (Quantity) control device(s) (dimmer control, wall switch, occupancy sensor) override for use with normally on inverter output bus to provide full illumination to designated emergency lights upon the failure or loss of commercial AC power.

D. Include (Quantity) zone sensing device(s) to sense voltage at individual zone lighting panels. The sensing device shall detect loss of power at the panel and shall signal the system to illuminate emergency fixtures within the specific zone only. If commercial AC power is acceptable at other zones, emergency lighting shall remain in the standby mode.

E. Include (3 output circuit breakers) (1 monitored output circuit breaker) on 550 watt rated unit's normally on output bus.

F. Include (6 output circuit breakers) (3 monitored output circuit breakers) on (1000) (1500) watt rated unit's normally on output bus.

G. Include (3 output circuit breakers) (1 monitored output circuit breaker) on 550 watt rated unit's normally off output bus.

H. Include (6 output circuit breakers) (3 monitored output circuit breakers) on (1000) (1500) watt rated unit's normally off output bus.

I. Include system output circuit breaker open or tripped alarm contacts on all output circuit breakers for use with remote and/or local annunciation indicators.

PART 3 EXECUTION

3.01 MANUFACTURERS WARRANTY

A. The manufacturer shall guarantee all systems to be free from material defects and workmanship for a period of 2 years following shipment from the factory.

B. Battery warranty shall be 15-year prorated with full replacement in the first year.

END OF SECTION 265600

SECTION 270000
LOW VOLTAGE SYSTEMS GENERAL REQUIREMENTS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions and Divisions 0 and 1 Specification Sections, apply to work of this Section.

B. Specification Section 260000 Electrical General Conditions.

1.02 SCOPE AND RELATED DOCUMENTS

A. The work performed under this specification shall be of good quality and performed in a workmanlike manner. In this context "good quality" means the work shall meet industry technical standards and quality of appearance. The Owner reserves the right to reject all or a portion of the work performed, either on technical or aesthetic grounds. The Installing Vendor/Contractor shall make all corrections as needed, to the satisfaction of the Architect.

B. Provide system documentation and Owner training as specified below.

C. An important item of the construction process for this project is the Pre-Construction Kick Off Meeting, which shall take place PRIOR to the rough-in of any systems identified in D. below.
   1. The General Contractor shall coordinate the scheduling of the meeting.
   2. The Owner's Representative and the Owner's IT Department Representative will be present for the meeting.
   3. The General Contractor, Electrical Contractor, and a representative from EACH Section shall attend this coordination meeting.
   4. This meeting is essential for early coordination.
   5. The estimated time is approximate and shall be extended as necessary.

D. The requirements of the conditions of the Contract, Supplementary Conditions, General Requirements, or other work specified for EACH specific low voltage Section listed below includes, but is not limited to the following sections:

			Pre-Construction Kick Off Meeting	
			Estimated time for EACH Section	Submit questions 14 days in advance
1.	Section 260000	Electrical General Conditions	30	
2.	Section 270000	Low Voltage System General Requirements	15	
3.	Section 270528	Pathways for Communications Systems	10	
4.	Section 272000	Data and Voice Infrastructure	30	
5.	Section 274116	Audio-Visual Systems	10	
6.	Section 275113	Communication/Clock/Program System	10	
7.	Section 281300	Access Control System	30	
8.	Section 281600	Intrusion Alarm System	15	
9.	Section 282300	Closed Circuit Television System (CCTV)	30	
10	Section 283176	Fire Alarm/Emergency Communications System	10	

E. Applicable Standards: All work shall be performed in accordance with the latest revisions of the following standards:
   1. International Building Code

2. International Fire Code
3. NEC (National Electrical Code)
4. Telecommunications Architectural Standards - In Washington State Government
5. ANSI-J-STD-607-A - Commercial Building Grounding and Bonding Requirements for Telecommunications

F. EACH Installing Vendor/Contractor for their Section shall possess a current and valid Washington State 06 Electrical Low Voltage License.

1.03 QUALITY ASSURANCE

A. Device or wiring arrangement shown on the drawings represents the intent of the system. If additional equipment (that may not be shown) is required to make a fully functional system, then provide such equipment as required.

B. Each specification Section that is governed by these specifications shall be provided, installed, commissioned, and warranted by a local Installing Vendor/Contractor that meets the following requirements for the equipment manufacturer that is being submitted for:
1. All equipment for EACH specification Section shall be provided and installed by a single supplier.
2. Have installed a minimum of three (3) systems within the past five (5) years.
3. Maintain a 24-hour emergency service program using manufacturer trained technicians. Shall respond to service calls within 24 hours during and after the warranty period.
4. The Installing Vendor/Contractor shall be manufacturer approved to purchase the equipment, have a local office staffed with manufacturer-certified installers that are capable of maintaining, servicing, and warranting the equipment being installed; who are full-time employees and are capable of programming, testing, inspecting, maintaining, warranting, and inventorying parts for the life of the system; and shall be located within a 100-mile radius of the project site.
5. Offices that require staff from another “branch office and/or company office” outside of this radius are not acceptable.

C. Prior to completion of the installation, the Installing Vendor/Contractor shall provide:
1. A preventative maintenance agreement which shall, at the Owner’s option, become effective at the end of the warranty period.
2. A proposal for off-site monitoring services where applicable.

1.04 SUBSTANTIAL COMPLETION

A. In addition to the “Substantial Completion” requirements, when applied to EACH of the specification Sections identified in “Scope and Related Documents”, Substantial Completion shall be defined as follows:
1. The stage in the progress of work where the work or designated portion is sufficiently complete in accordance with the Contract Documents, so that the Owner can utilize the work for its intended use.
2. ALL of the requirements listed in “Testing & Complete System Functionality” shall be met. Once all conditions have been met, this shall be deemed Substantial Completion. These requirements shall be completed on or before the Substantial Completion date listed in the Contract Documents.
3. The Owner reserves the right to withhold up to 10% of the funds for each low voltage system until that system has been shown, to the full satisfaction of the Owner, to function properly.

1.05 DOCUMENTATION

A. Document Format:
1. All documents shall be generated on a PC. Provide these documents electronically (where applicable).
a. Data sheets, installation manuals, technical documents, brochures, and user manuals may be in PDF format.
b. Power Point presentation(s) shall be in MS-Power Point.

c. Test forms and other project-specific documents shall be in an editable format, either MS Word or MS Excel.
d. Drawings and details shall be in AutoCAD 2013 or newer.

1.06 SUBMITTALS

A. Submittals shall be provided for EACH low voltage system specification section number and shall contain, but not be limited to the items listed below:

B. Submittals – Prior to installation of any equipment, the Installing Vendor/Contractor shall provide the Architect with seven (7) copies of submittals for approval. With the approval of the Architect, electronic submittals in PDF format may be substituted for hard copy. Provide the following:
   1. A complete materials list of the quantity of each device, the manufacturer, model number, and description of the equipment for each individual system component or device that will be provided. This list shall precede the data sheets.
      a. Each system component or device data sheet shall have and indicating arrow next to each component or device that is being submitted.
      b. Each submittal shall be by EACH low voltage system specification section number and each submittal shall have its own list of data sheets. Combined submittal sections are not authorized.

1.07 GOVERNING CODES AND CONFLICTS

A. If the requirements of this section, related sections, or the Project Drawings exceed those of the governing codes and regulations, then the requirements of this section, related sections, and the drawings shall govern. However, nothing in this section, related sections or the drawings shall be construed to permit work not forming to all governing codes and regulations.

1.08 PROJECT CONDITIONS – CIVIL PLANS

A. The Installing Vendor/Contractor shall carefully coordinate the various symbols utilized on the drawings, and shall consult the civil plans to determine site conditions in the various areas.

PART 2 PRODUCTS

2.01 MATERIALS

A. Provide all equipment as defined in each specification and on the drawings.

B. All equipment, panels, power supplies, and devices shall be manufactured under the appropriate category by Underwriters Laboratories, Inc. (UL), and shall bear the UL label.

C. All equipment for each system shall bear the UL label. Partial or pending listings shall not be acceptable. It shall be the Installing Vendor's/Contractor's responsibility to ensure that these requirements are met, and replace any and all equipment up to and including the entire system, if these requirements are not met.

D. EACH of the specified Low Voltage Systems identified in PART 1 of these specifications including the design, devices and/or wiring arrangement shown on the drawings, represent that based on various equipment manufacturers. Any changes resulting from differences between the specified product and other manufacturers or substitute manufacturers, shall be the responsibility of the Installing Vendor/Contractor.
   1. Substitutions of the specified equipment and/or supplier will be considered provided that sufficient documentation is provided to the Engineer which certifies that the equipment and/or supplier qualification meets the requirement of these specifications. Any request for substitution shall be submitted by the Installing Vendor/Contractor in writing so as to be received by the Architect not later than (10) ten days prior to the bid due date. Equipment that is approved by the Engineer will be issued by addendum prior to the bid date.

E. Refer to PART 1 for any equipment that is not specifically defined.

2.02 CONDITION OF MATERIAL

A. All equipment shall be new, in un-opened boxes, and be the most current model available for each component and/or device that is provided for this project. For products that use firmware, the most current version available shall be downloaded and installed at each component and/or device, prior to any programming being performed. Outdated or used equipment, as determined by the Architect, shall be removed and replaced by the Installing Vendor/Contractor at no cost to the Owner.

B. All equipment and components shall be installed in strict compliance with manufacturers' recommendations. Consult the manufacturers' installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc., before beginning system installation. All materials shall be in working order as intended by the manufacturer, at the completion of the project.

2.03 WIRE GUARDS

A. Provide at locations where designated on the drawings. Provide wire guards to protect the device from damage. At a minimum, all field devices located in the gymnasium(s) and multipurpose room(s) shall have wire guards installed.

B. Provide and install wire guards that are sized appropriately to protect each device at locations indicated on the drawings, but will not interfere with the operation of any device. The device shall operate as intended by the manufacturer after the wire guard has been installed.

C. Wire guards shall be made using seven (7) gauge welded steel and be chrome plated.
   1. Use Space Age Electronics, HSG Series or PSG Series, or approved equal. Size as required.

2.04 TERMINAL CABINETS, TERMINAL STRIPS, ENCLOSURES AND OUTLET BACKBOXES

A. On-Site System Information Binder and Enclosure: EACH specification section identified on the first page of this specification shall have an Information Binder that shall be housed in a System Information enclosure. The enclosure shall have a hinged door with the text "(Section Title here) Information", with each specific system name silk screened onto the enclosure door, and shall bear the Underwriters Laboratories "UL" label. A "T-Turn" cam lock shall be used to keep the enclosure door closed, and a key shall NOT be required to open the enclosure. Use the following Space Age Electronics model number, or approved equal:
   1. All systems (other than fire alarm): Model # YD9048DBXAA. Verify with the Architect the color of the enclosure(s) prior to ordering the enclosure. There shall be no additional charge to the Owner for changes to the color of the enclosure.
   2. For the fire alarm: Model # YD9049DBXAA shall be red in color, have a hinged door, and have "Fire Alarm System Documentation" silk screened on the enclosure door.

B. Terminal Cabinets (TC):
   1. See EACH Specification for terminal cabinet requirements (where applicable).

C. Terminal Strips:
   1. See EACH Specification for terminal strip requirements (where applicable).

D. Enclosures:
   1. Each systems control panel, power supply, TC, and other metal enclosures shall have the following:
      a. Use key operated locks to secure the enclosure (keyed so that a single key can lock and unlock all enclosure locks for the entire system), and provide ten (10) keys.
      b. Use some form of wire management that uses permanently secured fasteners (no double-back tape), and uses reusable and adjustable Velcro-style cable straps, which shall be installed approximately every four (4) inches within each enclosure.

E. Backboxes:
   1. Each system backbox, with the exception of specific backboxes, shall be metal and installed specific to the system it is being used on.
      a. Provide Red Randl Industries Inc., 5 Square boxes or equal for all fire alarm devices.

b. Provide Blue Randl Industries Inc., 5 Square boxes or equal for all A/V locations. Provide single gang mud ring for all A/V locations only requiring single gang faceplate and provide double gang mud ring for all A/V locations requiring double gang faceplate. See A/V schedule for more information.
c. Provide Blue Randl Industries Inc., 5 Square box or equal for all telecom workstation locations with single gang mud ring unless noted otherwise.

2.05 PROOF OF DELIVERY FORM

A. When providing equipment to the Owner, the Installing Vendor/Contractor shall provide the following transmittal document and obtain the necessary signatures.
1. The Installing Vendor's/Contractor's Transmittal Document is defined as:
a. Company logo
b. Name
c. Address
d. Telephone number
e. Delivery date
f. Installing Vendor's/Contractor's representative name that is making the delivery
g. Quantity of each item
h. Manufacturers' name and model number
i. The exact same description of the device
j. Provide a "signature" line for the Owner's Representative
k. Provide a "printed name" line for the Owner's Representative
l. Provide a "date" line for the Owner's Representative

PART 3 EXECUTION

3.01 WORK ENVIRONMENT

A. General:
1. The Installing Vendor/Contractor shall have implemented an OSHA approved safety plan at their place of business. All staff should adhere to it in their daily practice.
a. Avoiding injury is the primary concern for this project. Use OSHA industry standards to avoid accidents.
2. Coordination with Other Trades:
a. It is the responsibility of the Installing Vendor/Contractor to coordinate with all trades for this project. Maintain all requirements for project schedule deadlines, rough-in, installation, programming, training, and ensuring that the Owner receives a fully functional system as defined in this specification.

3.02 APPROVED EQUIPMENT AND PERMITS

A. No equipment shall be delivered to the job site until Submittals have been reviewed and approved by the Architect.

B. An approved set of Submittals shall be continuously available at the job site during construction, for review by the Architect.

C. Obtain all permits as required, prior to installation of any equipment. They shall be continuously available at the job site during construction, for review by the Architect.

3.03 SYSTEMS PLYWOOD BACK BOARDS

A. Systems plywood back boards shall be used to mount enclosures of any kind, to any wall or surface. The systems plywood back boards shall be securely fastened to the walls to accommodate no less than ten times the total weight of the equipment to be mounted. The systems plywood back boards shall be a minimum of 3/4", APA exterior-grade Douglas Fir A-C, and fire retardant with a flame spread rating not more than 25 when tested according to ASTM E-84. Provide the systems plywood back boards from the floor up to ceiling height (not exceeding 12'-0") on all walls shown, unless otherwise noted. The entire back board shall be painted with three (3) coats of fire-retardant paint (the color shall match the adjacent surface). EACH enclosure, when mounted, shall bear a minimum of 150 pounds weight on the enclosure.

B. Mounting of equipment shall be logically placed, and shall be located at the top, bottom, left, or right portion of the systems plywood back boards to accommodate future growth of the system. Under no circumstances will the equipment be allowed to be mounted in the middle of the back boards.

3.04 GROUNDING

A. Ground all equipment per the manufacturers' recommendations, per Division 26 and as required by code.

B. Provide grounding and bonding per ANSI-STD-J-607-A, which includes, but is not limited to: cable trays, racks, conduit sleeves, and other equipment connected to the TMGB/TGB.

C. The minimum conductor size shall be # 6 green insulated copper grounding conductor. However, the size of each conductor shall be based on the actual cable length as defined in ANSI-STD-J-607-A. See Section 272000 "TMGB and TGB (Telecommunication Grounding Busbars)" for additional grounding requirements.

3.05 DEVICE RELOCATIONS

A. Device location may be changed prior to installation, within 15'-0" without extra charge, if so desired by the Architect.

3.06 INSTALLATION

A. Provide all equipment, wiring, conduit, and outlet boxes required for the installation of a complete, fully functioning, operating system in accordance with applicable local, state, national codes, AHJ requirements, the manufacturers' recommendations, these plans and specifications. All circuits not in conduit must be wired with UL listed power limited cable under NEC 725, Class II wiring. Plenum cable shall be utilized in all return air plenum ceilings.

B. Provide 120VAC wiring and connections to the control panels, EACH amplifier, CPU, DVR, and power supply as required for a fully functional system, while maintaining all of the design requirements described elsewhere within each system specifications. At a minimum, this shall include the following:
   1. Multiple power supplies and/or the control panel may be placed on the same circuit, while maintaining all code mandated load calculations, but shall be on circuits that are dedicated for EACH system.
      a. Consult with the Architect to verify load calculations meet all code requirements.
      b. Install 120VAC wiring and conduit as specified in Division 26.

C. Maintain all fire wall ratings as required.

D. Installation of equipment and devices that pertain to other work in the contract shall be closely coordinated with the appropriate subcontractors.

E. EACH manufacturers' authorized representative shall provide on-site supervision of the installation for EACH of the systems equipment for the duration of the project. This includes programming, training, and the Owner's ability to use the Complete System Functionality as it was designed.

F. Install wire guards at locations as shown on the drawings and as described elsewhere within these specifications.

G. Every attempt shall be made to avoid running telecommunications close to (less than 2'-0") and/or parallel to other communication cables in the building, all lighting, and conduits containing 120VAC (or greater). This shall be to avoid interference with any other service or system, operation, or maintenance purposes such as access boxes, ventilation-mixing boxes, access hatches to air filters, switch or electrical outlets, electrical panels, fire alarm equipment, clock systems, and lighting fixtures. Avoid crossing areas horizontally just above or below any conduit and/or riser. Route cables in such a manner to allow other cables to enter the conduit and/or riser without difficulty at a later time by maintaining maximum distance from these openings. Maintain all recommended distances from other cables, as required by the manufacturer. Install cable to whichever of these two requirements are more stringent.

H. Room numbers shown on plans are architectural designs numbers for construction purposes. These numbers are NOT to be used for programming. Final system programming shall reflect the final room numbering plan and actual room signage, unless directed otherwise in writing or as specified in another specification section.

3.07 MOUNTING HEIGHTS, LOCATIONS, AND SETTINGS

A. Install all equipment as recommended by the manufacturer.

B. The installation of EACH device, enclosure, and/or control panel shall be installed so that the maintenance staff will be able to access, test and/or replace any component of the system. If this installation does not meet this requirement to the satisfaction of the Architect, it will not be accepted. The Installing Vendor/Contractor shall be required to remove the item, patch and paint the area to the satisfaction of the Architect, and reinstall the device, enclosure, or control panel as required to make the system easily maintainable and acceptable, at no additional cost to the Owner.

C. Control Panels, Power Supplies, and Locations:
   1. Mount control panels, power supplies, and enclosures (provide quantities as required) with approximately two (2) inches of separation between the enclosures.
   2. Each enclosure, when mounted, shall meet the following criteria:
      a. Conduit shall not enter any enclosure or panel, except where conduit entry is approved by the manufacturer.
      b. Chase nipple the enclosures together. At a minimum, use two (2) 1½" conduits. Size and/or provide additional conduits as required. Provide conduits between enclosures to accommodate an additional 100% conduit fill while maintaining all NEC requirements. Avoid installing chase nipples where batteries are to be installed (contact the manufacturer and/or the Installing Vendor/Contractor prior to drilling any holes). Any chase nipples installed where batteries are to be located will be rejected, and require the reinstallation as specified, up to and including installing new enclosures.
      c. The bottom of the chase nipples shall be a minimum of two (2) inches above the location where any batteries are to be installed.
      d. EACH enclosure door shall be able to open no less than 105°.
      e. The top of each enclosure shall be mounted at the same height of 60inches above the finished floor and shall be level.
      f. If changes to the above requirements are preferred, contact the Architect for approval prior to rough-in.

D. All equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place (i.e., devices shall not be supported solely by suspended ceilings). Fasteners and supports shall be able to support the no less than four (4) times the weight of the equipment and/or device.

E. Rack Equipment: EACH rack shall be securely attached to the floor and/or wall using the manufacturers' recommended mounting hardware.

F. See each system specification for additional mounting information.

3.08 FLUSH MOUNT AND SURFACE MOUNT EQUIPMENT AND ENCLOSURE LOCATIONS

A. Prior to rough-in, consult the Architect for clarification for flush mount and surface mount locations.

B. Flush mounted equipment and enclosures shall be installed in areas where the rooms are finished such as administrative areas, offices, work rooms, break room and corridors. Provide the appropriate finish work around each enclosure as required. This type of equipment includes, but is not limited to the following:
   1. Enclosures: Typically, are control panels, power supplies, etc.
      a. Provide the manufacturers' flush mount trim rings, adapters, and/or brackets for this type of equipment.

C. Surface mounted equipment and enclosure shall be installed in areas where the rooms are NOT finished such as electrical rooms, MDF/IDF rooms, mechanical rooms, or utility rooms. Unless otherwise noted, this equipment shall be installed on the systems plywood back boards. This type of equipment includes, but is not limited to the following:
   1. Enclosures: Typically, are control panels, power supplies, etc.
   2. Punch Blocks: Typically, are used with telephone PBX and intercom equipment.
   3. Wall-mounted and floor -mounted racks.

3.09 NUMBERING AND LABELING

A. Phenolic Plates:
   1. Install phenolic plates at each of the control panels, power supplies, terminal cabinets, and racks.
      a. All phenolic plates shall be secured to each enclosure with rivets.
      b. Install each plate 1” from the top of the enclosure, and be centered on the door. Relocate as required to avoid interfering with equipment or components within the enclosure or prevent the enclosure door from closing properly. The location of the phenolic plates shall be consistently installed in the same location on each system enclosure, at EACH location.

B. Terminal Cabinets:
   1. Label each termination point on the inside of EACH enclosure door. All information shall be legible, as defined by the Architect.

C. Addressable Devices/Address Point Labels (where applicable):
   1. Install the address label for each addressable device on or near the device. Verify with the Architect, prior to installation.
   2. Clean the surface from dust, grease, or lubricants as recommended by the manufacturer of the label.
   3. The addressable label shall be able to be viewed by the general public when standing on the ground.
      a. Prior to installation, coordinate with the Owner’s Representative for exact location of how and/or where to mount the address label for EACH device type to fulfill this requirement, prior to installation.
   4. Provide the following address label format:
      a. The background shall be clear (see through).
      b. The text shall be black in color, and a minimum of ½” tall.
      c. Use Brothers or P-Touch models to produce the label.

3.10 ON-SITE SYSTEM INFORMATION BINDER ENCLOSURE

A. The Installing Vendor/Contractor shall install the wall mount enclosure that is labeled “(Section Title here) information”. The enclosure shall be located in the administrative area or the MDF room. Verify the exact location with the Architect, prior to installation.

B. The enclosure shall have a site-specific manual, in a “D” style 3-ring binder with an 18-inch heavy-duty chain securely fastened to the inside of the enclosure.

3.11 TESTING & COMPLETE SYSTEM FUNCTIONALITY (FOR ALL SYSTEMS THAT IDENTIFY THIS TESTING REQUIREMENT)

A. The warranty shall NOT begin until the following conditions have been met:
   1. The Installing Vendor/Contractor shall provide a copy of the (Section Number and Section Title here) - Operational Test Form that has been performed and submitted to the Architect for review. The purpose of this document is to show that the Installing Vendor/Contractor has in fact performed a complete test. In some cases, every device may not pass the test. This shall serve as the Installing Vendor’s/Contractor’s own punch list, to make corrections prior to the Acceptance Test. This must be completely filled out, and have an original signature of the representative of the Installing Vendor/Contractor. Allow for a minimum of ten (10) business days for the Architect to review this document.

2. After the Architect's review of the System Operational Test Form, the Architect will discuss the results of the test with the Installing Vendor/Contractor.
3. The Installing Vendor/Contractor shall coordinate with the Architect to witness the Performance Test. Allow for a minimum of ten (10) business days to schedule this testing.
4. System Testing:
    a. The Installing Vendor/Contractor shall provide two-way communication devices for their own staff, each Owner's Representative, and the Architect, so that all parties can communicate as required to perform all tests.
    b. The Installing Vendor/Contractor shall demonstrate the testing of each device, to the Owner's Representative and the Architect, and document this information on the (Section Number and Section Title here) - Performance Test Form.
    c. Upon the completion and passing the Performance Test with 100% positive results, the Acceptance Test Form shall be signed by the Installing Vendor/Contractor, the Owner's Representative, and the Architect.
        1) If the Installing Vendor/Contractor fails this test by NOT passing the test with 100% positive results, the following shall occur:
            (a) The Installing Vendor/Contractor shall make all of the necessary corrections to provide 100% positive results.
            (b) The Installing Vendor/Contractor shall document the corrective action taken for each item that failed the Test, and submit to the Architect for review. Upon approval by the Architect, the Acceptance Test shall be rescheduled.
        2) The Installing Vendor is subject to the Close Out requirements as specified in Section 200000, Schedule of Values.
5. Training:
    a. Refer to EACH specific section for the training requirements as described in "Training Materials and Programming Survey".
6. Complete System Functionality:
    a. After ALL of the above conditions have been met, deemed by a "Pass" on the Governing Acceptance Form - (Section Name and Section Title here), and the required signatures have been received, Complete System Functionality shall be deemed complete, as the Owner has the ability to use the system as it was designed.
7. Warranty:
    a. The warranty period shall now begin, and the initiating date of the warranty period shall commence on the date of the Owner's ability to use the Complete System Functionality as it was intended. Refer to the "Warranty" section of this specification for more information.

3.12 WARRANTY

A. See "Testing & Complete System Functionality", listed elsewhere in these specifications, to establish the requirements and confirm when the actual warranty period shall begin.

B. The Installing Vendor/Contractor shall include in the pricing of their bid that they will honor and provide EACH of the manufacturers' full-term warranty period for the provision of replacement equipment for EACH individual device and/or component provided for this project. The completed and fully functional system, including wiring, installation, and all equipment shall be free from inherent mechanical and electrical defects. At a minimum, this shall be no less than one (1) year from the date of Complete System Functionality as defined in "Testing & Complete System Functionality" portion of this specification. Warranty service for the on-site replacement of equipment shall be provided by the system supplier's manufacturer trained representative during normal working hours, Monday through Friday, excluding holidays, and response for service shall be delivered no later than the following business day after the call was received.

C. When the manufacturers' warranty exceeds one year, the Installing Vendor/Contractor shall be responsible for replacing the actual component or device for the full duration of the manufacturers' warranty, if the Owner or their representative chooses to take the item to the Installing Vendor's/Contractor's place of business. If the Owner chooses to have the Installing Vendor/Contractor provide on-site service, then the Installing Vendor/Contractor is entitled to their standard published (or negotiated) labor rates and miscellaneous material items to replace the damaged warranty item.

D. The Installing Vendor/Contractor who is authorized to provide warranty service for this project is defined in "Quality Assurance" located in Part 1 of this specification.

END OF SECTION 270000

SECTION 270528
PATHWAYS FOR COMMUNICATIONS SYSTEMS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions and Divisions 0 and 1 Specification Sections, apply to work of this Section.

B. Specification Section 260000 Electrical General Conditions.

1.02 SCOPE

A. The installation shall include innerduct, fire-rated and non-fire-rated penetration assemblies, conduit, cable tray, and wire management.

B. The bonding of metallic raceways.

C. The work performed under this specification shall be of good quality and performed in a workmanlike manner. In this context "good quality" means the work shall meet industry technical standards and quality of appearance. The Owner reserves the right to reject all or a portion of the work performed, either on technical or aesthetic grounds. The Installing Vendor/Contractor shall make all corrections as needed, to the satisfaction of the Architect.

D. The system shall meet ALL of the requirements listed in Section 270000 Low Voltage Systems General Requirements PART 3 “Testing & Complete System Functionality”, prior to “Substantial Completion”.

E. Contractual information, guidelines, requirements, or other work specified to provide a fully functional system for Section 270528 includes, but is not limited to the sections identified in Section 270000.

1.03 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications Sections, apply to work specified in this Section.

B. Applicable Standards: All work shall be performed in accordance with the latest revisions of the following standards:
   1. National Electrical Manufacturers Association:
      a. NEMA FG 1 - Fiberglass Cable Tray Systems
      b. NEMA VE 1 - Metal Cable Tray Systems
      c. NEMA VE 2 - Cable Tray Installation Guidelines
   2. NFPA 70 - National Electrical Code.
   3. ANSI/TIA-568-C.0 - Generic Telecommunications Cabling for Customer Premises.
   4. ANSI/TIA-569-B - Commercial Building Standard for Telecommunications Pathways and Spaces.
   5. ANSI-J-STD-607-A - Commercial Building Grounding and Bonding Requirements for Telecommunications.

1.04 QUALITY ASSURANCE

A. Installing Contractor Qualifications:
   1. Work in this section shall be performed by a licensed and bonded low voltage Installing Vendor/Contractor with a minimum of five (5) years’ experience in the installation and maintenance of high-speed data and voice networks. Only Installing Vendors/Contractors whose primary business is that of installing, maintaining, troubleshooting, and testing telecommunication infrastructures shall perform this work.
   2. License Classification: Installing Vendor/Contractor must possess a valid Washington State 06 Electrical Low Voltage License.

1.05 GOVERNING CODES AND CONFLICTS

A. If the requirements of this section or the Project Drawings exceed those of the governing codes and regulations, then the requirements of this section and the Drawings shall govern. However, nothing in this section or the Drawings shall be construed to permit work not conforming to all governing codes and regulations.

1.06 PROJECT CONDITIONS ARCHITECTURAL PLANS

A. The Installing Vendor/Contractor shall carefully coordinate the various symbols utilized on the drawings and shall consult the architectural plans to determine ceiling and floor types in the various areas.

1.07 SUBMITTALS

A. Refer to Section 270000 Low Voltage Systems General Requirements for additional data sheet submittal requirements.

PART 2 PRODUCTS

2.01 MATERIALS

A. See Section 270000 Low Voltage Systems General Requirements for additional requirements.

B. The Installing Vendor/Contractor shall review the Site Plans, Floor Plans, Riser Diagrams, and Detail Sheets for additional work that is required to be performed by the Installing Vendor/Contractor of this section.

2.02 COORDINATION

A. Refer to “Installation of Owner Furnished Equipment” for additional coordination and installation requirements.

B. Refer to “Submittals” listed elsewhere in this specification for additional coordination requirements.

2.03 SEISMIC BRACING

A. Provide Seismic Bracing as required by the Authority Having Jurisdiction (AHJ).

B. This includes, but is not limited to:
   1. Racks
   2. Cable trays
   3. Cable supports

2.04 INNERDUCTS AND CONDUIT SEALS

A. Innerduct (Fabric Mesh):
   1. The Installing Vendor/Contractor shall provide the proper type of fabric mesh innerduct for the application in which it is being used.
   2. Provide flexible multi-cell fabric mesh innerduct consisting of white polyester and nylon resin polymer.
   3. EACH cell shall contain a factory-installed pull tape, which shall be a different color for EACH cell.
   4. Manufactured by MaxCell: Model # MXE64283BK (black), or approved equal. Provide quantities as required where shown on plans.
      a. This shall be the default color for one (1) 3-Cell innerduct.
   5. Manufactured by MaxCell: Model # MXE64283RD (red), or approved equal. Provide quantities as required where shown on plans.
      a. Where two (2) 3-Cell innerducts are shown in a single conduit on the plans, this shall be the second color.
   6. Manufactured by MaxCell: Model # MXE64283 (blue), or approved equal. Provide quantities as required where shown on plans.
      a. Where three (3) 3-Cell innerducts are shown in a single conduit on the plans, this shall be the third color.

B. Innerduct (Non-Metallic Tubing):
   1. Provide 1” corrugated innerduct for EACH fiber optic cable run.
   2. Innerduct shall be rated for the application and environment that it is installed in and shall meet all Code and AHJ requirements.
   3. Non-Metallic Tubing for fiber optic cables shall be orange in color.
   4. Provide quantities as required where shown on plans.
   5. Approved manufacturer: Pyramid Industries or approved equal.

C. Inflation Bags (for 3” Conduits and 4” Conduits):
   1. Inside EACH hand hole and inside EACH man hole, install inflation bags in 3” Conduits and 4” Conduits that comes into the building. Provide inflation bags in EACH conduit at the opposite end (in the MDF and designated IDF locations).
   2. Provide inflation bags.
   3. Locate inflation bags in EACH 3” underground conduit and in EACH 4” underground conduit (at each end of the conduit) that is routed between the MDF and EACH designated IDF location.
   4. Manufactured by MaxCell: Model # MXCITB3 (for 3” conduits), or approved equal. Provide quantities as required.
      a. Seal each conduit as described above using the manufacturer approved inflation seal method at the completion of the project.
      b. Provide six (6) 3” conduit inflation bags (when this sized conduit is used on this project) to the Owner at the completion of the project.
   5. Manufactured by MaxCell: Model # MXCITB4 (for 4” conduits), or approved equal. Provide quantities as required.
   6. Seal each conduit as described above using the manufacturer approved inflation seal method at the completion of the project.
   7. Provide six (6) 4” conduit inflation bags (when this sized conduit is used on this project) to the Owner at the completion of the project.
   8. Inflation Tool:
      a. Provide one (1) new (unopened package) inflation tool to the Owner at the completion of the project.
      b. Manufactured by MaxCell: Model # MXCITT, or approved equal.
   9. Gas Cartridges:
      a. Provide 12 new (unopened packages) gas cartridges to the Owner at the completion of the project.

D. Duct Seal (for conduits that are 2.5” or less):
   1. Inside EACH hand hole and inside EACH man hole, install a water-tight seal in EACH conduit that comes into the building. Provide a water-tight seal in EACH conduit at the opposite end (in the MDF and designated IDF locations).
   2. In addition to the above locations, provide duct seal that includes, but is not limited to other conduits such as:
      a. Reader boards
      b. Portables
      c. Hand holes for future equipment
   3. Manufactured by Ideal: Model # 31-601, or manufactured by Gardner Bender: Model # DS-130, or approved equal.

2.05 OPEN CABLING SUPPORT & HARDWARE

A. Each cable support shall be UL listed for the application and meet the TIA requirements for structured cabling systems.

B. Provide manufacturer approved mounting brackets and fasteners.

C. Do not exceed the cable support manufacturer’s cable fill capacity for each type provided for this project.

D. Do not exceed the cable manufacturer's recommendations for cable suspension in open cabling environments.

E. J-Hooks shall have a galvanized finish.
   1. Manufactured by Erico CADDY: Model # CAT32HP, or approved equal. Provide quantities as required.
   2. Manufactured by Erico CADDY: Model # CAT48HP, or approved equal. Provide quantities as required.

F. Mounting Tree:
   1. Manufactured by Erico CADDY: Model # CATHPTM, or approved equal. Provide quantities as required.

G. Adjustable Cable Support:
   1. Manufactured by Erico CADDY: Model # CAT425 Series, or approved equal. Provide quantities as required.

H. Conduit Waterfalls:
   1. Conduit waterfalls shall be used where conduits empty into cable trays.
   2. Manufactured by Panduit: Model # CWF400, or approved equal. Provide quantities as required.

I. Conduit Bushings:
   1. Conduit bushings shall be used to protect communications cabling where conduits terminate in accessible ceiling space.
   2. Bushings shall be non-metallic to reduce cable abrasion.
   3. Manufactured by Arlington: Model # EMTXXX, or approved equal. Provide quantities as required.

2.06 CABLE TRAY – WIRE BASKET STYLE:

A. Chatsworth Products (CPI) is the basis of design for all wire-style cable. Equivalent manufacturer's solutions may be submitted for prior approval no less than two (2) weeks before bid date closing. Products not submitted for prior approval shall be rejected.

B. Provide seismic bracing.

C. The cable tray shall be UL Classified.

D. The cable tray shall be 4" high x 18" wide (unless otherwise noted).
   1. Manufactured by Chatsworth Products Inc (CPI): Model # 34821-618, or approved equal. Provide quantities as required.

E. Splice Bar:
   1. Manufactured by Chatsworth Products Inc (CPI): Model # 34739-501, or approved equal. Provide quantities as required.

F. Splice Bolt/Washer:
   1. Manufactured by Chatsworth Products Inc (CPI): Model # 34728-501, or approved equal. Provide quantities as required.

G. Trapeze Support Bracket:
   1. Manufactured by Chatsworth Products Inc (CPI): Model # 34730-620, or approved equal. Provide quantities as required.
   2. Unistrut may be used in lieu of the above model number if approved by the AHJ.

H. Cable Radius Drop:
   1. Manufactured by Chatsworth Products Inc (CPI): Model # 34747-701, or approved equal. Provide quantities as required.

I. Ground Clamp:
   1. Manufactured by Chatsworth Products Inc (CPI): Model # 34838-001, or approved equal. Provide quantities as required.

2.07 CABLE TRAY – LADDER STYLE:

A. Chatsworth Products (CPI) is the basis of design for all ladder-style cable. Equivalent manufacturer's solutions may be submitted for prior approval no less than two (2) weeks before bid date closing. Products not submitted for prior approval shall be rejected.

B. Provide seismic bracing where required by the AHJ.

C. The cable tray shall be UL Classified.

D. The cable tray shall be 1.5" high x 18" wide (unless otherwise noted) with 9" rung spacing in steel construction that has been painted by the manufacturer.
   1. Manufactured by Chatsworth Products Inc (CPI): Model # 11275-718, or approved equal. Provide quantities as required.

E. Butt Splice Rack Mount Plate:
   1. Manufactured by Chatsworth Products Inc (CPI): Model # 16301-701, or approved equal. Provide quantities as required.

F. Junction Splice:
   1. Manufactured by Chatsworth Products Inc (CPI): Model # 16302-701, or approved equal. Provide quantities as required.

G. Swivel Butt Splice:
   1. Manufactured by Chatsworth Products Inc (CPI): Model # 16487-701, or approved equal. Provide quantities as required, where applicable.

H. Swivel Junction Splice:
   1. Manufactured by Chatsworth Products Inc (CPI): Model # 16488-701, or approved equal. Provide quantities as required, where applicable.

I. Wall Mount Bracket:
   1. Manufactured by Chatsworth Products Inc (CPI): Model # 11746-718, or approved equal. Provide quantities as required.

J. Rack Mount Plate:
   1. Manufactured by Chatsworth Products Inc (CPI): Model # 12730-718, or approved equal. Provide quantities as required.

K. Ground Strap:
   1. Manufactured by Chatsworth Products Inc (CPI): Model # 40164-001, or approved equal. Provide quantities as required.

L. Cable Runway Dividers:
   1. Manufactured by Chatsworth Products Inc (CPI): Model # 13392-721, or approved equal. Provide quantities as required.

M. Cable Radius Drop:
   1. Manufactured by Chatsworth Products Inc (CPI): Model # 12100-718, or approved equal. Provide quantities as required.
   2. Manufactured by Chatsworth Products Inc (CPI): Model # 12101-702, or approved equal. Provide quantities as required.

2.08 FIRE RATED AND NON-FIRE RATED PENETRATIONS

A. Provide fire rated penetration equipment for EACH wall that is rated for fire-rated walls.

B. Provide industry standard penetration methods for EACH wall that is not a fire rated wall.

C. A firestop system shall be comprised of the item or items penetrating the fire rated structure; the opening in the structure and the materials and assembly of the materials used to seal the penetrated structure. Firestop systems comprise of an effective block for fire, heat, vapor, and pressurized water stream.

D. All penetrations through fire rated building structures (walls and floors) shall be sealed with an appropriate firestop system. This requirement applies to through penetrations (complete penetration) and membrane penetrations (through one side of a hollow fire rated structure). Any penetrating items (e.g., riser slots and sleeves, cables, conduit, cable tray, and raceways, etc.) shall be properly firestopped.

E. Firestop systems shall be UL Classified to ASTM E814 (UL 1479).

F. All firestop systems shall be installed in accordance with the manufacturer's recommendations and shall be completely installed and available for inspection by the local authorities prior to cabling system acceptance.

G. For EACH penetration, the following requirements shall apply:
   1. Provide pathway assemblies for EACH low voltage system cables for each individual assembly opening.
   2. Provide the quantity of pathway assemblies required for the horizontal cables, while maintaining all code requirements. Additionally, provide one (1) pathway assembly opening for EACH system listed on the Electrical Legend (This includes, but is not limited to: Fire Alarm System, Intrusion Alarm System, Intercom System, Access Control System, CCTV System, etc.), and no less than two (2) spare empty assembly openings, which shall remain empty at the completion of the project.

2.09 ADDITIONAL SYSTEM EQUIPMENT

A. See Part 3 of this specification for additional provision of system equipment and/or labor.

PART 3 EXECUTION

3.01 GENERAL

A. See Section 270000 Low Voltage Systems General Requirements for additional information.

B. Prior to rough-in, coordinate with the Architect for the exact installation location(s) and areas to avoid.

C. Install all equipment per the manufacturer's recommendation.

3.02 PRODUCT INSPECTIONS

A. The Installing Vendor/Contractor shall inspect all cable prior to installation to verify that it is identified properly on the reel identification label, that it is of proper gauge, containing correct number of pairs, and is the material ordered. Any physical damage to the cable and wire must be noted; un uniform jacket thickness and jacket tightness should also be identified. Note any buckling of the jacket, which would indicate possible problems.

3.03 GROUNDING AND BONDING

A. Provide grounding and bonding per ANSI-STD-J-607-A, which includes, but is not limited to: cable trays, racks, conduit sleeves, and other equipment connected to the TMGB/TGB.

B. The minimum conductor size shall be #6 green insulated copper grounding conductor. However, the size of each conductor shall be based on the actual cable length as defined in ANSI-STD-J-607-A.

3.04 HORIZONTAL PATHWAYS

A. It is the responsibility of the contractor to ensure that ALL PATHWAYS for the permanent link of each balanced twisted pair cable shall not exceed 295' in length from work area outlet to telecommunications room patch panel.

B. To ensure this length, all pathways shall be coordinated and installed prior to pouring of any slabs or the installation of any permanent structure which would inhibit a conduit or cable tray run from being installed after the structure is complete.

3.05 FIRE RATED AND NON-FIRE RATED PENTRATIONS

A. Install per manufacturer's recommendations.

B. Maintain all code and AHJ requirements.

3.06 EXPANSION JOINTS, SEISMIC JOINTS, AND BUILDING SEPARATIONS

A. All cabling crossing expansion joints, seismic joints, and building separations shall be installed inside flexible conduit connections and shall be fire rated per code and AHJ requirements.

B. Cable Trays crossing expansion joints, seismic joints, and building separations shall be installed with appropriate expansion splice plates per manufacturer's recommendations.

3.07 PLENUMS

A. Provide metallic conduit through building plenum spaces for all cables which do not bear a CMP rated label.

3.08 WARRANTY

A. The warranty shall be direct to the end user, from the manufacturer, supported through the certified Installing Vendor/Contractor, and shall cover both materials and labor costs for any claims related to the warranty program. If the Installing Vendor/Contractor were to default, the manufacturer will assume responsibility of employing another certified installer to maintain the existing warranty. Bids from installers or Installing Vendors/Contractors who are not certified by the connecting hardware manufacturer and wire manufacturer at the time of project bid will be rejected.

3.09 OPERATION & MAINTENANCE MANUALS (O&M'S)

A. Provide all Operation & Maintenance Manual (O&Ms) documentation as defined in Section 270000 Low Voltage Systems General Requirements and listed elsewhere in this specification.

3.10 DEMONSTRATION AND TRAINING

A. Upon completion of the system installation, the installation representative shall conduct a system test for the Owner, Owner's Representative, Architect, and Engineer.

B. Upon completion of the installation, after test and demonstration, the Installing Vendor/Contractor shall provide to the Architect a signed written statement substantiating the:

1. "System has been completely tested, demonstrated to the Owner's Representative, and accepted by the appropriate authority."

END OF SECTION 270528

SECTION 260000
ELECTRICAL GENERAL CONDITIONS

PART 1 GENERAL

1.01 WORK INCLUDED

A. It is the intention of this division of the specifications and the accompanying drawings to describe and provide for the furnishing, installing, testing and placing in satisfactory and successful operation all equipment, materials, devices, and necessary appurtenances to provide a complete electrical system, together with such other miscellaneous installations and equipment hereinafter specified and/or shown in the plans. The work shall include all materials, appliances and apparatus not specifically mentioned herein or noted on the plans, but which are necessary to make a complete working installation of all electrical systems shown on the plans or described herein. Equipment and devices furnished and installed under other divisions of this specification (or by the Owner) shall be connected under this division. The drawings and specifications are complementary and what is called for in either is binding as if called for in both.

B. By submitting a bid, the Contractor is acknowledging that he has made a thorough examination of the Contract Documents, existing site and building conditions, and has determined that these documents do sufficiently describe the scope of construction work required under this Contract.

C. Conform to the General Conditions, Supplementary Conditions, and related work in other Divisions for all work in Divisions 26, 27, and 28. See Division 01 for sequence of work

D. Included in Divisions 26, 27, and 28 is all work and related items necessary to provide all electrical installations except as specifically excluded. In general, this includes all labor, equipment, tools, etc., to complete the electrical work.

1.02 RELATED WORK

A. Temporary Power and Lighting - See Section 015100

B. Mechanical Control Wiring – See Division 23

C. Cutting and Patching - See Division 01

D. Trenching, backfill and asphalt work – See Division 33.

1.03 REFERENCE STANDARDS

A. The work shall comply with the latest edition of the applicable Standards and Codes of the following:

ASTM	American Society for Testing and Materials
NBFU	National Board of Fire Underwriters
NEC	National Electrical Code
---	State Electrical Code
NESC	National Electrical Safety Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
U.L.	Underwriters Laboratories Inc.
IPCEA	Insulated Power Cable Engineers Associated
CBM	Certified Ballasts Manufacturers
---	Federal, State and Local Building Codes
ETL	Electrical Testing Laboratories

B. If any conflict occurs between Government adopted Code Rules and this specification, the codes are to govern. Nothing in these drawings and specifications shall be construed to permit work not conforming with governing codes. Also, this shall not be construed as relieving the Contractor from complying with any requirements of the plans and specifications which may be in excess of, but not in conflict with, requirements of the Governing Codes.

1.04 SUBMITTALS

A. Shop Drawing Submittals
   1. This Contractor shall submit to the Architect as described in Section 01 60 00. When shop drawings are submitted electronically, they shall be submitted as described in Paragraph B below.
      a. Manufacturer's Catalog Data.
      b. Complete Physical and Technical Data.
      c. Wiring Diagrams.
      d. Detailed Reference (written or highlighted) noting compliance with the appropriate specification section and applicable item numbers within that section.
      e. Other Descriptive Data as required by the Architect/ Engineer.
   2. The Contractor shall submit to the Architect electronic shop drawings in PDF format. Electronic Shop Drawings that are submitted without following the format as outlined below will be returned for corrections without any further review.
      a. A separate PDF file shall be submitted for each Division including All submittal items for that Division as outlined below:
         1) Division 25 – Integrated Automation
         2) Division 26 – Electrical
         3) Division 27 – Telecommunications
         4) Division 28 – Electronic Safety and Security
      b. The contractor shall provide either a digital or hardware method of transporting the electronic submittal to the Architect. Files larger than 10Megabytes shall not be sent via email and shall be transferred via a file transfer protocol, PC compatible CD or PC compatible thumb drive. Divisions shall not be broken up into separate files for transfer via email.
      c. Each Specification PDF shall be submitted with the following format and salient attributes:
         1) Cover page including:
            (a) Project Title as indicated on the plans
            (b) Project Location including address, city, state, country
            (c) Prime Contractor name, phone number, and email address
            (d) Sub-Contractor name, phone number, and email address
            (e) Specification Division number and title
         2) Index Page outlining each specification section included in the submittal. This list shall be linked to a corresponding Specification Section Divider for each section. This link shall enable the reviewer to jump to a specification section by clicking the item in the list.
         3) Specification Section Divider: Shop Drawings shall be divided by specification section and each section shall begin with a divider page outlining the Specification number, title, and a list of submittal items for the section. In the upper right-hand corner of the divider page, a link shall be provided returning the reviewer to the Index Page.
         4) Each Submittal Item listed on the Specification Section Divider shall be linked to the specific item being submitted. Each Submittal Item shall be highlighted yellow with a note reference to the specific paragraph giving the submittal requirements.
         5) Each page of the submittal shall be numbered in the bottom right corner of the page. Page numbering shall be Roman numerals for all pages before the First Specification Section. Each Specification Section page shall be numbered with the Specification Section number, a dash, and the page number in the Specification Section.
         6) Specification items shall be specifically highlighted as they apply to the project rather than highlighting an entire product family. Items that do not apply to this project shall be crossed out with a red “X”.
         7) The PDF file shall not be protected to prevent printing, selecting of text within the document, or extracting of pages from the document.

3. Shop drawings shall be submitted complete, at one time, and with each item indexed with dividers and separated per specification section and shall include, at a minimum, the items of equipment listed in each specification shall be provided:
4. Within ten (10) working days after the date of the letter rejecting any items of equipment, lighting fixtures, or materials as not in accordance with the specifications, the Contractor shall submit a new list of items to furnish and install in place of those items rejected. If the Contractor fails to submit this new list within the above specified time, or if any items on this second list are rejected as not being in accordance with these specifications, the Engineer may select the items which the Contractor shall furnish and install without change in Contract price or time of completion.
5. The acceptance of a manufacturer's name or product by the Engineer does not relieve the Contractor of the responsibility for providing materials and equipment which comply in all details with the requirements of the Contract Documents. The Contractor shall be solely responsible for submitting materials at such a time to allow a minimum of two weeks for Engineer's review.
6. Electrical Drawings for the project have been developed by the Engineer using AutoCAD Revision 2013 software or newer. These drawing files will be made available to the Contractor for development of shop drawings and/or As-Builts with a signed waiver of responsibility.

B. As-Built Drawings
   1. The Contractor shall maintain, in addition to any reference drawings, an as-built set of prints, on which all deviations from the original design shall be drafted in a neat, legible manner with red colored pencil. This red-lined set shall identify all drawing revisions including addenda items, change orders, and Contractor revisions. The Contractor is responsible to revise panel schedules and load calculations as required.
   2. Drawings shall show locations of all concealed raceway runs larger than 1", giving the number of conductors and size of raceway. Underground ducts shall be shown with cross section elevations. All pipe, raceway, manholes or lines of other trades shall be included.
   3. The Contractor shall update all references to specific products to indicate products actually installed on project. This shall include, but not be limited to, lighting fixtures, baseboard heaters, etc.
   4. Upon completion of the Division 26 work, the Contractor shall deliver the red-lined drawings and one (1) set of neatly marked up as-built drawings to Architect.

D. Warranty
   1. Provide a written warranty that the Division 26, 27, and 28 work is free from mechanical and electrical defects. Contractor shall replace and repair, to the satisfaction of the Engineer, any parts of the installation which may fail within a period of 12 months after the certificate of final acceptance *or* date of substantial completion, provided that such failure is due to defects in material or workmanship, or failure to follow the specifications and drawings.
   2. See Section 270000 for additional requirements of low voltage systems.

E. Instructions and Manuals
   1. Operation and maintenance data shall be submitted in accordance with Section 017823.
   2. Manuals shall contain shop drawings, wiring diagrams, operating and maintenance instructions, replacement parts lists, and equipment nameplate data for all equipment and systems installed under the project. Signal equipment submittals shall contain step-by-step circuit description information designed to acquaint maintenance personnel with equipment operation in each mode of operation. Manuals shall contain original brochures supplied by manufacturers. Copies of originals will not be accepted.

3. Each type of device provided shall be identified in the O & M Manual using the same identification as shown on the drawings and specifications. The information included must be the exact equipment installed, not the complete "line" of the manufacturer. I Installed equipment shall be neatly and clearly identified on sheets where both installed equipment and other equipment are shown. Parts lists shall give full ordering information assigned by the original parts manufacturer. Relabeled and/or renumbered parts information as reassigned by equipment supplier are not acceptable. The following information shall be provided for each device:
   a. Manufacturer's name, address, and phone number.
   b. Local supplier's name, address, and phone number.
   c. Complete parts lists including quantities and manufacturer's part numbers.
   d. Installation instructions.
   e. Recommended maintenance items including maintenance procedure and recommended interval of maintenance listed in hours of operation, calendar unit or other similar time unit.
4. The O & M Manual shall be assembled as detailed in Section 017000. As a minimum, the following sections shall be broken out:

F. Wiring Diagrams for each system shall be complete for the specific system installed under the Contract. "Typical" line diagrams will not be acceptable unless properly marked to indicate the exact field installation.

1.05 PERMITS & FEES

A. The Contractor shall obtain and pay for all licenses, permits, and inspections required by laws, ordinances, and rules governing work specified herein. The Contractor shall arrange for inspection of work by the inspectors and shall give the inspectors all necessary assistance in their work of inspection.

B. The Contractor shall consult with and follow the requirements of the local fire, power, telephone, and television utilities serving the area and shall coordinate the work with them.

C. Utility connection and hook-up charges for power and telephone shall be paid by the Owner directly to the utility. The Electrical Contractor is required to provide any and all coordination necessary to support the utility connection, file for application of service (or assist the Owner in filing for application of service) and coordinate dates for service with the utilities.

1.06 DEFINITIONS

A. When "provide" is used, it shall be interpreted as "furnishing and installing complete in operating condition".

B. When "drawings" is used, it shall be interpreted as "all Contract Drawings for all disciplines".

C. When "Contractor" is used, it shall be interpreted as the Electrical Contractor.

1.07 INTENT OF DRAWINGS

A. The electrical drawings are intended to serve as working drawings for general layout. The equipment layout is diagrammatic and, unless specifically dimensioned or detailed, does not indicate all fittings, hardware, or appurtenances required for a complete operating installation.

B. Anything shown on the drawings but not covered in the specifications, or anything covered in the specifications but not shown on the drawings, shall be as if covered in both. In case of conflict between the drawings and specifications, the Engineer will select the method to be used. The Contractor shall be responsible for verifying all measurements before proceeding with the work.

C. Wiring diagrams are not intended to indicate the exact course of raceways or exact location of outlets. Raceway and outlet locations are approximately correct and are subject to revision as may be necessary or desirable at the time of installation. Precise location in every case shall be subject to the Engineer's approval.

1.08 PROTECTION

A. The Contractor shall store and guard all equipment before installation and shall protect same, and replace any equipment that has been damaged prior to final acceptance. See Division 01 for detailed requirements.

1.09 HOUSEKEEPING

A. All electrical materials shall be kept stored in an orderly fashion protected from heat, cold, and the weather.

B. All marred surfaces shall be refinished and painted after installation.

C. All debris shall be removed from premises during work, as directed, and at completion of job.

1.10 TEMPORARY USE

A. Temporary or interim use of any and all portions of the electrical system shall be under the supervision of the Electrical Contractor.

B. Temporary power and lighting for use during construction shall be provided per the requirements of the Division 01 specifications.

1.11 WORK NOT INCLUDED

A. Indicated motors, controls, and equipment as described in other divisions shall be furnished by other trades, but shall be moved, set, and wired to electrical controls and power supply by the Electrical Contractor.

B. Work to be included under this Contract shall be defined on drawings and in these specifications. Any details beyond these limits are meant only to give installation clarity to that portion which is a part of this Contract.

1.12 INSTRUCTION PERIODS

A. Upon completion of the work and after all tests and final inspection of the work by the authority(ies) having jurisdiction, the Contractor shall demonstrate and instruct the Owner's designated operation and maintenance personnel in the operation and maintenance of the various electrical systems. The Contractor shall arrange scheduled instruction periods with the Owner. The Contractor's representatives shall be superintendents or foremen knowledgeable in each system and suppliers' representatives when so specified.

B. Costs for time involved by Contractor shall be included in the bid.

1.13 COMPLETION OF WORK

A. Upon completion of the Division 26, 27, and 28 work, the Contractor shall comply with requirements of Section 017000 for project closeout.

B. Arrange for and obtain all required inspections and certificates pertaining to the Division 26, 27, and 28 work and deliver the certificates to the Engineer in triplicate.

C. Prior to or at the time of final inspection, the Contractor shall, as outlined in detail in the specifications, complete the delivery of all the following items:

1.	Completion Letter	
2.	Certificate of Final Inspection. Electrical Inspector Fire Department	COMPLETION OF WORK 260000 – 1.17
3.	Warranty to Owner (with copy for Engineer	SUPPLEMENTARY GENERAL CONDITIONS 260000 - 1.13
4.	Marked Set of As-Built Electrical Drawings	GENERAL AS-BUILT DRAWINGS 260000 – 1.12
5.	Certificate of Completion and Document Requirements for Protective Device Study	ELECTRICAL SYSTEM PROTECTIVE DEVICE STUDY - 260573

6.	Motor Current Readings	GENERAL, TESTS 260519 – 3.03(D)
7.	Phase Current Readings	GENERAL, TESTS 260519 – 3.03 (E)
8.	OHMIC Test Readings	GENERAL, TESTS 260519 – 3.03 (B)
9.	Ground Fault Settings	
10.	Panelboard and Special Equipment Shop Drawings and Final Approved List of Materials Installed	MATERIALS, GENERAL 260000 – 2.03
11.	Certificate of Feeders Torque Results	WIRES AND CABLES - 260519
12.	Wiring diagrams, Maintenance Manuals, Operation Instructions, and Brochures (5 sets minimum)	GENERAL, INSTRUCTIONS & MANUALS – 260000 – 1.14

* Secure delivery instructions from Architect for delivery to Owner.

1.14 SCHEDULE OF VALUES

A. Provide Schedule of Values per Division 01 and related project requirements.

B. Divisions 26, 27, and 28 Breakdown: Provide schedule of values for the following categories (as a minimum):

1. Electrical Mobilization
2. Electrical Submittals
3. Electrical General Project Management, General Design, General Coordination
4. Branch Circuit Materials Rough-in
5. Branch Circuit Materials Rough in – Labor
6. Branch Circuit Trim – Materials
7. Branch Circuit Trim – Labor
8. Service Materials
9. Service Materials – Labor
10. Feeder Materials
11. Feeder Materials - Labor
12. Panelgear, Disconnects, Starters
13. Panelgear, Disconnects, Starters – Labor
14. Light Fixtures
15. Light Fixtures – Labor
16. *Intercom/Clock System
17. *Distributed Audio-Video Communication System
18. *Classroom Audio-Visual Systems
19. *Closed Circuit Television System (CCTV)
20. *Sound Systems – Break out per space
21. *Fire Alarm/Emergency Communication System
22. *Security System
23. *Data System
24. Generator and Transfer Switches
25. Electrical System Protective Device Study
26. Commissioning
27. Electrical Punchlist, Closeout, and Owner Training

*Provide engineering/shop drawings, material, and labor for each system. Engineering/shop drawings shall be 10% of the labor and material value.

C. The dollar value for “Electrical Punchlist, Closeout, and Owner Training” shall in no case be less than 2% of the total dollar value of the Division 26, 27, and 28 work (or as indicated in Division 01, whichever is higher). The dollar value for “Commissioning” shall in no case be less than 3% of the total dollar value of the Division 26 work (or as indicated in Division 01, whichever is higher).

D. The Contractor is advised that in addition to payments held out for retainage and project final completion (i.e., “Electrical Punchlist, Closeout, and Owner Training”), as specified above and in Division 01, the Owner reserves the right to withhold 10% of the funds for any of the above categories until the systems (of that category) have been proven to operate as specified and have been completely tested and adjusted.

PART 2 PRODUCTS

2.01 COMPETITIVE PRODUCTS

A. Any reference in the specifications to any article, device, product, material, fixture, form, or type of construction by name, make, or catalog number shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition. The Contractor, in such cases, may use any article, device, product, material, fixture, form, or type of construction which in the judgment of the Engineer, expressed in writing, is equal to that specified. However, any manufacturer not listed as an accepted bidder for a specific item must be submitted for acceptance in writing in accordance with
Section 016000.

2.02 MANUFACTURER/EQUIPMENT PRIOR APPROVALS

A. Any manufacturer/equipment not listed as an approved substitute for a specified item must be submitted for acceptance in accordance with Section 016000, in writing, with detailed information to include:
   1. Manufacturer's Catalog Data
   2. Complete Physical and Technical Data
   3. Wiring Diagrams
   4. Detailed reference (written or highlighted) noting compliance with the appropriate Specification Section and all applicable Specification item numbers within that Section
   5. Complete type written index cross referencing all proposed substitutes and specified items
   6. Detailed reference to specified items (written or highlighted) noting equal quality and performance of proposed substitute equipment
   7. Other descriptive data, as required by the Engineer

B. If substitute material is determined to be acceptable by the Engineer, it will be included in a subsequent Addenda prior to bidding. The acceptance of a manufacturer’s name or product by the Engineer does not relieve the Contractor of the responsibility for providing materials and equipment which comply in all details with the requirements of the Contract Documents.

C. Only materials which are specified or published in addenda as acceptable shall be used.

2.03 MATERIALS

A. All materials must be of the quality herein specified. All materials shall be new, of the best quality, and free from defects. They shall be designed to ensure satisfactory operation and operational life in the environmental conditions which will prevail where they are being installed.

B. Each type of material shall be of the same make and quality. The materials furnished shall be standard products of the manufacturers regularly engaged in the production of such equipment and shall be the manufacturer's latest standard design.

C. All materials shall be U.L. or E.T.L. listed for the purpose for which they are used.

D. Equipment in compliance with U.L. standards but not bearing their label is not acceptable. If the manufacturer cannot arrange for labeling of an assembled unit at the factory the unit shall be field evaluated per the Washington State Administrative Code (WAC) and the electrical inspector’s requirements.

2.04 COMPLETE SYSTEM

A. All the systems mentioned shall be complete and operational in every detail except where specifically noted otherwise. Mention of certain materials in these specifications shall not be construed as releasing the Contractor from furnishing such additional materials and performing all labor required to provide a complete and operable system.

2.05 NAMEPLATES

A. Provide nameplates constructed of plastic (black on white) laminated material engraved through black surface material to white sublayer (attach with screws on NEMA 1 enclosures). EXCEPTION (1): Emergency distribution system component labeling - white letters on red background. Exception (2): Series rated systems shall be yellow background with white letters.
   1. Service Entrance Label: Refer to Section 2624 3.
   2. Panelboard Labels: Refer to Section 262416.
   3. Switch and Receptacle Labels: Refer to Section 262726.
   4. Motor Starter and Disconnect Labels: Refer to Section 262816.
   5. Special Equipment/Outlet Labels: Refer to Appropriate Sections.
   6. Medium Voltage Feeder Tags: Refer to Section 260573.
   7. Under 600 Volt Feeder Tags: Refer to Section 260519.

PART 3 EXECUTION

3.01 GENERAL

A. Careful consideration shall be given to clearances under and over beams, pipes and ducts, to provide proper headroom in all cases. Check drawings to determine heights of all suspended ceilings and size of pipe shafts where raceway and wire-ways shall run. Coordinate installation of Divisions 26, 27, and 28 wiring and equipment with Division 23 and other trades. Where insufficient room for proper installation appears, obtain clarification from Engineer before any installation begins.

B. Cutting and Patching:
   1. Obtain permission from the Architect and/or Owner’s Representative prior to cutting. Locate cuttings so they will not weaken structural components. Cut carefully and only the minimum amount necessary. Cut concrete with diamond core drills except where space limitations prevent the use of such drills.
   2. All construction materials damaged or cut into during the installation of this work must be repaired or replaced with materials of like kind and quality as original materials by skilled labor experienced in that particular building trade.

3.02 COORDINATION

A. The Contractor is responsible for accomplishing work contained within Divisions 26, 27, and 28. The work shall coordinate with that of the other Contractors and/or other trades doing work in the building. The contractor shall examine all drawings, including the several divisions of mechanical, structural, civil and architectural, for construction details and necessary coordination. Specific locations of construction features and equipment shall be obtained from the Contract Documents, field measurements, and/or from the trade providing the material or equipment. No extra costs will be allowed for failure to obtain this information.

B. All conflicts shall be reported to the Engineer in writing before installation for decision and correction. Special attention is called to the following items:
   1. Door swings to the end that switches will be located on "Strike" side of the door.
   2. Location of grilles, pipes, sprinkler heads, ducts, and other mechanical equipment so that all electrical outlets, lighting fixtures, and other electrical outlets and equipment are clear from and in proper relation to these items.
   3. Location of cabinets, counters, and doors so that electrical outlets, lighting fixtures, and equipment are clear from and in proper relation to these items.
   4. Type and height of ceiling.

5. All device measurements referenced on drawings or specifications are to be centered of device unless noted otherwise.

C. The Contractor will not be paid for work requiring reinstallation due to lack of coordination or interference with other Contractors or trades. This includes, but is not limited to, removing, replacing, relocating, cutting, patching, and finishing.

D. The Contractor shall review the installation manual for each device to be installed. If a conflict appears to occur between the manufacturer's recommended installation practices and the plans or specifications, notify the Engineer immediately. Final determination shall be by the Engineer. The Contractor will not be paid for reinstallation due to failure to comply with manufacturer instructions or design documents.

E. Device and fixture locations may be changed within 15 feet without extra charge if so desired by the Engineer, before installation.

3.03 REQUESTS FOR INFORMATION (RFI)

A. It is our intent to provide a timely response for RFIs regarding Division 26, 27, and 28 Work. To further expedite this process, where a suggestion can be determined or derived at by the initiator of the RFI, it is required this suggestion be supplied with the submitted RFI. If no suggestion is given where one is possible, the RFI will be returned as incomplete.

3.04 CLEANING AND PAINTING

A. All equipment, whether exposed to the weather or stored indoors shall be covered to protect it from water, dust and dirt.

B. After installing, all metal finishes shall be cleaned and polished, cleaned of all dirt, rust, cement, plaster, grease, and paint.

C. All equipment with a primer coat of paint shall be given two (2) or more coats of a finish enamel and scratched surfaces be refinished to look like new. Markings, identification, and nameplates shall be replaced.

3.05 EQUIPMENT IDENTIFICATION

A. Provide identifying engraved Bakelite nameplate on all equipment, including pull boxes, to clearly indicate its use, area served, circuit identification, voltage, and any other useful data.

B. Each auxiliary system, including communications, shall be clearly labeled to indicate its function.

3.06 DEVIATION

A. Deviation from the shop drawings in construction or installation of equipment shall not be made unless Shop Drawings showing proposed deviations are submitted to and approved by the Engineer. If any equipment is furnished under this or other divisions with current, voltage, or phase ratings that differ from those shown on the drawings, the Contractor shall notify the Engineer in writing immediately and shall not connect said equipment until instructed as to required changes by the Architect. No extension of time will be granted as a result of such changes.

3.07 EXCAVATIONS

A. All excavations are to be conducted so that no walls or footings shall be disturbed in any way.

B. Remove all surplus earth not needed for backfilling and dispose of same as directed.

3.08 WIRING METHODS

A. All low voltage wiring shall be in raceway with junction boxes and fittings where concealed in walls, in inaccessible ceiling space, or where exposed in finished or unfinished areas.

B. Provide conduit sleeves through all walls to accommodate all low voltage cabling. Conduit sleeves shall be sized to allow for 40% future spare capacity.

C. All branch circuit wiring shall be installed in raceway with junction boxes and fittings.

D. Provide access panels as needed for pull boxes and equipment located above ceiling or behind walls.

E. All emergency systems outlet and junction boxes shall have a red plastic tag inside marked critical or life safety as applicable.

F. Multiple feeder runs shall be rod hung, using a strut type channel with individual one-hole clamps, back plates, and machine screws.

G. Any low voltage cables that are not terminated at both ends shall be tagged and labeled per code.

H. See Section 270000 for additional requirements of low voltage systems.

3.09 PENETRATIONS OF FIRE RATED ELEMENTS

A. Penetrations of fire rated elements must be made such as to retain that rating. See architectural sheets for specific fire rated locations.

3.10 HANGERS AND SUPPORTS

A. Provide hangers, brackets, and suspension rods and supplementary steel to support equipment.

B. Hangers provided under other divisions shall not be used for support of Division 26, 27, or 28 equipment unless permitted by Architect/Engineer.

3.11 CHASES AND OPENINGS

A. Provide to the masonry and concrete trades all templates and details of chases, openings in floors, and walls as required for Division 26, 27, and equipment installation.

3.12 PAINTING

A. Painting in general will be covered under another division of this specification, except items furnished under Divisions 26, 27, and 28 that are scratched or marred in shipment or installation and shall be refinished by the Division 26 Contractor.

3.13 WORKMANSHIP AND OBSERVATION

A. Workmanship shall be of the best quality and none but competent workers shall be employed under the supervision of a competent foreman. All completed work shall represent a neat, professional appearance.

B. All work and materials shall be subject to observation at any and all times by representatives of the Engineer.

3.14 MISCELLANEOUS

A. Provide complete seismic anchorage and bracing for the lateral and vertical support of conduit and electrical equipment, as required by the International Building Code.

B. Conduits that cross seismic separations shall be installed with flexible connection suitable to accommodate conditions. Secure raceways on each side of a separation and provide a minimum of 36” length of flexible conduit to span separation.

3.15 CABLE AND WIRING ROUTED UNDERGROUND OR UNDERSLAB

A. All cables and conductors, both line voltage and low voltage, routed underground or underslab shall be U.L. listed for installation in wet locations per NEC and WAC codes.

3.16 TRAINING

A. Scheduled Instruction periods shall be as indicated in each specification section:

1.	Access Control System	1/2 day
2.	CCTV System	1/2 day
3.	Data Network	1/2 day
4.	Daylighting Control Systems	1/2 day
5.	Fire Alarm System	1/2 day
6.	Low Voltage Lighting Control Systems	1/2 day
7.	Security System	1/2 day

END OF SECTION 260000

SECTION 260005
ELECTRICAL – EXISTING SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Portions of the existing electrical lighting, power and signal systems are to be removed as detailed on the drawings.

1.02 RELATED DOCUMENTS

A. Section 260000 – Electrical General Conditions

1.03 REFERENCE STANDARDS

Not applicable

1.04 SUBMITTALS

Not applicable

PART 2 PRODUCTS

2.01 EXISTING MATERIALS

A. Existing materials which are a part of the building shall remain the property of the Owner, unless directed by the Owner to be removed.

B. It is the Contractor's responsibility to include in the bid all costs associated with necessary demolition to allow new construction shown in the Contract Documents, unless specifically noted otherwise. The Contractor shall remove all existing receptacles, lighting fixtures, low voltage devices, backboxes, abandoned raceways, conductors, and any auxiliary items to allow for new construction and finish work to occur as complimented by the Contract Documents.

C. Contractor is responsible for removal of electrical connections, disconnect switches, and starters for all mechanical equipment scheduled to be demolished. The Contractor shall check all demolition plans and actual field conditions for unit locations.

D. Areas not included in the scope of work or not included as part of the phasing schedule shall remain fully operational.

2.02 EXISTING MATERIALS NOT TO BE RE-INSTALLED

A. In coordination with the Architect/Engineer, these materials shall be made available for his inspection and decision as to whether the Owner will retain possession. Items selected for retention shall be delivered to a location on the premises selected by the Owner and turned over to him. Take reasonable care to avoid damage to this material. If the Contractor fails to conform to this requirement, he shall purchase and turn over to the Owner replacement materials of like kind and quality.

B. All material not selected for retention by the Owner and debris shall be disposed of by the Contractor. This shall include, but not be limited to, removal of PCB type ballasts and fluorescent lamps which shall be disposed of in accordance with EPA requirements.

C. Electrical Contractor shall coordinate with the Hazardous Abatement Contractor on panelboards that may be identified by them as needing abatement and assist them in disconnecting power and notifying them when the abatement can occur.

PART 3 EXECUTION

3.01 EXISTING CONDITIONS

A. Examine the structure, building, and conditions under which Division 26 work is to be installed for conditions detrimental to proper and timely completion of the work. Do not proceed with work until deficiencies encountered in installation have been corrected. Report any delay or difficulties encountered in installation of Divisions 26, 27 and 28 work which might be unsuitable to connect with work by other divisions of this specification. Failure to report conditions shall constitute acceptance of other work as being fit and proper for the installation of Divisions 26, 27 and 28 work.

B. Electrical Contractor to provide circuit tracing of all existing circuits in all areas that are to remain, be reused and/or relocated to new panels.

C. Maintain continuity of existing circuits of equipment to remain. Existing circuits of equipment shall remain energized. Circuits which are to remain but were disturbed during demolition shall have circuits, wiring, and power restored back to original condition.

D. This is a multiple phased occupied facility. The Electrical Contractor is responsible to maintain full operation of all systems in the occupied portions of the facility. Failure to do so will result in liquidated damages.

3.02 DEMOLITION

A. Switchboards, panelboards, signaling systems, other electrical equipment free standing (or surface mounted), raceway (exposed) and conductors no longer in service as a result of this Contract shall be removed. Unused raceways or sleeves shall be cut flush at ceiling, floor or wall and filled with grout.

B. At the completion of the project, the end product shall have a finished appearance. All abandoned or temporarily utilized material shall be removed.

3.03 NEW DEVICES IN REMODEL AREAS

A. Provide surface mounting for devices on existing walls. Where existing boxes are indicated to be reused, extend box as necessary and provide new devices and plates.

3.04 EXISTING PANELBOARD

A. Any modifications made to existing panels must be incorporated into the existing circuit index on the panel. If more than three circuits are modified a new typewritten index incorporating the changes to the existing index shall be installed in the existing panel.

B. Listing shall match circuit breaker arrangements, typically with odd numbers on the left and even numbers on the right. Room numbers used shall be final room numbers used in the building as verified with the Owner.

END OF SECTION 260005

SECTION 260010
EXCAVATION AND BACKFILL FOR ELECTRICAL UNDERGROUND UTILITIES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Excavation and Associated Grading

B. Trenching and Trench Protection

C. Backfilling and Compaction

D. Verification of Existing Utilities

E. Protection of Utilities

1.02 RELATED SECTIONS

A. Section 260000 – Electrical General Conditions

B. Section 260533 – Raceways

C. Section 260519 – Wires and Cables

D. Section 265000 – Lighting

E. Section 270000 – Low Voltage System General Requirements

F. Section 272000 – Data and Voice Infrastructure

G. Section 281600 – Intrusion Alarm System

H. Section 283100 – Fire Alarm System

1.03 REFERENCE STANDARDS

A. The publications listed below form a part of this specification to the extent referenced.

B. American Society of Testing and Materials (ASTM) Publications:

1.	D 422-63	Particle Size Analysis of Soils.
2.	D 423-66	Liquid Limit of Soils.
3.	D 424-59	Plastic Limit and Plasticity Index of Soils.
4.	D 1557-78	Moisture Density Relations of Soils using a 10 lb. (4.54kg) Rammer and 18 inches (457 mm) Drop.
5.	D 2167-66	Density of Soil In-Place by the Rubber Balloon Method.
6.	D 2217-66	Wet preparation of Soil Samples for Particle-Size Analysis and Determination of Soil Contents.
7.	D 2487-69	Classification of Soils for Engineering Purposes.
8.	D 2922-81	Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
9.	E 548-79	Generic Criteria for Use in the Evaluation of Testing and Inspection Agencies.

1.04 SUBMITTALS

A. Gravelly Sand Barrow Material

B. Drainage Gravel

C. Special Bedding and Initial Backfill Material

D. O&M Manuals
   1. All Product Data

1.05 PRODUCT DATA

A. The contractor shall include product data identifying compliance with all pertinent items of Part 2 of this specification. All pertinent options shall be identified in the product data submittal. If options have not been identified clearly, the submittal will be rejected.

1.06 QUALITY ASSURANCE

A. Inspection of Job Conditions: Prior to starting work and during work, the installer shall examine the work by others, site and job conditions under which excavation, trenching, and backfilling for underground utilities work will be performed, and notify the General Contractor in writing of unsatisfactory conditions or work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

B. Codes and Standards: Comply with requirements of the following codes and standards (Latest Edition) except as modified herein:
   1. International Conference of Building Officials, "International Building Code".
   2. Local requirements for all utility work.
   3. OSHA and WISHA regulations.
   4. APWA Standard Specifications.
   5. National Electrical Code – NFPA 70.

1.07 RESPONSIBILITY

A. The Contractor is solely responsible for compliance with the requirements of the drawings, specifications, local codes and standards, proper construction coordination with work of other trades, and protection and worker's safety. Contractor shall advise Engineer of any discrepancy in, or disagreement with the specifications and/or drawings prior to starting work and not proceed until issue is resolved. Commencement of work shall indicate Contractor's acknowledgement of his expertise in this type of work. Any delay resulting from failure to comply with this procedure will not be basis for an extension of the completion date.

PART 2 MATERIALS

2.01 SATISFACTORY MATERIALS

A. Materials classified as ASTM D2487, Unified Soil Classification System as SW, SP, GW, and GP are satisfactory for backfill use. Materials classified as SP-SM, GP-GM, GM, GC and ML are also satisfactory for backfill use provided that they contain moisture contents suitable for the intended use and are reasonably free of organic matter. Native material, not considered unsatisfactory as specified below, may comply. Except that no material shall have any object with a dimension exceeding 2 inches and no object shall be sharply angular.

2.02 UNSATISFACTORY MATERIALS

A. Materials classified in ASTM D2487, Unified Soil Classification System as PT, OH, and OL are unsatisfactory. Unsatisfactory materials also include man-made fills, refuse and all materials containing excessive organic matter or having moisture contents which are not suitable for the intended use, or having objects with dimensions exceeding 2 inches (boulders, etc.).

2.03 UNSTABLE MATERIAL

A. Unstable material shall consist of material too wet to properly support the utility conduit or appurtenance structure, and material identified as unsuitable in the National Electrical Code 300-5(F).

2.04 GRAVELLY SAND BORROW MATERIAL

A. Gravelly sand borrow material to provide backfill, or replace unsuitable soil, shall meet the requirements of SW, SP, GW, and GP materials, except that the maximum percentage passing the No. 200 sieve shall not exceed 5% based on the soil fraction passing the U.S. No. 4 sieve, and not contain discrete particles greater than 2 inches in diameter.

2.05 DEGREE OF COMPACTION

A. Degree of compaction shall be expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D1557, Method D. Minimum compaction requirements shall be as specified in PART 3.

2.06 DRAINAGE GRAVEL

A. Shall be 3/4-inch washed gravel with no more than 2% passing 1/2-inch sieve opening.

2.07 SPECIAL BEDDING AND INITIAL BACKFILL MATERIAL

A. Minus 3/8-inch washed pea gravel.

PART 3 EXECUTION

3.01 EXCAVATION

A. If workers enter any trench or other excavation four or more feet in depth that does not meet the open pit requirements of WSDOT Section 2.09.3(3)B, it shall be shored and cribbed. The Contractor alone shall be responsible for worker safety. All trench safety systems shall meet the requirements of the Washington Industrial Safety and Health Act, Chapter 49.17 RCW.

B. Excavation of every description and of whatever substances encountered shall be performed to allow the installation of all utilities at the lines and grades as required. During excavation, material satisfactory for backfilling shall be stockpiled in an orderly manner at a distance from the banks of the trench sufficient to avoid overloading and to prevent slides or cave-ins. Adequate drainage shall be provided for the stockpiles and surrounding areas by means of ditches, dikes, or other approved methods. The stockpiles shall also be protected from contamination with unsatisfactory excavated material or other material that may destroy the quality and fitness of the suitable stockpiled material.

C. If the Contractor fails to protect the stockpiles and any material becomes unsatisfactory as a result, such material shall be removed and replaced with satisfactory on-site or imported material from approved sources at no additional cost to the Owner.

D. Excavated material not required or not satisfactory for backfill shall be removed from the site and shall be disposed of off site, at the Contractor's expense, at the Contractor's waste area. Any excess satisfactory excavated materials shall not be mixed with unsatisfactory materials. Unsatisfactory materials shall not cover available suitable materials, or be disposed of in such a manner as to interfere with subsequent borrow operations.

E. Grading shall be done as may be necessary to prevent surface water from flowing into the excavation, and any water accumulating therein shall be removed so that the stability of the bottom and sides of the excavation is maintained. Unauthorized over-excavation shall be backfilled in accordance with paragraph 3.05 BACKFILLIING at no additional cost to the Owner.

F. The Contractor shall provide dewatering as required for installation of underground work.

3.02 TRENCH EXCAVATION

A. The trench excavation shall meet the requirements of the National Electrical Code and local utility standards.

B. Bottom Preparation: The bottoms of trenches shall be accurately graded to provide uniform bearing and support for the bottom quadrant of each section of the conduit and for bedding. Stones of 2 inches or greater in any dimension, or as recommended by the conduit manufacturer, whichever is smaller, shall be removed to avoid point bearing.

C. Removal of Unsuitable Material: Where unsuitable material is encountered in the bottom of the trench, such material shall be removed to the depth directed and replaced to the proper grade with select granular material as provided in paragraph 3.05 BACKFILLING. When removal of unsuitable material is required due to the fault or neglect of the Contractor in his performance of the work, the resulting material shall be excavated and replaced by the Contractor without additional cost to the Owner.

D. Bedding: The bedding surface for the conduit shall provide a firm foundation of uniform density throughout the entire length of the conduit. The conduit shall be bedded carefully in a soil foundation accurately shaped and rounded to conform to the lowest one-fourth of the outside portion of circular conduit or to the lower curved portion of conduit arch for the entire length of pipe or arch. When necessary, the bedding shall be taped. Provide bedding using pea gravel where noted on the drawings.

3.03 EXCAVATION FOR APPURTENANCES

A. Excavation for manholes, handholes or similar structures below grade shall be sufficient to leave at least 12 inches clear between the outer structure surfaces and the face of the excavation or support members. When concrete or masonry is to be placed in an excavated area, special care shall be taken not to disturb the bottom of the excavation. Excavation to the final grade level shall not be made until just before the concrete or masonry is to be placed.

3.04 JACKING, BORING, AND TUNNELING

A. Unless otherwise indicated, excavation shall be by open cut, except that sections of a trench may be jacked, bored, or tunneled if the raceway, cable or duct can be safely and properly installed and backfill can be properly tamped in such sections.

3.05 BACKFILLING

A. Backfill material shall be compacted to 6" layers and as specified in Paragraph 3.06 - Compaction.
   1. Trench Backfill: Trenches shall be backfilled to finish grade.
   2. Replacement of Unstable Material: Unstable material removed from the bottom of the trench of excavation shall be replaced with select granular material or gravel borrow placed in layers not exceeding 6 inches loose thickness.
   3. Bedding and Initial Backfill: Bedding shall consist of satisfactory materials. Initial backfill shall be in 6-inch lift.

3.06 COMPACTION

A. Each layer of fill, or the excavated subgrade, shall be compacted to at least 95%, per ASTM D1557, of laboratory maximum density. Compaction shall be accomplished by approved tamping rollers, pneumatic-tired rollers, three-wheel power rollers, or other approved compaction equipment.

3.07 PROTECTION

A. Newly graded excavated or bedded areas shall be protected from traffic and from erosion, and any settlement or washing away that may occur from any cause, prior to acceptance, shall be repaired and grades reestablished to the required elevations and slopes.

END OF SECTION 260010

SECTION 260519
WIRES AND CABLES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide all wire, cable, and terminations complete.

1.02 RELATED DOCUMENTS

A. Section 260000 – Electrical General Conditions

B. Section 260532 – Outlet and Pull Boxes

C. Section 260533 – Raceway

1.03 REFERENCE STANDARDS

A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013 (Reapproved 2018).

B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2011 (Reapproved 2017).

C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010, with Editorial Revision (2020).

D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2020).

E. ASTM B800 - Standard Specification for 8000 Series Aluminum Alloy Wire for Electrical Purposes - Annealed and Intermediate Tempers; 2005 (Reapproved 2021).

F. ASTM B801 - Standard Specification for Concentric-Lay-Stranded Conductors of 8000 Series Aluminum Alloy Wire for Subsequent Covering of Insulation; 2018.

G. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2017.

H. ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes; 2013.

I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2021a.

J. FM 3971 - Fire Protective Coatings and Wraps for Grouped Cables; 2019.

K. FS A-A-59544 - Cable and Wire, Electrical (Power, Fixed Installation); Federal Specification; 2008a (Validated 2019).

L. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

M. NECA 104 - Recommended Practice for Installing Aluminum Building Wire and Cable; 2012.

N. NECA 120 - Standard for Installing Armored Cable (AC) and Metal-Clad Cable (MC); 2012.

O. NECA 121 - Standard for Installing Nonmetallic-Sheathed Cable (Type NM-B) and Underground Feeder and Branch-Circuit Cable (Type UF); 2007.

P. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2009.

Q. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.

R. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

S. UL 4 - Armored Cable; Current Edition, Including All Revisions.

T. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.

U. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.

V. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.

W. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.

X. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.

Y. UL 493 - Thermoplastic-Insulated Underground Feeder and Branch-Circuit Cables; Current Edition, Including All Revisions.

Z. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.

AA. UL 854 - Service-Entrance Cables; Current Edition, Including All Revisions.

BB. UL 1569 - Metal-Clad Cables; Current Edition, Including All Revisions.

CC. UL 2277 - Outline of Investigation for Flexible Motor Supply Cable and Wind Turbine Tray Cable; Current Edition, Including All Revisions.

DD. UL 4703 - Standard for Photovoltaic Wire; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data
   1. Copper Wire
   2. Aluminum Wire
   3. Splices and Connections
   4. Cable Tag Type(s)

B. Testing – See Part 3
   1. Megger Test
   2. Torque Certifications

C. O&M Manuals
   1. Megger Test
   2. Torque Certifications

1.05 PRODUCT DATA

A. The contractor shall include product data identifying compliance with all pertinent items of Part 2 of this specification. All pertinent options shall be identified in the product data submittal. If options have not been identified clearly, the submittal will be rejected.

PART 2 PRODUCTS

2.01 WIRE AND CABLE (COPPER, 600-VOLT)

A. Interior and Above Grade: All wires to be Type THW or RHW. Type THWN/THHN or XHHW wire may be utilized at Contractors option, subject to code requirements. Wire and cables shall be brought to project in original containers bearing the underwriters label. Provide Type AVA wire where conductors are subject to temperature above 167 Degrees F.

B. Underground: All conductors to be type USE. Increase Raceway size when necessary to accommodate conductors per code. Exception: Underground conductors completely contained in code recognized Raceway and boxes may be Type THW, THWN or XHHW.

2.02 WIRE AND CABLE (ALUMINUM, 600-VOLT)

A. May be used at Contractor's option (except for ground cable) subject to the following requirements:
   1. Increased size for same current capacity (increased raceway size may be necessary).
   2. No aluminum conductors smaller than #4 AWG shall be used.
   3. Insulation requirements are the same as for copper conductor wires and cables.
   4. Aluminum conductors shall be made of an AA-8000 series electrical grade aluminum alloy conductor material.

2.03 SPLICES

A. Above Grade: Solderless type only. Preinsulated "twist-on" type (limited to size #10 and smaller). Bolt on compression type with application of preformed insulated cover, heat shrinkable tubing or plastic insulated tape acceptable for all sizes.

B. Below Grade: Splices below grade shall be in handholes and shall be made watertight with epoxy resin type splicing kits similar to Scotchcast.

2.04 TERMINATIONS

A. Compression set, bolted or screw terminal.

B. Conductors #12 and smaller shall utilize eye or forked tongue type compression set terminator when termination is to a bolted or screw set type terminal block or terminal cabinet.

2.05 PLASTIC CABLE TIES

A. Nylon or Equivalent, locking type.

2.06 CABLE TAGS

A. Cable tags shall be installed on all three phase feeder cables. Tags shall be embossed with feeder power source and circuit number, i.e., panel A-26. Use tag part No. FT201 for cables up to 1-1/2 inch, use FT-205 for over 1-1/2 inch.

PART 3 EXECUTION

3.01 GENERAL

A. Install all wiring in Raceway unless shown or specifically authorized otherwise.

3.02 WIRE SIZE

A. No. 12 AWG minimum for power and lighting circuits.

B. Provide solid wire for No. 14 AWG and smaller, and stranded conductors for No. 12 AWG and larger (600) volts.

3.03 TESTS

A. In addition to the factory testing of all equipment and cable, the Contractor shall test all wiring connections for continuity and ground before any fixtures or other loads are connected. Tests shall be made with a 500V minimum DC "Megger" type tester. If tests indicate faulty insulation (less than 2 megohms), such defects shall be corrected and tested again. Contractor shall provide all apparatus to make tests and shall bear all expenses of required testing. Routine operation tests shall be made on all pieces of equipment to demonstrate that working parts are in operating condition. Results of all tests shall be recorded and submitted to the Architect. The Contractor shall immediately replace all parts, which fail to pass the test.

B. All circuits both in and out of the building shall test out free of grounds, short circuits and other defects.

C. Check and record catalog number and ampere size of controller overload heaters installed, nameplate full-load amperes, and actual operating amperes of each motor. **IMPORTANT**: Submit recorded data in triplicate to the Engineer. Check proper load balance on the electrical system, direction of rotation, lubrication, and overload protection of all motors before placing in operation.

D. Provide a log of ampere reading for all panels from phase to neutral for 4 wire panels and from phase to phase for 3 wire panels. These readings shall be taken with all loads activated.

E. The final test of all equipment shall be made on dates designated by the Architect/Engineer and all readings shall be made in his presence.

F. Feeders shall be checked to ensure all phases are energized before connecting to their respective motors. Each motor shall rotate in the proper direction for its respective load. Prior to rotation test, all bearings shall be inspected for proper lubrication.

G. Minimum megger test for equipment shall be as follows:

Equipment Maximum Voltage Rating	Minimum Test Resistance
1,000-Volts or less	2 Megohms

H. Provide certification of torque values for feeder and service entrance conductors per equipment manufacturer's recommendation.

3.04 CONDUCTOR SIZES, REFERENCED ON PLANS

A. Copper, type THW or RHW unless noted.

3.05 ALUMINUM CONDUCTORS

A. Aluminum conductors serving switchboards and service entrance rated panelboard shall be terminated using compression type oxide inhibiting compound filled aluminum lugs only.

B. Compression fittings shall be sized for the conductor used and shall be set with a tool, which assures a preset deformation before release.

C. Aluminum lugs, where in contact with copper studs, bolts or bus, shall be plated.

D. Bolted aluminum lugs shall be installed with a Belleville washer under nut unless specifically permitted otherwise.

E. Branch panelboards with bolted pressure lugs shall use aluminum conductors designed to minimize creep; i.e., Stabiloy by ALCAN. Oxide inhibiting joint compound shall be applied to both the conductor and terminal lug. Manufacturer's torque specifications shall be used to prevent creep.

3.06 PULLING

A. Use no mechanical means for pulling No. 8 AWG conductors and smaller. Powdered soap stone or approved spray cream shall be the only lubricant used.

3.07 STRIPPING INSULATION

A. Do not ring the cable, always pare or pencil.

3.08 TAPING

A. If used shall be half lapped synthetic tape.

3.09 CONDUCTORS IN PANELS AND SWITCHBOARDS

A. Conductors in panels, switchboards, and terminal cabinets shall be neatly grouped and formed in a manner to "Fan" into terminals with regular spacing.

3.10 CABLE SUPPORTS

A. Provide conductor support devices as required by code in vertical cable runs.

3.11 RACEWAY SIZES REFERENCED ON DRAWINGS

A. Raceways are sized for copper, type THW, unless otherwise noted. Size all Raceways per code unless specifically noted to be larger on the drawings.

END OF SECTION 260519

SECTION 260526
GROUNDING

PART 1 GENERAL

1.01 WORK INCLUDED

A. A grounding system shall be provided for neutral ground and equipment ground as required by code.

B. An isolated grounding system shall be provided for all isolated ground receptacles as allowed by Code (NEC 250-146, paragraph d).

C. Provide all grounding of other systems as indicated in Divisions 26, 27, and 28.

1.02 RELATED SECTIONS

A. All Division 26 Specifications

B. All Division 27 Specifications

C. All Division 28 Specifications

1.03 REFERENCE STANDARDS

A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System; 2012.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings; 2017.

D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. NFPA 99 - Health Care Facilities Code; 2018.

G. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data
   1. Grounding Conductors
   2. Grounding Appurtenances
      a. Ground Rods
      b. Ground Busses (Electrodes)
   3. Grounding Conductors

B. Test Results
   1. Ground Resistance

C. O&M Manuals
   1. All Product Data and Test Results

1.05 PRODUCT DATA

A. The contractor shall include product data identifying compliance with all pertinent items of Part 2 of this specification. All pertinent options shall be identified in the product data submittal. If options have not been identified clearly, the submittal will be rejected.

1.06 BRANCH CIRCUIT GROUNDING CONDUCTORS

A. This facility is required by NEC 517-11 to be provided with branch circuit ground wires. (Do not provide ground wires in rooms and spaces exempted by NEC 517-30).

PART 2 PRODUCTS

2.01 GROUNDING CONDUCTORS

A. Copper, code size, with physical protection where subject to damage. Bare or green insulated.

2.02 GROUND RODS

A. 3/4" x 8'-0" copper clad steel.

2.03 ISOLATED GROUND BARS

A. Provide in all panels containing isolated ground circuits.

PART 3 EXECUTION

3.01 GENERAL

A. Provide all grounding for electrical systems and equipment as required by codes and as specified herein.

3.02 SIZE OF GROUND WIRE

A. As required by code. Where ground wire is exposed to physical damage or is used outside of the building, protect with conduit.

3.03 GROUND RODS

A. Provide as shown and/or required. Connect the ground conductor to each rod.

3.04 CONCRETE-ENCASED ELECTRODE

A. Provide in accordance with NEC, Article 250.52 (A)(3) and Article 250.68 (C)(3).

3.05 GROUND CONNECTION OF WATER PIPING

A. Metal internal piping shall be grounded, as part of this Contract. This includes jumpers for dielectric fittings.

3.06 CONNECTION TO THE GROUND BUS

A. Provide connections in accordance with the codes; including but not limited to conduit system, switchboard frame, service neutral and electrically operated equipment and devices. No device or equipment shall be connected for electrical service which has a neutral conductor connected to a grounding conductor or to the frame within the device or equipment.

3.07 METHOD OF CONNECTION

A. Make all underground ground connections and ground cable splices by thermal welding. Aboveground ground connections and ground cable splices may be by permanent compression connector. Grounding lugs, where provided as standard Manufacturer's items on equipment furnished, may be used.

3.08 FLEXIBLE RACEWAY

A. Shall not be used for grounding. Install separate ground conductor in all flexible raceway.

3.09 PVC RACEWAY

A. Install separate ground conductor in all PVC raceway as required per code.

3.10 DROP CORDS

A. Shall have a grounding wire and be connected with a grounding type plug and receptacle.

3.11 TESTING REQUIREMENTS (*UTILIZE IF THE SERVICE IS 600 AMPS AND OVER, LIGHTNING PROTECTION IS REQUIRED OR COMM REQUIREMENT)

A. Measure the OHMIC value of the Electric Service Entrance metallic "System Ground" with reference to "Earth Ground" using the "Multiple Ground Rod Fall-In-Potential" method and suitable instruments. Maximum resistance to ground shall be less than
25 ohms. If this resistance cannot be obtained with the ground system shown, notify the Architect immediately for further instructions. Provide OHMIC test results to Engineer.

END OF SECTION 260526

SECTION 260532
OUTLET AND PULL BOXES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide outlet and pull boxes to enclose devices, permit the pulling of conductors and for wire splices and branches.

1.02 RELATED SECTIONS

A. Section 260000 – Electrical General Conditions

B. Section 260519 – Wires and Cables

C. Section 262726 – Switches and Receptacles

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.

C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

D. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.

E. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. SCTE 77 - Specification for Underground Enclosure Integrity; 2017.

H. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

I. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

J. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

K. UL 1203 - Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data
   1. Outlet and Pull Boxes (Interior & Exterior)
   2. Nameplate Types
   3. Sound Attenuation Products

B. O&M Manuals
   1. All Product Data

1.05 PRODUCT DATA

A. The contractor shall include product data identifying compliance with all pertinent items of Part 2 of this specification. All pertinent options shall be identified in the product data submittal. If options have not been identified clearly, the submittal will be rejected.

PART 2 PRODUCTS

2.01 INTERIOR WIRING

A. General: Outlet and pull boxes shall be welded, 4-11/16” square, 3” deep. Provide with extension rings and plaster rings where required to meet the finished surface of the wall and/or ceiling. Large pull boxes shall be fabricated sheet steel, zinc coated or baked enamel finish, with return flange and screw retained cover.

B. Surface Metal Raceway: Boxes of same Manufacture and to match Raceway. Boxes to accommodate standard devices and device plate.

C. Concrete and Masonry: Boxes for casting in concrete or mounting in masonry walls shall be the type specifically designed for that purpose.

D. Install pull boxes so as to be accessible after completion of building construction.

E. Ceiling outlet boxes shall be galvanized octagonal 4 inch, 1-1/2-inch-deep (without fixture stud), 2-1/8 inches deep (with fixture stud).

2.02 EXTERIOR WIRING

A. Above Grade: Outlet and junction boxes shall be cast or malleable iron or shall be cast of corrosion resistant alloy compatible with Raceway to which it is connected. Pull boxes shall be fabricated of heavy gauge steel and hot dipped galvanized. All boxes shall have gasketed covers.
   1. Exterior outlet boxes shall be weather resistant and rain tight, with appropriate covers, gaskets, and screws.

B. Below Grade: Unless otherwise noted or as required by Code, and where exposed to earth, handholes and vaults shall be constructed of precast concrete with base, and shall include lid with galvanized, diamond plate, slip-resistant door with locking hatch. Door shall be spring-assisted with full 180-degree swing, where available, and shall be H-20 rated where installed in traffic areas. Where not exposed to earth, box shall comply with Paragraph 2.02A above. Provide with configuration, cover, grates and reinforcing as required by the particular installation.
   1. For systems rated 600V and under, minimum box size shall be equivalent to H^2 Pre-cast Type 2 junction box.
   2. For systems rated over 600V, minimum box size shall be equivalent to Oldcastle Precast 444LA.

PART 3 EXECUTION

3.01 ANCHORING

A. All boxes shall be firmly anchored directly or with concealed bracing to building studs or joints. Boxes must be so attached so that they will not "Rock" or "Shift" when devices are operated.

3.02 FLUSH MOUNTING

A. Except for surface mounted boxes or boxes above accessible ceilings, all boxes shall have front edge (box or plaster ring) even with the finished surface of the wall or ceiling.

3.03 ELECTRICAL OUTLETS

A. General: Coordinate the work of this section with the work of other sections and trades. Study all Drawings that form a part of this Contract and confer with various trades involved to eliminate conflicts between the work of this section and the work of other trades. Check and verify outlet locations indicated on Architectural Drawings, door swings, installation details, layouts of suspended ceilings and locations of all plumbing, heating and ventilating equipment.

B. Centered on Built-In Work: In the case of doors, cabinets, recessed or similar features, or where outlets are centered between such features, such as between a door jamb and a cabinet, make these outlet locations exact. Relocate any outlets which are located off center.

C. Above Counter: Locate device outlet just above backsplash or 6” above counter if there is no backsplash. Review casework shop drawings prior to final rough-in.

D. Vertical and Horizontal Relationships: Where more than one outlet is shown or specified to be at the same elevation or one above the other, align them exactly on centerlines horizontally or vertically. Relocate as directed all such outlets (including lighting, receptacle, power signal and thermostat outlets) which are not so installed, at no additional cost to Owner.

E. Device Outlet Height: Measure from the finished floor.

*Switches	4 Feet, Set Vertically, to Top of Box
*Receptacles, Telecommunications	18 Inches, Set Vertically to Centerline
Other	As Noted or as Directed by Architect
* *Heights may vary.*	*See Drawings for additional information*

F. Ceiling Location: For acoustical material locate outlet either at the corner joint or in the center of a panel, whichever is closer to the normal spacing. Locate all outlets in the same room in the same panel location.

G. Installed In Sound Walls: Boxes installed in sound walls shall not be installed back-to-back. All boxes shall be separated by one stud space and shall be interconnected with flex conduit with a 90° loop. Where stud space separation is not possible, utilize sound attenuating mastic around each box. 3M Fire Barrier Moldable Putty Pads MPP+ (2.54 mm minimum) or similar.

3.04 ELECTRICAL WORK IN COUNTERBACKS, MILLWORK AND CASEWORK

A. Provide as shown and/or specified. Provide templates, where required, to other trades for drilling and cutting to ensure accurate location of electrical fixtures (outlets and devices) as verified with the Architect. Provide all wiring, devices, plates and connections required by said fixture.

3.05 CONNECTION TO EQUIPMENT

A. For equipment furnished under this or other Divisions of the Specifications, or by others. Provide outlet boxes of sizes and at locations necessary to serve such equipment. An outlet box is required if the equipment has pigtail wires for external connection, does not have space to accommodate circuit wiring used. Study equipment details to assure proper coordination.

3.06 BLANK COVERS

A. Provide blank covers or plates over all boxes not covered by equipment.

3.07 JUNCTION OR PULL BOXES

A. Pull and junction boxes shall be installed as shown, and to facilitate pulling of wire and to limit the number of bends within code requirements. Boxes shall be permanently accessible and shall be placed only at locations approved by the Architect.

B. In suspended ceiling spaces, boxes shall be supported from the structure independently from ceiling suspension system.

C. The Drawings do not necessarily show every pull or Junction Box required. The Contractor is permitted to provide boxes deemed necessary by him for his work when installed in accordance with these Specifications.

3.08 ELECTRIC WATER COOLER

A. Conceal the Electrical Outlet behind the unit housing as provided for by the Manufacturer.

3.09 BOXES CONTAINING MULTIPLE DEVICES

A. Boxes containing emergency and normal devices are permitted only with steel barriers Manufactured especially for the purpose of dividing the box into two completely separate compartments.

B. Device Boxes Containing Multiple Devices and Wiring Rated Over 150 Volts to Ground and Over 300 Volts Between Conductors are permitted only with steel barrier manufactured especially for the purpose of dividing the box into separate compartments for each device having exposed live parts.

3.10 BOXES IN EARTH

A. Provide for all wire splices and as required to pull conductors. Boxes (handholes) shall be set in place on a 3" sand bed. Coverplates shall be flush to, and match the slope of, the final surface grade.

3.11 COLOR CODING

A. All Junction Boxes installed in accessible spaces and exposed in unfinished areas shall be color coded using spray paint or tape on the box and cover as applicable in the following manner:
277/480-Volt ..... Sand
120/208-Volt ..... Gray
Emergency Power ..... Orange
Fire Alarm ..... Red
Clock & Program ..... Green
Intrusion Alarm ..... Yellow
Telephone ..... Dark Blue
Nurse Call ..... Light Blue
Public Address ..... Silver
Television ..... Rust

B. The colors shall match the colors used on the Raceway - See Section 260533.

3.12 NAMEPLATES

A. For all line voltage junction boxes, provide black legible writing indicating panel & circuit numbering of all wiring in junction box.

END OF SECTION 260532

SECTION 260533
RACEWAY

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide Raceway System complete.

1.02 RELATED SECTIONS

A. Section 260000 – Electrical General Conditions

B. Section 260519 – Wires and Cables

C. Section 260532 – Outlet and Pull Boxes

1.03 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2020.

B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S); 2020.

C. ANSI C80.5 - American National Standard for Electrical Rigid Metal Conduit -- Aluminum (ERMC-A); 2020.

D. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit; 2018.

E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

F. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2013.

G. NECA 102 - Standard for Installing Aluminum Rigid Metal Conduit; 2004.

H. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); 2017.

I. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.

J. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2020.

K. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2021.

L. NEMA TC 14 (SERIES) - Reinforced Thermosetting Resin Conduit and Fittings Series; 2015.

M. NEMA TC 14.AG - Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings; 2015.

N. NEMA TC 14.BG - Belowground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings; 2015.

O. NEMA TC 14.XW - Extra Heavy Wall Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings; 2015.

P. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

Q. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.

R. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.

S. UL 6A - Electrical Rigid Metal Conduit-Aluminum, Red Brass, and Stainless Steel; Current Edition, Including All Revisions.

T. UL 360 - Liquid-Tight Flexible Metal Conduit; Current Edition, Including All Revisions.

U. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

V. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.

W. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.

X. UL 651A - Schedule 40 and 80 High Density Polyethylene (HDPE) Conduit; Current Edition, Including All Revisions.

Y. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.

Z. UL 797A - Electrical Metallic Tubing - Aluminum and Stainless Steel; Current Edition, Including All Revisions.

AA. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.

BB. UL 2419 - Outline of Investigation for Electrically Conductive Corrosion Resistant Compounds; Current Edition, Including All Revisions.

CC. UL 2420 - Belowground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings; Current Edition, Including All Revisions.

DD. UL 2515 - Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings; Current Edition, Including All Revisions.

EE. UL 2515A - Standard for Supplemental Requirements for Extra Heavy Wall Reinforced Thermosetting Resin Conduit (RTRC) and Fittings; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data
   1. Raceways
   2. Raceway Fittings
   3. Sealants & Penetrations
   4. Nylon Pull Cord
   5. Spacers & Stand-Offs

B. O&M Manuals
   1. All Product Data

1.05 PRODUCT DATA

A. The contractor shall include product data identifying compliance with all pertinent items of Part 2 of this specification. All pertinent options shall be identified in the product data submittal. If options have not been identified clearly, the submittal will be rejected.

PART 2 PRODUCTS

2.01 GALVANIZED RIGID STEEL CONDUIT (GRS)

A. General: Hot dipped galvanized.

B. Fittings: Galvanized malleable iron or noncorrosive alloy compatible with galvanized conduit. Erickson couplings, watertight split couplings (O.Z. type or equivalent) permitted. Running thread or set screw type fittings not approved.

2.02 INTERMEDIATE METAL CONDUIT (IMC)

A. General: Hot Dipped galvanized.

B. Fittings: Galvanized malleable iron or noncorrosive alloy compatible with galvanized conduit. Erickson couplings, watertight split couplings (O.Z. type or equivalent) permitted. Running thread or set screw type fittings not approved.

2.03 ELECTRICAL METALLIC TUBING (EMT)

A. General: Hot dipped galvanized.

B. Fittings: Raintight; steel or malleable iron type using a split corrugated compression ring and tightening nut or stainless-steel locking disc. Steel set screw fittings are acceptable for dry locations. Indenter, drive-on and pressure cast or die cast type set screw are not acceptable.

2.04 FLEXIBLE METAL CONDUIT (FMC, LFMC)

A. Dry Locations:
   1. General: Galvanized flexible steel for dry locations only.
   2. Fittings: Malleable iron or steel, Thomas and Betts "squeeze" type or equal.

B. Damp and Wet Locations:
   1. Liquid Tight: Polyvinyl chloride (PVC) weatherproof cover over flexible steel conduit.
   2. Fittings: Thomas and Betts "liquid tight" or equal.

2.05 SURFACE METAL RACEWAY

A. Formed steel or aluminum type. Standard factory finish. Where color choice is available, consult Architect/Engineer for selection prior to ordering.

2.06 RIGID NON-METALLIC CONDUIT (PVC)

A. Schedule 40 rigid polyvinyl chloride type unless otherwise noted.

2.07 RIGID ALUMINUM CONDUIT

A. Permitted only in specified locations.

B. Fittings copper free cast aluminum.

2.08 REINFORCED THERMOSETTING RESIN CONDUIT (RTRC)

A. Above Ground:
   1. General: RTRC suitable for above ground locations only. For use in marine and corrosive environments.
   2. Fittings: Compatible with conduit type and suitable for the environment installed.

B. Below Ground:
   1. General: RTRC suitable for underground locations only. For use in marine and corrosive environments.
   2. Fittings: Compatible with conduit type and suitable for the environment installed.

C. Exposed Subject to Extreme Conditions:
   1. General: RTRC which is installed under piers, exposed to extreme conditions, or in areas subject to vandalism shall be extra heavy wall RTRC and suitable for the environment where installed.
   2. Fittings: Compatible with the conduit type and suitable for the environment where installed.

PART 3 EXECUTION

3.01 GENERAL

A. Install Raceway concealed in construction unless noted otherwise on the Drawings or specifically approved in writing by the Architect/Engineer.

B. Cut Raceway ends square, ream and extend maximum distance into all couplings and connectors.

C. Provide and install manufactured end caps on all Raceway ends during construction to prevent the entrance of water or dirt. Tape, as a cover, not permitted.

D. Swab out all Raceways before pulling wires.

E. All elbows for GRS and PVC Raceway shall be factory radius bends. For all other Raceway, use factory radius bends of 1-1/4" and larger diameter.

F. Raceway shall not penetrate sheet metal ducts unless permission is granted by Architect/Engineer. All sleeves shall be provided for Raceway installation.

G. Provide 2 - 3/4" C.O. stub into accessible ceiling space from all recessed panelboards or systems terminal boxes.

H. Minimum size of conduit shall be ¾” in diameter for branch circuit wiring.

3.02 GALVANIZED RIGID STEEL CONDUIT

A. All Connections shall be watertight. Install for all Raceways in concrete or where subject to damage.

3.03 INTERMEDIATE METAL CONDUIT

A. Intermediate metal conduit is permitted as a substitute for galvanized rigid steel conduit except where GRS is required by code.

3.04 ELECTRICAL METALLIC TUBING

A. Install for wiring in masonry, frame construction, furred ceilings and above suspended ceilings. May be used for exposed work in unfinished areas where not subject to damage. Where construction involves masonry work, surface cut masonry units wherever such masonry units are to remain unplastered or uncovered in complete construction.

3.05 RIGID ALUMINUM CONDUIT

A. May be used in lieu of galvanized rigid steel conduit where Raceway is run above grade or inside of buildings; rigid aluminum conduit not permitted where Raceways are encased in or attached to concrete or are below grade.

3.06 RACEWAYS UNDERGROUND

A. Galvanized rigid steel conduit - painted with two coats of bitumastic paint - or galvanized rigid steel conduit with 15 mil. polyvinyl chloride (PVC) jacket (repair abrasions with PVC base paint or PVC).

B. PVC Raceways may be used for underground runs when permitted by code. Field bends, when necessary, shall be formed only with factory recommended heater. Penetrations through floor and walls shall be galvanized rigid steel (GRS) conduit. PVC, if used, shall be increased in size from that shown to include code required ground wire.

C. All underground bends in excess of 10 degrees and all elbows shall be GRS.

D. Arrange and slope Raceways entering building to drain away from building.

E. Ground wires shall be provided in all PVC Raceway.

3.07 INSERTS, SHIELDS AND SLEEVES

A. Furnish and set in place, in advance of pouring slabs and walls, all inserts and sleeves needed to execute Division 26 equipment installation.

B. Where supports in slabs are required after wall has been poured, use a drilled-in threaded insert, installed as recommended by Manufacturer.

C. Sleeves shall be provided for all wall penetrations.

3.08 RACEWAYS THAT STUB UP THROUGH FLOOR

A. Install at such depth that the exposed Raceway is vertical and no curved section of the elbow is visible.

B. PVC Raceway shall not be stubbed through floors.

3.09 SEALING OF RACEWAY PENETRATIONS

A. Exterior Wall Surfaces Above Grade: Seal around all penetrations with caulking approved by Engineer. For concrete construction above ground level, cast Raceway in wall or core drill wall and hard pack with a mixture of equal parts of sand and cement.

B. Exterior Surfaces Below Grade: Cast Raceway into wall (or floor) or use manufactured seal assembly (such as O.Z. type "FSK") cast in place.

C. Roofs: Provide mopped, lead, roof jack where Raceway penetrates roof membrane.

D. Fire Rated Floors, Walls, Ceiling/Roofs: Concrete or masonry, seal around Raceway penetration with Dow Corning 3-6548 silicone RTV foam or approved equal. Plaster or gypsum wallboard, seal around Raceway penetration with plaster, fire tape per local Fire Marshal's requirements.

3.10 SEALING OF RACEWAYS

A. Seal interior of all Raceways which pass through buildings roofs, floors or through outside walls of the building, above or below grade. Seal on the end inside the building using duct sealing mastic, non-hardening compound type, specially designed for such service to maintain the integrity of the seal of the wall, floor or roof. Pack around the wires in the Raceways.

3.11 HANGERS FOR RACEWAYS

A. In suspended ceiling spaces Contractor may, at his option, attach 1/2" or 3/4" EMT Raceways to the ceiling suspension system where such system is structurally suitable on independent wire secured at both ends; in which case, provide clips manufactured for the purpose.

B. When more than two Raceways will use the same routing, group together on a patented channel support system (such as Unistrut).

3.12 SURFACE METAL RACEWAY

A. Install parallel to building surface (i.e., wall, ceiling, floor). Fasten to surface as recommended by Manufacturer. Mount so Raceway is in the least obvious location. Shall be used in lieu of conduit in finished areas.

3.13 FLEXIBLE CONDUIT

A. Flexible conduit shall be used **only** for connection to motors and equipment subject to vibration with 90 degrees loop minimum to allow for isolation and for lay-in fluorescent fixtures above T-Bar ceilings. For fixture installations, one end of flex must terminate in rough-in junction box. Flex conduit shall not be installed over 6' long or used to connect from fixture to fixture. Use liquid tight for pumps, equipment which is regularly washed down, and equipment in damp locations. Provide ground wire.

3.14 COLOR CODING

A. General: Provide color bands of tape or paint one inch (25 mm) wide for Raceways up to two inches (51 mm) in diameter and one-half the Raceway diameter for larger Raceways, applied at panel and pullbox locations within each room, and 50 ft. (15.25 m) on centers within an area.

B. Color Banding:

120/208 Volt	Gray
277/480 Volt	Sand
Clock and Program	Green
Emergency Power	Orange
Fire Alarm	Red
Intrusion Alarm	Yellow
Low Voltage Switching	Black
Nurse Call	Light Blue
Public Address	Silver
Telephone	Dark Blue
Television	Rust

C. The colors shall match the colors used on the boxes - See Section 260532.

3.15 PULL CORDS

A. Nylon type shall be included in all installed empty Raceway.

END OF SECTION 260533

SECTION 260534
METAL CLAD CABLE (TYPE MC) AND FITTINGS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide Metal Clad (Type MC) Cable for power, control and lighting systems.

B. Provide wiring connections and terminations.

1.02 RELATED SECTIONS

A. Section 260000 – Electrical General Conditions

B. Section 260532 – Outlet and Pull Boxes

1.03 REFERENCE STANDARDS

A. UL 1569. Products shall be tested, approved and labeled/listed by Underwriters Laboratories, Inc.

1.04 SUBMITTALS

A. Product Data
   1. AC Cable & Fittings

B. Testing
   1. Megger

C. O&M Manuals
   1. All Product Data

1.05 PRODUCT DATA

A. The contractor shall include product data identifying compliance with all pertinent items of Part 2 of this specification. All pertinent options shall be identified in the product data submittal. If options have not been identified clearly, the submittal will be rejected.

1.06 USES PERMITTED

A. MC Cable is permitted to be used for 20amp lighting and power circuits where routing is above grade, concealed and the installation meets the requirements of NEC 330.

B. MC Cable shall NOT be used for homerun circuits from the fixture, receptacle, or equipment to the panelboard. Hard conduit must be used from the panelboard to the nearest accessible ceiling space to the panelboard.

C. MC Cable shall not be used for HVAC equipment.

PART 2 PRODUCTS

2.01 CABLE ASSEMBLY

A. Metal clad cable assemblies shall consist of 2, 3 or 4 current carrying conductors and an equipment ground conductor.

B. Conductors: Solid Copper conductor, No. 12 AWG minimum or No. 10 AWG maximum. Installation methods shall be as specified under Part 3 - Execution.

C. Insulation: Conductor insulation shall be rated 600-volt, Type THHN, 90°C dry.

D. Fillers: Fillers shall be non-hygroscopic and non-wicking.

E. Binder: Core binder shall be corrugated polyester.

F. Sheath: The metal sheath shall be galvanized steel or aluminum. The metal sheath shall be extruded onto the cable or applied longitudinally, then wrapped and welded. The sheath shall then be corrugated for greater flexibility.

G. Jacketing: When PVC jacketing is required, the jacket shall be flame-retardant PVC with a temperature range of -40°C to 90°C.

H. Equipment Grounding Conductor: The equipment ground wire shall be of the same construction as specified in 2.02.A and 2.02.B and be at a minimum the same size as the current carrying conductors. The insulation color shall be green.

2.02 FITTINGS

A. Fittings shall be UL listed and identified for such use with metal clad continuous corrugated sheath cable, with or without PVC jacketing, as is appropriate for the installation.

B. Connectors shall be of steel or malleable iron and shall be a squeeze type clamp connector with a locknut for non-jacketed metal clad cable. Compression gland type connectors shall be used for jacketed metal clad cable.

PART 3 EXECUTION

3.01 INSTALLATION – POWER AND LIGHTING SYSTEMS WIRING

A. All wiring shall be installed in compliance with the latest version of the National Electrical Code and all other applicable codes and standards as indicated elsewhere in these specifications.

B. Use of metal clad cable shall be permitted only for lighting, equipment and receptacle branch circuits. Metal clad cable shall not be permitted in locations designated to be hazardous Class I, II or III.

C. Metal clad cable shall be permitted only for motor circuits where the motor being served is less than ½ HP and rated for 120V, single phase. Metal clad cable is not permitted for HVAC equipment and controls.

D. Metal clad cable shall only be installed concealed within walls and above ceiling interstitial spaces. Where there is no ceiling interstitial space, metal clad cable may not be used.

E. Metal clad cable shall not be installed between floor levels. Provide hard pipe (i.e., EMT, RGS, IMC) when routing between floors levels.

F. Bends in corrugated sheath metal clad cable shall be made so that the cable will not be damaged. The radius of the curve of the inner edge of any bend shall not be less than seven (7) times the diameter of the metallic sheath.

G. Metal clad cable is not permitted to connect branch circuits to fumehoods, gas storage cabinets, or chemical storage cabinets.

H. No metal clad cable shall be installed in ventilation ducts or plenums.

I. Conductors in Enclosures: Provide neat and workmanlike installation with conductors tied with T&B Ty-Rap, Virginia Plastics, or equal, nylon wire ties in terminal cabinets, gutters and similar locations.

J. MC cable shall only be installed in dry locations.

3.02 FITTINGS

A. Fittings used for connecting metal clad cable to boxes, light fixtures or other equipment shall be UL listed and identified for such use.

B. Cable preparation for installation of fittings shall follow manufacturer’s instructions. The manufacturer’s specialized tools shall be used for preparing cable ends for installation of fittings.

C. The cable end shall be cut square to ensure flush seating of the cable into the fitting. Fitting securement screws shall be properly torqued. Cable ends shall be fitted with insulating bushings intended for the type of metal clad cable being installed.

D. For jacketed metal clad cable, the outer jacket shall be removed to the length specified by the fitting manufacturer’s instructions. Remove oils or solvent by-products from the outer jacket of the cable. The cable end shall be cut square to ensure flush seating of the cable into the fitting. The fitting gland nut shall be properly torqued to the manufacturer’s specifications.

3.03 ARRANGEMENT AND SUPPORT

A. Metal clad cables shall be run parallel with walls or structural elements. Vertical runs shall be plumb; horizontal runs level and parallel with structure, as appropriate. Groups shall be racked together neatly with both straight runs and bends parallel and uniformly spaced.

B. Metal clad cables shall be securely fastened in place at intervals of not more than six feet, with suitable clamps or fasteners of approved type, and all vertical conduits shall be properly supported to present a mechanically rigid and secure installation.

C. Metal clad cable installed parallel to framing members, such as studs, joist, or rafters, shall be supported so that the nearest outside surface of the cable is not less than 1-1/4 inches from the nearest edge of the framing member. Where this distance cannot be maintained, the cable shall be protected by a steel plate, sleeve, or equivalent that is at least 1/16-inch thick.

D. Maintain at least 6-inch clearance between metal clad cables and other piping systems. Maintain 12-inch clearance between metal clad cables and heat sources such as flues, steam pipes, and heating appliances.

E. No metal clad cable shall be fastened to other conduits or pipes or installed so as to prevent the ready removal of other pipes or ducts for repairs.

F. Individual metal clad cables hung from roof structure or structural ceiling shall be supported by split-ring hangers and wrought-iron hanger rods. Where three (3) or more metal clad cables are suspended from the ceiling in parallel runs, use steel channels, Kindorf, Unistrut or equal, hung from 1/2-inch rods to support the conduits. The conduit on these channels shall be held in place with metal clad cable clamps designed for the particular channel that is used.

G. Secure metal clad cable support racks to concrete walls and ceilings by means of cast-in-place anchors; die-cast, rustproof alloy expansion shields; or cast flush anchors. Wooden plugs, plastic inserts, or gunpowder driven inserts shall not be used as a base to secure conduit supports.

H. Metal clad cable shall be supported immediately on each side of a bend and not more that one (1) foot from an enclosure where a run of metal clad cable ends.

I. Use of Cable Tray:
   1. The sum of the cross-sectional areas of all cables shall not exceed the maximum allowable cable fill area allowed by NEC Tables 392.9, 392.9(E) and 392.9(F).
   2. Cables shall be installed in a single layer with a maintained spacing of not less than one cable diameter between cables.
   3. Ampacity of cables installed in cable tray shall meet the requirements of NEC 392.11.

3.04 INSPECTION AND TESTS

A. General: The electrical installation shall be inspected and tested to ensure safety to building occupants and operating personnel and conformity to Code

B. Measure and record insulation resistance of all power and control wiring including insulation resistance of all equipment:
   1. The insulation resistance of each circuit phase-to-phase and phase-to-ground shall be measured. For circuits rated less than 600 volts, the resistance shall not be less than 2 megohms.
   2. Systems rated above 240 volts shall be tested with a 1000-volt Megohmeter. Circuits rated 240 volts and below shall be tested with a 500-volt Megohmeter. The D.C. potential shall be applied for thirty (30) seconds.

C. The contractor shall record test readings and submit certified test to the Engineer for review and acceptance approval before energizing respective circuits.

END OF SECTION 260534

SECTION 260536
CABLE TRAY

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide Cable Tray System complete.

1.02 RELATED SECTIONS

A. Section 260000 – Electrical General Conditions

B. Section 260526 – Grounding

C. Section 270528 – Pathways for Communications Systems

1.03 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.

C. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; 2020.

D. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2019.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2021a.

F. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

G. NEMA VE 1 - Metal Cable Tray Systems; 2017.

H. NEMA VE 2 - Cable Tray Installation Guidelines; 2018.

I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

A. Product Data
   1. Cable Tray
   2. Cable Tray Fittings
   3. Cable Tray Supports

B. Shop Drawings
   1. Cable Tray
   2. Cable Tray Fittings
   3. Cable Tray Supports
   4. Cable Tray Grounding

C. O&M Manuals
   1. All Product Data

1.05 PRODUCT DATA

A. The contractor shall include product data identifying compliance with all pertinent items of Part 2 of this specification. All pertinent options shall be identified in the product data submittal. If options have not been identified clearly, the submittal will be rejected.

1.06 SHOP DRAWINGS

A. The contractor shall provide equipment dimension drawings for cable tray, cable tray fittings, and cable tray supports.

B. The contractor shall provide manufacturers recommended details for properly grounding cable trays for a continuously grounded cable tray system.

PART 2 PRODUCTS

2.01 PRODUCT NAME

A. Flextray Cable Management System or approved equal. Approved flexible site configurable wire mesh basket tray – 5mm minimum wire gauge thickness.

2.02 MANUFACTURER

A. GS Metals Corp. Manufacturer must have US production facilities; tray must be produced and finished in the United States with full domestic content.

B. Tray specified shall be UL classified and listed. Tray shall have T-weld on top rail in order to avoid sharp surfaces or protrusions on tray surface.

2.03 CABLE MANAGEMENT SYSTEM

A. Product Description: Tray must be a welded wire mesh cable management system. The open mesh permits easy access to the tray and provides continuous ventilation of cables installed in the tray. A continuous ground conductor fixing system shall be accomplished by the use of approved splices and bonding jumper or a continuous rigid welded steel wire mesh cable management system. Continuous safety edge wire shall be welded to the top of tray. Wire mesh shall be welded at all intersections.

B. Composition & Materials:
   1. Cable tray shall be produced from high mechanical strength steel wire, which is first welded into a net, then formed into channels to carry the cables. Covers and inserts shall be available to protect cables. There shall be a minimum of (5) five splicing options to effectively connect trays end to end.

C. Mesh size shall be 2” x 4”. The channel depth shall be 4” and the width 12”.

D. Cable tray supports shall be wall mounted and support the cable tray from below to allow full access to the cable tray from above. Optionally, the contractor may support the cable tray using another method with approval from the engineer. Cable tray supports shall be designed to accommodate the weight of the cable tray at 100% cable fill.

PART 3 EXECUTION

3.01 GENERAL

A. Install cable tray in configuration as indicated on the drawings.

B. Connect all tray sections together with approved splicing methods suggested by the manufacturer to maintain an effective ground bond.

C. Cable tray supports shall be wall mounted and support the cable tray system from below to allow full access to the cable tray from above. Optionally, the contractor may support the cable tray using another method with approval from the engineer. Cable tray supports shall be designed to accommodate the weight of the cable tray at 100% cable fill.

D. Install cable tray at a minimum height of 6” above the ceiling tile.

E. Maintain a 12” clearance above the cable tray, free from all obstructions.

F. Cable tray shall be installed at the same elevation, unless obvious obstructions prevent this.

G. Where cable tray is indicated to pass through a wall, the Contractor shall stop the tray on either side of the wall and provide sleeves through the wall. The sleeves shall be sized to accommodate the fill area and capacity of the cable tray.

H. Cable tray shall be bonded to all conduit sleeves and data racks.

END OF SECTION 260536

SECTION 260539
FLOOR OUTLET DEVICES – FLUSH

PART 1 GENERAL

1.01 WORK INCLUDED

A. The floor box provides the interface between power and communication cabling in an on grade or above grade concrete floor where power and/or communication services are required.

1.02 RELATED SECTIONS

A. Section 260000 – Electrical General Conditions

1.03 SUBMITTALS

A. Product Data: provide catalog cuts of specified floor boxes and accessories upon request.

B. The manufacture's catalog numbers specified represent the minimum standard required. If product alternate manufactures are selected from the approved manufacture list, they must be equal to or exceed the standards and quality criteria set forth by listed Hubbell Inc. catalog numbers. Alternative manufactures must submit catalog cuts and samples for approval 10 days prior to bid date.

C. In general, all floor boxes shall be of size and type indicated on drawings herein specified. All floor boxes shall be located as directed by architect or as dimensioned on the architectural drawings. If drawings are not dimensioned, coordinate exact location prior to rough-in.

D. O&M Manuals

1.04 CLASSIFICATION AND USE

A. Floor boxes, covers, above floor fittings and accessories shall be of same manufacturer and be designed, manufactured, tested and installed to comply with UL514A, UL514C and NCE/NFPA 370-17(b), covers are suitable for tile, terrazzo, wood, and carpet covered floors.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Following are acceptable:
   1. Hubbell Inc. Wiring Device-Kellems or approved equal.

2.02 MATERIALS

A. Stamped Steel – For Installation Above Grade:
   1. Concealed 4-gang Capacity Deep Floor Box – Carpet or Tile Floor Applications:
      a. The recessed floor box shall allow for the activation of power, data and communication in a single box. All connections shall be made below the surface of the floor, recessed inside the box. When the box is in use, only the cords exiting the unit will be visible. The depth of the box shall be 4", with total dimensions of 10" square. Conduit connections shall be made through knockouts sized ½", ¾", 1", 1¼". Four individual wiring chambers shall include barriers to provide separation between power and low voltage conductors. Internal chamber plugs allow for various wire routing methods. Four #12 A.W.G. green grounding lead wire assemblies are included to assure a proper grounding path. The deep floor box shall be exterior coated with fusion bonded epoxy paint for on grade use. Covers with no flange for tile floor applications must be available. Non-metallic service plates must be furnished separately to enclose each of four individual wiring chambers. When installed, these plates will enclose four wiring chambers. Service plate options include blank, duplex, Style Line and 20A single Twist-Lock receptacle openings. Provide appropriate plates and blank plates for application.

2.03 MATERIALS – COVERS

A. Covers for Concealed Large Capacity Stamped Steel*:* Cover/flange assemblies re-enforced with metal cover plate shall be mounted to the box previously mentioned. Cover shall be made of die-cast aluminum. Flanges and cable doors shall be made of thermoplastic (ABS) or die-cast aluminum. The die-cast aluminum covers shall be brushed aluminum. All covers shall be UL listed for either tile floors or carpet floors. A die-cast aluminum cover shall also be available with no flange and a solid surface (no-insert required) for tile floor applications. This cover shall be hinged to allow for access to connections inside the box. When the box is in use, cable(s) will exit through two cable doors located on opposite ends of the cover. When the box is not in use, the cover will lay flush with the floor. This cover is 180 degrees reversible and will accept a carpet insert.

1. ScrubShield gasketing technology and pass 2003 UL 514A scrub-water exclusion test requirements for carpet applications.

PART 3 EXECUTION

3.01 GENERAL

A. Cast metal watertight floor boxes shall be used in slabs, on grade level or below.

B. Steel concrete tight floor boxes shall be used in slabs above grade level.

C. After positioning the box, conduit is installed in accordance with local codes.

D. Box shall be secured and pre-pour adjustments made.

E. Grease shall be applied to outside of cement cover and exposed portion of adjustable collar.

F. Cover shall be duct taped prior to pour.

G. Locate boxes after pour and cement cover shall be removed.

H. Wires shall be pulled and receptacles installed per local and national codes.

I. Provide all service plates required to complete installation to include required plates for receptacles, low voltage devices and blank plates.

J. Coordinate cover orientation with architect prior to installation.

END OF SECTION 260539

SECTION 260573
ELECTRICAL SYSTEM STUDIES

PART 1 GENERAL

1.01 WORK INCLUDED

A. This section includes the requirements for the contractor to perform electrical system studies based on the selected electrical equipment.

B. The required studies include but are not limited to a Coordination Study and an Arc Flash Assessment Study.

C. Each of the studies performed shall be based on the actual equipment to be installed. Any revisions of the selected equipment shall result in an updated study with the revised equipment submitted for review and approval prior to ordering equipment.

D. If the contractor installs different equipment than was included in the approved electrical system studies, the owner reserves the right to require the contractor to replace the non-approved electrical equipment at no additional cost to the owner.

E. The contractor shall provide all studies in agreement with all applicable codes and standards. If a specific code is applicable to the electrical system being modeled, the code shall be referenced and the portion of the electrical system impacted shall be noted.

1.02 RELATED SECTIONS

A. Conform to the General Conditions, Supplementary Conditions, and related work in other Divisions for all work in Division 26. See Division 01 for sequence of work.

B. Section 260000 – Electrical General Conditions

C. Section 262413 – Switchboards

D. Section 262416 – Panelboards

E. Section 262419 – Motor Controllers

F. Section 262813 – Fuses

G. Section 262816 – Disconnects and Fused Switches

H. reference standards

I. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2011 (Reaffirmed 2017).

J. IEEE 141 - IEEE Recommended Practice for Electrical Power Distribution for Industrial Plants; 1993 (Reaffirmed 1999).

K. IEEE 242 - IEEE Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems; 2001, with Errata (2003).

L. IEEE 399 - IEEE Recommended Practice for Industrial and Commercial Power Systems Analysis; 1997.

M. IEEE 551 - IEEE Recommended Practice for Calculating Short-Circuit Currents in Industrial and Commercial Power Systems; 2006.

N. IEEE 1584 - IEEE Guide for Performing Arc-Flash Hazard Calculations; 2018, with Errata (2019).

O. NEMA MG 1 - Motors and Generators; 2018.

P. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.

Q. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

R. NFPA 70E - Standard for Electrical Safety in the Workplace; 2021.

1.03 SUBMITTALS

A. Qualifications
   1. Contractor Qualifications

B. Report
   1. Overcurrent Protective Device Coordination Study – To be submitted with associated electrical equipment product data submittals prior to ordering equipment.
   2. Arc Flash Assessment Study – To be submitted a minimum of two months prior to electrical inspection with the intent that label installation can occur prior to final electrical inspection by the AHJ.

C. O&M Manuals
   1. Qualifications
   2. Arc Flash Assessment Study
   3. Digital Copy of Arc Flash Assessment Study (PDF)
   4. Electrical System Model (Native Format)
   5. Test Results

1.04 QUALIFICATIONS

A. All Studies shall be prepared by a qualified professional electrical engineer who is independent of the equipment manufacturer.

1.05 REPORTS

A. During the Shop Drawing process and prior to ordering electrical equipment, the contractor shall submit an **Electrical System Overcurrent Protective Device Coordination Study**. The Coordination study shall be submitted with the product data for all devices included in the coordination study and shall be formatted as indicated in Paragraph 2.01.

B. After the electrical system has been installed and is ready for energization, the Contractor shall provide an **Arc Flash Assessment Study**. The Arc Flash Assessment shall be submitted for approval prior to substantial completion. Once the Arc Flash Assessment Study is approved, the Contractor shall print and install the approved Arc Flash notification labels on all equipment containing overcurrent protective devices. Labels installed outdoors shall be suitable for outdoor installation. The Arc Flash Assessment Study shall be assembled as outlined in Paragraph 2.02.

C. The contractor shall provide to the owner the following information to be included in the Operation and Maintenance Manual:
   1. Final Arc Flash Assessment Study submitted in accordance with the requirements outlined in Specification 260000 Electrical General Conditions.
   2. The electronic copy shall also include a sub-folder with the software model used to perform the calculations. The model shall include all files necessary to access and review the model electronically. The Contractor shall include a Text File in the directory labeled “MODEL_INFORMATION.TXT” which includes the following:
      a. Project Name
      b. Electrical Contractor Name
      c. Software used to model the system including version
      d. Date the model was last updated
      e. Contact information for the individual/organization who prepared the model.

1.06 DEFINITIONS

A. For the purposes of this section, the following definitions shall apply:
   1. Coordinated: Full coordination outside of the instantaneous region of the overcurrent devices.
   2. Selectively Coordinated: Full coordination including the instantaneous region of the overcurrent devices.
   3. Instantaneous Region: Operating time during a fault of several milliseconds or less
   4. Short Time Region: Operating time during a fault from tenths of a second to several seconds. Region between the instantaneous and long time regions.
   5. Long Time Region: Operating time during a fault of minutes to hours.

PART 2 PRODUCTS

2.01 PROTECTIVE DEVICE COORDINATION STUDY

A. Protective Device Coordination Study shall be provided showing how overcurrent devices coordinate in the electrical distribution system. A Coordination Study shall be provided with the Product Data submittals for equipment containing overcurrent protective devices to ensure overcurrent devices are properly coordinated prior to ordering equipment and after the equipment has been installed to provide settings and Arc Flash Labels for all electrical equipment as recommended by the National Electrical Safety Code.

B. The contractor shall submit an Electrical System Overcurrent Protective Device Coordination Study during the Shop Drawing submittal phase of the project prior to ordering equipment with overcurrent protective devices. The Coordination study shall be submitted with the product data for all devices included in the coordination study. For modifications/additions to existing electrical systems, at a minimum the Coordination Study at this phase shall include:
   1. All new electrical equipment containing overcurrent devices
   2. The existing overcurrent protective devices immediately downstream of the new electrical equipment
   3. All existing overcurrent protective devices upstream of the new electrical equipment to the main electrical utility service entrance.

C. The contractor shall submit an Electrical System Overcurrent Protective Device Coordination Study during the Arc Flash Assessment Study phase of the project which includes all electrical equipment which will be provided with an Arc Flash Label.

D. All overcurrent protection devices shall be provided as a coordinated system by the manufacturer. Any cases where the selected manufacturer is unable to coordinate two overcurrent devices in series due to the sizes indicated in the design, the engineer shall be notified and a recommended coordination solution provided by the manufacturer prior to or during the submittal phase. For overcurrent protection devices 400A and larger where the manufacturer is unable to provide a coordinated system, the overcurrent protection devices shall include Long-Time/Short-Time/Instantaneous (LSI) time delay and ampacity settings minimum.

E. Unless noted otherwise, when a main service overcurrent device with adjustable Ground Fault trip has been specified, the next level feeder overcurrent devices shall also include adjustable Ground Fault trip. The Coordination Study shall also provide recommended settings for all adjustable Ground Fault trip devices.

F. All emergency system overcurrent protection devices shall be selectively coordinated as defined by applicable codes and standards (2017 NEC 700.32 and WAC 296-46B-700). The scope of the selectively coordinated system shall be as defined by applicable local, state, and federal codes.

G. The Protective Device Coordination Study shall present the following information in an organized report:
   1. Coordination Study Title Page shall include:
      a. Project Name
      b. Electrical Contractor name
      c. Date Study was performed
      d. Study Type (ie Overcurrent Device Coordination Study)
      e. Name/Company/Contact information for organization performing the study
      f. Analysis software used to perform the study including version
   2. Coordination Study Executive Summary shall include a brief project description, an overall description of the electrical system, and a listing of any items that may need resolution. If specific Code requirements exist for any portion of the electrical system, they shall be noted in addition to how the requirement was implemented.

3. Coordination Study Analysis shall include a detailed outline of the overcurrent device coordination analysis. Time Current Curves shall be provided for each unique coordination path in the electrical system from the Main service protective device to the largest branch circuit breaker. Each Time Current Curve shall be uniquely labeled. The report shall include a list of the overcurrent devices included in each Time Current Curve and a description of any potential un-coordinated devices with the potential impact on the electrical system due to the lack of coordination.
4. Conclusion shall include a summary of overall protective device coordination for the electrical system being modeled. The Conclusion shall also include a table listing all devices with adjustable settings and the recommended settings based on the coordination study. Any uncoordinated electrical devices that include recommended revisions shall be listed with the proposed system revision.
5. As an Appendix, the Coordination Study shall include a one-line diagram of the modeled system with each bus and overcurrent device identified. The naming of the devices in the one-line diagram shall exactly match the device names in the report and time-current curves.

2.02 ARC FLASH ASSESSMENT STUDY

A. After the electrical system has been installed and is ready for energization, the Contractor shall provide an Arc Flash Assessment Study. The Arc Flash Assessment Study shall be submitted for approval prior to substantial completion. Once the Arc Flash Assessment Study is approved, the Contractor shall print and install the approved Arc Flash notification labels on [all] [new] equipment containing overcurrent protective devices.

B. The Arc Flash Assessment Study shall include the following at a minimum:
   1. Study Title Page shall include the following information
      a. Project Name
      b. Date Study was performed
      c. Name/Company/Contact information for organization performing the study
      d. Analysis software used to perform the study including version
   2. An Index shall be provided listing each Section included in the Arc Flash Assessment Report.
   3. Study Executive Summary shall a brief overview of each section of the Study including any recommended revisions to the electrical system based on the results of the Study. The overview shall include at a minimum, any pieces of equipment with a calculated fault current that exceeds the equipment rating, a listing of any overcurrent devices with revised settings, a brief listing of un-coordinated equipment that necessitate revisions, and a listing of each piece of equipment with a Dangerous level of Arc Flash energy.

C. Each of the following sections and appendices shall include a dedicated Cover Page outlining the contents of the Section.

D. Section #1 Fault Analysis shall include an updated Fault Current Analysis of the [entire] [revised] electrical system. The Fault Analysis shall include as a minimum the following information:
   1. The available fault current at the Utility for the fault analysis shall be based on the actual Utility fault current and not an assumption. For electrical distribution systems that are primary metered, the study shall include the primary electrical system back to the point of service including but not limited to actual cable lengths/sizes/types and any overcurrent protective devices. The study shall include correspondence from the utility showing the available fault current at the utility service point in the appendices.
   2. Updated cable size/type/length shall be included in the report based on the installed conditions.
   3. Updated transformer information based on the installed transformer nameplates
   4. Current limiting fuses shall be indicated where applicable based on the actual equipment installed.
   5. Large motors (>50hp) shall be included in the analysis. Smaller motors shall be grouped together at each panel/switchboard.

6. A Table shall be provided with a comparison of calculated fault current to equipment fault rating for each piece of equipment containing overcurrent protective devices. The calculated fault current shall be adjusted as necessary based on the calculated X/R ratio.
7. Any equipment that is found to have a rating less than the calculated/adjusted fault current shall be specifically indicated along with recommended corrective action.
8. The Fault Analysis shall include the system model one-line diagram with the following information indicated:
    a. Utility connection point with available fault current and X/R ratio.
    b. Cables with conductor size, length, parallel count, raceway type.
    c. Transformers with impedance, kva, X/R ratio.
    d. Large motors (>50hp). Smaller motors shall be grouped together at each panel/switchboard.
    e. Electrical equipment with overcurrent protective devices showing calculated fault current.

E. Section #2 Protective Device Coordination Study shall include an updated Coordination Study for the [entire] [revised] distribution system as outlined in Paragraph 2.01. The updated coordination study shall optimize settings to provide coordination while reducing the Arc Flash energy present.

F. Section #3 Arc Flash Assessment Study shall analyze the [entire] [revised] electrical distribution system to determine the incident energy and recommendations for safety at electrical equipment as recommended by the National Electrical Safety Code. The Arc Flash Assessment Study shall include a description of the method used to calculate the Arc Flash energy present and the assumptions of the study. The following additional items shall be included in the study as a minimum:
    1. Table summarizing the Arc flash energy present at each pieces of equipment and the conditions under which the incident energy occurred. The table shall also include the arcing time, fault current, upstream overcurrent device, and any notes for different conditions present.
    2. A template Arc Flash label with each piece of information included on the label explained.
    3. Sample Arc Flash Labels for each piece of equipment in the model showing the code required information.

G. Appendix A shall include that correspondence from the electric utility providing the available fault current used in the analysis.

H. Appendix B shall include cut sheets for all electrical equipment included in the Arc Flash Assessment study.

PART 3 EXECUTION

3.01 TESTING/VERIFICATION

A. The contractor shall implement the settings revisions indicated in the Arc Flash Assessment Study and provide testing of each piece of electrical equipment with adjustable overcurrent protective devices to verify proper operation in accordance with the manufacturer’s recommendations. The test reports shall indicate the following at a minimum:
    1. Equipment name.
    2. Date of the test.
    3. Name and organization of the individual performing the testing
    4. Test results. Any equipment failing the testing shall be replaced at no additional cost to the owner.
    5. As-Left settings. These settings shall be as indicated in the Arc Flash Assessment Study. Any settings that vary from the Study shall be either updated in the Study including a revised submittal package or shall be corrected in the field and an updated test report provided.

3.02 FIELD APPLIED ARC FLASH LABELS

A. After the Arc Flash Assessment Study is approved, the recommended settings have been implemented, and the electrical equipment has been successfully tested, the Contractor shall provide Arc Flash and Shock Hazard warning labels on all electrical devices containing overcurrent protection stating the following information at a minimum:
    1. PPE level of protection

2. Incident energy (cal/cm^2) at 24” from switchboards and 18” for all other electrical equipment unless specified otherwise by the Owner/Engineer
3. Flash hazard boundary
4. Glove class
5. Limited approach distance
6. Restricted approach distance
7. Prohibited approach distance

B. Labels shall be permanently affixed to the equipment or wiring method and shall not be hand written.

C. The label shall be of sufficient durability to withstand the installed environment. Labels installed outdoors shall be suitable for outdoor installation with no degradation due to sun light or precipitation.

D. The label shall meet ANSI Z535 guidelines and requirements.

END OF SECTION 260573

SECTION 260924
NETWORKED LOW VOLTAGE LIGHTING CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Single space wireless lighting control systems and associated components:
   1. Wireless occupancy/vacancy sensors.
   2. Wireless daylight sensors.
   3. Wired load control modules with wireless communication inputs.
      a. Includes fixture control modules with wired occupancy/vacancy/daylight sensors.
   4. Wired receptacles with wireless communication inputs.
   5. Wireless fixture control components factory-installed in luminaires not specified in this section.
   6. Wired wall dimmers and switches with wireless communication inputs.
   7. Wired wallbox occupancy sensors with wireless communication inputs.
   8. Wireless control stations.
   9. LED Drivers.
   10. Power interfaces.
   11. Digital dimming ballast modules.

B. Wireless hub(s) for centralized control, monitoring, and system integration.

C. Software data and analytics dashboard, including server requirements.

1.02 RELATED REQUIREMENTS

A. Section **230900**: Building Energy Management Control system, for interface with lighting control system.

B. Section **26*2726 – Switches & Receptacles***:

C. Finish requirements for wall controls specified in this section.

D. Accessory receptacles and wallplates, to match lighting controls specified in this section.

E. Section **26*5000 - Lighting***

1.03 REFERENCE STANDARDS

A. 47 CFR 15 - Radio Frequency Devices; current edition.

B. ANSI C82.11 - American National Standard for Lamp Ballasts - High Frequency Fluorescent Lamp Ballasts - Supplements; 2011.

C. ANSI/ESD S20.20 - Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding Electrically Initiated Explosive Devices); 2014.

D. ASTM D4674 - Standard Practice for Accelerated Testing for Color Stability of Plastics Exposed to Indoor Office Environments; 2002a (Reapproved 2010).

E. CAL TITLE 24 P6 – California Code of Regulations, Title 24, Part 6 (California Energy Code); 2013.

F. CSA C22.2 No. 223 – Power Supplies with Extra-low-voltage Class 2 Outputs; 2015.

G. IEC 60929 - AC and/or DC-Supplied Electronic Control Gear for Tubular Fluorescent Lamps - Performance Requirements; 2015.

H. IEC 61000-4-2 - Electromagnetic Compatibility (EMC) - Part 4-2: Testing and Measurement Techniques - Electrostatic Discharge Immunity Test; 2008.

I. IEC 61347-2-3 - Lamp Control Gear - Part 2-3: Particular Requirements for A.C. and/or D.C. Supplied Electronic Control Gear for Fluorescent Lamps; 2011, with Amendments, 2016.

J. IEEE 1789 - Recommended Practice for Modulating Current in High-Brightness LEDs for Mitigating Health Risks to Viewers; 2015.

K. IEEE C62.41.2 - Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (Cor 1, 2012).

L. ISO 9001 - Quality Management Systems-Requirements; 2008.

M. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

N. NECA 130 - Standard for Installing and Maintaining Wiring Devices; National Electrical Contractors Association; 2010.

O. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; National Electrical Manufacturers Association; 2015.

P. NEMA SSL 7A – Phase Cut Dimming for Solid State Lighting: Basic Compatibility; National Electrical Manufacturers Association; 2015.

Q. NEMA WD 1 - General Color Requirements for Wiring Devices; National Electrical Manufacturers Association; 1999 (R 2015).

R. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

S. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.

T. UL 508 - Industrial Control Equipment; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

U. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.

V. UL 935 - Fluorescent-Lamp Ballasts; Current Edition, Including All Revisions.

W. UL 1310 – Class 2 Power Units; Current Edition, Including All Revisions.

X. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.

Y. UL 1598C - Light-Emitting Diode (LED) Retrofit Luminaire Conversion Kits; Current Edition, Including All Revisions.

Z. UL 2043 - Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces; Current Edition, Including All Revisions.

AA. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the placement of sensors and wall controls with millwork, furniture, equipment, etc.
   2. Coordinate the placement of wall controls with actual installed door swings.
   3. Coordinate the placement of daylight sensors with windows, skylights, and luminaires to achieve optimum operation. Coordinate placement with ductwork, piping, equipment, or other potential obstructions to light level measurement installed under other sections or by others.
   4. Coordinate the work to provide luminaires and lamps compatible with the lighting controls to be installed.
   5. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

B. Pre-Wire Meeting***;*** Include **as part of the base bid the** additional costs for Lighting Control Manufacturer to conduct on-site meeting prior to commencing work. Manufacturer to review with installer:
   1. Low voltage wiring requirements.
   2. Separation of power and low voltage/data wiring.
   3. Wire labeling.
   4. Wireless hub locations and installation.
   5. Lighting Control Manufacturer Sensor Layout and Tuning service may be specified in Part 2 under "LIGHTING CONTROLS - GENERAL REQUIREMENTS".
   6. Where Lighting Control Manufacturer Sensor Layout and Tuning service is specified in Part 2 under "LIGHTING CONTROLS - GENERAL REQUIREMENTS", sensor locations to be reviewed in accordance with layout provided by Lighting Control Manufacturer. Lighting

Control Manufacturer may direct Contractor regarding sensor relocation should conditions require a deviation from locations indicated.

7. Control locations.
8. Computer jack locations.
9. Load circuit wiring.
10. Network wiring requirements.
11. Connections to other equipment.
12. Installer responsibilities.

C. Sequencing:
   1. Do not install sensors and wall controls until final surface finishes **and painting** are complete.

1.05 SUBMITTALS

A. See Section **260000** ***Electrical General Conditions*** for submittal procedures.

B. Lighting Control Manufacturer Sensor Layout and Tuning service may be specified in Part 2 under "LIGHTING CONTROLS - GENERAL REQUIREMENTS".

C. Design Documents: Where Lighting Control Manufacturer Sensor Layout and Tuning service is specified in Part 2 under "LIGHTING CONTROLS - GENERAL REQUIREMENTS", Lighting Control Manufacturer to provide plans indicating occupancy/vacancy and/or daylight sensor locations.

D. Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.
   1. Occupancy/Vacancy Sensors: Include detailed basic motion detection coverage range diagrams.
   2. Wall Dimmers: Include derating information for ganged multiple devices.

E. Manufacturer's Installation Instructions: Include application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

F. Use the following paragraph to specify system performance-verification documentation at an additional cost (requires On-Site Full-Scope Start-Up Service to be specified under “FIELD QUALITY CONTROL” in Part 3). System Performance-Verification Documentation is often required for LEED projects, projects which involve a commissioning agent, or Title 24 (California) projects. Edit the second choice to have this additional cost included as an alternate or as part of the base bid.

G. This documentation will be completed by a Lutron Services Company Representative during the startup of the Lutron lighting control system. This documentation defines the functional test procedures to be used and the results of the onsite testing of the Lutron equipment. A copy of this documentation will be delivered after startup completion.

H. System Performance-Verification Documentation***;*** Include **as part of the base bid** additional costs for manufacturer's enhanced documentation detailing start-up performance-verification procedures and functional tests performed along with test results.

I. Include the following paragraph if lighting control acceptance testing required by California Title 24, Part 6 (California Energy Code) is specified in Part 3 under "COMMISSIONING".

J. Project Record Documents: Record actual installed locations and settings for lighting control system components.

K. Operation and Maintenance Data: Include detailed information on lighting control system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.

L. Warranty: Submit sample of manufacturer's Warranty or Enhanced Warranty as specified in Part 1 under “WARRANTY”. Submit documentation of final executed warranty completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications:
   1. With the proliferation of wireless devices, experience working with RF controls is critical to understanding good design for reliability.
   2. Company with not less than ten years of experience manufacturing lighting control products using wireless communication between devices.
   3. Registered to ISO 9001, including in-house engineering for product design activities.
   4. If there is a problem on the job site, the manufacturer must be reachable 24 hours per day, 7 days per week to resolve any lighting control issues. If this service is not provided, project cost overruns and delays can occur. Additionally, answering services can add to frustration and delays.
   5. Provides factory direct technical support hotline available 24 hours per day, 7 days per week.
   6. Qualified to supply specified products and to honor claims against product presented in accordance with warranty.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store products in a clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

1.08 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

A. Manufacturer's Standard Warranty, Without Manufacturer Full-Scope Start-Up:
   1. Manufacturer Lighting Control System Components, Except Wireless Sensors, Ballasts/Drivers and Ballast Modules: One year 100 percent parts coverage, no manufacturer labor coverage.
   2. Wireless Sensors: Five years 100 percent parts coverage, no manufacturer labor coverage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Lutron Vive

B. Acuity nLight AIR

C. Substitutions:
   1. No other Manufacturers are allowed.

D. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

2.02 LIGHTING CONTROLS - GENERAL REQUIREMENTS

A. Sensor Layout and Tuning: Include **as part of the base bid** additional costs for Lighting Control Manufacturer's Sensor Layout and Tuning service:
   1. Lighting Control Manufacturer to take full responsibility for wired or wireless occupancy/vacancy and daylight sensor layout and performance for sensors provided by Lighting Control Manufacturer.
   2. Lighting Control Manufacturer to analyze the reflected ceiling plans, via supplied electronic AutoCAD format, and design a detailed sensor layout that provides adequate occupancy sensor coverage and ensures occupancy and daylight sensor performance per agreed upon sequence of operations. Contractor to utilize the layouts for sensor placement.
   3. During startup, Lighting Control Manufacturer to direct Contractor regarding sensor relocation, as required, should conditions require a deviation from locations specified in the drawings.

4. Lighting Control Manufacturer to provide up to two additional post-startup on-site service visits, within one calendar year from Date of Substantial Completion to fine-tune sensor calibration per the agreed upon sequence of operations.

B. Provide products listed, classified, and labeled by Underwriter's Laboratories Inc. (UL) as suitable for the purpose indicated.

C. Unless specifically indicated to be excluded, provide all required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, programming, etc. as necessary for a complete operating system that provides the control intent indicated.

D. Typical dimming equipment is rated for 40 degrees C (104 degrees F). This is the maximum ambient temperature that can exist while the dimming equipment is operating at full load conditions. Include the following paragraph to ensure that the operating equipment is designed to operate at worst case environmental conditions without affecting product life.

E. Design lighting control equipment for 10-year operational life while operating continually at any temperature in an ambient temperature range of 32 degrees F (0 degrees C) to 104 degrees F (40 degrees C) and 90 percent non-condensing relative humidity.

F. Electrostatic Discharge Tolerance: Design and test equipment to withstand electrostatic discharges without impairment when tested according to IEC 61000-4-2.

G. Power dropouts occur frequently. The momentary interruption of power should not cause extended periods without lighting or require some manual intervention to reset the lighting system. Some manufacturers may define power failure memory as a feature that handles momentary power outages on the order of 20 seconds. This does not account for power outages that occur for a longer period of time.

H. Power Failure Recovery: When power is interrupted for any period of time and subsequently restored, lights to automatically return to same levels (dimmed setting, full on, or full off) as prior to power interruption.

I. Wireless Devices:
   1. Wireless device family includes area or fixture level sensors, area or fixture level load controls for dimming or switching, and load controls that can be mounted in a wallbox, on a junction box, or at the fixture.
   2. Wireless devices including sensors, load controls, and wireless remotes or wall stations, can be set up using simple button press programming without needing any other equipment (e.g., central hub, processor, computer, or other smart device).
   3. Wireless hub adds the ability to set up the system using any smart device with a web browser (e.g., smartphone, tablet, PC, or laptop).
   4. System does not require a factory technician to set up or program the system.
   5. Capable of diagnosing system communications.
   6. Capable of having addresses automatically assigned to them.
   7. Receives signals from other wireless devices and provides feedback to user.
   8. Capable of determining which devices have been addressed.
   9. RF Range: 60 feet (18 m) line-of-sight or 30 feet (9 m) through typical construction materials between RF transmitting devices and compatible RF receiving devices.
   10. The FCC sets limits on EMI/RFI for both non-consumer (commercial and industrial) and consumer (residential) applications. The class B, consumer limits are more stringent than the class A, non-consumer limits.
   11. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of CFR, Title 47, Part 15, for Class B application.

J. Wireless Network:
   1. RF Frequency: 434 MHz; operate in FCC governed frequency spectrum for periodic operation; continuous transmission spectrum is not permitted.
      a. Wireless sensors, wireless wall stations and wireless load control devices do not operate in the noisy 2.4 GHz frequency band where high potential for RF interference exists.
      b. Wireless devices operate in an uncongested frequency band providing reliable operation.

c. Fixed network architecture ensures all associated lights and load controls respond in a simultaneous and coordinated fashion from a button press, sensor signal, or command from the wireless hub (i.e. no popcorning).

2. Distributed Architecture: Local room devices communicate directly with each other. If the wireless hub is removed or damaged, local control, sensing, and operation continues to function without interruption.
3. Local room devices communicate directly with each other (and not through a central hub or processor) to ensure:
   a. Reliability of system performance.
   b. Fast response time to events in the space (e.g. button presses or sensor signals).
   c. Independent operation in the event of the wireless hub being removed or damaged.

K. Device Finishes:
1. Wall Controls: **White**
2. Standard Colors: Comply with NEMA WD1 where applicable.
3. Daylight or fluorescent lighting generate ultraviolet light which can cause parts that do not meet ASTM D4674 to discolor/yellow over time.
4. Visible Parts: Exhibit ultraviolet color stability when tested with multiple actinic light sources as defined in ASTM D4674. Provide proof of testing upon request.

L. Use the following paragraph if interface with building automation system will be required. Any specific requirements can be added as subparagraphs below.

M. Interface with building automation system*.*

2.03 WIRELESS SENSORS

A. General Requirements:
1. Operational life of 10 years without the need to replace batteries when installed per manufacturer's instructions.
2. Communicates directly to compatible RF receiving devices through use of a radio frequency communications link.
3. Does not require external power packs, power wiring, or communication wiring.
4. Capable of being placed in test mode to verify correct operation from the face of the unit.

B. Lutron's occupancy/vacancy sensors are wireless, battery-powered passive infrared (PIR) sensors that automatically control lights via RF communication to compatible dimming and switching devices. These sensors detect the heat from people moving within an area to determine when the space is occupied. The sensors then wirelessly transmit the appropriate commands to the associated dimming and switching devices to turn the lights on or off automatically. They combine both convenience and exceptional energy savings along with ease of installation.

C. Wireless Occupancy/Vacancy Sensors:
1. General Requirements:
   a. Provides a clearly visible method of indication to verify that motion is being detected during testing and that the unit is communicating to compatible RF receiving devices.
   b. Include the following paragraph to ensure that the line-of-sight is not obstructed due to dust and other contaminants.
   c. Utilize multiple segmented lens, with internal grooves to eliminate dust and residue build-up.
   d. Lutron's XCT signal processing technology greatly enhances the performance of PIR sensors, enabling them to "see" fine motions that other sensors couldn't previously detect. Plus, the user-replaceable batteries are designed to last up to 10 years.
   e. Sensing Mechanism: Passive infrared coupled with technology for sensing fine motions. Signal processing technology detects fine-motion passive infrared (PIR) signals without the need to change the sensor's sensitivity threshold.
   f. Provide optional, readily accessible, user-adjustable controls for timeout, automatic/manual-on, and sensitivity.

g. Turns off lighting after reasonable and adjustable time delay once the last person to occupy the space vacates a room or area. Provide adjustable timeout settings of 1, 5, 15, and 30 minutes.
h. Capable of turning dimmer's lighting load on to an optional locked preset level selectable by the user. Locked preset range to be selectable on the dimmer from 1 percent to 100 percent.
i. Color: White.
j. Provide all necessary mounting hardware and instructions for both temporary and permanent mounting.
k. Provide temporary mounting means for drop ceilings to allow user to check proper performance and relocate as needed before permanently mounting sensor. Temporary mounting method to be design for easy, damage-free removal.
l. Sensor lens to illuminate during test mode when motion is detected to allow installer to place sensor in ideal location and to verify coverage prior to permanent mounting.
m. Ceiling-Mounted Sensors:
    1) Provide surface mounting bracket compatible with drywall, plaster, wood, concrete, and compressed fiber ceilings.
    2) Provide recessed mounting bracket compatible with drywall and compressed fiber ceilings.
n. Wall-Mounted Sensors: Provide wall or corner mounting brackets compatible with drywall and plaster walls.

2. Wireless Combination Occupancy/Vacancy Sensors:
    a. Wireless occupancy sensor has three settings available: Auto-On/Auto-Off, Auto-On Low-Light/Auto-Off, and Manual-On/Auto-Off
    b. Auto-On Low-Light feature will only turn lights on automatically if there is less than approximately 1 fc (10 lux) of ambient light
    c. Simple and intuitive adjustments available for Timeout, Auto-On, and Activity settings
    d. Supports advanced occupancy features, such as dependent occupancy groups and customizable occupied/unoccupied presets in some systems
    e. Refer to product specification submittal of receiving device to determine system limits.
    f. Ceiling-Mounted Sensors: Programmable to operate as an occupancy sensor (automatic-on and automatic-off), an occupancy sensor with low light feature (automatic-on when less than one footcandle of ambient light available and automatic-off), or a vacancy sensor (manual-on and automatic-off).
    g. Wireless occupancy sensor has two settings available: Auto-On/Auto-Off, and Manual-On/Auto-Off
    h. Simple and intuitive adjustments available for Timeout, Activity, and Auto-On settings
    i. Supports advanced occupancy features, such as dependent occupancy groups and customizable occupied/unoccupied presets in some systems
    j. Refer to product specification submittal of receiving device to determine system limits
    k. Wall-Mounted Sensors: Programmable to operate as an occupancy sensor (automatic-on and automatic-off), or a vacancy sensor (manual-on and automatic-off).
    l. If more than one model is required, the optional choice can be used to assign type designations. Make sure that designations indicated on the drawings are consistent with those specified here.
    m. Product(s):
        1) Wireless ceiling-mounted occupancy/vacancy sensor using infrared technology for sensing occupancy coupled with Lutron XCT Technology for sensing fine motion. Sensor can be auto-on/auto-off, auto-on low light/auto-off, or manual on/auto-off. Ceiling-mounted sensors are recommended for spaces with ceilings less than 12 feet high.
        2) Ceiling-Mounted Occupancy/Vacancy Sensor
            (a) Coverage from 324 square feet to 676 square feet depending on ceiling height from 8 to 12 feet; 360-degree field of view.

3) Wireless 180 degree coverage wall-mount occupancy/vacancy sensor using infrared technology for sensing occupancy coupled with Lutron XCT Technology. Sensor can be auto-on/auto-off or manual on/auto-off.
4) Wall-Mounted Occupancy/Vacancy Sensor
   (a) Minor motion coverage of 1500 square feet and major motion coverage of 3000 square feet with mounting height of 6 to 8 feet; 180-degree field of view.
5) Wireless 90 degree coverage corner-mount occupancy/vacancy sensor using infrared technology for sensing occupancy coupled with Lutron XCT Technology. Sensor can be auto-on/auto-off or manual on/auto-off.
6) Corner-Mounted Occupancy/Vacancy Sensor
   (a) Minor motion coverage of 1225 square feet and major motion coverage of 2500 square feet with mounting height of 6 to 8 feet; 90-degree field of view.
7) Wireless hallway occupancy/vacancy sensor using infrared technology for sensing occupancy coupled with Lutron XCT Technology. Sensor can be auto-on/auto-off or manual on/auto-off.
8) Hallway Occupancy/Vacancy Sensor
   (a) Major motion coverage of up to 150 feet with mounting height of 6 to 8 feet; narrow field of view.

3. Wireless Vacancy-Only Sensors:
   a. Visit www.lutron.com for more information on California Title 24 requirements.
   b. Operates only as a vacancy sensor (manual-on and automatic-off.
   c. Product(s):
      1) Wireless ceiling-mounted vacancy sensor using infrared technology for sensing occupancy coupled with Lutron XCT Technology for sensing fine motion. Sensor is manual on/auto-off (meets California Title 24 requirements). Ceiling-mounted sensors are recommended for spaces with ceilings less than 12 feet high.
      2) Ceiling-Mounted Vacancy-Only Sensor
         (a) Coverage from 324 square feet to 676 square feet depending on ceiling height from 8 to 12 feet; 360-degree field of view.
      3) Wireless 180-degree coverage wall-mount vacancy-only sensor using infrared technology for sensing occupancy coupled with Lutron XCT Technology. Sensor is manual-on/auto-off (meets California Title 24 requirements).
      4) Wall-Mounted Vacancy-Only Sensor
         (a) Minor motion coverage of 1500 square feet and major motion coverage of 3000 square feet with mounting height of 6 to 8 feet; 180-degree field of view.
      5) Wireless 90-degree coverage corner-mount vacancy-only sensor using infrared technology for sensing occupancy coupled with Lutron XCT Technology. Sensor is manual-on/auto-off (meets California Title 24 requirements).
      6) Corner-Mounted Vacancy-Only Sensor
         (a) Minor motion coverage of 1225 square feet and major motion coverage of 2500 square feet with mounting height of 6 to 8 feet; 90-degree field of view.
      7) Hallway Vacancy-Only Sensor
         (a) Major motion coverage of up to 150 feet with mounting height of 6 to 8 feet; narrow field of view.

D. Wireless Daylight Sensors:
   1. Lutron's wireless daylight sensor is a battery-powered sensor that automatically controls lights via RF communication to compatible dimming or switching devices. This sensor mounts to the ceiling and measures light in the space. The sensor then wirelessly transmits the light level to the associated dimming or switching devices that automatically control the lights to balance light level in the space. The sensor combines both convenience and exceptional energy savings along with ease of installation.
   2. Open-loop basis for daylight sensor control scheme.
   3. Stable output over temperature from 32 degrees F (0 degrees C) to 104 degrees F (40 degrees C).

4. Partially shielded for accurate detection of available daylight to prevent fixture lighting and horizontal light component from skewing sensor detection.
5. Provide linear response from 2 to 150 footcandles.
6. Color: White.
7. Mounting:
    a. Provide surface mounting bracket compatible with drywall, plaster, wood, concrete, and compressed fiber ceilings.
    b. Provide all necessary mounting hardware and instructions for both temporary and permanent mounting.
    c. Provide temporary mounting means for drop ceilings to allow user to check proper performance and relocate as needed before permanently mounting sensor. Temporary mounting method to be design for easy, damage-free removal.

2.04 LOAD CONTROL MODULES

A. Provide wireless load control modules as indicated or as required to control the loads as indicated.

B. Junction Box-Mounted Modules:
    1. Plenum rated.
    2. 0-10 V Dimming Modules:
        a. Product(s):
            1) 8 A dimming module with 0-10V control, without emergency mode
            2) 8 A dimming module with 0-10V control, with emergency mode
        b. Communicates via radio frequency with up to ten compatible occupancy/vacancy sensors, ten wireless control stations, and one daylight sensor.
        c. IEC 60929 is a standard for electronic fluorescent ballasts, and is used by other lighting equipment controlled by low voltage signals including LED drivers and low voltage controlled neon. It defines specific methods for 0-10V, pulse width modulation (PWM), and Digitally Addressable Lighting Interface (DALI).
        d. Single low voltage dimming module with Class 1 or Class 2 isolated 0-10V output signal conforming to IEC 60929 Annex E.2; source or sink automatically configures.
        e. Certain applications, such as hallways, may require that the lights never turn off. For these areas, select the minimum light level option and the load will lower to programmed low-end level. Default operation lowers to OFF.
        f. Selectable minimum light level.
        g. Configurable high- and low-end trim.
        h. Relay: Rated for 0-10 V ballasts, LED drivers, or fixtures that conform with NEMA 410.
        i. Dimming Modules with Emergency Mode:
            1) Operation With Wireless Hub: Upon loss of power, dimming module enters and remains in emergency mode as long as wireless hub is de-energized; upon restoration of power to wireless hub, dimming module returns to normal mode and lights automatically return to same levels (dimmed setting, full on, or full off) as prior to power interruption.
            2) Operation Without Wireless Hub: Upon loss of power, dimming module enters and remains in emergency mode for 90 minutes, during which time local unit buttons and wireless controls are disabled.
            3) Used with emergency lighting interface to achieve total system UL 924 listing.
    3. Phase Selectable Dimming Modules:
        a. Lutron's Vive Phase Select PowPak® dimming module is a radio frequency (RF) control that operates phase control fluorescent ballasts or LED drivers based on input from Pico® remote controls and Radio Powr Savr™ sensors. The dimming module is ideal for small areas (e.g., classrooms, conference rooms, private offices). Communication with RF input devices (e.g. Pico® remote controls, Radio Powr Savr™ sensors) is accomplished by using Lutron Clear Connect® RF Technology. Visit www.lutron.com for data sheets and other information.

b. Product(s):
   1) Phase selectable dimming module, without emergency mode
   2) Phase selectable dimming module, with emergency mode
c. Communicates via radio frequency with up to ten compatible occupancy/vacancy sensors, ten wireless control stations, and one daylight sensor.
d. Dimming
   1) UL listed for LED control in forward or reverse phase modes. Provide published LED performance testing on both forward and reverse phase dimming.
   2) UL listed for fluorescent, electronic low voltage, and magnetic low voltage control.
e. Provides leading-edge or trailing-edge dimming; manual configuration.
f. Certain applications, such as hallways, may require that the lights never turn off. For these areas, select the minimum light level option and the load will lower to programmed low-end level. Default operation lowers to OFF.
g. Selectable minimum light level.
h. Configurable high- and low-end trim.
i. Provide cycle-by-cycle compensation for incoming variations, including changes in frequency, harmonics, and line noise; accommodate up to plus/minus two percent change in frequency per second.
j. Comply with NEMA SSL 7A.
k. Rated Load: Electronic low voltage (reverse phase, 450 W, 120/277 V), dimmable LED (reverse phase, 450 VA, 120/277 V; forward phase, 200 W, 120 V), incandescent/halogen (450 W, 120/277 V), magnetic low voltage (400 VA/320 W, 120/277 V), LED Driver (3 A, 120 V - maximum of 13 drivers), fluorescent (forward phase, 400 VA, 120/277 V).
l. Dimming Modules with Emergency Mode:
   1) Operation With Wireless Hub: Upon loss of power, dimming module enters and remains in emergency mode as long as wireless hub is de-energized; upon restoration of power to wireless hub, dimming module returns to normal mode and lights automatically return to same levels (dimmed setting, full on, or full off) as prior to power interruption.
   2) Operation Without Wireless Hub: Upon loss of power, dimming module enters and remains in emergency mode for 90 minutes, during which time local unit buttons and wireless controls are disabled.
   3) Used with emergency lighting interface to achieve total system UL 924 listing.

4. Digital Ballast/LED Driver Dimming Modules:
   a. The PowPak Single Zone Control Module with EcoSystem is a radio frequency (RF) control that operates up to 32 EcoSystem LED drivers or fluorescent ballasts for the purpose of high performance dimming and control in a Vive system or with Vive standalone products. This control is based on input from Pico remote controls and Radio Powr Savr sensors. The control module is ideal for small areas (e.g., classrooms, conference rooms, private offices). Communication with RF input devices (e.g., Pico remote controls, Radio Powr Savr sensors) is accomplished by using Lutron Clear Connect RF technology.
   b. Single dimming module with Class 1 or Class 2 isolated digital output signal conforming to IEC 60929; capable of direct control without interface.
   c. Provides direct low-voltage control of up to 32 compatible digital ballasts/LED drivers as a single zone (multiple ballasts/LED drivers connected to same module will be at same light level).
      1) Electronically links a digital ballast/LED driver to a zone for both dimming and turning on/off.
      2) Electronically assigns occupancy/vacancy sensors for manual on/auto off and auto on/auto off control.
      3) Electronically assigns wireless control stations for manual local control.
      4) Electronically assigns daylight sensor for automatic daylight dimming.

d. Communicates via radio frequency with up to ten compatible occupancy/vacancy sensors, ten wireless control stations, and one daylight sensor.
e. Selectable minimum light level.
f. Configurable high- and low-end trim.

5. Relay Modules:
   a. Product(s):
      1) 16 A relay module, without emergency mode, without contact closure output
      2) 16 A relay module, with emergency mode, without contact closure output
      3) 16 A relay module, without emergency mode, with contact closure output
      4) 5 A relay module, without emergency mode, without contact closure output
      5) 5 A relay module, without emergency mode, with contact closure output
   b. Communicates via radio frequency with up to ten compatible occupancy/vacancy sensors, ten wireless control stations, and one daylight sensor.
   c. Lutron Softswitch circuitry prevents arcing at the relay contacts for all three load types, and extends the relay life in excess of one million cycles. Switching high inrush loads can damage relay controls over time. The arcing of these relays, depending on load, typically will limit relay life to 10,000 or 50,000 cycles.
   d. Relay:
      1) Rated Life of Relay: Typical of 1,000,000 cycles at fully rated 16 A for all lighting loads.
      2) Load switched in manner that prevents arcing at mechanical contacts when power is applied to and removed from load circuits.
      3) Fully rated output continuous duty for inductive, capacitive, and resistive loads.
   e. Contact Closure Output:
      1) Single contact closure output with normally open and normally closed dry- maintained contacts suitable for connection to third party equipment (e.g., building management system, HVAC system, etc.).
      2) Contact Ratings: Resistive load; 1 A at 0-24 VDC, 0.5 A at 0-24 VAC.
      3) Controlled by associated occupancy/vacancy sensors and wall controls.
      4) Provide in all classrooms and offices.
   f. Relay Modules With Emergency Mode:
      1) Operation With Wireless Hub: Upon loss of power, relay module enters and remains in emergency mode as long as wireless hub is de-energized; upon restoration of power to wireless hub, relay module returns to normal mode and lights automatically return to same levels (dimmed setting, full on, or full off) as prior to power interruption.
      2) Operation Without Wireless Hub: Upon loss of power, relay module enters and remains in emergency mode for 90 minutes, during which time local unit buttons and wireless controls are disabled.
      3) Used with emergency lighting interface to achieve total system UL 924 listing.

6. 20 A Receptacle Modules:
   a. Product(s):
      1) 20 A receptacle module, without contact closure output
      2) 20 A receptacle module, with contact closure output
   b. Communicates via radio frequency with up to ten compatible occupancy/vacancy sensors, and ten wireless control stations.
   c. Relay:
      1) Load switched in manner that prevents arcing at mechanical contacts when power is applied to and removed from load circuits.
      2) Motor rating of 1 HP at 120 V, 2 HP at 277 V.
   d. Contact Closure Output:
      1) Single contact closure output with normally open and normally closed dry-maintained contacts suitable for connection to third party equipment (e.g. building management system, HVAC system, etc.).

2) Contact Ratings: Resistive load; 1 A at 0-24 VDC, 0.5 A at 0-24 VAC.
3) Controlled by associated occupancy/vacancy sensors and wall controls.

7. Contact Closure Output Modules:
   a. Lutron's PowPak® CCO Module is a radio frequency (RF) device that provides a single dry contact closure output based on input from Pico® wireless controls and Radio Powr Savr™ wireless occupancy/vacancy sensors and wireless daylight sensors. It can be powered by up to 24 VAC or 24 VDC for easy connection and integration into building management, HVAC, VAV, and other third party systems. PowPak® modules communicate with compatible Lutron sensors using Clear Connect® RF Technology, which ensures smooth, consistent performance.
   b. Communicates via radio frequency with up to ten compatible occupancy/vacancy sensors, ten wireless control stations, and one daylight sensor.
   c. Contact Closure Output:
      1) Single contact closure output with normally open and normally closed dry-maintained contacts suitable for connection to third party equipment (e.g. building management system, HVAC system, etc.).
      2) Contact Ratings: Resistive load; 1 A at 0-24 VDC, 0.5 A at 0-24 VAC.
      3) Operation affected by associated occupancy/vacancy sensors and wall controls.

C. Fixture Control Modules/Sensors:
   1. Fixture Control Modules:
      a. Communicates via radio frequency with up to ten compatible occupancy/vacancy sensors, ten wireless control stations, and one daylight sensor.
      b. Communicates via wired input with one combination occupancy/daylight or vacancy/daylight fixture sensor.
      c. Coordination between Wired and Wireless Sensors:
         1) Occupancy/Vacancy Sensing: Wired and wireless sensors work in conjunction (occupancy detected by either sensor turns lights on and vacancy detected by both sensors turns lights off).
         2) Daylight Sensing: Wireless sensor takes precedence over wired sensor.
      d. Certain applications, such as hallways, may require that the lights never turn off. For these areas, select the minimum light level option and the load will lower to programmed low-end level. Default operation lowers to OFF.
      e. Selectable minimum light level.
      f. Configurable high- and low-end trim.
      g. Plenum rated.
      h. Mounts to fixture or junction box through ½ inch (16 mm) trade size knockout.
      i. Digital Ballast/LED Driver Fixture Control Modules:
         1) Product(s):
            (a) Digital ballast/LED driver fixture control module, without emergency mode
            (b) Digital ballast/LED driver fixture control module, with emergency mode
         2) Supports reporting of energy measurement to wireless hub at accuracy of plus/minus 2 percent or 0.5 W (whichever is higher).
         3) IEC 60929 is a standard for electronic fluorescent ballasts, and is used by other lighting equipment controlled by low voltage signals including LED drivers and low voltage controlled neon. It defines a specific method for digital control.
         4) Single integral controller with Class 1 or Class 2 isolated digital output signal conforming to IEC 60929; capable of direct control without interface.
         5) Control of digital dimming ballasts/drivers requires the ability to address, program, and assign zone and sensor control to the digital lighting loads. Doing so can be achieved directly from the integral power and control module. Direct control of 120V and/or 277V lighting usually requires a power interface that couples both power and control. With the integral digital ballast control output, no additional interfaces are required.

6) Provides direct low-voltage control of up to 3 compatible digital ballasts/LED drivers.
   (a) Electronically links a digital ballast/LED driver to a zone for both dimming and turning on/off.
   (b) Electronically assigns occupancy/vacancy sensors for manual on/auto off and auto on/auto off control.
   (c) Electronically assigns wireless control stations for manual local control.
   (d) Electronically assigns daylight sensor for automatic daylight dimming.
7) Fixture Control Modules With Emergency Mode:
   (a) Operation With Wireless Hub: Upon loss of power, fixture control module enters and remains in emergency mode as long as wireless hub is de-energized; upon restoration of power to wireless hub, fixture control module returns to normal mode and lights automatically return to same levels (dimmed setting, full on, or full off) as prior to power interruption.
   (b) Operation Without Wireless Hub: Upon loss of power, fixture control module enters and remains in emergency mode for 90 minutes, during which time local unit buttons and wireless controls are disabled.
   (c) Used with emergency lighting interface to achieve total system UL 924 listing.

j. 0-10 V Dimming Fixture Control Modules:
1) Lutron's PowPak® wireless fixture control is a radio frequency (RF) device that controls either the Lutron EcoSystem® or 0-10 V ballasts/drivers (depending on model) based on RF input from Pico® wireless controls and Radio Powr Savr™ wireless occupancy/vacancy sensors or wired inputs from the PowPak® fixture sensor. The control module mounts to a fixture or junction box. Communication with RF input devices is accomplished using Lutron Clear Connect® RF Technology, which ensures smooth, consistent performance.
2) Product(s):
   (a) 0-10 V dimming fixture control module, without emergency mode;
   (b) 0-10 V dimming fixture control module, with emergency mode
3) Supports reporting of energy measurement to wireless hub at accuracy of plus/minus 2 percent or 0.5 W (whichever is higher).
4) IEC 60929 is a standard for electronic fluorescent ballasts, and is used by other lighting equipment controlled by low voltage signals including LED drivers and low voltage controlled neon. It defines specific methods for 0-10V, pulse width modulation (PWM), and Digitally Addressable Lighting Interface (DALI).
5) Single low voltage dimming module with Class 1 or Class 2 isolated 0-10V output signal conforming to IEC 60929 Annex E.2; source or sink automatically configures.
6) Provides 0-10 V control for up to 3 ballasts/LED drivers (1 A load at 120-277 V, 6 mA max control current).
7) Rated for switching 0-10 V ballasts, LED drivers, or fixtures that conform with NEMA 410.
8) Fixture Control Modules With Emergency Mode:
   (a) Operation With Wireless Hub: Upon loss of power, fixture control module enters and remains in emergency mode as long as wireless hub is de-energized; upon restoration of power to wireless hub, fixture control module returns to normal mode and lights automatically return to same levels (dimmed setting, full on, or full off) as prior to power interruption.
   (b) Operation Without Wireless Hub: Upon loss of power, fixture control module enters and remains in emergency mode for 90 minutes, during which time local unit buttons and wireless controls are disabled.
   (c) Used with emergency lighting interface to achieve total system UL 924 listing.

2. Wired Fixture Sensors:
    a. Occupancy/Vacancy Sensing:
        1) Lutron's XCT signal processing technology greatly enhances the performance of PIR sensors, enabling them to "see" fine motions that other sensors couldn't previously detect.
        2) Passive infrared coupled with technology for sensing fine motions. Signal processing technology detects fine-motion passive infrared (PIR) signals without the need to change the sensor's sensitivity threshold.
        3) Coverage: 300 square feet with mounting height of 8 to 12 feet; 360-degree field of view.
        4) Sensor Timeout: 15 minutes.
            (a) Sensor timeout adjustable via wireless hub when connected to compatible fixture control module.
    b. Daylight Sensing:
        1) Automatic calibration.
        2) Provide linear response to changes in perceived light level.
            (a) Response adjustable via wireless hub when connected to compatible fixture control module.
        3) Closed loop proportional control scheme.
        4) Sensor Range: 0 to 150 footcandles (0 to 1600 lux).
    c. Mounts to fixture or ceiling.

2.05 LUMINAIRE COMPONENTS (FACTORY-INSTALLED)

A. Luminaires specified on the drawings to be provided with factory-installed wireless fixture control components as specified below

B. Wireless Fixture Control Dongle:
1. Product(s):
    a. RF only (no integral sensing capability)
    b. RF with occupancy/vacancy and daylight sensing
2. Communicates via radio frequency with up to ten compatible occupancy/vacancy sensors, ten wireless control stations, and one daylight sensor.
3. Certain applications, such as hallways, may require that the lights never turn off. For these areas, select the minimum light level option and the load will lower to programmed low-end level. Default operation lowers to OFF.
4. Selectable minimum light level.
5. Supports configurable high- and low-end trim.
6. Plenum rated in accordance with UL 2043.
7. Mounts to fixture through hole.
8. Wireless Fixture Control Dongle with Integral Sensing Capabilities:
    a. Occupancy/Vacancy Sensing:
        1) Lutron's XCT signal processing technology greatly enhances the performance of PIR sensors, enabling them to "see" fine motions that other sensors couldn't previously detect.
        2) Passive infrared coupled with technology for sensing fine motions. Signal processing technology detects fine-motion passive infrared (PIR) signals without the need to change the sensor's sensitivity threshold.
        3) Coverage: 300 square feet with mounting height of 8 to 12 feet; 360 degree field of view.
        4) Sensor Timeout: 15 minutes.
            (a) Sensor timeout adjustable via wireless hub.
    b. Daylight Sensing:
        1) Automatic calibration.
        2) Provide linear response to changes in perceived light level.
            (a) Response adjustable via wireless hub.

3) Closed loop proportional control scheme.
4) Sensor Range: 0 to 150 footcandles (0 to 1600 lux).

c. Coordination between Integral and Wireless Sensors:
1) Occupancy/Vacancy Sensing: Integral and wireless sensors work in conjunction (occupancy detected by either sensor turns lights on and vacancy detected by both sensors turns lights off).
2) Daylight Sensing: Wireless sensor takes precedence over integral sensor.

C. Digital Bus Interface:
1. Provides power for wireless fixture control dongle and up to four LED drivers (60mA at 17-19 VDC).
2. DALI compliant.
3. UL listed.

2.06 WIRELESS CONTROL STATIONS

A. The Pico Wireless Control is a flexible and easy to use device that allows the user to control dimmers and switches. The Pico wireless control can function as a tabletop control on a pedestal, a lightweight handheld remote, or it can be wall-mounted with or without a Lutron Claro faceplate, to mimic a traditional keypad. The battery-operated control requires no external power or communication wiring. Models are available with integral night light. Visit www.lutron.com for data sheets and other information.

B. Product(s):
1. 2-Button with Raise/Lower Control
a. Button Marking: **Light (icons).**
2. Screw Mounting Kit
3. Wallbox Adapter

C. Quantity: As indicated on the drawings;

D. Communicates directly to compatible RF receiving devices through use of a radio frequency communications link.

E. Does not require external power packs, power or communication wiring.

F. Controls can be programmed with different functionality through system software without any hardware changes.

G. Allows for easy reprogramming without replacing unit.

H. Button Programming:
1. Single action.

I. Includes LED to indicate button press or programming mode status.

J. Mounting:
1. Capable of being mounted directly to a wall under a faceplate.
2. Faceplates: Provide stainless steel.

K. Power: Battery-operated with minimum ten-year battery life (3-year battery life for night light models).

L. Finish: **White**

2.07 WIRELESS HUBS

A. Product(s):
1. Wireless hub without BACnet***; Lutron Vive Hub***.
a. Flush-mount wireless hub; supports up to 70 total paired devices.
b. Flush-mount wireless hub; supports up to 700 total paired devices.
c. Surface-mount wireless hub; supports up to 700 total paired devices.

B. Integrated multicolor LED provides feedback on what mode the hub is in for simple identification and diagnosis.

C. Integrated processor and web server allows hub to set up and operate the system without any external connections to outside processors, servers, or the internet.

D. Utilizes Ethernet connection for:
   1. Networking up to 64 hubs together to create a larger system.
   2. Integration with Building Management System (BMS) via native BACnet
   3. Remote connectivity capabilities, including maintaining system date/time and receiving periodic firmware updates (requires internet connection).

E. A single hub or network of hubs can operate on either a dedicated lighting control only network or can be integrated with an existing building network as a VLAN.

F. Communicates directly to compatible RF devices through use of radio frequency communications link; does not require communication wiring; RF range of 71 feet through walls to cover an area of 15836 square feet. Make sure the device and hub is on the same floor.

G. Communicates directly to mobile device (smartphone or tablet) or computer using built-in Wi-Fi, 2.4 GHz 802.11b/g; wireless range of 71 feet through walls. Make sure the device and hub is on the same floor).
   1. Does not require external Wi-Fi router for connecting to the hub.

H. Allows for system setup, control, and monitoring from mobile device or computer using web-based software:
   1. Any given load device can be controlled by 10 occupancy sensors, 10 Pico remote controls or 1 daylight sensor (Pico remote controls and sensors must be located within 30 ft (9 m) of the load device they are controlling.
   2. Supports paired devices up to maximum number indicated including compatible wireless sensors, wireless control stations, and wireless load devices.
   3. Allows for timeclock scheduling of events, both time of day and astronomic (sunrise and sunset).
      a. Timeclock is integrated into the unit and does not require a constant internet connection.
      b. Retains time and programming information after a power loss.
      c. 365-day schedulable timeclock allows for:
         1) Scheduling of events years in advance.
         2) Setting of recurring events with exceptions on holidays.
      d. Time clock events can be scheduled to:
         1) Send lights to a desired level and select the fade rate desired to reach that level.
         2) Adjust level lights go to when occupied.
         3) Adjust level lights go to when unoccupied.
         4) Enable/disable occupancy.
         5) Adjust timeout of sensors
         6) Control individual devices, areas, or groups of areas. When connected to server, only areas or groups of areas can be controlled with timeclock events.
   4. Daylighting:
      a. Daylighting can be enabled/disabled. Can be used to override the control currently taking place in the space.
      b. The following is particularly useful when new departments move into a space.
      c. Daylight set point can be adjusted with the software to increase or decrease the electric light level in the room based on the same amount of natural light.
   5. Uses RF signal strength detection to find nearby devices for quick association and programming without having to climb ladders.
      a. Association and setup does not require a factory technician to perform.
   6. System using wireless hub(s) can operate with or without connection to the internet.
   7. Supports automatic demand response for load shedding via:
      a. Local contact closure without need for separate interface.
      b. OpenADR® 2.0b compliant utility command.
      c. BACnet

8. Support automatic generation of alerts in web-based application for designated events/triggers, including:
    a. Low-battery condition in battery-operated sensors and controls; alert cleared when battery is replaced.
    b. Missing device (e.g., control or sensor); alert cleared when device is detected by system.
9. Wireless hub can be firmware upgraded to provide new software features and system updates.
    a. Firmware update can be done either locally using a wired Ethernet connection or Wi-Fi connection, or remotely if the wireless hub is connected to the internet.

I. Web-Based Application:
1. Accessibility and Platform Support:
    a. Web-based; runs on most HTML5 compatible browsers (including Safari and Chrome).
    b. Supports multiple platforms and devices; runs from a tablet, desktop, laptop, or smartphone.
    c. User interface supports multi-touch gestures such as pinch to zoom, drag to pan, etc.
    d. Utilizes HTTPS (industry-standard certificate-based encryption and authentication for security).
    e. Multi-level Password Protected Access: Individual password protection on both the integrated Wi-Fi network and web-based software.
    f. WPA2 security for Wi-Fi communication with wireless hub.
2. System Navigation and Status Reporting:
    a. Area Tree View: Easy navigation by area name to view status and make programing adjustments through the software.
    b. Area and device names can be changed in real time.
3. Setup app available for iOS and Android that allows for:
    a. Job registration to extend product warranty.
    b. Management of setup for multiple projects in different locations.
    c. Creation of handoff documents that are sent directly to a facility manager via email once setup is complete.
    d. Backup of wireless hub database to cloud for hub replacement.
    e. Access to native help and instructions to assist user with system setup.

J. BACnet Integration:
1. Provide ability to communicate by means of native BACnet IP communication (does not require interface) to lighting control system from a user-supplied 10BASE-T or 100BASE-T Ethernet network.
2. Requires only one network connection per hub.
3. BACnet Integrator Capabilities:
    a. The BACnet integrator can command:
        1) Area light output.
        2) Enable/Disable:
            (a) Area occupancy sensors.
            (b) Area daylighting.
        3) Daylighting level.
        4) Area occupied and unoccupied level
        5) Occupancy sensor timeouts (for fixture sensors).
    b. The BACnet integrator can monitor:
        1) Area on/off status.
        2) Area occupancy status.
        3) Enable/Disable:
            (a) Area occupancy sensors.
            (b) Daylighting.
            (c) Timeclocks.
        4) Daylighting level.

5) Light levels from photo sensors.
6) Area occupied and unoccupied level.
7) Occupancy sensor timeouts.

K. Scenes:
1. Support programmable scenes to control individual devices, areas, or groups of areas on demand.
2. Scenes may be activated via:
a. Contact closure input.
b. API integration.
c. Manual activation in app.

L. Emergency Mode:
1. Support emergency mode to, when triggered, send lights to defined levels and lock out controls for load control modules equipped with emergency mode.
2. Emergency mode may be activated via:
a. Contact closure input.
b. API integration.
c. Manual activation in app.

M. Contact closure inputs provide integration with devices by others including devices for Title 24 Automatic Demand Response

N. Contact closure inputs on multiple hubs can be wired in parallel. DO NOT wire inputs in parallel with other equipment as it can cause the inputs on either of the devices to falsely trigger.

O. To ensure proper operation of contact closure inputs, a PS-J-20W-UNV power supply may not be used to provide power to more than one hub.

P. Contact Closure Interface: Provide two contact closure inputs; accepts both momentary and maintained contact closures that can be used for automatic demand response.

Q. Rated for use in air-handling spaces as defined in UL 2043.

R. Visit www.lutron.com for more information on California Title 24 requirements.

S. Meets CAL TITLE 24 P6 requirements.

T. Wiring distance for any single inter-hub wiring link segment is 330 ft (100 m) max; use Lutron-provided Ethernet switches for longer distances

U. Provide Ethernet switch(es) as required for inter-hub network wiring per manufacturer’s instructions; do not exceed manufacturer’s required maximum wiring segment lengths.

2.08 ACCESSORIES

A. Emergency Lighting Interface:
1. Lutron's Application Note #106 contains more information on emergency lighting systems.
2. Provides total system listing to UL 924 when used with lighting control system.
3. Senses all three phases of building power.
4. If power on any phase fails provides output to send lights controlled to defined levels. Lights to return to their previous intensities when normal power is restored.
5. Accepts contact closure input from fire alarm control panel.

2.09 SOURCE QUALITY CONTROL

A. Factory Testing
1. To ensure that 100 percent of the lighting control products work at installation, the manufacturer should test 100 percent of all assemblies at full rated load in the factory. This testing will assure that every product has been tested and guaranteed to work. Sampling would only prove that the samples work and should not be acceptable.
2. Perform full-function factory testing on all completed assemblies. Statistical sampling is not acceptable.

3. To ensure that 100 percent of the lighting control products work at installation, the manufacturer should test 100 percent of all ballasts at the factory.
4. Perform full-function factory testing on 100 percent of all ballasts and LED drivers.
5. Sample burn-in is used to verify the consistency of quality for the supplied devices and manufacturing processes so that they meet the design intent.
6. Perform factory burn-in of 100 percent of all ballasts at 104 degrees F (40 degrees C).

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that ratings and configurations of system components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive system components.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Use the following paragraph to specify an optional visit for system and network integration consultation. Edit the choice to have this additional value included as an alternate or as part of the base bid.

B. **A System and Network Integration Consultation is required for a job that will integrate with a third party BMS system.**

C. System and Network Integration Consultation: Include **as part of the base bid** additional costs for Lighting Control Manufacturer to conduct meeting with facility representative and other related equipment manufacturers to discuss equipment and integration procedures.
   1. Coordinate scheduling of visit with Lighting Control Manufacturer. Manufacturer recommends that this visit be scheduled early in construction phase, after system purchase but prior to system installation.

3.03 INSTALLATION

A. Perform work in a neat and workmanlike manner in accordance with NECA 1 and, where applicable, NECA 130.

B. Install products in accordance with manufacturer's instructions.

C. Sensor Locations:
   1. Lighting Control Manufacturer Sensor Layout and Tuning service may be specified in Part 2 under "LIGHTING CONTROLS - GENERAL REQUIREMENTS".
   2. Where Lighting Control Manufacturer Sensor Layout and Tuning service is specified in Part 2 under "LIGHTING CONTROLS - GENERAL REQUIREMENTS", locate sensors in accordance with layout provided by Lighting Control Manufacturer. Lighting Control Manufacturer may direct Contractor regarding sensor relocation should conditions require a deviation from locations indicated. Where Lighting Control Manufacturer Sensor Layout and Tuning service is not specified, locate sensors in accordance with Drawings.
   3. Sensor locations indicated are diagrammatic. Within the design intent, reasonably minor adjustments to locations may be made in order to optimize coverage and avoid conflicts or problems affecting coverage, in accordance with manufacturer's recommendations.

D. Interior sensors work mainly with diffused light, as such, they have a much higher lighting gain than exterior sensors. Electric light sources can affect these sensors unless the sensors are shielded from the light given off by electric light sources.

E. Ensure that daylight sensor placement minimizes sensor view of electric light sources. Locate ceiling-mounted and luminaire-mounted daylight sensors to avoid direct view of luminaires.

F. Many lamp manufacturers recommend seasoning fluorescent lamps prior to dimming in order to ensure full rated life.

G. Lamp Burn-In: Operate lamps at full output for prescribed period per manufacturer's recommendations prior to use with any dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.

H. If the lamp leads exceed the specification, premature lamp failure and/or trouble starting the lamps may result.

I. If the lamp leads exceed the specification, trouble starting the lamps may result.

J. LED Light Engine/Array Lead Length: Do not exceed 100 feet (31 m).

3.04 FIELD QUALITY CONTROL

A. Edit the choice in the following paragraph to indicate whether or not Lutron Full-Scope Start-Up Service will be required. Keep in mind however that without Lutron Start-Up Service, Standard Warranty coverage is significantly reduced. Coordinate with warranty requirements specified in Part 1 under "WARRANTY".

B. Manufacturer's Full-Scope Start-Up Service **is required.**

C. If Lutron Full-Scope Start-Up Service is not specified in the paragraph above, the following paragraph may be used to specify optional manufacturer programming services, available for purchase in blocks of time for either on-site or remote programming.

D. Manufacturer’s Programming Service:
   1. Product(s):
      a. On-site programming, 8-hour block
   2. Also include **as part of the base bid** additional costs for manufacturer to perform **remote** programming tasks for another **8 hours**.

E. Manufacturer's Full-Scope Start-Up Service:
   1. On-Site Full-Scope Start-Up Service: Manufacturer's authorized Service Representative to conduct site visit upon completion of lighting control system installation to perform system startup and verify proper operation:
      a. Lighting Control Manufacturer Sensor Layout and Tuning service may be specified in Part 2 under "LIGHTING CONTROLS - GENERAL REQUIREMENTS".
      b. Authorized Service Representative to verify sensor locations, in accordance with layout provided by Lighting Control Manufacturer; Lighting Control Manufacturer may direct Contractor regarding sensor relocation should conditions require a deviation from locations indicated.
      c. Verify connection of power wiring and load circuits.
      d. Verify connection and location of controls.
      e. Energize wireless hubs.
      f. Associate occupancy/vacancy sensors, daylight sensors, wireless remotes, and wall stations to load control devices.
      g. Provide initial rough calibration of sensors; fine-tuning of sensors is responsibility of Contractor unless provided by Lighting Control Manufacturer as part of Sensor Layout and Tuning service.
      h. Program timeclock schedules per approved sequence of operations.
      i. Configure load shed parameters per approved sequence of operations.
      j. Verify system operation control by control.
      k. Obtain sign-off on system functions.
      l. Train Owner's representative on system capabilities, operation, and maintenance.

F. Use the following paragraph to specify startup of lighting control system outside normal business hours (at an additional cost). Edit the choice to have this additional cost included as an alternate or as part of the base bid.

G. Correct defective work, adjust for proper operation, and retest until entire system complies with contract documents.

3.05 ADJUSTING

A. Use the following paragraph to specify an optional on-site meeting with the Lighting Control Manufacturer to make adjustments to the lighting control system, after all equipment and room furnishings have been installed (at an additional cost). Edit the first choice to have this additional cost included as an alternate or as part of the base bid.

B. This meeting may be desired in order to meet the lighting designer's original design intent. These adjustments may include light level, fade time and delay in lighting scenes.

C. On-Site Scene and Level Tuning: Include **as part of the base bid** additional costs for Lighting Control Manufacturer to visit site to conduct meeting with **Engineer** to make required lighting adjustments to the system for conformance with original design intent.

D. Lighting Control Manufacturer Sensor Layout and Tuning service may be specified in Part 2 under "LIGHTING CONTROLS - GENERAL REQUIREMENTS".

E. Sensor Fine-Tuning: Lighting Control Manufacturer to provide up to two additional post-startup on-site service visits for fine-tuning of sensor calibration. Where Lighting Control Manufacturer Sensor Layout and Tuning service is not specified, Contractor to provide fine-tuning of sensor calibration.

3.06 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.07 COMMISSIONING

A. See Electrical Commissioning Specification for commissioning requirements.

B. Use the following paragraph to specify that lighting control acceptance testing required by California Title 24, Part 6 (California Energy Code) be performed by Lighting Control Manufacturer (requires on-site start-up to be specified under “FIELD QUALITY CONTROL” in Part 3). Edit the second choice to have this additional cost included as an alternate or as part of the base bid.

C. Required documentation associated with this service is also specified in Part 1 under “SUBMITTALS”.

D. Include **as part of the base bid** costs for Lighting Control Manufacturer to perform lighting control acceptance testing in accordance with Washington State Energy Code, latest edition. Submit required documentation.

3.08 CLOSEOUT ACTIVITIES

A. Demonstration:
   1. Demonstrate proper operation of lighting control devices to **Engineer** and correct deficiencies or make adjustments as directed.
   2. Use the following paragraph to specify an optional on-site walkthrough to demonstrate system functionality (at an additional cost). Edit the first choice to have this additional cost included as an alternate or as part of the base bid.
   3. **An on-site walkthrough to demonstrate system functionality to a commissioning agent is often required for LEED projects, other projects which involve a commissioning agent, or Title 24 (California) projects.** During this visit, the manufacturer's authorized Service Representative will perform tasks, at the request of the facility representative or commissioning agent, such as to demonstrate wall control functions, explain timeclock schedules or describe occupancy or daylight sensor functionality.
   4. On-Site Performance-Verification Walkthrough: Include **as part of the base bid** additional costs for lighting control manufacturer to provide on-site demonstration of system functionality to **facility representative**.

B. Training:
   1. Lutron's standard on-site full-scope start-up procedure for Vive system includes training of customer representatives. Include the paragraph below to specify additional training visits.

2. Include services of manufacturer's certified service representative to perform on-site training of Owner's personnel on operation, adjustment, and maintenance of lighting control system as part of on-site system start-up services.

3.09 PROTECTION

A. Protect installed products from subsequent construction operations.

END OF SECTION 260924

SECTION 262213
DRY TYPE TRANSFORMERS

PART 1 GENERAL

1.01 WORK INCLUDED

A. When shown on drawings, provide dry type transformers complete. Transformers shall be UL listed and comply with NEMA Standard ST-20.

1.02 RELATED SECTIONS

A. Section 260000 – Electrical General Conditions

B. Section 260526 – Grounding

1.03 REFERENCE STANDARDS

A. 10 CFR 431, Subpart K - Energy Efficiency Program for Certain Commercial and Industrial Equipment - Distribution Transformers; Current Edition.

B. ANSI C57.12.01/NEMA ST-20: General Requirements for Distribution, Power, and Regulating Transformers.

C. ANSI/NETA MTS-2019 Standard for Maintenance Testing Specifications for Electrical Power Equipment and Systems.

D. IEEE C57.94 - IEEE Recommended Practice for Installation, Application, Operation, and Maintenance of Dry-Type Distribution and Power Transformers; 2015.

E. IEEE C57.96 - IEEE Standard Guide for Loading Dry-Type Distribution and Power Transformers; 2013.

F. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

G. NECA 409 - Standard for Installing and Maintaining Dry-Type Transformers; 2015.

H. NEMA ST-20: Dry-Type Transformers for General Applications.

I. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

J. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.

K. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

L. Transformers shall be NEMA TP-22016 Energy Efficient compliant and meet the requirements of the Department of Energy, 10 CFR Energy Conservation Standards for Distribution Transformers.

M. UL 506 - Standard for Specialty Transformers; Current Edition, Including All Revisions.

N. UL 1561 - Standard for Dry-Type General Purpose and Power Transformers; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data
   1. Transformers (Dry Type)

B. Shop Drawings
   1. Transformers (Dry Type)

C. Testing
   1. Transformers (Dry Type)

D. O&M Manuals
   1. All Information from Previous Submittals
   2. Mfg. Maintenance Manual
   3. Recommended Maintenance Procedures

1.05 PRODUCT DATA

A. The contractor shall include product data identifying compliance with all pertinent items of Part 2 of this specification. All pertinent options shall be identified in the product data submittal. If options have not been identified clearly, the submittal will be rejected.

B. Provide transformer specifications with included options and manufacturers product data sheets for the submitted transformer. The selected features and options for each transformer shall be clearly identified. Optional items which are not applicable shall be clearly identified for each transformer (e.g., crossed out). Optional items that are not crossed out may be required at no additional cost regardless of whether they are identified in the specifications.

1.06 SHOP DRAWINGS

A. Prepare and submit for review prior to manufacture; include dimensioned front plan and section views, wiring and connection diagrams and bolting template. Contractor shall indicate on the drawings, mounting methods and connection lugs required.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Tierney.

B. Sorgel Quiet Quality.

C. General Electric QL.

D. Federal Pacific.

E. Similar units by Cutler-Hammer, Acme or Hevi-Duty may be utilized if the core and coil assembly is mounted on rubber isolation pads.

2.02 CABINET

A. Steel panel enclosure over core, coil, and terminal chamber with louvered openings for convection cooling. Cooling and terminal access shall be possible with both sides and rear of enclosure obstructed.

B. Provide weatherproof or special enclosure when required for environment in which it is located.

2.03 WINDINGS

A. Separate primary and secondary. Windings shall have Class H insulation and shall be rated for continuous operation at rated KVA with temperature rise of not over 150 degrees C above a 40 degree C ambient, with a maximum hot spot temperature of 220 degrees C. Windings and core and coil assembly shall be treated and built to resist the effects of dirt and moisture.

B. Core coil shall be mounted on rubber isolation mounting pads. Cores shall have a common core construction having low hysterisis and eddy current losses grounded to the transformer core. The neutral bus shall be sized and configured for at least 200% of the secondary full load current. Transformer impedance shall be a minimum of 3 and a maximum of 5%. The transformer shall be UL listed and suitable for non-sinusoidal loads with a K factor of 4.

C. Shall contain grounded electrostatic shield.

D. When transformers are Y-Y construction the core shall be a five-legged type. Tertiary winding is not permitted.

2.04 PRIMARY TAPS

A. Four full capacity taps, minimum of two 2-1/2 percent above and two 2-1/2 percent below normal (rated) primary voltage.

2.05 CONNECTIONS

A. Unless noted otherwise, three phase transformers shall have a 480-volt delta connected primary and 208Y/120-volt, three phase, four wire connected secondary, single-phase transformers shall be 480-volt primary, 120/240 volt secondary. Provisions for external connections shall be made by means of a terminal board employing lugs conforming which are compatible with the external conductors installed. (Note: aluminum conductors require special lugs.) All connections shall be accessible for front and top of cabinet.

2.06 NOISE LEVEL

A. Noise level shall not exceed ANSI Standard C89.2 sound levels of 45 db for sizes less than 51 KVA, 50 db for 51-150 KVA, 55 db for 151-300 and 60 db for greater than 300 as measured by NEMA ST20.

B. When shown, transformers shall be ultra-quiet type. Noise level shall not exceed 35 db for all sizes through 300 KVA. Shall be similar to Tierney Quietran. All ultra-quiet transformers shall be factory certified to have noise levels not exceeding those specified. Forward certification to Engineer and include copy in the O&M Manual.

2.07 EFFECIENCY

A. Dry transformers shall have a minimum efficiency that complies with NEMA TP-2-2016.

2.08 VIBRATION ISOLATORS

A. The following are options that the Contractor may utilize for the vibration isolators:
   1. **Vibration pads** shall be cork, neoprene, and steel construction, B-Line model CNNK or equal.
   2. **Neoprene pad spacers** shall be B-Line model NNP or equal.

PART 3 EXECUTION

3.01 MOUNTING

A. Transformers shall be attached to the building structure to prevent overturning in the event of earthquake. All attachment nuts to have washer and rubber pad spacer under them. Provide neoprene pad spacers under mounting rails. Transformers shall be mounted on floor, wall or suspended from ceiling as noted in the contract documents or as required. Remove all shipping blocks prior to installation.

B. Transformers with enclosures designed for floor mounting where suspended from ceiling shall be suspended on a trapeze constructed of a minimum of two horizontal structural channels hung from threaded rods attached to structural members or inserts in structural slab. Channel, rod, and inserts shall be sized for not less than 400% load safety factor.

C. Transformers shall be installed with four spring vibration isolators, one at each corner, when any of the following conditions are present. Size each isolator for the full transformer weight.
   1. Transformer is 45 KVA or larger.
   2. Transformer is located higher than one floor above grade.
   3. Transformer is noted "SIM" in the contract documents.

D. All transformers mounted directly on a wall shall be mounted with vibration pads sized to give 400% safety factor.

3.02 CONNECTIONS

A. 208/120-volt three phase secondary transformers shall be considered "grounded neutral separately derived systems" and be grounded per code accordingly.

B. Transformer raceway connections shall be flexible metal raceway. See Specification Section 260533.

C. Voltage Tap Connection: Connect all transformers at "normal" tap. After facility is completely energized, measure secondary voltages at all transformers and service switchboard. Forward a list to the Architect/Engineer for evaluation. Include copy in O&M Manuals. Reconnect taps as subsequently directed. All costs associated with this work shall be included in base bid.

3.03 TESTING

A. Visual and Mechanical Inspection: Verification of transformer connections including proper bonding and grounding in compliance with the design documents and applicable codes and standards, proper mounting including vibration isolators, and that manufacturer recommended installation procedures have been completed.

B. The following transformer tests and measurements shall be performed, and the results submitted for review:
   1. Separate-source voltage withstand test.
   2. Induced voltage test.
   3. Voltage ratio measurement and check of polarity connections.
   4. No-load current and no-load loss measurement.
   5. Primary and secondary winding resistance measurement.
   6. Short-circuit impedance and load-loss measurement.
   7. Partial discharge measurement.

END OF SECTION 262213

SECTION 262413
SWITCHBOARDS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide all service entrance and main distribution switchgear with equipment as shown and described, with continuous full load ampacities as indicated.

1.02 RELATED SECTIONS

A. Section 260000 – Electrical General Conditions

B. Section 260573 – Electrical System Studies

C. Section 264300 – Surge Protective Devices

1.03 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e (Amended 2017).

B. IEEE C57.13 - IEEE Standard Requirements for Instrument Transformers; 2016.

C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

D. NECA 400 - Standard for Installing and Maintaining Switchboards; 2007.

E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

F. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013.

G. NEMA PB 2 - Deadfront Distribution Switchboards; 2011.

H. NEMA PB 2.1 - General Instructions for Proper Handling, Installation, Operation, and Maintenance of Deadfront Distribution Switchboards Rated 600 Volts or Less; 2013.

I. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.

J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

K. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.

L. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

M. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

N. UL 891 - Switchboards; Current Edition, Including All Revisions.

O. UL 1053 - Ground-Fault Sensing and Relaying Equipment; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data
   1. Switchboards
   2. Integral Meter

B. Shop Drawings
   1. Switchboards

C. Testing
   1. Visual and Mechanical Assessment
   2. Torquing (>=1000A)
   3. Adjustable Trip Testing

D. O&M Manuals
   1. All Information from Previous Submittals
   2. Mfg. Maintenance Manual
   3. Recommended Maintenance Procedures

1.05 PRODUCT DATA

A. The contractor shall include product data identifying compliance with all pertinent items of Part 2 of this specification. All pertinent options shall be identified in the product data submittal. If options have not been identified clearly, the submittal will be rejected.

B. Provide switchboard specifications including all main and feeder breaker sizes ad ratings, metering components including CTs and PTs, surge protective devices and any other equipment included within the switchboard assembly. All features to be included with each switchboard shall be clearly indicated. Any optional features not crossed out may be required.

1.06 SHOP DRAWINGS

A. Provide switchboard one-line drawing showing each switchboard section

B. Provide switchboard dimension drawings including but not limited to horizontal and vertical bussing, breaker sizes and locations, bus ratings, conduit entry windows, enclosure information and associated equipment information.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Square-D

B. ABB

C. Cutler-Hammer

D. Siemens

2.02 ENCLOSURES

A. Shall be freestanding, steel with steel angle or channel framework of adequate strength and rigidity necessary to resist all conditions of use to which it may be subjected and to support all equipment, devices and appurtenances contained therein. Front plates shall be installed in sections so that all parts of the board are front accessible without disturbing other parts. A removable lifting angle shall be provided at the top and bottom of each shipping section(s).

B. Minimum 12-gauge steel, except front panels and doors may be minimum 14 gauge.

C. Shall be front access only unless noted otherwise.

D. Provide on 3-inch housekeeping concrete pad with minimum 3-inch lip on front and sides.

E. Finish shall be factory applied; standard gray color for all exterior and interior painted surfaces. Other colors may be considered.

F. Outdoor installation shall be NEMA 3R.

2.03 SWITCHBOARD DIMENSIONS

A. Overall height of switchboards shall not exceed 90 inches (not including base channels). Length and depth shall not exceed dimensions as scaled or noted in contract documents. Manufacturers whose equipment dimensions exceed those indicated shall notify the Engineer in writing 10 days prior to bid date. These Manufacturers may not bid as "Not Conforming to Contract Documents". Contractor shall base bid only on equipment which fully complies with contract documents. Cost of building modifications or switchboard relocations, if permitted, or other additional work required to fit larger size switchboard(s) than shown on drawings shall be borne totally by the Contractor.

2.04 SWITCHBOARD BUSBARS

A. Aluminum or copper at manufacturer's option, factory fabricated; carried to terminals for connection to service cables or busway. Brace switchboard components for symmetrical fault current shown plus a symmetrical offset (50,000-amp bracing minimum). Aluminum bus shall be tin plated over its full length.

B. Busbar Joints:
   1. Busbar to busbar shall be bolted, lapped and silver or tin plated, having low contact resistance and low temperature rise. For aluminum bus bolt using Grade 5 bolts with Belleville washers.

2. Overcurrent devices shall be bolted to busbars using Grade 5 bolts and Belleville washers. Exception: Square-D I-line and 30-200A fused switches

C. Conductor connectors shall be bolted to busbars using Grade 5 bolts and Belleville washers. Where aluminum conductors are utilized for feeders the connectors shall conform with Section 260519.

D. System of Bussing: Three phase, 4 wire, full size neutral unless otherwise noted.

E. Ground Bus: Full length ground bus bonded to frame conforming to U.L. 891 for minimum size except larger as required by the code for grounding neutral conductor.

2.05 SWITCHBOARD COMPONENTS

A. Switchboards shall include (but not limited to) the following components:
1. Shall be full-fault current rated, series rating of devices is not allowed.
2. Switches and fuses or breakers as shown. If fuses are used, provide all necessary fuses and spares per Section 262813.
3. Space for future switches or breakers as shown including complete bussing and required hardware for mounting devices. Space for metering and instrumentation components, and current limiters (when required).
4. Miscellaneous appurtenances as required for a complete installation.
5. Cleats for securing all conductors.

B. When Serving as Service Entrance Equipment:
1. Shall conform to UL 869 and have a Service Entrance Type UL label
2. Shall be full-fault current rated, series rating of devices is not allowed. See drawings.
3. Where utility company metering equipment is shown, provide current transformer space, meter base(s), metering conductors and miscellaneous appurtenances as required by serving utility.
4. Shall contain surge arrestors on all phases for voltage surge protection on secondary (under 600V) electrical wiring systems. Similar to Square-D, J9200.

C. Digital Line Meter/Monitor **(Spec Writer) this may add size to the switchboard, please verify)**
1. Provide a digital line Meter / Monitor device equal to Cutler-Hammer type IQ DP-4000 Series having the features and functions specified below. The Meter / Monitor device shall consist of a single microprocessor-based unit capable of monitoring and displaying the functions listed below with the accuracy indicated; the MM4 shall auto range between units, kilounits and megaunits. The Meter / Monitor device shall provide the adjustable protection functions indicated and the capability to communicate data via twisted pair network. The MM4 shall be UL listed, CUL and CE certified and also meet ANSI standard C37.90.1 for surge withstand.

METERED VALUES	ALARM FUNCTIONS (ACCURACY % FULL SCALE)
AC Phase Amperes +/- (0.3%)	Voltage Phase Loss
AC Phase Voltage +/- (0.3%)	(less than 50% rms)
Watts +/- (0.6%)	Current Phase Loss
VA +/- (0.6%)	(1/16 largest phase)
vars +/- (0.6%)	Phase Voltage Unbalance
Power Factor 1.0% (+/- 1 digit)	(5 to 40% – 5% steps)
Frequency +/- (0.1 Hz)	Phase Voltage Reversal
Watthours +/- (0.6%)	Overvoltage
varhours +/- (0.6%)	(105 to 140% – 5% steps)
VA hours +/- (0.6%)	Undervoltage (95 to 60% – 5% steps)
Watt Demand with	Time Delay for Overvoltage,
10-, 15-, 20-, 25-, 30-,	Undervoltage, and Phase
45-, 60-minute interval)	Unbalance (0 to 20 seconds –
%THD (through 31st harmonic)	1-sec. steps)
Voltage – minimum/maximum	

METERED VALUES	ALARM FUNCTIONS (ACCURACY % FULL SCALE)
Current – minimum/maximum	
Power – minimum/maximum	
Power Factor – minimum/maximum	
Frequency – minimum/maximum	
Peak % THD	
Peak Demand	

2. Input ranges of the Meter / Monitor device shall accommodate external current transformers with ranges from 5/5 through 12,800/5 amperes. Provide external current transformers sized for incoming service. Potential transformers shall be self-included and fused up to 600 volts. Above 600 volts, provide fused external potential transformers.
3. Control power shall be capable of being supplied from the monitored incoming AC line without the need for a separate AC supply control circuit or separate remote power source (96 to 264V AC or 100 to 350V DC) where shown on the drawings.
4. Provide the following features:
   a. Synchronizing pulse input shall be provided, and when activated, shall override the preset watt demand interval and let the utility control the demand window.
   b. Load shed feature, which activates the pulse initiation relay when a user selected parameter exceeds a pre-programmed range.
   c. Outputs shall have separate Form C (NO/NC) trip and alarm contacts with ratings of 10 amperes at 115/240V AC or 30V DC resistive. In addition, provide a separate Form C (NO/NC) contact to provide a programmable kilowatt-hour pulse output. The pulse shall be KYZ type.
5. Provide an addressable communication card capable of transmitting all data, including trip data over a compatible two-wire local area network to a central personal computer for storage and/or printout. The network shall also be capable of transmitting data in RS-232c format via a translator module.

D. Ground Fault Protection: Provide the following ground fault protection equipment on breakers (switches) rated 1000 amps or more, and as indicated.
1. A current transformer (also called a sensor or current monitor) installed and connected to indicate the sum of all phase and neutral currents. (Zero sequence method). A current transformer on the grounding conductor is not acceptable.
2. A current transformer (also called a ground break relay) operated by the current transformer. Trip point shall be adjustable (calibrated scale indication) from 20% to 60% of the breaker or switch rating (or 1200 amps whichever is lower). The sensor shall also include an adjustable time delay (calibrated scale indication) from .1 second to .4 second (approximately).
3. A monitor or test panel whose functions shall furnish a means to test the ground fault system; monitor to control voltage; indicate when the sensor has tripped the breaker (switch); and reset the system.
4. A trip device on the breaker or switch operated by the ground fault sensor.

E. Ground current meter and current transformer similar to Square-D #EA1GG/GF1 with current transformer on the neutral bonding jumper.

2.06 NAMEPLATES

A. Nameplates shall be installed on all switchboards. Each individual switch shall be identified with a nameplate adjacent to the switch, describing the load connected.

B. Provide a service entrance label nameplate on the main switchboard which includes the following:
1. Architect
2. Electrical Consultant
3. Electrical Contractor
4. Date of Installation
5. Service Voltage & Bus Amperage Rating

6. Symmetrical Short Circuit Current Rating
7. Year of Manufacture

C. Lettering size shall be suitable for the size of plate and information contained. Nameplates shall be engraved plastic (3/8-inch high minimum letters). Attach with stainless steel screws.

D. Nameplate color shall be: Emergency System - white on red, normal System - white on black.

E. Provide a riser diagram drawing using non-fading ink and mylar installed under glass and attached to the exterior of the main switchboard showing feeder runs, panels, transformers and raceway sizes.

2.07 SINGLE PHASING SENSORS

A. Provide single phasing sensors to trip the main switches in the event of a single-phase failure.

2.08 CLEATS

A. Provide for securing all feeder cables within the switchboard.

PART 3 EXECUTION

3.01 MOUNTING

A. Shall be bolted to floor using 1/2" x 8" (minimum) black mild steel foundation anchor J-bolts and anchored similarly to building structure to prevent overturning in the event of earthquake. Provide 3" thick structural concrete "housekeeping pad". J-Bolts in the floor shall be set in the structural floor and extend through the housekeeping pad with sufficient threads to attach the switchboard.

3.02 WIRING

A. Shall conform to applicable Sections of these specifications.

B. Shall be secured to switchboard enclosure with cleats. Maximum spacing shall not exceed 24 inches.

3.03 SPACE

A. Verify space available with equipment sizes and code required working clearances prior to submittals of shop drawings

3.04 GROUNDING

A. Provide pursuant to Section 260526.

3.05 UTILITY REQUIREMENTS

A. When service switchboard includes utility company metering equipment, provide all devices and wiring to meet serving utility requirements.

3.06 PULSE OUTPUT FOR REMOTE METERING, SINGLE PHASE, UNDER/OVER VOLTAGE OUTPUT

A. Provide programming of the digital meter assembly and provide all necessary components to supply a calibrated pulse output signal and a single phase, under/over voltage signal to interface with the EMCS system. Programming shall be provided by a factory authorized representative. Coordinate with the EMCS Contractor as required for complete operation.

3.07 TESTING

A. Perform visual and mechanical assessment including but not limited to verification of manufacturers installation instructions, verification of grounding in agreement with the contract documents and applicable codes and standards, and proper mounting of equipment to the floor or pad.

B. Torquing requirements and installation of all terminations 1,000 amps and above shall be certified by an independent testing agency.

C. All breakers with adjustable trip settings shall be set as recommended by the coordination study. These settings shall be verified and tested by an independent testing agency.

END OF SECTION 262413

SECTION 262416
PANELBOARDS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide all panelboard equipment, complete; dead front type.

1.02 RELATED SECTIONS

A. Section 260000 – Electrical General Conditions

B. Section 260573 – Electrical System Studies

C. Section 264300 – Surge Protective Devices

1.03 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e (Amended 2017).

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C. NECA 407 - Standard for Installing and Maintaining Panelboards; 2015.

D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

E. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2000, with Errata (2008).

F. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013.

G. NEMA PB 1 - Panelboards; 2011.

H. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less; 2013.

I. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.

J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

K. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

L. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

M. UL 67 - Panelboards; Current Edition, Including All Revisions.

N. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.

O. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

P. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

Q. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

R. UL 1053 - Ground-Fault Sensing and Relaying Equipment; Current Edition, Including All Revisions.

S. UL 1699 - Arc-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data
   1. Panelboards

B. Shop Drawings
   1. Panelboards

C. Testing
   1. Visual and Mechanical Assessment
   2. Torquing (>=1000A)

3. Adjustable Trip Testing

D. O&M Manuals
   1. All Information from Previous Submittals
   2. Mfg. Maintenance Manual
   3. Recommended Maintenance Procedures

1.05 PRODUCT DATA

A. The contractor shall include product data identifying compliance with all pertinent items of Part 2 of this specification. All pertinent options shall be identified in the product data submittal. If options have not been identified clearly, the submittal will be rejected.

B. Provide panelboard specifications including all main and branch breaker sizes and ratings, metering components including CTs and PTs, surge protective devices and any other equipment included within the panelboard assembly. All features to be included with each panelboard shall be clearly indicated. If selected features are not indicated, the submittal will be rejected.

1.06 SHOP DRAWINGS

A. Provide panelboard one-line drawing showing main connection and bussing

B. Provide panelboard dimension drawings including but not limited to bussing, breaker sizes and locations, bus ratings, enclosure information and associated equipment information.

PART 2 PRODUCTS

2.01 PANELBOARD TYPE

A. Panelboards shall be rated at proper voltage and current for intended use with busbars of copper or aluminum. Panels shall be 3-phase, 4-wire, 100% neutral, unless noted otherwise. Where aluminum is utilized, all lugs shall be of an approved compression type. Provide multiple lugs where conductors in parallel or "feed through" are shown on the Drawings.

B. Conductor Connectors shall be bolted to busbars using Grade 5 bolts and Belleville washers. Feeder conductor connectors shall be rated for 75 Degree C. wire when 75 Degree C. wire is indicated. Where aluminum conductors are utilized for feeders or branch circuits the connectors shall conform with Section 260519.

C. Panelboards shall have a separate ground bus bonded to the panelboard frame.

D. Where 120-Volt, 15- or 20-Amp breakers are intended for switching loads they shall be of type rated for switching duty labeled "SWD."

2.02 ACCEPTABLE MANUFACTURERS

A. ABB

B. Square-D

C. Siemens

D. Cutler-Hammer

2.03 CIRCUIT BREAKERS

A. The following interrupting capacity, 10,000 AIC Symmetrical shall be considered minimum. Other ratings shall be as specified on panel schedules shown on the Drawings. Series rating of breakers is not allowed.

B. Mount breakers in all panelboards so that breaker handles operate in a horizontal plane. Bolt in type only. Provide common trip on all multiple pole breakers.

C. Where noted, provide spare breakers, complete for future connection of wiring circuits. Where "Space" is indicated for breakers, provide all bussing and breaker mounting hardware in the panelboard, provide steel knockouts in dead front metal closure of unused part of panel. If any steel knockouts are removed, provide breakers in such spaces or approved cover plates. Open spaces are not permitted.

D. For multi-wire branch circuits, provide approved breaker handle ties where required by NEC 210.4.

E. An Arc-fault circuit interrupter shall be provided for all receptacles, lighting fixtures, and smoke detector in bedrooms/living units.

2.04 CABINET FOR EACH PANELBOARD

A. Flush or surface, as indicated; tight closing doors without play, when latched. Where two cabinets are located adjacent to each other in finished areas, provide matching trim of the same height. Where a remote-controlled switch or contactor is mounted in any panelboard, mount on same frame as panelboard interior with screw retained access door in dead front shield; common door over circuit breakers and remote-controlled device. Where flush mounted, provide (2) 3/4" conduits to accessible ceiling space for future expansion.

B. All conduits for future expansion shall stub into a junction box, where located above grade, and shall be sealed in the panel.

C. Provide cabinets of sufficient dimensions to allow for future expansion and addition of circuit breakers within the panelboards as indicated on panel schedules.

D. Provide cabinet front with full-height hinged door. One door over the interior and an additional hinged dead front cover over interior and wireway (door-in-door). Full-height front cover hinged to box with concealed trim clamps. Provide flush door locks.

E. Provide lock for each cabinet door. All Electrical Distribution Equipment Locks shall be keyed identically. Key system shall match existing. Supply Owner with minimum six keys.

F. Fasten panelboard front with machine screws with oval counter-sunk heads, finish hardware quality, with escutcheons or approved trim clamps. Clamps accessible only when dead front door is open are acceptable. Surface mounted panelboards with fronts greater than 48 inches vertical dimension shall be hinged at right side in addition to hinged door over dead front.

G. Finish: Provide factory prime coat for cabinets to be located in finished areas. Where cabinets are located in unfinished areas, standard lacquer or enamel finish, gray or blue-gray color, shall be substituted for factory prime coat.

2.05 SYSTEM OF NUMBERING AND BUS ARRANGEMENT

A. Shall be as shown on the Panel Schedules on the Drawings.

2.06 PANELBOARD NAMEPLATE

A. Provide engraved and filled (or color layer - engraved through outer layer) plastic nameplate with ½-inch high characters (for panel name); attached with screws to each NEMA 1 panelboard front. White on black, include voltage, phases, wires and minimum A.I.C. Rating in 3/8-inch characters.

B. Nameplate color shall be:
   1. Emergency System: White letters on red
   2. Normal System: White letters on black

C. Provide a service entrance label nameplate on the main panelboard which includes the following:
   1. Architect
   2. Electrical Consultant
   3. Electrical Contractor
   4. Date of Installation
   5. Service Voltage & Bus Amperage Rating
   6. Symmetrical Short Circuit Current Rating
   7. Year of Manufacture

D. Provide a riser diagram drawing using non-fading ink and mylar installed under glass and attached to the exterior of the main panelboard showing feeder runs, panels, transformers and raceway sizes.

PART 3 EXECUTION

3.01 MOUNTING

A. Secure in place with top of cabinet at 6'-0", unless otherwise noted. Top of cabinet and trim shall be level. Firmly anchor cabinets directly or with concealed bracing to Building Structure. When panels are not located in or directly on a wall, provide a support frame of formed steel channel which is anchored to the floor and Ceiling Structure. Interiors shall not be installed until Structure is totally enclosed. Where panels are mounted adjacent to each other, the top edges shall be at the same height.

3.02 CIRCUIT INDEX

A. For each branch circuit panelboard provide a typewritten index listing each circuit in the panelboard by number with its proper load designation. Mount with a transparent protective cover inside cabinet door. Listing shall match circuit breaker arrangements, typically with odd numbers on the left and even numbers on the right. Room numbers used shall be final room numbers used in the building as verified with the Owner, and not room number assigned on Plans.

3.03 CABINET PAINTING

A. Cabinets furnished as prime painting shall be field painted to match color of adjacent wall. (See Division - Painting).

3.04 SPACE

A. Verify space available with equipment sizes and Code Required Working Clearances prior to Submittal of Shop Drawings.

3.05 GROUNDING

A. Provide separate ground busbar for all panels supplying isolated ground circuits.

3.06 FEED THROUGH AND DOUBLE LUGS

A. Provide feed through or double lugs with amperage equal to the incoming feeder amperage unless shown as larger.

3.07 TESTING

A. Perform visual and mechanical assessment including but not limited to verification of manufacturers installation instructions, verification of grounding in agreement with the contract documents and applicable codes and standards, and proper mounting of equipment to the floor or pad.

B. Torquing requirements and installation of all terminations 1,000 amps and above shall be certified by an independent testing agency.

C. All breakers with adjustable trip settings shall be set as recommended by the coordination study. These settings shall be verified and tested by an independent testing agency.

END OF SECTION 262416

SECTION 262419
MOTOR CONTROLLERS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Work under this section includes all requirements for motor controls to be furnished under the electrical portion of the work on all electrical motor driven equipment. Individually mounted starters shall be provided by Division 26 Contractor. Motor controls shall conform to NEMA Standards for each specific purpose.

B. The Division 26 Contractor shall furnish all motor controllers not included with equipment furnished under other divisions of these specifications or by Owner. The Division 26 Contractor shall install all motor controllers including all controllers not factory assembled into equipment furnished under other divisions of these specifications or by Owner.

1.02 RELATED SECTIONS

A. Section 260000 – Electrical General Conditions

1.03 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e (Amended 2017).

B. IEEE C37.20.7 - IEEE Guide for Testing Metal-Enclosed Switchgear Rated up to 38 kV for Internal Arcing Faults; 2007 (Corrigendum 2010).

C. IEEE C57.13 - IEEE Standard Requirements for Instrument Transformers; 2016.

D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

E. NECA 402 - Standard for Installing and Maintaining Motor Control Centers; 2014.

F. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

G. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2000, with Errata (2008).

H. NEMA ICS 2.3 - Instructions for the Handling, Installation, Operation, and Maintenance of Motor Control Centers; 2019.

I. NEMA ICS 5 - Industrial Control and Systems: Control Circuit and Pilot Devices; 2017.

J. NEMA ICS 6 - Industrial Control and Systems: Enclosures; 1993 (Reaffirmed 2016).

K. NEMA ICS 18 - Motor Control Centers; 2001 (Reaffirmed 2007).

L. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013.

M. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.

N. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

O. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.

P. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

Q. UL 845 - Motor Control Centers; Current Edition, Including All Revisions.

R. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

S. UL 977 - Fused Power-Circuit Devices; Current Edition, Including All Revisions.

T. UL 1053 - Ground-Fault Sensing and Relaying Equipment; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data
   1. Motor Controllers

B. Shop Drawings
   1. Motor Controllers

C. Testing
   1. Visual and Mechanical Assessment
   2. Test Procedure
   3. Test Results

D. O&M Manuals
   1. All Information from Previous Submittals
   2. Mfg. Maintenance Manual
   3. Recommended Maintenance Procedures

1.05 PRODUCT DATA

A. The contractor shall include product data identifying compliance with all pertinent items of Part 2 of this specification. All pertinent options shall be identified in the product data submittal. If options have not been identified clearly, the submittal will be rejected.

B. Provide motor controller product data for all types and sizes utilized for this project including but not limited to specifications and features, manufacturers product data, withstand rating, and any other pertinent product details. All features to be included with each motor controller shall be clearly indicated. If selected features are not indicated, the submittal will be rejected.

1.06 SHOP DRAWINGS

A. Provide dimension drawings for each type and size of motor controller utilized for this project including but not limited to enclosure dimensions, enclosure front view showing lights, pushbuttons, switches, labeling, and any other devices to be installed for motor control and monitoring.

B. Provide schematic drawings for each type and size of motor controller utilized for this project including but not limited to one-line drawings, control schematics, and any other devices to be installed for motor control and monitoring. Schematic drawings shall clearly indicate interfaces to I/O external to the motor controller with a brief description of the I/O function.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Square D

B. Allen Bradley

C. General Electric

D. Cutler-Hammer

E. Siemens

2.02 MOTOR VOLTAGE INFORMATION

A. Voltages available are 480 Volt, 3 phase or 208 Volt, 3 Phase, and 115 Volt Single Phase.

B. Circuits are designed (in general) for motors as follows:
   1. Smaller than 1/2 H.P. - 115 Volts, Single Phase 1/2 H.P. and larger - 460 or 200 Volts, 3 Phase

C. Verify motor sizes and voltages provided under other divisions and notify General Contractor immediately if any discrepancies are noted.

2.03 MOTOR STARTERS

A. Magnetic Motor Starters: Unless noted otherwise, shall be full voltage non-reversing with three overloads sized to suit nameplate amperes of motor served, motor "On" and "Off" pilot lights, "Hands-Off-Auto" switch, and auxiliary contacts for interlocking.

B. Combination Motor Starter/Disconnect: Shall be fused switch type with all features of Paragraph A above. In addition, provide disconnect switch auxiliary contacts for disconnection of externally powered control circuits where applicable. Fuses shall be sized in accordance with motor manufacturer's requirements.

C. Manual Starters: Shall be toggle switch or push-button type, lockable in the "Off" position, with overload relays, pilot light and enclosure pursuant to Paragraph D below. Manual starters shall only be used where specifically shown or called out on the drawings and only for single phase, fractional horsepower motors.

D. Enclosures: All motor controllers shall be contained in an enclosure suitable for the environment in which the controller is mounted, and shall be weatherproof when exposed to weather.

E. Overload Devices: Shall be melting alloy or bimetallic type. One overload shall be provided for each phase. Provisions shall be made for resetting the overload devices from outside the starter enclosure. Provide ambient compensated overload devices only when the motor is at a constant temperature and the controller is subject to a separate, varying temperature. Automatic reset overload devices are not permitted.

2.04 MOTOR CONTROL CENTERS

A. Motor Control Centers shall consist of one or more enclosed vertical sections jointed together to form a rigid, free-standing assembly. The construction of the Motor Control Center shall meet the requirements set forth by U.L. 845, NEMA number ECS-2-322 and the N.E.C. The enclosure shall in accordance with NEMA standards type 12. Wiring shall be Class II Type B. Terminal blocks shall be conventional track mounted.

2.05 NAMEPLATES

A. Pursuant to Section 260000, Paragraph 2.05, provide nameplates permanently attach (with screws on NEMA 1 enclosures) on each controller, nameplates with the following information: Load served, voltage, phase, short circuit rating, panel/circuit number and where applicable fuse size and type.

2.06 FAN SHUTDOWN RELAYS

A. Contractor shall provide relay(s) with sufficient contacts to shutdown all fans over 2000 cfm upon receipt of Fire Alarm. See Section 283100. Coordinate coil voltage with Fire Alarm System Supplier.

2.07 POWER FACTOR CORRECTION

A. Provide power factor correction capacitors for all motors 25 horsepower and above. Capacitor size when indicated on the drawings is an approximation only. Final size shall be determined by the Contractor based on the recommendations of the motor manufacturer to bring the power factor to between 0.9 and 0.95. All capacitors are to be fused, with blown fuse indicators mounted on the front of the unit. Provide discharge resistors when required by code.

PART 3 EXECUTION

3.01 FINISHED AREAS

A. In finished areas, mount motor protection switches flush and install suitable coverplates.

3.02 HEATERS

A. Install heaters co-related with full-load current of motors provided.

3.03 OVERLOADS

A. Set overload devices to suit motors provided.

3.04 SUPPORTS

A. Securely mount to equipment, wall or acceptable mounting frame.

3.05 FAN SHUTDOWN WIRING

A. Provide wiring interlock connections for all (over 2000 cfm) fan starter control circuits via Division 23 furnished fan shutdown relay to shutdown fans upon receipt of Fire Alarm.

3.06 FAN SHUTDOWN WIRING

A. Provide wiring interlock connections for all (over 2000 cfm) fan starter control circuits via a relay to shutdown fans upon receipt of Fire Alarm.

3.07 CONNECTION TO MECHANICAL EQUIPMENT ON ROOFS

A. The Contractor shall coordinate all roofing penetrations with the general contractor and roofing contractor to assure that the roofing warranty is maintained.

B. Attachment of conduits to the roof to serve mechanical equipment and devices shall comply with Section 260533.

3.08 MECHANICAL EQUIPMENT NAMEPLATE RATINGS

A. The Division 26 Contractor shall verify that the nameplate ratings of the mechanical equipment, when they arrive on site, are consistent with the ampacity called out on the drawings. The Contractor shall bring any discrepancies to the Engineers attention prior to installation of conduit and wiring.

3.09 TESTING

A. Provide visual and mechanical assessment of each motor controller showing that they have been installed per the manufacturers recommendations, are accessible, installation is complete and is in agreement with the contract documents.

B. Provide testing procedure for each type of motor controller for review and approval by the engineer. Test procedure shall include testing of each control feature for each motor controller. Test procedure shall be submitted to the engineer a minimum of two weeks prior to the date of schedule testing.

C. Provide operational testing of each motor controller showing that the motor controller has been properly wired and that all features are operating in agreement with the contract documents. Submit results of operational testing to the engineer for review and approval within two weeks of motor controller testing.

END OF SECTION 262419

SECTION 262726
SWITCHES AND RECEPTACLES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide all wiring devices and plates.

1.02 RELATED SECTIONS

A. Section 260000 – Electrical General Conditions

B. Section 260532 – Outlet and Pull Boxes

C. Section 272000 – Data and Voice Infrastructure

1.03 REFERENCE STANDARDS

A. FS W-C-596 - Connector, Electrical, Power, General Specification for; 2017h.

B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush-mounted (General Specification); 2017g.

C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

D. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.

E. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2015).

F. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2016.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.

I. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.

J. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.

K. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

L. UL 1310 - Class 2 Power Units; Current Edition, Including All Revisions.

M. UL 1449 - Standard for Surge Protective Devices; Current Edition, Including All Revisions.

N. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.

O. UL 1917 - Solid-State Fan Speed Controls; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data
   1. Switches and Receptacles
   2. Device Plates
   3. Labels

B. O&M Manuals
   1. All Information from Previous Submittals

1.05 PRODUCT DATA

A. The contractor shall include product data identifying compliance with all pertinent items of Part 2 of this specification. All pertinent options shall be identified in the product data submittal. If options have not been identified clearly, the submittal will be rejected.

B. Provide product data for each switch and receptacle utilized on the project. The product data shall be provided for each type and include but not be limited to device ratings, color, and suitable uses.

C. Provide product data for each device plate utilized on the project. The product data shall be provided for each type and include but not be limited to color and suitable uses.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Hubbell

B. Pass & Seymour

C. Leviton

D. Cooper

2.02 GENERAL REQUIREMENTS

A. Push-in terminals are not allowed.

B. All devices color shall be white, unless otherwise noted.

2.03 SWITCHES

A. Emergency Push-Button Switches: Provide a red emergency push-button, momentary contact, yellow enclosure with clear plastic cover. Reset shall be by twisting the push-button.
   1. For Shut-Down of Boilers: Switch shall be connected through an auxiliary contact tied to the boiler power supply. Label shall read: “Boiler shut-down”. The switch shall be located adjacent to an exit door.
   2. Approved Manufacturer: STI – Safety Technology International.

B. "Industrial Specification Grade", quiet type, rated 277-volt, 20 amp, unless noted, with plastic handle. Single pole, double pole, 3-way, or locking type as required. Meets Fed. Spec. WS-896 Provide matching styles and colors in other devices as required for the conditions of installation. Hubbell CSB120, Eaton CSB120, Leviton 1221, and P&S 20AC1

C. Interchangeable type shall be rated same as above.

D. LED Dimmer: LED 0-10V dimmer switch shall be compatible with supplied LED board and driver. Dimmer switch shall have vertical slide with a positive “on/off” button. Dimmer shall have high and low end, field adjustable trim setting. Provide with associated power pack for control. Lutron Diva or approved equal.

E. Momentary Contact Line Voltage Switches: Single pole, double throw, 3-wire, normally open. Rating same as above.

F. Magnetic Low-Voltage Dimmer: Dimmer switch shall be listed for use with magnetic low-voltage light fixtures. Dimmer switch shall have a vertical slide with a positive “off” button. The dimmer shall be rated for a minimum of 1500VA. Dimmer shall have a radio/TV interference filter. Leviton ‘Renoir’ series.

G. Incandescent Dimmer: Incandescent dimmer switch shall be rated at 2000 watts, 120-volt, 60 hertz. Dimmer switch shall have a vertical slide with a positive “off” button. Dimmer shall have a radio/TV interference filter. Leviton ‘Renoir’ series.

H. Fluorescent Dimmer: Fluorescent dimmer switch shall be rated at 1200VA (900 Watts maximum loading), 120V or 277V, 60 hertz. Dimmer switch shall have a vertical slide with positive “off” button. Suitable for single-pole and 3-way. Dimmer shall have a radio/TV interference filter. Dimmer shall be matched with electronic dimming ballast. See specification section 16500. Leviton ‘Renoir’ series.

I. Key Operated: Hubbell HBL1221L (or equal) with 1209 Key. Provide 24 spare Keys.

J. Timer Switch: Provide electronic light timer switch where indicated on drawings. The timer switch shall be connected to the room lighting and fan. The timer switch shall be programmable for time-out from 5 minutes to 2 hours. Set timer for standard 20 minutes time-out period, time scrolls up, flash off, beeper on. Manufacturer: Watt Stopper – Inteli-switch Digital Time Switch.

K. Motor rated switches: Switches serving as motor disconnecting means shall be horsepower rated with overload relays and meet requirements as stated above. See manual starters in Section 262419, ‘Manual Starters’.

L. Combination AFCI/Switch: 15 amp rated, 20-amp feed-through, 125 Volt outlet branch circuit combination AFCI/Switch; back and side wired. Leviton AFSW1.

M. Device plates shall be Hubbell and Cooper Type 302 stainless steel.

2.04 RECEPTACLES

A. In All Unfinished Areas & Non-Occupy Able Spaces: Provide "Industrial Specification Grade", Duplex NEMA 5-20R configuration (20-Amp, 120-Volt) unless shown otherwise. Must have “rivetless ground” contact manufactured as an integral component of the external ground screw terminal. Meets Fed Spec. WC-596 Hubbell HBL5362, Cooper 5362, P&S 5362A, and Leviton 5362.

B. In All Finished Areas: Provide heavy duty specification grade; general purpose 20 amp. 125-volt, Nema 5-20R, 2P, 3W decora plus duplex receptacle, straight blade, commercial grade, self-grounding, back & side wired. Leviton 16352

C. Self-Testing Ground-Fault Circuit-Interrupter (GFCI) Duplex Receptacles: 20A. 125V AC; 2-pole, 3 wire grounding; 10,000 amps current interrupting; green light indicator when power is ‘on’; red light indicator when device is in the tripped position; Red “EOL” (end of life) indicator with rapid flash when the unit has reached end of life and/or cannot provide GFCI protection. Provide GFI receptacles where required by code.

D. Faceless Self-Testing Ground-Fault Circuit-Interrupter Device: 20A. 125V AC; 2-pole, 3 wire grounding; 10,000 amps current interrupting; green light indicator when power is ‘on’; red light indicator when device is in the tripped position; Red “EOL” (end of life) indicator with rapid flash when the unit has reached end of life and/or cannot provide GFCI protection. Provide faceless self-testing ground fault device ahead of switched receptacles that require GFI protection per code. Mount device in same backbox as the device it is protecting.

E. Dedicated Computer Receptacle: Duplex NEMA 5-20R configuration, grey in color. Leviton 5362G, and Cooper IG5362.

F. Tamper resistant receptacle & USB charger: Duplex 20 Amp; 125V; 3.6-amp USB charging capability. Leviton T5832

G. Switched Receptacles: Switched Receptacles: Switched receptacles shall be ‘green’ in color, smooth nylon face, with permanently marked for use with automatic control systems, back and side wired, decora style. Hubbell DR20C2GN or Hubbell DR20C2GNTR (Tamper Resistant) or Leviton G5362-2TN (GFCI)

H. "Hospital Grade", Duplex NEMA 5-20R configuration (20-Amp, 120-Volt) unless shown otherwise. Hubbell 8300-I, and Cooper 8300.

I. Tamper resistant, Duplex NEMA 5-20R Configuration: Hubbell BR20ITR, Leviton 5362-SGI, and Cooper TR8300, or Leviton TDR20 to match decora style installed in finished spaces per paragraph B above.

J. AFCI Tamper-Resistant Duplex Receptacles: 15 Amp. 125 volt; 20-amp feed-through, tamper resistant, AFCI; back and side wired. Leviton AFTR1.

K. Operating Room Ceiling Drop - NEMA L5-20R configuration (20 amp, 125V) receptacle U.L. listed for hospital use. Locking type Hubbell 23000-HG, and Cooper 23000. Provide ten (10) matching plugs.

L. X-Ray Receptacles - 50-amp, 2 pole, 3 wire, 250 Volt. A.C. grounding type with stainless steel coverplate assembly. Hubbell No. 25505, and Cooper 25505. Provide two (2) matching plugs.

M. Weather Resistant (WR) / Ground Fault Circuit-Interrupter (GFCI) Outdoor Duplex Receptacles: NEMA 5-20R. Hubbell GFTR201 or equal, for 20 Amp, 125-Volt AC.

N. Special Purpose Receptacles: For special purpose receptacles, see drawings for voltage, amperage, and phase. Provide with matching plug delivered to the Owner.

2.05 OCCUPANCY SENSORS

A. Provide self-adjusting occupancy sensor light switching devices for control of lighting in all rooms and offices shown on drawings. Sensors shall be ceiling or wall mounted to provide adequate coverage. Occupancy sensors shall be “Leviton”, Model OSC20-M0W for ceiling mounting, OSW12-M0W for wall mounting, complete with OSP20-RD0 power pack and associated mounting hardware. Provide “Leviton” ODSOD-ID wall switch sensors where shown. Sensors shall be wired to maintain switching and circuits shown on drawings.

2.06 OCCUPANCY SENSORS

A. Provide occupancy sensor switch(es) for control of lighting in all rooms and offices shown on the drawings. Sensors shall be ceiling or wall mounted to provide adequate coverage. Occupancy sensors shall be “Watt Stopper”, or approved equal. Wall mounted sensors shall be Model DT-300, complete with power pack and associated mounting hardware. Wall mounted sensors shall be model DT-200 complete with power pack and associated mounting hardware. Combination occupancy sensor/switch shall be WA200. Combination occupancy sensor/switch, dual circuit shall be WA300. Sensors shall be wired to maintain switching and circuits shown on drawings.

2.07 OCCUPANCY SENSORS

A. Provide occupancy sensor switches for control of lighting in classrooms as shown on the drawings. Sensors shall be ceiling mounted to provide adequate coverage. Occupancy sensor shall be “Sensor Switch” Model CM-PDT-R, complete with power pack PP-20-20P, Auxiliary Relay SP-20-20P and associated mounting hardware. Sensors shall be wired and installed per manufacturer’s direction to maintain switching and circuits shown on drawings. Where multiple sensors are located in an individual room, sensors shall be wired parallel with the relays such that either sensor will provide input to turn all lights on and reset time delay. Where occupancy sensors are shown on the drawings to be wall mounted, provide WSD or approved equal.

2.08 DEVICE PLATES

A. Interior: Plates for recessed boxes shall be Hubbell and Cooper Type 302 stainless steel. Attachment screws shall match finish of plate. Plates for surface mounted boxes shall be of pressed stainless steel with size to fit exactly the box used.
   1. Where a duplex receptacle is indicated next to a USB receptacle, provide a dual-gang faceplate and mount both devices in the same backbox under the same faceplate.

B. Exterior: Intermatic # WP1010MC, for vertical mount and # WP1010HMC for horizontal mount, or equivalent for receptacles. Metal cover shall be raintight while-in-use.

2.09 LABELING

A. For NEMA 5-20r receptacles, each device shall be identified with a clear label with black typing stating the panel & circuit number.

B. For receptacles other than NEMA 5-20R, the coverplate shall have ampere rating, voltage and phase engraved on a phenolic label and attached to the cover plate.

2.10 MULTIOUTLET ASSEMBLY (WHEN SHOWN)

A. Provide assemblies complete, including necessary fittings and hardware with circuits as indicated on Plans and outlet spacing as indicated. All assemblies shall contain ground wire. Wiremold or equal.

2.11 SPARE DEVICES

A. Provide the following spare devices:

Device	Quantity
Single-pole switch	3
Duplex receptacle	5
Dedicated duplex receptacle	3
Isolated ground receptacle	4
GFI receptacle	3
20A, single-phase equipment connection	5
20A, three-phase equipment connection	3

B. Each spare device shall include 100 feet of conduit, wire, faceplate and labor; all as required for a complete installation. Location of these units to be determined by the Owner's representative at the site. Unused devices shall be turned over to the Owner.

PART 3 EXECUTION

3.01 MOUNTING

A. Rigidly fasten each device to the outlet box at proper position with the wall to bring receptacle flush with plate or switch handle the proper distance through the plate.

B. Occupancy sensors that are ceiling mounted shall be located a minimum of 4'-0" away from a mechanical equipment diffuser.

3.02 ORIENTATION

A. Set Switches vertical with handle operating vertically, up position "ON" at +48" above finished floor.

B. Set Receptacles vertical with ground slot down at +18" above finished floor.

C. Set Exterior Receptacles horizontal at +18" above finished grade.

3.03 DEVICE PLATES

A. Shall be stainless steel for each new wiring device and for each telephone and signal equipment outlet, except where equipment mounted thereon covers the outlet box completely.

B. Provide new covers on existing outlet boxes being reused.

3.04 DIMMER SWITCHES

A. Provide a separate neutral for each phase.

B. Fluorescent dimmer switches require a 4 square backbox per switch.

3.05 RECEPTACLE GROUNDING

A. Provide bare bonding wire between receptacle grounding terminal and box. Plaster ear screws connecting frame to the box will not be acceptable for grounding.

B. Provide green insulated grounding conductor in all branch circuits supplying isolated ground and ground-fault circuit-interrupter type receptacles.

3.06 HANDICAPPED ACCESS

A. Comply with requirements of Washington State Handicapped Access Code.

END OF SECTION 262726

SECTION 262813
FUSES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide all fuses as required. Provide three (3) spare of each size and type required. Fuses shall not be installed until equipment is ready to be energized. This measure prevents fuse damage during shipment of the equipment from the manufacturer to the jobsite or from water that may contact the fuse before the equipment is installed. Final tests and inspections shall be made prior to energization of the equipment. This shall include a thorough cleaning, tightening, and review of all electrical connections and inspection of all grounding conductors. All fuses shall be furnished by the Electrical Contractor. All fuses shall be of the same manufacturer.

1.02 RELATED DOCUMENTS

A. Section 26 00 00 – Electrical General Conditions

1.03 REFERENCE STANDARDS

A. NEMA FU 1 - Low Voltage Cartridge Fuses; 2012.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. UL 248-1 - Low-Voltage Fuses - Part 1: General Requirements; Current Edition, Including All Revisions.

D. UL 248-4 - Low-Voltage Fuses - Part 4: Class CC Fuses; Current Edition, Including All Revisions.

E. UL 248-8 - Low-Voltage Fuses - Part 8: Class J Fuses; Current Edition, Including All Revisions.

F. UL 248-10 - Low-Voltage Fuses - Part 10: Class L Fuses; Current Edition, Including All Revisions.

G. UL 248-12 - Low-Voltage Fuses - Part 12: Class R Fuses; Current Edition, Including All Revisions.

H. UL 248-15 - Low-Voltage Fuses - Part 15: Class T Fuses; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data
   1. Fuses
   2. Spare Fuse Cabinet

B. O&M Manuals
   1. All Information from Previous Submittals
   2. Mfg. Maintenance Manual
   3. Recommended Maintenance Procedures

1.05 PRODUCT DATA

A. The contractor shall include product data identifying compliance with all pertinent items of Part 2 of this specification. All pertinent options shall be identified in the product data submittal. If options have not been identified clearly, the submittal will be rejected.

PART 2 PRODUCTS

2.01 MAINS, FEEDERS, AND BRANCH CIRCUITS

A. Circuits 601 to 6000 amperes shall be protected by current limiting BUSSMANN Low-Peak Time-Delay Fuses KRP-C. Fuse links shall be pure silver links (99.9% pure), delay and must hold 500% of rated current for a minimum of 4 seconds, clear 20 times rated current in .01 seconds or less and be listed by Underwriters Laboratories Inc., with an interrupting rating of 200,000 amperes r.m.s.

B. Circuits 0 to 600 amperes shall be protected by current limiting BUSSMANN LOW-PEAK Dual-Element Fuses LPN-RK (250 volts) or LPS-RK (600 volts). All dual-element fuses shall have separate overload and short-circuit elements. Fuse shall incorporate a spring activated thermal overload element having a 284°F. melting point alloy and shall be independent of the short-circuit clearing chamber. The fuse must hold 500% of rated current for a minimum of 10 seconds and be listed by Underwriters Laboratories, Inc., with an interrupting rating of 200,000 amperes r.m.s. symmetrical. The fuses shall be UL Class RK1 to maintain the Engineered protection of the system components.

C. Motor Circuits: All individual motor circuits with full load amperes ratings (FLA) of 480 amperes or less shall be protected by BUSSMANN LOW-PEAK Dual-Element Fuses LPN-RK (250 volts) or LPS-RK (600 volts). Larger H.P. motors shall be protected by BUSSMANN Type KRP-C Low-Peak Time-Delay Fuses of the ratings shown on the drawings. All other motors, (such as 1.0 service factor motors) shall be protected by BUSSMANN LOW-PEAK Dual-Element Fuses LPN-RK (250 volts) or LPS-RK (600 volts) installed in ratings of approximately 115% of the motor full load current except as noted above. The fuses shall be UL Class RK1 Dual Element Time Delay or Class L.

D. Fluorescent fixtures shall be protected by BUSSMANN Fuses GLR or GMF installed in HLR Holder. They shall have individual protection on the line side of the ballast. A fuse and holder shall be mounted within or as part of the fixture. Size and type of fuse to be recommended by the ballast manufacturer.

2.02 SPARE FUSES

A. Spare fuses shall be provided with a minimum of three of each ampere rating. See Section 265000 for quantities of spare fusing required for ballasted light fixtures.

2.03 ACCEPTABLE MANUFACTURERS

A. Bussman

B. Little Fuse

2.04 SPARE FUSE CABINET

A. Provide a spare fuse cabinet for the above-required spare fuses. Cabinet front and lock shall match panelboard equipment specified in Section 262416.

2.05 NAMEPLATE

A. Provide Nameplate "Spare Fuse Cabinet." Construct and attach in accordance with Section 262416, Paragraph 2.06.

PART 3 EXECUTION

3.01 FUSES

A. Install in all fusible devices provided under this Contract.

3.02 SPARE FUSE CABINET

A. Locate in Main Distribution Switchboard Room or as shown on drawings.

END OF SECTION 262813

SECTION 262816
DISCONNECTS AND FUSED SWITCHES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provided all disconnects, fused and unfused, required by code for equipment furnished under this and other divisions of these specifications and as shown on the drawings.

1.02 RELATED SECTIONS

A. Section 260000 – Electrical General Conditions

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

C. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013.

D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

H. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.

I. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data
   1. Disconnect Switches

B. Shop Drawings
   1. Disconnect Switches

C. O&M Manuals
   1. All Information from Previous Submittals
   2. Mfg. Maintenance Manual
   3. Recommended Maintenance Procedures

1.05 PRODUCT DATA

A. The contractor shall include product data identifying compliance with all pertinent items of Part 2 of this specification. All pertinent options shall be identified in the product data submittal. If options have not been identified clearly, the submittal will be rejected.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. General Electric

B. Square-D

C. Siemens

D. Cutler-Hammer

2.02 DISCONNECTS

A. Switch shall be heavy-duty type, shall be quick-break and shall be horsepower rated. Switch shall have blades as required to open all ungrounded conductors and shall be single throw unless noted.

B. Enclosure shall have interlocking cover to prevent opening door when switch is closed. Door interlock shall include a defeating scheme, shall be padlockable in the "Off" position.

C. Enclosure shall be suitable for environment in which mounted. All exterior enclosures shall have a minimum raintight rating.

2.03 FUSED SWITCHES (OR FUSED DISCONNECTS)

A. Shall be as above with addition of fuse space and clips to accept only fuses as noted in Section 262813.

B. Fuses shall be provided in all fused disconnects.

C. Fuses shall be sized in accordance with manufacturer's requirements of protected equipment.

2.04 ELEVATOR POWER MODULE SWITCH

A. Provide Elevator Control Switch in a single NEMA enclosure with all necessary relay(s), control transformer and other options (as listed below), and as shown on drawings. The Elevator Control Switch shall have an ampere rating to accommodate the inrush current associated with the rated horsepower and include a fusible switch with shunt trip capabilities. The switch shall utilize Class J Fuses (provided separately under
section 262813). The following shall be included in the switch:
   1. 100 VA control power transformer with primary and secondary fuses.
   2. Isolation relay (3PDT, 10 amp, and 120V). The coil of the isolation relay shall be 120 Vac or 24 Vdc.
   3. Normally open dry contact shall be provided for the Fire Alarm Safety System to energize the isolation relay and activate the shunt trip solenoid (140 VA inrush at 120V).
   4. The switch shall include a 120-volt key to test switch and a 1-NO/1-NC mechanically interlocked auxiliary contact rated 5A, 120 Vac as standard.
   5. “ON” Pilot Light (Green, Red or White).
   6. Isolated Full Capacity Neutral Lug.
   7. Fire Alarm Voltage Monitoring Relay (Needed to comply with NFPA 72).
   8. Main Switch Auxiliary Contacts (1 NO/1 NC).

B. The module shall have been successfully tested to a short circuit rating with Bussmann® Low-Peak® Class J fuses at 200,000 amps RMS Symmetrical.

C. All switches shall have shunt trip capabilities at 120 Vac from remote fire safety signal.

D. Branch feeders shall be selectively coordinated and fed with an upstream supply over-current protective device at a minimum of 2:1 size ratio utilizing LOW-PEAK® (Class J, RK1, or L) fuses.

E. Approved Manufacturers: Cooper – Bussman; Eaton

2.05 NAMEPLATES

A. Provide nameplates on all enclosures and include the following information: Load served, voltage, phase, panel and circuit number. Construct and attach in accordance with
Section 260000, Paragraph 2.05.

PART 3 EXECUTION

3.01 SUPPORTS

A. Secure solidly to wall or approved mounting frame. Disconnects supported only by Raceway are not acceptable.

3.02 SPLICES

A. Wiring space within enclosure shall not be used as a junction box.

3.03 INSTALLATION

A. All material installation shall be in accordance with manufacturers’ recommendations and the provisions of applicable codes.

B. Fuses shall not be installed until equipment is ready to be energized.

END OF SECTION 262816

SECTION 263613
3-WAY MANUAL TRANSFER SWITCH

PART 1 GENERAL

1.01 WORK INCLUDED

A. Contractor shall furnish, deliver, install and test the 3-way manual transfer switches as specified herein and in accordance with the drawings.

1.02 QUALITY ASSURANCE

A. 3-way manual transfer assembly switch shall be UL listed and labeled under the UL 1008 standard.

B. 3-way manual transfer switch manufacturer shall provide a complete factory assembled, wired and tested 3-way manual transfer switch.

C. 3-way manual transfer switch shall be factory Hi-pot tested for a period of not less than 60 seconds.

D. 3-way manual transfer switch installation shall meet all applicable NEC standards.

E. 2017 NEC 700.3 (F) compliant when used in conjunction with an ATS.

1.03 SUBMITTALS

A. Prepare and submit detailed shop drawings for review prior to manufacture. Include the following information (written or highlighted): wiring diagrams, dimensions, front view, catalog information indicating complete electrical and mechanical characteristics and compliance with all items of Section 263613.

B. Upon installation of 3-way manual transfer switches Contractor shall submit manufacturer's Operating & Maintenance Manual which shall include as a minimum:
   1. Certified as-built General Arrangement drawings and Wiring Diagram.
   2. Materials / Component List including part numbers.
   3. Maintenance and service requirements.
   4. Certificate of Compliance and hi-pot test data.

1.04 WARRANTY

A. 3-way manual transfer switches shall be covered by manufacturer's warranty for a minimum period of (1) one year after shipment from manufacturer.

1.05 DEFITIONS

A. Disconnect(s): 100% Rated Molded Case Circuit Breaker or Molded Case Switch as indicated on the drawings.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. ESL Power Systems Inc. 'Triple Switch' or equal as approved by the Engineer.

2.02 3-WAY MANUAL TRANSFER SWITCHES

A. 3-way manual transfer switch shall consist of (3) mechanically-interlocked disconnects, male cam-style inlet connectors, female cam-style outlet connectors, power distribution blocks and grounding terminals, all housed within a pad-lockable enclosure.

B. 3-way manual transfer switch enclosure shall be Type 3R, constructed of continuous seam-welded, powder coated galvanized steel. The main access shall be through an interlocked, hinged door that extends the full height of the enclosure. Access for both portable generator cables with female cam-style plugs and for load bank cables with male cam-style plugs shall be via drawn flange cable entry openings in the bottom of enclosure for wall mount units, or hinged lower door for pad mount units. A hinged flap door shall be provided to cover the cable openings when cables are not connected; the hinged flap door shall allow cable entry only after the main access door has been opened. Enclosure shall be powder coated after fabrication; color shall be wrinkle gray RAL 7035.

C. Cam-style male connectors (inlets) and cam-style female connectors (outlets) shall be UL Listed single-pole separable type and rated 400 amps at 600VAC. All cam-style connectors shall be color coded. Cam-style connectors shall be provided for each phase and for ground, and shall also be provided for neutral. Each of the phase cam-style connectors and the neutral cam-style connectors within the enclosure shall be factory-wired to a disconnect. The ground cam-style male connectors shall be bonded to the enclosure, and a ground lug shall be provided for connection of the facility ground conductor. None of the cam-style connectors shall be accessible unless all (3) disconnects are in the “OFF” position and the main access door is open.

D. A power distribution block shall be provided for load-side field wiring. The power distribution block shall be factory wired to the disconnects.

E. Disconnects shall be UL Listed 3-pole and the short circuit interrupt rating shall be a minimum of 10kAIC. Trip rating of the disconnects shall be as shown on the drawings. One disconnect shall control the connection between the permanent generator and the automatic transfer switch. The second circuit breaker shall control the connection between the permanent generator and the load bank female cam-style connectors. The third circuit breaker shall control the connection between the automatic transfer switch and the portable generator male cam-style connectors.
All (3) disconnects shall include UL Listed door-mounted operating mechanisms, preventing the opening of the main access door unless all (3) breakers are in the “OFF” position.
All (3) disconnects shall be mounted behind a dead-front panel. The load-side of the disconnects shall not be energizable unless the main access door is closed and one of the disconnects is in the “ON” position. The (3) disconnects shall be safety interlocked by mechanical means to ensure that only certain breakers can be closed at any given time.

2.03 RATING

A. Shall have voltage, amperage and ampere withstand ratings as indicated on the drawings.

PART 3 EXECUTION

3.01 MOUNTING

A. Wall mounted or free-standing assembly as per plans.

3.02 INSTALLATION

A. Prior to installation of 3-way manual transfer switches, Contractor shall examine the areas and conditions under which the 3-way manual transfer switch is to be installed and notify the Engineer in writing if unsatisfactory conditions exist.

B. 3-way manual transfer switch shall be installed as shown on the drawings and per the manufacturer’s written instructions. In addition, the installation shall meet the requirements of local codes, the National Electrical Code and National Electrical Contractors Association’s “Standard of Installation”.

C. Conduit entry into the 3-way manual transfer switch shall be by Contractor; Contractor shall furnish and install listed watertight conduit hubs, as manufactured by MYERS or T&B, for each conduit entry on the 3-way manual transfer switch. The incoming hub size shall match the conduit size for feeders and ground as shown on the drawings. The outgoing hub size shall match the conduit size for loads and ground as shown on the drawings. Hubs shall be properly installed and tightened to maintain Type 3R integrity of the 3-way manual transfer switch enclosure.

D. Contractor shall terminate feeder conductors, load conductors and ground per the manufacturer’s instructions. All field wiring terminations shall be torqued as required per the instructions on the 3-way manual transfer switch’s power distribution blocks, disconnects & ground lugs.

3.03 FIELD TESTING

A. Prior to energizing 3-way manual transfer switch, the Contractor shall perform the following checks and tests as a minimum:
   1. Verify mounting and connections are complete and secure.
   2. Verify internal components and wiring is secure.
   3. Perform continuity check of all circuits.

4. Perform 1,000 VDC megger test on feeder, load and ground cables.
5. Verify dead-front is secure.
6. With the 3-way manual transfer switch dead-front in place and the main access door closed and properly latched, actuate all (3) Operator Mechanisms; verify:
   a. With the disconnect controlling the connection between the permanent generator and the automatic transfer switch (ATS) in the “ON” position, neither of the other (2) disconnects can be turned to the “ON” position.
   b. With the disconnect controlling the connection between the permanent generator and the automatic transfer switch (ATS) in the “OFF” position, the other (2) diconnects can be turned “ON” or “OFF”, independent of each other.
   c. With the disconnect controlling the connection between the permanent generator and the automatic transfer switch (ATS) in the “OFF” position and with either or both of the other (2) disconnects in the “ON” position, the breaker controlling the connection between the permanent generator and the automatic transfer switch (ATS) cannot be turned “ON”.
7. Confirm operation of the 3-way manual transfer switch ground receptacle by attaching a plug to the 3-way manual transfer switch ground receptacle and then verify that the plug is grounded to the facility ground.
8. Once normal power has been applied, confirm operation of 3-way manual transfer switch by following directions on main access door.

3.04 OPERATIONS AND MAINTENANCE MANUALS

A. Provide pursuant to Specification Section 260000. Manuals shall in addition contain the following information:
   1. Operating Instructions
   2. Recommended maintenance.
   3. The first page of the manual shall contain the name, address and phone number of the local representative to be called for service and parts.

3.05 INSTRUCTION

A. The Contractor shall (after one week (minimum) written notification to Architect) conduct an instruction session during which all maintenance and operational aspects of the system will be described and demonstrated to personnel selected by the Owner in conjunction with instruction period for Generator System Equipment. The session shall be conducted by a Contractor's representative thoroughly familiar with the characteristics of the system. O & M Manual information regarding the system shall be turned over to the Architect prior to scheduling the instruction session.

END OF SECTION 263613

SECTION 264300
SURGE PROTECTIVE DEVICE (SPD)

PART 1 GENERAL

1.01 WORK INCLUDED

A. This Section describes the materials and installation requirements for transient voltage surge suppressors (TVSS), alternatively called Surge Protective Devices (SPD). TVSS/SPD devices are used for the protection of all AC electrical circuits from the effects of lightning induced currents, substation switching transients and internally generated transients resulting from inductive and/or capacitive load switching.

B. This specification also describes the mechanical and the electrical requirements for the TVSS devices. The TVSS shall be suitable for application in both category A, B and C environments as described in ANSI/IEEE C62.41- 2002.

C. The TVSS shall be of parallel design and provide individual protection components connected Line to Ground and Line to Line for Delta and High Resistance Grounded systems and Line to Ground, Line to Neutral and Neutral to Ground for Wye and Single-Phase distribution systems.

D. Systems not providing discreet protection components in the above configuration will be rejected. A schematic diagram showing the configuration and technology of all internal connected components must be provided with submittals.

E. The TVSS devices will be used both near electrical service entrance locations and at locations distant from service entrance locations (Panels, MCC's, Equipment Disconnects, etc.). For the purposes of this section, it should not be assumed that on Wye systems a neutral to ground bond will not be located electrically close to the suppressor location, thus discreet Neutral to Ground Suppression and Filter components are required.

F. The Manufacturer/Vendor shall furnish all of the necessary TVSS/SPD products and related hardware (i.e., flush mounting kits, mounting brackets, etc.) as required for the installation of the Transient Voltage Surge Suppression (TVSS) / Surge Protective Devices (SPD) System suitable for the application.

1.02 RELATED SECTIONS

A. Section 260000 – Electrical General Conditions

B. Section 260519 - Wire and Cable

C. Section 260526 - Grounding

D. Section 260532 – Outlet and Pull Boxes

E. Section 260533 – Raceways

F. Section 262413 - Switchboards

G. Section 262416 – Panelboards

1.03 REFERENCE STANDARDS

A. IEEE Standard C62.41.1, IEEE Standard C62.41.2 & IEEE Standard C62.45 (latest revisions)

B. MIL-STD-220 - Method of Insertion Loss Measurement; 2009c (Validated 2014).

C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

E. NEMA LS1 (latest revision)

F. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. TVSS device shall be designed to allow installation in accordance with latest adopted version of the National Electrical Code (NEC), National Electrical Safety Codes (NESC) and applicable OSHA 1910 requirements.

I. UL 1283 - Standard for Electromagnetic Interference Filters; Current Edition, Including All Revisions.

J. UL 1449 - Standard for Surge Protective Devices; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data
   1. Surge Protective Device (SPD)

B. Shop Drawings
   1. Surge Protective Device (SPD)

C. Qualifications
   1. Manufacturer Qualifications

D. Testing
   1. Performance and Durability Test Results

E. Warranty
   1. Manufacturer Warranty

F. O&M Manuals
   1. All Information from Previous Submittals
   2. Mfg. Maintenance Manual
   3. Recommended Maintenance Procedures

1.05 PRODUCT DATA

A. The contractor shall include product data identifying compliance with all pertinent items of Part 2 of this specification. All pertinent options shall be identified in the product data submittal. If options have not been identified clearly, the submittal will be rejected.

1.06 QUALIFICATIONS

A. Each complete suppression unit shall be UL1449 3rd Edition Listed as a Transient Voltage Surge Suppressor. UL 1449 test data for TVSS devices proposed, including UL let through voltage classification shall be provided with submittal. Units shall bear suppressed voltage rating issued by UL.

B. Engineer reserves the right to have an employee or a representative designated by firm witness any testing required by this document. Vendor/manufacturer shall provide written notice of intent to test and shall coordinate testing with Engineer, should Engineer desire to witness tests.

C. Performance & Durability Testing: Units shall be tested by an independent test agency in accordance with test procedures outlined in ANSI/IEEE C62.45, NEMA LS1 & UL1449. The following test data shall be provided:
   1. Provide Maximum Surge Current (Single Pulse Rated, 8/20µS, by mode, Amperes) as per NEMA LS1-1992 – 2.2.9 with submittals document. Maximum surge current rating shall not be less than 120kA (60kA per mode including N-G) for branch panel models in low exposure areas, high exposure areas and for IEEE C62.41.1-2002 - Category B Switchboard and Motor Control Center Locations. Maximum surge current rating (per phase in applicable modes other than Neutral to Ground) shall not be less than 240kA (120kA per mode including N-G) for IEEE C62.41.1-2002 - Category C Locations, including all Electrical Equipment located at Service Entrance location. Provide proof of completion of such tests and test data with submittal data. Provide surge current ratings for each applicable protection mode (L-L, L-N, L-G & N-G) with submittals.

2. Provide durability test data utilizing the ANSI/IEEE C62.41-1991, Category C3, 20kV/10kA, 1.2 x 50 S - 8x20S combination waveform. Provide test data with submittals. Let through voltages shall be provided for all applicable protection modes
(L-N, L-G & N-G) from zero reference. All TVSS/SPD devices (including branch panel) shall withstand a minimum of 5,000 hits delivered at a rate of one pulse per minute. Unit shall not fail or suffer let through voltage degradation of more than 7%. Lead length for testing and let through measurements shall be 6". Provide lead length used for testing with submittals.
3. Provide performance test data utilizing the ANSI/IEEEC62.41.2-2002, Exposure - High, 10kV/10kA, 1.2 x 50µS - 8x20µS combination waveform. Provide test data with submittals. Let through voltages shall be provided for all applicable protection modes (L-N, L-L & L-G) from zero reference. Lead length for testing and let through measurements shall be 6". Provide lead length used for testing with submittals.
4. Provide let through voltage test data and test waveforms used for (N-G) with the submittals for units intended for grounded Wye systems.
5. Provide let through voltage test data for the ANSI/IEEE C62.41.2-2002, Category B, 0.5µS-100 kHz 6kV/.5kA ring wave (L-L, L-N & L-G) with the submittals. Let through voltages shall be provided for all applicable protection modes and shall be measured from the zero reference.
6. Provide let through voltage test data for the ANSI/IEEE C62.41.2-2002, Neutral grounded at service entrance – Far Category, 0.5µS-100 kHz 3kV ring wave (N-G) with the submittals for units intended for grounded systems.
7. If available, test data shall be provided for the ANSI/IEEEC62.41.2-2002 level three category of the 5/50 nS EFT Burst waveform as a part of this submittal package. Let through voltages shall be provided for all applicable protection modes
(L-L, L-N, L-G & N-G).
8. All TVSS/SPD tests must provide let through voltages using a positive polarity pulse at the 90-degree phase angle location on the sine wave for Category B and C waveforms and 180-degree for Category A waveforms. Let through voltages must be measured from the zero-voltage reference line for the tests.
9. All let through voltage test results must be provided with a minimum of six inches of lead length as measured from the point where the wire would normally exit the TVSS enclosure (standard installation) to the point of termination. Wire used for test must be of the type of building wiring material recognized by the latest adopted version of the NEC and must be readily available for wiring commercial buildings, unless permanently attached to and supplied with suppressor. Conductors sizing used for test shall be based on manufacturer's installation instructions for the proposed product.
10. The above test results, including oscillographs, test conditions, identity of the testing lab and the test technicians and engineers shall be provided as part of the submittal package. The manufacturer shall provide the contact phone number for a readily available factory engineer responsible for answering questions about this product and the tests performed. Information shall be provided in a format that is easily to analyze and review.

11. Maximum Let Through Voltages based on above requirements:

Peak Voltage Let Through Table
Peak Let Through Voltages (measured from zero reference per NEMA LS-1) shall not exceed:

Voltage & Configuration	Test / Wave	L-L	L-N	L-G	N-G	Phase Angle
480/277 Wye - Grounded	C3 – 20 kV/10ka	2500	1600	1900	1700	90
480/277 Wye - Grounded	B3 – 6 kV/3kA	1700	1000	1100	1000	90
480/277 Wye - Grounded	A1 – 2kV – 67A	150	150	150	150	180
480/277 Wye - Grounded	UL1449 Rev2 Update	1500	800	800	800	----
480 Delta	C3 – 20 kV/10ka	2400	N/A	2400	N/A	90
480 Delta	B3 – 6 kV/3kA	2000	N/A	1900	N/A	90
480 Delta	A1 – 2kV – 67A	75	N/A	1200	N/A	180
120/208 Wye	C3 – 20 kV/10ka	1400	1100	1300	1150	90
120/208 Wye	B3 – 6 kV/3kA	950	550	600	550	90
120/208 Wye	A1 – 2kV – 67A	100	75	120	100	180
120/208 Wye	UL1449 Rev2 Update	800	400	400	400	-----
120/240 Split Phase	C3 – 20 kV/10ka	1400	1100	1250	1200	90
120/240 Split Phase	B3 – 6 kV/3kA	1000	600	600	600	90
120/240 Split Phase	A1 – 2kV – 67A	100	75	120	95	180

D. Manufacturers Qualifications: Only firms regularly engaged in the manufacture of TVSS products for category C locations (ANSI/IEEE C62.41.1-2002), and whose products have been providing satisfactory service for not less than five years, shall be considered. A customer reference list, with a minimum of five contact names and current phone numbers shall be provided with the submittals. All manufacturer qualifications shall be provided as part of the submittal.

E. The successful manufacturer/vendor shall assign a technical contact person for TVSS application, installation and warranty questions. This contact shall be available to provide a response to a technical question within a maximum of two business days.

F. The Engineer reserves the right to accept or reject any or all submittals, to request additional information as deemed necessary or to request submittals for a different unit that may be deemed more appropriate for this installation.

G. Engineer reserves the right to have an employee or a representative designated by firm witness any testing required by this document. Vendor/manufacturer shall provide written notice of intent to test and shall coordinate testing with Engineer, should Engineer desire to witness tests.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. The TVSS shall be compatible with the electrical system voltage, current, system configuration and intended applications.

B. The TVSS maximum continuous operation voltage (MCOV) shall be capable of sustaining 115% of the nominal RMS voltage (with the associated peak voltage of 1.414*RMS) continuously without degradation and heating.

C. The TVSS shall only use clamping components connected in parallel with the supply to limit the surge voltages.

D. Arc Discharge components, such as Gas Tube Arresters shall not be used as the sole protection component in any protection mode. Gas Tube Arresters may be used in conjunction with other components, such as MOV's and SAD's to provide protection. Where Gas Tube Arresters are installed, the circuit shall be specifically designed to prevent power follow current.

E. Internal Fusing – If provided, shall be component level style:
   1. Component Level Fusing:
      a. Each Metal Oxide Varistor, or other primary suppression component, shall be individually fused for safety and performance to allow the SPD to withstand the full rated single pulse peak surge capacity per mode without the operation or failure of the fuses. Overcurrent fusing that limits the listed peak surge current of the SPD is not acceptable. Replaceable cartridge type per phase or per mode overcurrent fusing is not acceptable.
      b. For arc quenching capability, minimization of smoke and contaminates in the event of a failure, and to ensure the safest possible design, all surge components, current carrying paths and fusing shall be packed in fuse grade silica sand.
      c. Fusing shall be present in every mode, including Neutral-to-Ground.
      d. The fusing shall be capable of interrupting up to a 200kA symmetrical fault current with 600VAC applied, providing a listed 200kAIC Short Circuit Current Rating (SCCR) without additional over-current protection.

F. Status Indication & Monitoring: The suppressor shall include individual Phase Status LEDs, a red Service Required LED, an integrated Audible Alarm with silence button and Form C dry contacts (N.O. or N.C.) for remote monitoring capability. The form C contacts must be rated a minimum of 65VDC/150VAC with a load of 30WDC/60VA AC, and must be isolated and insulated from the ground plane and the power system to prevent Surges from reaching the monitoring system. The system shall provide insulation and isolation against any impressed voltages. Contacts shall be designed to change state upon device failure or loss of power.

G. The protection should be housed in the appropriate NEMA rated, heavy duty powder coated steel enclosure. This enclosure must provide complete protection against personnel hazards and damage to equipment should a failure of the TVSS protection device occur. This enclosure shall also be designed to allow connection of the TVSS device without sharp bends in the conductors and lead lengths of less than 18" from the TVSS Lugs (or enclosure opening for devices with leads attached) to the final point of attachment to the power system for the application (assuming connection point is 12" from the exterior of the enclosure).

H. Manufacturer shall provide a comprehensive warranty that provides for unlimited full replacement of a suppressor that is damaged or that fails to meet manufacturers published specifications and specifications provided within, without pro-rating value. Warranty shall provide coverage for a minimum period of 20 years for individual units (standard warranty) and. Series SPDs shall be covered for 10 years. These Unlimited Replacement Warranties cannot exclude system overvoltages or direct lightning strike events. Warranty shall not require any factory or third-party testing. Warranty shall apply to installed unit(s) for the duration of the warranty period no matter who owns the facility or equipment. All warranty information and copies of warranty documents must be provided with this response.
   1. All replacements shall be of same make, model and configuration as original unit unless otherwise requested or approved by customer.
   2. The manufacturer/vendor shall provide a warranty replacement unit at the facility within 5 days of receipt of written notification that the TVSS unit has failed, at no cost to the customer.
   3. If the manufacturer/vendor requires inspection of the installed unit to validate warranty claim, the manufacturer/vendor must visit the site where the failed TVSS device(s) are located within 3 days of notification. This visit will be performed at no cost to customer. This section does not modify the requirement for the TVSS replacement to be within 5 days of written notification as described in section G, above.
   4. The replacement unit shall be sent to the facility without shipping, handling, examination or other fees.

I. Complete, comprehensive installation instructions shall be provided for the TVSS systems proposed. Installation instructions must provide for compliance with latest adopted NEC requirements and UL listing requirements, while not degrading performance of TVSS device as tested. Provide copies of installation instructions for the models proposed with the specification response. Successful vendors/manufacturer shall provide a complete, comprehensive installation checklist.

J. If manufacturer claims TVSS device to have filtering capabilities, provide complete information on filtering performance of TVSS device with specification response. This information must include attenuation across a stated frequency range. If the TVSS is a UL 1283 listed device, the manufacturer shall provide all performance specifications for filter attenuation.

K. Provide complete enclosure dimensions (H*W*D) and cutsheets indicating dimensions including locations of terminations and wire entry locations with specification response.

L. Provide UL Short Circuit Current Ratings (SCCR). Minimum ratings shall be 200kAIC without additional/external over-current protection.

M. Manufacturer shall make available metal flush plates for distribution and branch panel SPDs. The flush plate shall provide for a clean architectural finish and be utilized where the attached panel is mounted flush.

N. Manufacturer must have knowledgeable local representation and distribution within 100 miles of the project location and must be willing to provide technical support, warranty claim support, and installation support for the project.

O. Successful manufacturer/vendor must be capable of supplying TVSS for project within 20 days of receipt of order for orders of 25 units and less for models submitted in response to this specification.

2.02 SERVICE ENTRANCE

A. Transient Voltage Surge Suppressors shall be installed at all service entrances of each building and as shown on the riser / one-line diagram. Suppressors shall be listed in accordance with UL 1449 3rd Edition, Standard for Safety, Transient Voltage Surge Suppressors.

B. For 3-phase, 4-wire plus ground configurations, suppressors shall provide suppression and filter elements between each phase conductor and the system neutral, each phase conductor and the system ground and between the neutral conductor and ground.

C. Suppressors shall include a passive circuit that allows the suppressor to actively follow the voltage waveform and provide a clamping envelope that follows the sine wave to limit low level IEEE C62.41 A1 ring waves (of either polarity) at all locations on the sine wave. This circuit shall also perform in the Neutral to Ground Mode where a sine wave does not exist. Details of circuit used to provide this function and information detailing and quantifying the performance of this circuit (in all modes with Category A1 ring wave) shall be provided with specification response. All Let Through Voltage (LTV) values shall not exceed those stated in section 1.04.C.11.

D. Indication of proper suppressor connection and operation shall be provided, consisting of status LEDs for each phase, a Red Service Required LED and an internal Audible Alarm with silence/mute button. Dry contacts (NO/NC) are required for external monitoring.

E. SPD shall exhibit fully redundant protection for each phase.

F. The surge suppressor shall be of parallel design and shall be capable of being removed and replaced without disrupting electrical service to the facility.

G. Suppressors shall consist of solid-state components and shall operate bi-directionally.

H. All surge protective devices shall be of the same manufacturer.

I. The minimum single impulse current rating (as per NEMA LS-1) shall not be less than 240,000 amperes per phase (120KA per mode). Provide proof of compliance by supplying certified test results from independent test lab with submittals.

J. Maximum size of TVSS/SPD units for Primary, Service Entrance applications is 15.5”x12.3”x8.25”.

2.03 SECONDARY SUPPRESSORS FOR MCC, DISTRIBUTION & BRANCH PANELS

A. Transient Voltage Surge Suppressors shall be installed at all service entrances of each building and as shown on the riser / one-line diagram. Suppressors shall be listed in accordance with UL 1449 3rd Edition, Standard for Safety, Transient Voltage Surge Suppressors.

B. For 3-phase, 4-wire plus ground configurations, suppressors shall provide suppression and filter elements between each phase conductor and the system neutral, each phase conductor and the system ground and between the neutral conductor and ground.

C. Suppressors shall include a passive circuit that allows the suppressor to actively follow the voltage waveform and provide a clamping envelope that follows the sine wave to limit low level IEEE C62.41 A1 ring waves (of either polarity) at all locations on the sine wave. This circuit shall also perform in the Neutral to Ground Mode where a sine wave does not exist. Details of circuit used to provide this function and information detailing and quantifying the performance of this circuit (in all modes with Category A1 ring wave) shall be provided with specification response. All Let Through Voltage (LTV) values shall not exceed those stated in section 1.04.C.11.

D. Indication of proper suppressor connection and operation shall be provided, consisting of status LEDs for each phase, a Red Service Required LED and an internal Audible Alarm with silence/mute button. Dry contacts (NO/NC) are required for external monitoring.

E. SPD shall exhibit fully redundant protection for each phase.

F. The surge suppressor shall be of parallel design and shall be capable of being removed and replaced without disrupting electrical service to the facility.

G. Suppressors shall consist of solid-state components and shall operate bi-directionally.

H. All surge protective devices shall be of the same manufacturer.

I. The minimum single impulse current rating (as per NEMA LS-1) shall not be less than 120,000 amperes per phase (60KA per mode). Provide proof of compliance by supplying certified test results from independent test lab with submittals.

J. Maximum size of TVSS/SPD units for Secondary Suppressors for MCC, Distribution & Branch Panel applications is 15.5”x12.3”x8.25”.

2.04 PRIOR APPROVALS

A. The following manufacturer(s) have submitted the required information and have been reviewed and approved for this project:

Total Protection Solutions SPD/TVSS by Thomas & Betts Power Solutions						
Voltage / Location	**480Y277v 3 Phase Bonded Wye**	**480v 3 Phase Delta**	**208Y120v 3 Phase Bonded Wye**	**208v 3 Phase Delta**	**120/240v Single / Split Phase**	**120v Fire Alarm, Security, PLC, etc.**
Main Services	**ST240-3Y480-FL**	ST240-480NN-FL	**ST240-3Y208-FL**	ST240-240NN-FL	ST240-1S240-FL	N/A
Distribution MCC & Branch Panels	**LP120-3Y480-FL**	ST120-480NN-FL	**LP120-3Y208-FL**	ST120-240NN-FL	LP120-1S240-FL	N/A
Dedicated Equipment	N/A	N/A	N/A	N/A	N/A	**LTE120-30A**

TVSS/SPD Applications Notes:
1. Use 60 Amp Circuit Breakers for Service Entrances and 30 Amp Circuit Breakers for Distribution, MCC & Branch Panel applications.
2. Use Delta units for unbonded/ungrounded and high resistance ground Wye applications.

Innovative Technology Protector by Eaton/Cutler Hammer						
Voltage / Location	**480Y277v 3 Phase Bonded Wye**	**480v 3 Phase Delta**	**208Y120v 3 Phase Bonded Wye**	**208v 3 Phase Delta**	**120/240v Single / Split Phase**	**120v Fire alarm Security, PLC, etc.**
Main Services	**PTE240-3Y201-L-SD**	PTE240-NN400-L-SD	**PTE240-3Y101-L-SD**	PTE240-NN201-L-SD	PTE240-1S101-L-SD	N/A
Distribution MCC & Branch Panels	**PTE120-3Y201-L-SD**	PTE120-NN400-L-SD	**PTE120-3Y101-L-SD**	PTE120-NN201-L-SD	PTE120-1S101-L-SD	N/A
Dedicated Equipment	N/A	N/A	N/A	N/A	N/A	**LTE120-30A**

PART 3 EXECUTION

3.01 GENERAL

A. Suppressors shall be installed per the manufacturer's installation instructions and the requirements of: the NEC, the local authority having jurisdiction and the project engineer.

B. Size overcurrent protective device and conductors per manufacturer's recommendations and NEC requirements.

C. Project Engineer or their appointed representative may perform inspection of the installed suppressors and reserves the right to require corrections to the installation to comply with manufacturer’s installation requirements and project specifications.

D. The SPD/TVSS supplier must provide on-site installation training for the electrical contractor.

3.02 SERVICE ENTRANCE

A. Install one primary suppressor at each utility service entrance to the facility as indicated on the drawings.

B. Suppressor shall be installed on the load side of the service entrance disconnecting means in accordance with NEC requirements.

C. Provide a 60 Amp circuit breaker (with a safety clip to ensure the circuit breaker cannot be inadvertently turned off) in the switchboard as over-current protection for the wire and as a disconnecting means for the SPD (or as specified by the manufacture).

D. Use minimum #6 AWG wire for connecting the SPD.

E. Conductors between suppressor and point of attachment shall be kept as short and straight as possible. Lead length of connecting conductor shall not exceed two (2) feet without written permission of the specifying Engineer. If length is exceeded, Contractor may be required to relocate SPD at no cost to the Owner.

F. Over-length SPD leads (greater than 24”) must be twisted together (1 twist/foot) and securely tie-wrapped once per foot to reduce impedance of the leads.

G. SPD leads may not be spliced.

H. Suppressor's ground shall be bonded to enclosure frame and the service entrance ground bus, and conduit between the TVSS/SPD and the switchboard must provide secure electrical/mechanical connections.

3.03 SECONDARY SUPPRESSORS FOR MCC, DISTRIBUTION & BRANCH PANELS

A. Install one secondary suppressor at each MCC, Distribution Panel, Branch Panel & Sub-Panel location as indicated on the drawings.

B. Provide a 30 Amp circuit breaker (with a safety clip to ensure the circuit breaker cannot be inadvertently turned off) in the panel being protected as over-current protection for the wire and as a disconnecting means for the SPD (or as specified by the manufacture).

C. Conductors between suppressor and point of attachment to the panelboard shall be kept as short and straight as possible. Mount the TVSS directly adjacent to the circuit breaker closest to the neutral bus, such that the maximum length of connecting wiring is kept as short as possible, not exceed 18 inches for all phase and neutral leads (24" for ground lead on IG panels). If length is exceeded, Contractor may be required to relocate SPD at no cost to the Owner.

D. Over-length SPD leads (greater than 18") must be twisted together (2 twists/foot) and securely tie-wrapped once per foot to reduce impedance of the leads. Quality compression butt-splice connections are required when extending SPD leads (wire nuts are not acceptable).

E. Grounding for all non-IG installations: Suppressor's ground lead shall be bonded to the panel enclosure with a small ground lug as close as possible to the TVSS mounting point. Conduit between the TVSS/SPD and the switchboard must provide secure electrical/mechanical connections.

F. Multiple "Feed-Through" Panels with shared SPD/TVSS units must be immediately adjacent to each other (side by side) with short tie cables not to exceed 36". Sub-panels must be feed from a primary panel with a "lug-out', lug-in" tie connection, and the tie connection lugs must be at the same end of the primary and sub-fed panel. i.e., bottom to bottom or top to top to ensure short tie "sub-feed" cables.
   1. Dual Panel Configurations: One SPD/TVSS per two panels
   2. Three and Four Panel Configurations: One SPD/TVSS installed on both outside panels of the multi-panel configuration, i.e., Install SPD on first (primary) and another one on the third or fourth sub-fed panel for a total of two SPDs.

END OF SECTION 264300

SECTION 265000
LIGHTING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide the lighting system complete and operational.

B. Recessed fixtures installed in fire-resistive ceiling construction shall have the same fire rating as the ceiling or shall be provided with fireproofing boxes having materials of the same fire rating as the ceiling.

1.02 RELATED SECTIONS

A. Section 260000 – Electrical General Conditions

1.03 REFERENCE STANDARDS

A. 47 CFR 15 - Radio Frequency Devices; current edition.

B. AASHTO LTS - Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signal; 2013 (Revised 2019).

C. ANSI C82.4 - American National Standard for Lamp Ballasts - Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps; 2017.

D. ANSI C82.11 - American National Standard for Lamp Ballasts - High Frequency Fluorescent Lamp Ballasts; 2017.

E. ANSI C136.10 - American National Standard for Roadway and Area Lighting Equipment - Locking-Type Photocontrol Devices and Mating Receptacles - Physical and Electrical Interchangeability and Testing; 2017.

F. ANSI O5.1 - American National Standard for Wood Poles - Specifications and Dimensions; 2017.

G. IEC 60529 - Degrees of Protection Provided by Enclosures (IP Code); 2013 (Corrigendum 2019).

H. IEEE C2 - National Electrical Safety Code; 2017.

I. IEEE C62.41.2 - IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (Corrigendum 2012).

J. IES LM-63 - IESNA Standard File Format for Electronic Transfer of Photometric Data and Related Information; 2002 (Reaffirmed 2008).

K. IES LM-79 - Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products; 2008.

L. IES LM-80 - Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays, and Modules; 2015, with Errata (2017).

M. IES RP-8 - Recommended Practice for Design and Maintenance of Roadway and Parking Facility Lighting; 2018.

N. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

O. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems; 2006.

P. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems; 2006.

Q. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; 2006.

R. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices; 2020.

S. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2012.

T. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

U. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

V. UL 844 - Luminaires for Use in Hazardous (Classified) Locations; Current Edition, Including All Revisions.

W. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.

X. UL 935 - Fluorescent-Lamp Ballasts; Current Edition, Including All Revisions.

Y. UL 1029 - High-Intensity-Discharge Lamp Ballasts; Current Edition, Including All Revisions.

Z. UL 1598 - Luminaires; Current Edition, Including All Revisions.

AA. UL 1598C - Light-Emitting Diode (LED) Retrofit Luminaire Conversion Kits; Current Edition, Including All Revisions.

BB. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data
   1. Lighting Fixtures
   2. Generator Transfer Device
   3. Light Poles & Foundations

B. Shop Drawings
   1. Lighting Fixtures
   2. Lighting Calculations for Substitutions

C. Warranty
   1. Lighting Fixtures

D. O&M Manuals
   1. All Information from Previous Submittals
   2. Mfg. Maintenance Manual
   3. Recommended Maintenance Procedures

1.05 PRODUCT DATA

A. The contractor shall include product data identifying compliance with all pertinent items of Part 2 of this specification. All pertinent options shall be identified in the product data submittal. If options have not been identified clearly, the submittal will be rejected.

B. When substitute fixtures are submitted (if permitted) the data shall clearly cross reference (written or highlighted) that the substitute fixture complies with every detail of the specified fixture. The substitute fixture must be supplied with an IES file for verification of the fixture performance and lumen output.
   1. The manufacturer’s representative will be required to provide the photometric reports for various areas with the substituted fixture to prove the foot-candle level is adequate and meets the design intent.
   2. The Engineer has the right to request a working sample of the substituted light fixture to verify quality and style meet the design intent.
   3. Fixtures not fully complying with the intent of the contract documents and design criteria will be rejected.

1.06 FIXTURE SCHEDULE MANUFACTURER'S SERIES NUMBERS

A. The design series reference does not necessarily represent the number, size, wattage, lumen output or special requirements as specified hereinafter.

B. Shall be neatly and clearly marked to indicate the fixtures, performance, efficiency, mounting methods comply with contract documents.

C. When substitute fixtures are submitted (if permitted) the data shall clearly cross reference (written or highlighted) that the substitute fixture complies with every detail of the specified fixture. The substitute fixture must be supplied with an IES file for verification of the fixture performance and lumen output.

D. The manufacturer's representative will be required to provide the photometric reports for various areas with the substituted fixture to prove the foot-candle level is adequate and meets the design intent.

E. The Engineer has the right to request a working sample of the substituted light fixture to verify quality and style meet the design intent.

F. Fixtures not fully complying with the intent of the contract documents and design criteria will be rejected.

PART 2 PRODUCTS

2.01 DLC COMPLIANCE

A. Light fixtures are required to be DLC 4.0 Compliance and be on a DLC Compliance listing to accommodate energy rebate.

2.02 METAL PARTS

A. Interior Fixtures: Steel or aluminum with manufacturer's standard color and finish as indicated on the Lighting Fixture Schedule, unless specified otherwise.

B. Exterior Fixtures: Corrosion resisting metal, a (non-ferrous, stainless steel or special finish) and in all cases suitable for outdoor service without tarnishing or other damage due to exposure; manufacturer's standard colors unless specified otherwise; cadmium plate all metal parts concealed by canopies, including screws, plates and brackets. All exposed fasteners shall be tamperproof.

2.03 LIGHT TRANSMITTING COMPONENTS

A. When not otherwise independently secured by other means the lens of any fixture shall be contained in a captive metal frame that remains attached to the fixture when door is in open position.

2.04 SPECIAL PARTS

A. Adapters, Plates, Brackets and Anchors: Provide where required by construction features of the building to suitably mount lighting fixture. All such appurtenances and mounting methods shall be approved by the Architect/Engineer prior to fabrication and installation.

B. Low Voltage Transformers: Provide and install where required to power individual or linear runs of low voltage light fixtures.

2.05 LAMPS

A. Solid-State Lighting: Fixtures shall have a lumen maintenance life expectancy (L_{70}) of > 50,000 hours, a CRI of > 80, and a CCT of 3500K or as shown on the light schedule. Each solid-state fixture model shall be tested in accordance with IES LM-79 & LM-80 requirements.

2.06 LED DRIVERS/POWER SUPPLIES

A. The LED drivers/power supplies shall meet the following criteria:
   1. Drive mode: Constant Current or Constant Voltage depending on the LED configuration for the light fixture.
   2. Output currents: 250 mA – 1000 mA
   3. Output voltages: 6VDC – 48VDC
   4. Input voltages: 110 to 277 VAC; 50/60 Hz.
   5. Power factor at >0.90 @ full load
   6. Line regulation accuracy: +/- 2%
   7. Load regulation accuracy: +/- 3%
   8. Greater than 85% efficient
   9. Output over-voltage, output over-current and output short circuit protection with auto recovery
   10. Provide each driver with onboard transient voltage suppression (TVS)
   11. Limited power source output to allow for class 2 wiring.
   12. Flicker Free 0-10V Dimmable to 10% light output.
   13. 5 Year Warranty.

2.07 GENERATOR TRANSFER DEVICE

A. Transfer device shall be installed integral to each light fixture and shall automatically transfer power from the normal power source to the emergency circuit upon loss of normal power. Bodine #GTD

B. Where the transfer device cannot be mounted in the light fixture and the transfer device is indicated to control more than (1) light fixture on the same switch leg, provide Bodine #GTD20A.

C. The device shall be capable of bypassing the local switching means when normal utility power has been lost. The device shall consist of a test switch, a normal power indicator light and an alternate power indicator light. The unit shall be contained within its own enclosure, suitable for mounting on the wall and above accessible ceilings. The device shall be able to accommodate up to 20 amps of lighting load.

2.08 EMERGENCY BATTERY BACK-UP IN FIXTURES

A. Emergency lighting shall be provided by using a LED fixture equipped with a Bodine BSL17C emergency driver. This emergency driver shall consist of a high-temperature, maintenance-free nickel-cadmium battery, charger and electronic circuitry contained in one 12” x 2 3/8” x 1 1/2” metal case.

B. Provide with an illuminated test switch (ITS) to monitor charger and battery and installation hardware.

C. The unit shall be suitable for indoor and damp locations and for sealed & gasketed fixtures, including fixtures rated for wet locations.

D. The emergency driver shall be capable of delivering up to 7.5 Watts to an LED load (30-130VDC) for a minimum of 90 minutes. The unit shall have a 15.0 Watt-hour battery capacity and shall comply with emergency standards set forth by the current NEC.

E. The emergency driver shall be UL Listed for field or factory installation.

F. Provide with 5-year manufacturer warranty.

2.09 HANGING FOR PENDANT FIXTURES

A. Rigid type, with not less than 5 thread engagement at each end, consisting of iron pipe, with brass or aluminum tubing casing, or painted tubing not less than 0.040 inches thick.

B. Aircraft cable, stainless steel, sized appropriately by manufacturer for weight and seismic zone.

C. Provide a canopy for each fixture hanger except where fixture conceals the outlet box directly without a canopy.

D. Provide a safety chain for all glass pendant fixtures and for all fixtures mounted in gymnasiums.

E. Provide Unistrut and mounting hardware above the ceiling to bridge structure, piping, and ductwork in order to mount the fixture centered in the space per the drawings.

2.10 OUTDOOR LIGHTING STANDARDS

A. Provide watertight insulating fuse in the base of lighting standards to individually protect each lighting fixture; buss Style "HEB" or approved, waterproof fuse holder with Buss fuse of appropriate capacity and voltage. Provide fuse for each hot circuit wire; do not fuse neutral.

B. Provide concrete preformed round poles with base plate for bolting to concrete foundation. Natural exposed aggregate finish. Height as noted on drawings.

C. Provide concrete foundations as shown on drawings. Field verify locations with Architect prior to installation of bases.

2.11 OUTDOOR GROUND MOUNTED LIGHTING FIXTURES

A. Provide concrete foundations for mounting of ground mounted lighting fixtures. Foundation shall be a minimum of 6” deeper than the light fixture and a minimum of 6” all around the base of the fixture. Provide #4 rebar with 3” minimum ring ties at 8” on center. The #4 rebar shall be vertically spaced approximately 6” apart. Field verify locations with Architect prior to installation of bases.

2.12 EXIT SIGNS

A. The signs shall be thermoplastic impact-resistant or as indicated on the panel schedule, scratch resist and corrosion proof. Faceplate and back cover shall be interchangeable on the housing.

B. Battery shall have a low-voltage disconnect to prevent excessively deep discharge.

C. LED – less than one watt of power consumption. The fixture shall operate in normal (AC mode) and emergency (DC input) modes.

2.13 INTEGRAL PHOTOCELLS

A. Where daylight harvesting photocells are mounted integral to light fixtures, the manufacturer shall provide a diode (or similar means) on the low voltage dimming control bus to ensure that the photocell dimming signal does not propagate to other light fixtures. If the manufacturer does not provide a means to keep the photocell dimming signal from propagating outside of the fixture, it is the responsibility of the Electrical Contractor to install the required diodes in a junction box outside of the fixture at no additional cost to the owner.

PART 3 EXECUTION

3.01 LIGHTING FIXTURES - GENERAL

A. Size and mounting height from finished floor to bottom of fixture as indicated on the drawings. Verify mounting provisions prior to the ordering of fixtures. Fixtures shall be UL listed for the location, and application in which they are installed.

B. Ceiling fixtures shall be coordinated with and suitable for installation in, on or from the ceiling as shown. Installation and support of fixtures shall be in accordance with NFPA 70 and manufacturer's recommendations.

C. Recessed fixtures installed in seismic areas shall be installed utilizing specially designed seismic clips.

D. Suspended fixtures installed in seismic areas shall have 45° swivel hangers and shall be located with no obstructions within the 45° range in all directions. The stem, canopy and fixture shall be capable of 45° swing.

3.02 DIFFUSERS AND ENCLOSURES

A. Install lighting fixture diffusers only after construction work, painting and clean up are completed. Prior to final acceptance, remove all lamps, reflectors and diffusers, wash, rinse and reinstall.

3.03 ADJUSTMENT OF FIXTURES

A. Make all final spotlight and adjustable light settings under the direction of the Architect/Engineer during a scheduled period of time prior to the completion of the project. Include costs for all equipment and personnel expenses required for adjustment.

B. For fixtures with indirect lighting, notify Engineer prior to installation of any circumstance where the fixture lamp source will be within 12" of ceiling.

3.04 SUPPORT OF FIXTURES

A. Recessed Troffer Type: For fixtures supported by the ceiling suspension system, provide integral tabs, which rotate into position after fixture is lifted into the ceiling cavity. Provide two safety chains secured to structural members above suspended ceiling. Circuit connection shall be through use of 60-inch flexible conduit from a rigidly supported junction box. For plaster or GWB ceilings, provide a plaster frame compatible with light fixture.

B. Recessed Downlight Type: Mount in frames suitable for the ceiling, with the recessed portion of the fixture securely supported from the ceiling framing. For fixtures supported by a ceiling suspension system, provide two safety chains secured to structural members above suspended ceiling.

C. Surface and Pendant Mounted Type:
   1. Where mounted on accessible ceilings, hang from structural members by means of hanger rods through ceiling or as approved.

2. Where ceiling is of insufficient strength to support weight of lighting fixture, provide additional framing to support as required. Fixtures shall be supported from structure with seismic bracing independent of ceiling.
3. For Pendant Mount Type: Provide a unistrut channel for mounting fixtures entire fixture length unless light fixture is designed specifically for supporting itself. Provide 3/8-inch thread rod secured to structural members for support of unistrut channel.
4. Continuous Runs of Fixtures: Straight when sighting from end to end, regardless of irregularities in the ceiling. Where fixtures are so installed, omit ornamental ends between sections.
5. Provide Unistrut and mounting hardware above the ceiling to bridge structure, piping and mechanical ductwork in order to mount the fixture per the Contract Documents.

D. Drivers/Power Supplies shall be accessible.

3.05 LOCATION

A. Mount to the dimensions shown on the drawings. Mount at quarter points where no dimensions appear. Architect shall specify mounting locations where no dimensions appear and quarter point mounting is impractical or not indicated on the drawings.

B. Refer to details, structural drawings, mechanical drawings, and coordinate with mechanical Contractor for equipment and ductwork mounted in ceilings to prevent conflict with light fixtures prior to installation. If conflicts cannot be resolved with the Mechanical Contractor, notify Architect/Engineer.

3.06 SPARE FIXTURES

A. Self-Luminous Exit Sign: Provide (2) two Self-Luminous Exit Signs Lithonia # DSW1X Green or Red to match EX1. Install at locations as directed by Architect.

3.07 CONCRETE FOUNDATIONS

A. Install at locations shown taking care to provide soil compaction same as required under paving to avoid settling and tilting of pole. Provide for all steel, concrete or aluminum poles shown. Concrete foundations shall have a minimum raceway sweeps of 90 degrees and anchor bolts shall be accurately set in foundations using a template supplied by the pole manufacturer. Concrete work and grouting; see Division 3 of the specifications. When concrete work has cured, base plates shall be leveled and grouted in place. Pole anchor bases shall then be set on base plates, leveled plumb on foundations, and secured with holding nuts.

3.08 FIXTURE TENTING

A. Contractor shall coordinate ceiling types with architectural drawings and specifications and provide equivalent fire rated enclosures above all light fixtures which penetrate rated ceilings.

B. Light fixtures that are not IC rated and are to be installed within 3” of insulation shall be provided with an EZ Barrier #EZB 16-24-9 protective cover designed for recessed light fixtures.

END OF SECTION 265000

SECTION 265600
EMERGENCY LIGHTING INVERTER

PART 1 GENERAL

1.01 WORK INCLUDED

A. This specification defines the electrical and mechanical characteristics and requirements for an uninterruptible stored emergency power supply system. The system as specified herein includes all the components required to deliver reliable, high quality uninterruptible power for emergency illumination and related life safety equipment. The system consists of a microprocessor controlled transistorized PWM inverter, high speed transfer devices, constant voltage regulating transformer, battery charging system, energy storage battery platform, a diagnostic monitoring display panel, and all the related hardware components and software to facilitate a functional centralized system. The emergency power supply system shall provide immunity from all line disturbances and power interruptions. The system includes an uninterrupted, normally on output power section and a normally off standby output power section, thus enabling compatibility with emergency lighting fixtures operating in normally on and standby operating modes. A self-diagnostic monitoring alarm system continuously advises of system status and battery condition.

1.02 RELATED SECTIONS

A. Section 260000 – Electrical General Conditions

1.03 REFERENCE STANDARDS

A. The systems shall be designed in accordance with applicable portions of the following standards:
   1. American National Standards Institute (ANSI C57.110).
   2. Institute of Electrical and Electronic Engineers (IEEE 519-1992) (C62.41-1991).
   3. National Electrical Manufacturers Association (NEMA PE-1).
   4. National Electric Code (NEC 2005) (NEC 2005, Article 700).
   5. National Fire Protection Association (NFPA 70) (NFPA 101) (NFPA 111).
   6. Underwriters Laboratories (U.L. 924).
   7. Federal Communications Commission (FCC Part 15, Sec. J, Class A).
   8. Federal Aviation Administration (FAA-G-201e).
   9. Listed U.L. Standards UL924 Emergency Lighting Equipment, UL924 Auxiliary Power Supplies, UL1778 and CUL1778 Standard for UPS Equipment.

1.04 SUBMITTALS

A. The manufacturer shall supply documentation for the installation of the system, including wiring diagrams and cabinet outlines showing dimensions, weights, BTUs, input/output current, input/output connection locations and required clearances.

B. The manufacturer shall be ISO9001 “Quality Assurance Certified” and shall upon request furnish certification documents.

C. The manufacturer shall be a United States based manufacturer with 5 years experience or greater in design and fabrication of centralized stored electrical energy emergency and standby power systems.

D. Factory test results shall be provided to show compliance with the requirements. The manufacturer shall include battery test documentation to validate the specified minimum emergency reserve with full rated KW load.

E. Submittals shall be specific for the equipment furnished and shall include as-built information.

F. O&M Manuals

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. The equipment specified shall be the eLITE - ELN Series centralized emergency lighting inverter system, manufactured by Controlled Power Company, or Lithonia Series ES or prior approved equal.

2.02 MANUFACTURED UNITS

A. The system shall be designed and manufactured to assure maximum reliability, serviceability and performance. The system's microprocessor, transistorized PWM inverter, highly filtered current and voltage regulated 2 stage battery charger and high-speed transfer devices shall be provided as one single main PC board for rapid service or replacement. The main PC board, constant voltage regulating transformer and filtering components shall be installed into one single main control module for rapid module service or replacement. The diagnostic monitor panel display and display select push button shall be mounted on the front of the system for easy operation and viewing. The system is to be furnished with internally located AC input circuit breaker and AC output circuit breakers. The battery and DC conductors shall be DC fuse protected. All conductors and transformer windings shall be copper constructed. Cabinets are wall and/or floor mountable, constructed of steel, front accessible through a hinged, key lockable door and shall be NEMA 2 drip proof rated for indoor use.
   1. Systems shall operate in accordance with requirements as specified herein to support any combination of fluorescent ballast fixtures, incandescent lamps, electronic and high-power factor fluorescent ballasts, HID fixtures or other approved loads up to the rating of the system. "Normally on" and "Normally off" AC output bus shall be 100% rated and limited only by the system maximum KW output rating.
   2. Normal Operation: The load is supplied with voltage regulated & isolated power derived from the output regulating transformer. When utility AC power is present, the battery charger maintains a ripple free float charge on the batteries.
   3. Uninterrupted Emergency Operation: Upon the failure or unacceptable deviation of commercial AC power, battery power is converted by the PWM inverter and filtered through the on-line regulating output transformer. There shall be no break or interruption of power to the load upon failure or restoration of the commercial AC power. Any transfer time resulting in a break or loss of power is unacceptable with reference to the uninterrupted output.
   4. Standby Emergency Operation: Upon the failure or unacceptable deviation of commercial AC power or upon a remote input "zone command on signal", the standby, normally off AC output section of the system shall become energized thus providing emergency power for standby lighting fixtures which are required to illuminate only in the event of emergency. Field adjustable timers shall be be included for use with on and off delay transition requirements.
   5. Automatic Restart: In the case of a commercial power outage that exceeds the battery run time requirement, the output of the inverter shall shut off, but automatically restart once commercial AC power returns. Recharging of the batteries shall commence immediately.
   6. System Power Output Capability: The stored emergency power supply system output power rating shall be (1000 watts).
   7. Battery Time Reserve Capacity: Battery shall be capable of producing emergency power for (90) minutes at full rated Watts.
   8. Reliability: MTBF 100,000 hours. MTTR, 1 Hour.

2.03 PERFORMANCE SPECIFICATIONS

A. Input Specifications:
   1. Input Voltage: 120 VAC or 277 VAC.
   2. Input Voltage Operating Range: +10% to -15% at full load without battery usage.
   3. Extended Range: The unit shall incorporate the use of variable range logic in conjunction with the load percentage to extend the input range up to +10% to -40% without battery usage while maintaining a regulated, usable output voltage.
   4. Frequency Range: 57.5 Hz to 62.5 Hz.
   5. Power Factor: Self correcting to >0.95 (approaching unity).
   6. Input Harmonics: < 5% THD (total harmonic distortion).
   7. Spike Attenuation: 3000:1.

B. Output Specifications:
   1. Output Voltage: 120 VAC or 277 VAC.
   2. Sine Wave Voltage: Maximum 5% harmonic distortion under linear load.

3. Crest Factor: 3.0: 1.
4. Harmonic Attenuation: Reflected load generated harmonics shall be attenuated 23dB at the input.
5. Line Voltage Regulation: +/-3%.
6. Load Regulation: Typically better than +/-3%.
7. Output Power Rating: KVA at 1.0 power factor (unity). KVA = KW
8. Isolation: NEC article 250-5d, shall comply with this standard that specifies a separately derived power source.

C. Battery Specifications:
1. Battery time: 90 Minutes at full rated Kwatt output capability, U.L. 924 Compliant.
2. Battery Type: Integral, valve regulated, sealed lead calcium, maintenance free.
3. Charger: 3 Amp., full wave, two stage, filtered.
4. Recharge Time: U.L. 924, NFPA 101, NFPA 111 compliant.
5. Buss Voltage: 24 VDC, Float 2.27 VPC, final 1.75 VPC.
6. Projected Life: Batteries shall have a projected service life of 5 years, 15 year prorate.

D. Performance Specifications:
1. Overload Capability: 125% for ten minutes.
2. Surge Capability: 150% of rated output without need of static bypass.
3. Frequency Stability: +0.2 Hz.
4. Inner Winding Capacitance: 0.01 pF (primary to secondary coupling).
5. Common Mode: 120 dB (10^6 : 1 ground noise attenuation).
6. Transverse Mode: 70 dB (3160 : 1 line noise attenuation).
7. Reactive Power Correction: Load at .6 pf corrected to > 0.95 at input (automatically correcting).
8. Efficiency: 89% typical under full rated load.
9. Reliability: 100,000 hours MTBF.

E. Environmental Specifications:
1. Operating Temperature: 0 (32) to 40 (105) degrees Celsius (F).
2. Storage Temperature: -20 to 50 degrees Celsius.
3. Relative Humidity: 95% non-condensing.
4. Elevation: 5,000 feet, 1,500 meters.
5. Audible Noise Level: Not greater than 50 dba.
6. Enclosure: NEMA 2. Drip proof for indoor use. Sealed, prohibiting rodent entry.

2.04 DISPLAY AND DIAGNOSTICS

A. Display Monitor and Diagnostics:
1. Display Panel – Systems shall include a local, front mounted, sealed, alphanumeric LED display. Display shall indicate inverter input voltage, inverter output voltage, % load, % battery as selected using a display select push button. System display panel shall include automatic visual status indicators for system on, system on battery, low battery, general alarm. Include audible alarm for system on battery, low battery and general alarm condition(s).
2. Communications Port (RS232) – Include communications port for remote monitoring access to general alarm conditions and electrical measurements.
3. General Alarm Conditions – General alarm conditions shall include: Loss of AC input power, Low battery warning, frequency fault, check battery, shorted SCR, low battery shutdown, low output voltage, high output voltage, system overload, system over temperature warning.
4. Electrical Measurements – Electrical measurements shall include: AC Input voltage, AC output voltage, output amps, % load, % battery voltage, output watts, output va, power factor, input line frequency, number of power outages recorded from last clear function, number of overloads recorded from last clear function.
5. Battery Replacement Testing – Include provision for determining battery life and scheduled battery replacement.

6. Status / Alarm relay interface normally open contacts shall be provided for optional remote annunciator panel or automatic message dialer. Include contacts for inverter on, utility AC power failure (system using battery power), low battery warning, general alarm.

2.05 ACCESSORIES (OPTIONAL EQUIPMENT)

A. Include automatic message dialer for telephone messaging to inform maintenance personnel of system alarm conditions for system on emergency battery power, low battery warning, general alarm.

B. Include remote annunciator panel for remote status indication of system alarm conditions for system on emergency battery power, low battery warning, general alarm.

C. Include (Quantity) control device(s) (dimmer control, wall switch, occupancy sensor) override for use with normally on inverter output bus to provide full illumination to designated emergency lights upon the failure or loss of commercial AC power.

D. Include (Quantity) zone sensing device(s) to sense voltage at individual zone lighting panels. The sensing device shall detect loss of power at the panel and shall signal the system to illuminate emergency fixtures within the specific zone only. If commercial AC power is acceptable at other zones, emergency lighting shall remain in the standby mode.

E. Include (3 output circuit breakers) (1 monitored output circuit breaker) on 550 watt rated unit's normally on output bus.

F. Include (6 output circuit breakers) (3 monitored output circuit breakers) on (1000) (1500) watt rated unit's normally on output bus.

G. Include (3 output circuit breakers) (1 monitored output circuit breaker) on 550 watt rated unit's normally off output bus.

H. Include (6 output circuit breakers) (3 monitored output circuit breakers) on (1000) (1500) watt rated unit's normally off output bus.

I. Include system output circuit breaker open or tripped alarm contacts on all output circuit breakers for use with remote and/or local annunciation indicators.

PART 3 EXECUTION

3.01 MANUFACTURERS WARRANTY

A. The manufacturer shall guarantee all systems to be free from material defects and workmanship for a period of 2 years following shipment from the factory.

B. Battery warranty shall be 15-year prorated with full replacement in the first year.

END OF SECTION 265600

SECTION 270000
LOW VOLTAGE SYSTEMS GENERAL REQUIREMENTS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions and Divisions 0 and 1 Specification Sections, apply to work of this Section.

B. Specification Section 260000 Electrical General Conditions.

1.02 SCOPE AND RELATED DOCUMENTS

A. The work performed under this specification shall be of good quality and performed in a workmanlike manner. In this context "good quality" means the work shall meet industry technical standards and quality of appearance. The Owner reserves the right to reject all or a portion of the work performed, either on technical or aesthetic grounds. The Installing Vendor/Contractor shall make all corrections as needed, to the satisfaction of the Architect.

B. Provide system documentation and Owner training as specified below.

C. An important item of the construction process for this project is the Pre-Construction Kick Off Meeting, which shall take place PRIOR to the rough-in of any systems identified in D. below.
   1. The General Contractor shall coordinate the scheduling of the meeting.
   2. The Owner's Representative and the Owner's IT Department Representative will be present for the meeting.
   3. The General Contractor, Electrical Contractor, and a representative from EACH Section shall attend this coordination meeting.
   4. This meeting is essential for early coordination.
   5. The estimated time is approximate and shall be extended as necessary.

D. The requirements of the conditions of the Contract, Supplementary Conditions, General Requirements, or other work specified for EACH specific low voltage Section listed below includes, but is not limited to the following sections:

			Pre-Construction Kick Off Meeting	
			Estimated time for EACH Section	Submit questions 14 days in advance
1.	Section 260000	Electrical General Conditions	30	
2.	Section 270000	Low Voltage System General Requirements	15	
3.	Section 270528	Pathways for Communications Systems	10	
4.	Section 272000	Data and Voice Infrastructure	30	
5.	Section 274116	Audio-Visual Systems	10	
6.	Section 275113	Communication/Clock/Program System	10	
7.	Section 281300	Access Control System	30	
8.	Section 281600	Intrusion Alarm System	15	
9.	Section 282300	Closed Circuit Television System (CCTV)	30	
10	Section 283176	Fire Alarm/Emergency Communications System	10	

E. Applicable Standards: All work shall be performed in accordance with the latest revisions of the following standards:
   1. International Building Code

2. International Fire Code
3. NEC (National Electrical Code)
4. Telecommunications Architectural Standards - In Washington State Government
5. ANSI-J-STD-607-A - Commercial Building Grounding and Bonding Requirements for Telecommunications

F. EACH Installing Vendor/Contractor for their Section shall possess a current and valid Washington State 06 Electrical Low Voltage License.

1.03 QUALITY ASSURANCE

A. Device or wiring arrangement shown on the drawings represents the intent of the system. If additional equipment (that may not be shown) is required to make a fully functional system, then provide such equipment as required.

B. Each specification Section that is governed by these specifications shall be provided, installed, commissioned, and warranted by a local Installing Vendor/Contractor that meets the following requirements for the equipment manufacturer that is being submitted for:
1. All equipment for EACH specification Section shall be provided and installed by a single supplier.
2. Have installed a minimum of three (3) systems within the past five (5) years.
3. Maintain a 24-hour emergency service program using manufacturer trained technicians. Shall respond to service calls within 24 hours during and after the warranty period.
4. The Installing Vendor/Contractor shall be manufacturer approved to purchase the equipment, have a local office staffed with manufacturer-certified installers that are capable of maintaining, servicing, and warranting the equipment being installed; who are full-time employees and are capable of programming, testing, inspecting, maintaining, warranting, and inventorying parts for the life of the system; and shall be located within a 100-mile radius of the project site.
5. Offices that require staff from another “branch office and/or company office” outside of this radius are not acceptable.

C. Prior to completion of the installation, the Installing Vendor/Contractor shall provide:
1. A preventative maintenance agreement which shall, at the Owner’s option, become effective at the end of the warranty period.
2. A proposal for off-site monitoring services where applicable.

1.04 SUBSTANTIAL COMPLETION

A. In addition to the “Substantial Completion” requirements, when applied to EACH of the specification Sections identified in “Scope and Related Documents”, Substantial Completion shall be defined as follows:
1. The stage in the progress of work where the work or designated portion is sufficiently complete in accordance with the Contract Documents, so that the Owner can utilize the work for its intended use.
2. ALL of the requirements listed in “Testing & Complete System Functionality” shall be met. Once all conditions have been met, this shall be deemed Substantial Completion. These requirements shall be completed on or before the Substantial Completion date listed in the Contract Documents.
3. The Owner reserves the right to withhold up to 10% of the funds for each low voltage system until that system has been shown, to the full satisfaction of the Owner, to function properly.

1.05 DOCUMENTATION

A. Document Format:
1. All documents shall be generated on a PC. Provide these documents electronically (where applicable).
a. Data sheets, installation manuals, technical documents, brochures, and user manuals may be in PDF format.
b. Power Point presentation(s) shall be in MS-Power Point.

c. Test forms and other project-specific documents shall be in an editable format, either MS Word or MS Excel.
d. Drawings and details shall be in AutoCAD 2013 or newer.

1.06 SUBMITTALS

A. Submittals shall be provided for EACH low voltage system specification section number and shall contain, but not be limited to the items listed below:

B. Submittals – Prior to installation of any equipment, the Installing Vendor/Contractor shall provide the Architect with seven (7) copies of submittals for approval. With the approval of the Architect, electronic submittals in PDF format may be substituted for hard copy. Provide the following:
   1. A complete materials list of the quantity of each device, the manufacturer, model number, and description of the equipment for each individual system component or device that will be provided. This list shall precede the data sheets.
      a. Each system component or device data sheet shall have and indicating arrow next to each component or device that is being submitted.
      b. Each submittal shall be by EACH low voltage system specification section number and each submittal shall have its own list of data sheets. Combined submittal sections are not authorized.

1.07 GOVERNING CODES AND CONFLICTS

A. If the requirements of this section, related sections, or the Project Drawings exceed those of the governing codes and regulations, then the requirements of this section, related sections, and the drawings shall govern. However, nothing in this section, related sections or the drawings shall be construed to permit work not forming to all governing codes and regulations.

1.08 PROJECT CONDITIONS – CIVIL PLANS

A. The Installing Vendor/Contractor shall carefully coordinate the various symbols utilized on the drawings, and shall consult the civil plans to determine site conditions in the various areas.

PART 2 PRODUCTS

2.01 MATERIALS

A. Provide all equipment as defined in each specification and on the drawings.

B. All equipment, panels, power supplies, and devices shall be manufactured under the appropriate category by Underwriters Laboratories, Inc. (UL), and shall bear the UL label.

C. All equipment for each system shall bear the UL label. Partial or pending listings shall not be acceptable. It shall be the Installing Vendor's/Contractor's responsibility to ensure that these requirements are met, and replace any and all equipment up to and including the entire system, if these requirements are not met.

D. EACH of the specified Low Voltage Systems identified in PART 1 of these specifications including the design, devices and/or wiring arrangement shown on the drawings, represent that based on various equipment manufacturers. Any changes resulting from differences between the specified product and other manufacturers or substitute manufacturers, shall be the responsibility of the Installing Vendor/Contractor.
   1. Substitutions of the specified equipment and/or supplier will be considered provided that sufficient documentation is provided to the Engineer which certifies that the equipment and/or supplier qualification meets the requirement of these specifications. Any request for substitution shall be submitted by the Installing Vendor/Contractor in writing so as to be received by the Architect not later than (10) ten days prior to the bid due date. Equipment that is approved by the Engineer will be issued by addendum prior to the bid date.

E. Refer to PART 1 for any equipment that is not specifically defined.

2.02 CONDITION OF MATERIAL

A. All equipment shall be new, in un-opened boxes, and be the most current model available for each component and/or device that is provided for this project. For products that use firmware, the most current version available shall be downloaded and installed at each component and/or device, prior to any programming being performed. Outdated or used equipment, as determined by the Architect, shall be removed and replaced by the Installing Vendor/Contractor at no cost to the Owner.

B. All equipment and components shall be installed in strict compliance with manufacturers' recommendations. Consult the manufacturers' installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc., before beginning system installation. All materials shall be in working order as intended by the manufacturer, at the completion of the project.

2.03 WIRE GUARDS

A. Provide at locations where designated on the drawings. Provide wire guards to protect the device from damage. At a minimum, all field devices located in the gymnasium(s) and multipurpose room(s) shall have wire guards installed.

B. Provide and install wire guards that are sized appropriately to protect each device at locations indicated on the drawings, but will not interfere with the operation of any device. The device shall operate as intended by the manufacturer after the wire guard has been installed.

C. Wire guards shall be made using seven (7) gauge welded steel and be chrome plated.
   1. Use Space Age Electronics, HSG Series or PSG Series, or approved equal. Size as required.

2.04 TERMINAL CABINETS, TERMINAL STRIPS, ENCLOSURES AND OUTLET BACKBOXES

A. On-Site System Information Binder and Enclosure: EACH specification section identified on the first page of this specification shall have an Information Binder that shall be housed in a System Information enclosure. The enclosure shall have a hinged door with the text "(Section Title here) Information", with each specific system name silk screened onto the enclosure door, and shall bear the Underwriters Laboratories "UL" label. A "T-Turn" cam lock shall be used to keep the enclosure door closed, and a key shall NOT be required to open the enclosure. Use the following Space Age Electronics model number, or approved equal:
   1. All systems (other than fire alarm): Model # YD9048DBXAA. Verify with the Architect the color of the enclosure(s) prior to ordering the enclosure. There shall be no additional charge to the Owner for changes to the color of the enclosure.
   2. For the fire alarm: Model # YD9049DBXAA shall be red in color, have a hinged door, and have "Fire Alarm System Documentation" silk screened on the enclosure door.

B. Terminal Cabinets (TC):
   1. See EACH Specification for terminal cabinet requirements (where applicable).

C. Terminal Strips:
   1. See EACH Specification for terminal strip requirements (where applicable).

D. Enclosures:
   1. Each systems control panel, power supply, TC, and other metal enclosures shall have the following:
      a. Use key operated locks to secure the enclosure (keyed so that a single key can lock and unlock all enclosure locks for the entire system), and provide ten (10) keys.
      b. Use some form of wire management that uses permanently secured fasteners (no double-back tape), and uses reusable and adjustable Velcro-style cable straps, which shall be installed approximately every four (4) inches within each enclosure.

E. Backboxes:
   1. Each system backbox, with the exception of specific backboxes, shall be metal and installed specific to the system it is being used on.
      a. Provide Red Randl Industries Inc., 5 Square boxes or equal for all fire alarm devices.

b. Provide Blue Randl Industries Inc., 5 Square boxes or equal for all A/V locations. Provide single gang mud ring for all A/V locations only requiring single gang faceplate and provide double gang mud ring for all A/V locations requiring double gang faceplate. See A/V schedule for more information.
c. Provide Blue Randl Industries Inc., 5 Square box or equal for all telecom workstation locations with single gang mud ring unless noted otherwise.

2.05 PROOF OF DELIVERY FORM

A. When providing equipment to the Owner, the Installing Vendor/Contractor shall provide the following transmittal document and obtain the necessary signatures.
1. The Installing Vendor's/Contractor's Transmittal Document is defined as:
a. Company logo
b. Name
c. Address
d. Telephone number
e. Delivery date
f. Installing Vendor's/Contractor's representative name that is making the delivery
g. Quantity of each item
h. Manufacturers' name and model number
i. The exact same description of the device
j. Provide a "signature" line for the Owner's Representative
k. Provide a "printed name" line for the Owner's Representative
l. Provide a "date" line for the Owner's Representative

PART 3 EXECUTION

3.01 WORK ENVIRONMENT

A. General:
1. The Installing Vendor/Contractor shall have implemented an OSHA approved safety plan at their place of business. All staff should adhere to it in their daily practice.
a. Avoiding injury is the primary concern for this project. Use OSHA industry standards to avoid accidents.
2. Coordination with Other Trades:
a. It is the responsibility of the Installing Vendor/Contractor to coordinate with all trades for this project. Maintain all requirements for project schedule deadlines, rough-in, installation, programming, training, and ensuring that the Owner receives a fully functional system as defined in this specification.

3.02 APPROVED EQUIPMENT AND PERMITS

A. No equipment shall be delivered to the job site until Submittals have been reviewed and approved by the Architect.

B. An approved set of Submittals shall be continuously available at the job site during construction, for review by the Architect.

C. Obtain all permits as required, prior to installation of any equipment. They shall be continuously available at the job site during construction, for review by the Architect.

3.03 SYSTEMS PLYWOOD BACK BOARDS

A. Systems plywood back boards shall be used to mount enclosures of any kind, to any wall or surface. The systems plywood back boards shall be securely fastened to the walls to accommodate no less than ten times the total weight of the equipment to be mounted. The systems plywood back boards shall be a minimum of 3/4", APA exterior-grade Douglas Fir A-C, and fire retardant with a flame spread rating not more than 25 when tested according to ASTM E-84. Provide the systems plywood back boards from the floor up to ceiling height (not exceeding 12'-0") on all walls shown, unless otherwise noted. The entire back board shall be painted with three (3) coats of fire-retardant paint (the color shall match the adjacent surface). EACH enclosure, when mounted, shall bear a minimum of 150 pounds weight on the enclosure.

B. Mounting of equipment shall be logically placed, and shall be located at the top, bottom, left, or right portion of the systems plywood back boards to accommodate future growth of the system. Under no circumstances will the equipment be allowed to be mounted in the middle of the back boards.

3.04 GROUNDING

A. Ground all equipment per the manufacturers' recommendations, per Division 26 and as required by code.

B. Provide grounding and bonding per ANSI-STD-J-607-A, which includes, but is not limited to: cable trays, racks, conduit sleeves, and other equipment connected to the TMGB/TGB.

C. The minimum conductor size shall be # 6 green insulated copper grounding conductor. However, the size of each conductor shall be based on the actual cable length as defined in ANSI-STD-J-607-A. See Section 272000 "TMGB and TGB (Telecommunication Grounding Busbars)" for additional grounding requirements.

3.05 DEVICE RELOCATIONS

A. Device location may be changed prior to installation, within 15'-0" without extra charge, if so desired by the Architect.

3.06 INSTALLATION

A. Provide all equipment, wiring, conduit, and outlet boxes required for the installation of a complete, fully functioning, operating system in accordance with applicable local, state, national codes, AHJ requirements, the manufacturers' recommendations, these plans and specifications. All circuits not in conduit must be wired with UL listed power limited cable under NEC 725, Class II wiring. Plenum cable shall be utilized in all return air plenum ceilings.

B. Provide 120VAC wiring and connections to the control panels, EACH amplifier, CPU, DVR, and power supply as required for a fully functional system, while maintaining all of the design requirements described elsewhere within each system specifications. At a minimum, this shall include the following:
   1. Multiple power supplies and/or the control panel may be placed on the same circuit, while maintaining all code mandated load calculations, but shall be on circuits that are dedicated for EACH system.
      a. Consult with the Architect to verify load calculations meet all code requirements.
      b. Install 120VAC wiring and conduit as specified in Division 26.

C. Maintain all fire wall ratings as required.

D. Installation of equipment and devices that pertain to other work in the contract shall be closely coordinated with the appropriate subcontractors.

E. EACH manufacturers' authorized representative shall provide on-site supervision of the installation for EACH of the systems equipment for the duration of the project. This includes programming, training, and the Owner's ability to use the Complete System Functionality as it was designed.

F. Install wire guards at locations as shown on the drawings and as described elsewhere within these specifications.

G. Every attempt shall be made to avoid running telecommunications close to (less than 2'-0") and/or parallel to other communication cables in the building, all lighting, and conduits containing 120VAC (or greater). This shall be to avoid interference with any other service or system, operation, or maintenance purposes such as access boxes, ventilation-mixing boxes, access hatches to air filters, switch or electrical outlets, electrical panels, fire alarm equipment, clock systems, and lighting fixtures. Avoid crossing areas horizontally just above or below any conduit and/or riser. Route cables in such a manner to allow other cables to enter the conduit and/or riser without difficulty at a later time by maintaining maximum distance from these openings. Maintain all recommended distances from other cables, as required by the manufacturer. Install cable to whichever of these two requirements are more stringent.

H. Room numbers shown on plans are architectural designs numbers for construction purposes. These numbers are NOT to be used for programming. Final system programming shall reflect the final room numbering plan and actual room signage, unless directed otherwise in writing or as specified in another specification section.

3.07 MOUNTING HEIGHTS, LOCATIONS, AND SETTINGS

A. Install all equipment as recommended by the manufacturer.

B. The installation of EACH device, enclosure, and/or control panel shall be installed so that the maintenance staff will be able to access, test and/or replace any component of the system. If this installation does not meet this requirement to the satisfaction of the Architect, it will not be accepted. The Installing Vendor/Contractor shall be required to remove the item, patch and paint the area to the satisfaction of the Architect, and reinstall the device, enclosure, or control panel as required to make the system easily maintainable and acceptable, at no additional cost to the Owner.

C. Control Panels, Power Supplies, and Locations:
   1. Mount control panels, power supplies, and enclosures (provide quantities as required) with approximately two (2) inches of separation between the enclosures.
   2. Each enclosure, when mounted, shall meet the following criteria:
      a. Conduit shall not enter any enclosure or panel, except where conduit entry is approved by the manufacturer.
      b. Chase nipple the enclosures together. At a minimum, use two (2) 1½" conduits. Size and/or provide additional conduits as required. Provide conduits between enclosures to accommodate an additional 100% conduit fill while maintaining all NEC requirements. Avoid installing chase nipples where batteries are to be installed (contact the manufacturer and/or the Installing Vendor/Contractor prior to drilling any holes). Any chase nipples installed where batteries are to be located will be rejected, and require the reinstallation as specified, up to and including installing new enclosures.
      c. The bottom of the chase nipples shall be a minimum of two (2) inches above the location where any batteries are to be installed.
      d. EACH enclosure door shall be able to open no less than 105°.
      e. The top of each enclosure shall be mounted at the same height of 60inches above the finished floor and shall be level.
      f. If changes to the above requirements are preferred, contact the Architect for approval prior to rough-in.

D. All equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place (i.e., devices shall not be supported solely by suspended ceilings). Fasteners and supports shall be able to support the no less than four (4) times the weight of the equipment and/or device.

E. Rack Equipment: EACH rack shall be securely attached to the floor and/or wall using the manufacturers' recommended mounting hardware.

F. See each system specification for additional mounting information.

3.08 FLUSH MOUNT AND SURFACE MOUNT EQUIPMENT AND ENCLOSURE LOCATIONS

A. Prior to rough-in, consult the Architect for clarification for flush mount and surface mount locations.

B. Flush mounted equipment and enclosures shall be installed in areas where the rooms are finished such as administrative areas, offices, work rooms, break room and corridors. Provide the appropriate finish work around each enclosure as required. This type of equipment includes, but is not limited to the following:
   1. Enclosures: Typically, are control panels, power supplies, etc.
      a. Provide the manufacturers' flush mount trim rings, adapters, and/or brackets for this type of equipment.

C. Surface mounted equipment and enclosure shall be installed in areas where the rooms are NOT finished such as electrical rooms, MDF/IDF rooms, mechanical rooms, or utility rooms. Unless otherwise noted, this equipment shall be installed on the systems plywood back boards. This type of equipment includes, but is not limited to the following:
   1. Enclosures: Typically, are control panels, power supplies, etc.
   2. Punch Blocks: Typically, are used with telephone PBX and intercom equipment.
   3. Wall-mounted and floor -mounted racks.

3.09 NUMBERING AND LABELING

A. Phenolic Plates:
   1. Install phenolic plates at each of the control panels, power supplies, terminal cabinets, and racks.
      a. All phenolic plates shall be secured to each enclosure with rivets.
      b. Install each plate 1” from the top of the enclosure, and be centered on the door. Relocate as required to avoid interfering with equipment or components within the enclosure or prevent the enclosure door from closing properly. The location of the phenolic plates shall be consistently installed in the same location on each system enclosure, at EACH location.

B. Terminal Cabinets:
   1. Label each termination point on the inside of EACH enclosure door. All information shall be legible, as defined by the Architect.

C. Addressable Devices/Address Point Labels (where applicable):
   1. Install the address label for each addressable device on or near the device. Verify with the Architect, prior to installation.
   2. Clean the surface from dust, grease, or lubricants as recommended by the manufacturer of the label.
   3. The addressable label shall be able to be viewed by the general public when standing on the ground.
      a. Prior to installation, coordinate with the Owner’s Representative for exact location of how and/or where to mount the address label for EACH device type to fulfill this requirement, prior to installation.
   4. Provide the following address label format:
      a. The background shall be clear (see through).
      b. The text shall be black in color, and a minimum of ½” tall.
      c. Use Brothers or P-Touch models to produce the label.

3.10 ON-SITE SYSTEM INFORMATION BINDER ENCLOSURE

A. The Installing Vendor/Contractor shall install the wall mount enclosure that is labeled “(Section Title here) information”. The enclosure shall be located in the administrative area or the MDF room. Verify the exact location with the Architect, prior to installation.

B. The enclosure shall have a site-specific manual, in a “D” style 3-ring binder with an 18-inch heavy-duty chain securely fastened to the inside of the enclosure.

3.11 TESTING & COMPLETE SYSTEM FUNCTIONALITY (FOR ALL SYSTEMS THAT IDENTIFY THIS TESTING REQUIREMENT)

A. The warranty shall NOT begin until the following conditions have been met:
   1. The Installing Vendor/Contractor shall provide a copy of the (Section Number and Section Title here) - Operational Test Form that has been performed and submitted to the Architect for review. The purpose of this document is to show that the Installing Vendor/Contractor has in fact performed a complete test. In some cases, every device may not pass the test. This shall serve as the Installing Vendor’s/Contractor’s own punch list, to make corrections prior to the Acceptance Test. This must be completely filled out, and have an original signature of the representative of the Installing Vendor/Contractor. Allow for a minimum of ten (10) business days for the Architect to review this document.

2. After the Architect's review of the System Operational Test Form, the Architect will discuss the results of the test with the Installing Vendor/Contractor.
3. The Installing Vendor/Contractor shall coordinate with the Architect to witness the Performance Test. Allow for a minimum of ten (10) business days to schedule this testing.
4. System Testing:
    a. The Installing Vendor/Contractor shall provide two-way communication devices for their own staff, each Owner's Representative, and the Architect, so that all parties can communicate as required to perform all tests.
    b. The Installing Vendor/Contractor shall demonstrate the testing of each device, to the Owner's Representative and the Architect, and document this information on the (Section Number and Section Title here) - Performance Test Form.
    c. Upon the completion and passing the Performance Test with 100% positive results, the Acceptance Test Form shall be signed by the Installing Vendor/Contractor, the Owner's Representative, and the Architect.
        1) If the Installing Vendor/Contractor fails this test by NOT passing the test with 100% positive results, the following shall occur:
            (a) The Installing Vendor/Contractor shall make all of the necessary corrections to provide 100% positive results.
            (b) The Installing Vendor/Contractor shall document the corrective action taken for each item that failed the Test, and submit to the Architect for review. Upon approval by the Architect, the Acceptance Test shall be rescheduled.
        2) The Installing Vendor is subject to the Close Out requirements as specified in Section 200000, Schedule of Values.
5. Training:
    a. Refer to EACH specific section for the training requirements as described in "Training Materials and Programming Survey".
6. Complete System Functionality:
    a. After ALL of the above conditions have been met, deemed by a "Pass" on the Governing Acceptance Form - (Section Name and Section Title here), and the required signatures have been received, Complete System Functionality shall be deemed complete, as the Owner has the ability to use the system as it was designed.
7. Warranty:
    a. The warranty period shall now begin, and the initiating date of the warranty period shall commence on the date of the Owner's ability to use the Complete System Functionality as it was intended. Refer to the "Warranty" section of this specification for more information.

3.12 WARRANTY

A. See "Testing & Complete System Functionality", listed elsewhere in these specifications, to establish the requirements and confirm when the actual warranty period shall begin.

B. The Installing Vendor/Contractor shall include in the pricing of their bid that they will honor and provide EACH of the manufacturers' full-term warranty period for the provision of replacement equipment for EACH individual device and/or component provided for this project. The completed and fully functional system, including wiring, installation, and all equipment shall be free from inherent mechanical and electrical defects. At a minimum, this shall be no less than one (1) year from the date of Complete System Functionality as defined in "Testing & Complete System Functionality" portion of this specification. Warranty service for the on-site replacement of equipment shall be provided by the system supplier's manufacturer trained representative during normal working hours, Monday through Friday, excluding holidays, and response for service shall be delivered no later than the following business day after the call was received.

C. When the manufacturers' warranty exceeds one year, the Installing Vendor/Contractor shall be responsible for replacing the actual component or device for the full duration of the manufacturers' warranty, if the Owner or their representative chooses to take the item to the Installing Vendor's/Contractor's place of business. If the Owner chooses to have the Installing Vendor/Contractor provide on-site service, then the Installing Vendor/Contractor is entitled to their standard published (or negotiated) labor rates and miscellaneous material items to replace the damaged warranty item.

D. The Installing Vendor/Contractor who is authorized to provide warranty service for this project is defined in "Quality Assurance" located in Part 1 of this specification.

END OF SECTION 270000

SECTION 270528
PATHWAYS FOR COMMUNICATIONS SYSTEMS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions and Divisions 0 and 1 Specification Sections, apply to work of this Section.

B. Specification Section 260000 Electrical General Conditions.

1.02 SCOPE

A. The installation shall include innerduct, fire-rated and non-fire-rated penetration assemblies, conduit, cable tray, and wire management.

B. The bonding of metallic raceways.

C. The work performed under this specification shall be of good quality and performed in a workmanlike manner. In this context "good quality" means the work shall meet industry technical standards and quality of appearance. The Owner reserves the right to reject all or a portion of the work performed, either on technical or aesthetic grounds. The Installing Vendor/Contractor shall make all corrections as needed, to the satisfaction of the Architect.

D. The system shall meet ALL of the requirements listed in Section 270000 Low Voltage Systems General Requirements PART 3 “Testing & Complete System Functionality”, prior to “Substantial Completion”.

E. Contractual information, guidelines, requirements, or other work specified to provide a fully functional system for Section 270528 includes, but is not limited to the sections identified in Section 270000.

1.03 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications Sections, apply to work specified in this Section.

B. Applicable Standards: All work shall be performed in accordance with the latest revisions of the following standards:
   1. National Electrical Manufacturers Association:
      a. NEMA FG 1 - Fiberglass Cable Tray Systems
      b. NEMA VE 1 - Metal Cable Tray Systems
      c. NEMA VE 2 - Cable Tray Installation Guidelines
   2. NFPA 70 - National Electrical Code.
   3. ANSI/TIA-568-C.0 - Generic Telecommunications Cabling for Customer Premises.
   4. ANSI/TIA-569-B - Commercial Building Standard for Telecommunications Pathways and Spaces.
   5. ANSI-J-STD-607-A - Commercial Building Grounding and Bonding Requirements for Telecommunications.

1.04 QUALITY ASSURANCE

A. Installing Contractor Qualifications:
   1. Work in this section shall be performed by a licensed and bonded low voltage Installing Vendor/Contractor with a minimum of five (5) years’ experience in the installation and maintenance of high-speed data and voice networks. Only Installing Vendors/Contractors whose primary business is that of installing, maintaining, troubleshooting, and testing telecommunication infrastructures shall perform this work.
   2. License Classification: Installing Vendor/Contractor must possess a valid Washington State 06 Electrical Low Voltage License.

1.05 GOVERNING CODES AND CONFLICTS

A. If the requirements of this section or the Project Drawings exceed those of the governing codes and regulations, then the requirements of this section and the Drawings shall govern. However, nothing in this section or the Drawings shall be construed to permit work not conforming to all governing codes and regulations.

1.06 PROJECT CONDITIONS ARCHITECTURAL PLANS

A. The Installing Vendor/Contractor shall carefully coordinate the various symbols utilized on the drawings and shall consult the architectural plans to determine ceiling and floor types in the various areas.

1.07 SUBMITTALS

A. Refer to Section 270000 Low Voltage Systems General Requirements for additional data sheet submittal requirements.

PART 2 PRODUCTS

2.01 MATERIALS

A. See Section 270000 Low Voltage Systems General Requirements for additional requirements.

B. The Installing Vendor/Contractor shall review the Site Plans, Floor Plans, Riser Diagrams, and Detail Sheets for additional work that is required to be performed by the Installing Vendor/Contractor of this section.

2.02 COORDINATION

A. Refer to “Installation of Owner Furnished Equipment” for additional coordination and installation requirements.

B. Refer to “Submittals” listed elsewhere in this specification for additional coordination requirements.

2.03 SEISMIC BRACING

A. Provide Seismic Bracing as required by the Authority Having Jurisdiction (AHJ).

B. This includes, but is not limited to:
   1. Racks
   2. Cable trays
   3. Cable supports

2.04 INNERDUCTS AND CONDUIT SEALS

A. Innerduct (Fabric Mesh):
   1. The Installing Vendor/Contractor shall provide the proper type of fabric mesh innerduct for the application in which it is being used.
   2. Provide flexible multi-cell fabric mesh innerduct consisting of white polyester and nylon resin polymer.
   3. EACH cell shall contain a factory-installed pull tape, which shall be a different color for EACH cell.
   4. Manufactured by MaxCell: Model # MXE64283BK (black), or approved equal. Provide quantities as required where shown on plans.
      a. This shall be the default color for one (1) 3-Cell innerduct.
   5. Manufactured by MaxCell: Model # MXE64283RD (red), or approved equal. Provide quantities as required where shown on plans.
      a. Where two (2) 3-Cell innerducts are shown in a single conduit on the plans, this shall be the second color.
   6. Manufactured by MaxCell: Model # MXE64283 (blue), or approved equal. Provide quantities as required where shown on plans.
      a. Where three (3) 3-Cell innerducts are shown in a single conduit on the plans, this shall be the third color.

B. Innerduct (Non-Metallic Tubing):
   1. Provide 1” corrugated innerduct for EACH fiber optic cable run.
   2. Innerduct shall be rated for the application and environment that it is installed in and shall meet all Code and AHJ requirements.
   3. Non-Metallic Tubing for fiber optic cables shall be orange in color.
   4. Provide quantities as required where shown on plans.
   5. Approved manufacturer: Pyramid Industries or approved equal.

C. Inflation Bags (for 3” Conduits and 4” Conduits):
   1. Inside EACH hand hole and inside EACH man hole, install inflation bags in 3” Conduits and 4” Conduits that comes into the building. Provide inflation bags in EACH conduit at the opposite end (in the MDF and designated IDF locations).
   2. Provide inflation bags.
   3. Locate inflation bags in EACH 3” underground conduit and in EACH 4” underground conduit (at each end of the conduit) that is routed between the MDF and EACH designated IDF location.
   4. Manufactured by MaxCell: Model # MXCITB3 (for 3” conduits), or approved equal. Provide quantities as required.
      a. Seal each conduit as described above using the manufacturer approved inflation seal method at the completion of the project.
      b. Provide six (6) 3” conduit inflation bags (when this sized conduit is used on this project) to the Owner at the completion of the project.
   5. Manufactured by MaxCell: Model # MXCITB4 (for 4” conduits), or approved equal. Provide quantities as required.
   6. Seal each conduit as described above using the manufacturer approved inflation seal method at the completion of the project.
   7. Provide six (6) 4” conduit inflation bags (when this sized conduit is used on this project) to the Owner at the completion of the project.
   8. Inflation Tool:
      a. Provide one (1) new (unopened package) inflation tool to the Owner at the completion of the project.
      b. Manufactured by MaxCell: Model # MXCITT, or approved equal.
   9. Gas Cartridges:
      a. Provide 12 new (unopened packages) gas cartridges to the Owner at the completion of the project.

D. Duct Seal (for conduits that are 2.5” or less):
   1. Inside EACH hand hole and inside EACH man hole, install a water-tight seal in EACH conduit that comes into the building. Provide a water-tight seal in EACH conduit at the opposite end (in the MDF and designated IDF locations).
   2. In addition to the above locations, provide duct seal that includes, but is not limited to other conduits such as:
      a. Reader boards
      b. Portables
      c. Hand holes for future equipment
   3. Manufactured by Ideal: Model # 31-601, or manufactured by Gardner Bender: Model # DS-130, or approved equal.

2.05 OPEN CABLING SUPPORT & HARDWARE

A. Each cable support shall be UL listed for the application and meet the TIA requirements for structured cabling systems.

B. Provide manufacturer approved mounting brackets and fasteners.

C. Do not exceed the cable support manufacturer’s cable fill capacity for each type provided for this project.

D. Do not exceed the cable manufacturer's recommendations for cable suspension in open cabling environments.

E. J-Hooks shall have a galvanized finish.
   1. Manufactured by Erico CADDY: Model # CAT32HP, or approved equal. Provide quantities as required.
   2. Manufactured by Erico CADDY: Model # CAT48HP, or approved equal. Provide quantities as required.

F. Mounting Tree:
   1. Manufactured by Erico CADDY: Model # CATHPTM, or approved equal. Provide quantities as required.

G. Adjustable Cable Support:
   1. Manufactured by Erico CADDY: Model # CAT425 Series, or approved equal. Provide quantities as required.

H. Conduit Waterfalls:
   1. Conduit waterfalls shall be used where conduits empty into cable trays.
   2. Manufactured by Panduit: Model # CWF400, or approved equal. Provide quantities as required.

I. Conduit Bushings:
   1. Conduit bushings shall be used to protect communications cabling where conduits terminate in accessible ceiling space.
   2. Bushings shall be non-metallic to reduce cable abrasion.
   3. Manufactured by Arlington: Model # EMTXXX, or approved equal. Provide quantities as required.

2.06 CABLE TRAY – WIRE BASKET STYLE:

A. Chatsworth Products (CPI) is the basis of design for all wire-style cable. Equivalent manufacturer's solutions may be submitted for prior approval no less than two (2) weeks before bid date closing. Products not submitted for prior approval shall be rejected.

B. Provide seismic bracing.

C. The cable tray shall be UL Classified.

D. The cable tray shall be 4" high x 18" wide (unless otherwise noted).
   1. Manufactured by Chatsworth Products Inc (CPI): Model # 34821-618, or approved equal. Provide quantities as required.

E. Splice Bar:
   1. Manufactured by Chatsworth Products Inc (CPI): Model # 34739-501, or approved equal. Provide quantities as required.

F. Splice Bolt/Washer:
   1. Manufactured by Chatsworth Products Inc (CPI): Model # 34728-501, or approved equal. Provide quantities as required.

G. Trapeze Support Bracket:
   1. Manufactured by Chatsworth Products Inc (CPI): Model # 34730-620, or approved equal. Provide quantities as required.
   2. Unistrut may be used in lieu of the above model number if approved by the AHJ.

H. Cable Radius Drop:
   1. Manufactured by Chatsworth Products Inc (CPI): Model # 34747-701, or approved equal. Provide quantities as required.

I. Ground Clamp:
   1. Manufactured by Chatsworth Products Inc (CPI): Model # 34838-001, or approved equal. Provide quantities as required.

2.07 CABLE TRAY – LADDER STYLE:

A. Chatsworth Products (CPI) is the basis of design for all ladder-style cable. Equivalent manufacturer's solutions may be submitted for prior approval no less than two (2) weeks before bid date closing. Products not submitted for prior approval shall be rejected.

B. Provide seismic bracing where required by the AHJ.

C. The cable tray shall be UL Classified.

D. The cable tray shall be 1.5" high x 18" wide (unless otherwise noted) with 9" rung spacing in steel construction that has been painted by the manufacturer.
   1. Manufactured by Chatsworth Products Inc (CPI): Model # 11275-718, or approved equal. Provide quantities as required.

E. Butt Splice Rack Mount Plate:
   1. Manufactured by Chatsworth Products Inc (CPI): Model # 16301-701, or approved equal. Provide quantities as required.

F. Junction Splice:
   1. Manufactured by Chatsworth Products Inc (CPI): Model # 16302-701, or approved equal. Provide quantities as required.

G. Swivel Butt Splice:
   1. Manufactured by Chatsworth Products Inc (CPI): Model # 16487-701, or approved equal. Provide quantities as required, where applicable.

H. Swivel Junction Splice:
   1. Manufactured by Chatsworth Products Inc (CPI): Model # 16488-701, or approved equal. Provide quantities as required, where applicable.

I. Wall Mount Bracket:
   1. Manufactured by Chatsworth Products Inc (CPI): Model # 11746-718, or approved equal. Provide quantities as required.

J. Rack Mount Plate:
   1. Manufactured by Chatsworth Products Inc (CPI): Model # 12730-718, or approved equal. Provide quantities as required.

K. Ground Strap:
   1. Manufactured by Chatsworth Products Inc (CPI): Model # 40164-001, or approved equal. Provide quantities as required.

L. Cable Runway Dividers:
   1. Manufactured by Chatsworth Products Inc (CPI): Model # 13392-721, or approved equal. Provide quantities as required.

M. Cable Radius Drop:
   1. Manufactured by Chatsworth Products Inc (CPI): Model # 12100-718, or approved equal. Provide quantities as required.
   2. Manufactured by Chatsworth Products Inc (CPI): Model # 12101-702, or approved equal. Provide quantities as required.

2.08 FIRE RATED AND NON-FIRE RATED PENETRATIONS

A. Provide fire rated penetration equipment for EACH wall that is rated for fire-rated walls.

B. Provide industry standard penetration methods for EACH wall that is not a fire rated wall.

C. A firestop system shall be comprised of the item or items penetrating the fire rated structure; the opening in the structure and the materials and assembly of the materials used to seal the penetrated structure. Firestop systems comprise of an effective block for fire, heat, vapor, and pressurized water stream.

D. All penetrations through fire rated building structures (walls and floors) shall be sealed with an appropriate firestop system. This requirement applies to through penetrations (complete penetration) and membrane penetrations (through one side of a hollow fire rated structure). Any penetrating items (e.g., riser slots and sleeves, cables, conduit, cable tray, and raceways, etc.) shall be properly firestopped.

E. Firestop systems shall be UL Classified to ASTM E814 (UL 1479).

F. All firestop systems shall be installed in accordance with the manufacturer's recommendations and shall be completely installed and available for inspection by the local authorities prior to cabling system acceptance.

G. For EACH penetration, the following requirements shall apply:
   1. Provide pathway assemblies for EACH low voltage system cables for each individual assembly opening.
   2. Provide the quantity of pathway assemblies required for the horizontal cables, while maintaining all code requirements. Additionally, provide one (1) pathway assembly opening for EACH system listed on the Electrical Legend (This includes, but is not limited to: Fire Alarm System, Intrusion Alarm System, Intercom System, Access Control System, CCTV System, etc.), and no less than two (2) spare empty assembly openings, which shall remain empty at the completion of the project.

2.09 ADDITIONAL SYSTEM EQUIPMENT

A. See Part 3 of this specification for additional provision of system equipment and/or labor.

PART 3 EXECUTION

3.01 GENERAL

A. See Section 270000 Low Voltage Systems General Requirements for additional information.

B. Prior to rough-in, coordinate with the Architect for the exact installation location(s) and areas to avoid.

C. Install all equipment per the manufacturer's recommendation.

3.02 PRODUCT INSPECTIONS

A. The Installing Vendor/Contractor shall inspect all cable prior to installation to verify that it is identified properly on the reel identification label, that it is of proper gauge, containing correct number of pairs, and is the material ordered. Any physical damage to the cable and wire must be noted; un uniform jacket thickness and jacket tightness should also be identified. Note any buckling of the jacket, which would indicate possible problems.

3.03 GROUNDING AND BONDING

A. Provide grounding and bonding per ANSI-STD-J-607-A, which includes, but is not limited to: cable trays, racks, conduit sleeves, and other equipment connected to the TMGB/TGB.

B. The minimum conductor size shall be #6 green insulated copper grounding conductor. However, the size of each conductor shall be based on the actual cable length as defined in ANSI-STD-J-607-A.

3.04 HORIZONTAL PATHWAYS

A. It is the responsibility of the contractor to ensure that ALL PATHWAYS for the permanent link of each balanced twisted pair cable shall not exceed 295' in length from work area outlet to telecommunications room patch panel.

B. To ensure this length, all pathways shall be coordinated and installed prior to pouring of any slabs or the installation of any permanent structure which would inhibit a conduit or cable tray run from being installed after the structure is complete.

3.05 FIRE RATED AND NON-FIRE RATED PENTRATIONS

A. Install per manufacturer's recommendations.

B. Maintain all code and AHJ requirements.

3.06 EXPANSION JOINTS, SEISMIC JOINTS, AND BUILDING SEPARATIONS

A. All cabling crossing expansion joints, seismic joints, and building separations shall be installed inside flexible conduit connections and shall be fire rated per code and AHJ requirements.

B. Cable Trays crossing expansion joints, seismic joints, and building separations shall be installed with appropriate expansion splice plates per manufacturer's recommendations.

3.07 PLENUMS

A. Provide metallic conduit through building plenum spaces for all cables which do not bear a CMP rated label.

3.08 WARRANTY

A. The warranty shall be direct to the end user, from the manufacturer, supported through the certified Installing Vendor/Contractor, and shall cover both materials and labor costs for any claims related to the warranty program. If the Installing Vendor/Contractor were to default, the manufacturer will assume responsibility of employing another certified installer to maintain the existing warranty. Bids from installers or Installing Vendors/Contractors who are not certified by the connecting hardware manufacturer and wire manufacturer at the time of project bid will be rejected.

3.09 OPERATION & MAINTENANCE MANUALS (O&M'S)

A. Provide all Operation & Maintenance Manual (O&Ms) documentation as defined in Section 270000 Low Voltage Systems General Requirements and listed elsewhere in this specification.

3.10 DEMONSTRATION AND TRAINING

A. Upon completion of the system installation, the installation representative shall conduct a system test for the Owner, Owner's Representative, Architect, and Engineer.

B. Upon completion of the installation, after test and demonstration, the Installing Vendor/Contractor shall provide to the Architect a signed written statement substantiating the:

1. "System has been completely tested, demonstrated to the Owner's Representative, and accepted by the appropriate authority."

END OF SECTION 270528

SECTION 312200
GRADING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Rough grading the site for site structures.

B. Finish grading.

1.02 RELATED REQUIREMENTS

A. Section 312316.13 - Trenching: Trenching and backfilling for utilities.

B. Section 329300 - Plants: Topsoil in beds and pits.

PART 2 PRODUCTS

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench mark and intended elevations for the Work are as indicated.

B. Verify the absence of standing or ponding water.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Stake and flag locations of known utilities.

C. Provide temporary means and methods to remove all standing or ponding water from areas prior to grading.

3.03 ROUGH GRADING

A. Remove subsoil from areas to be further excavated, re-landscaped, or re-graded.

B. Do not remove wet subsoil , unless it is subsequently processed to obtain optimum moisture content.

C. When excavating through roots, perform work by hand and cut roots with sharp axe.

D. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.

E. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack surface water control.

3.04 FINISH GRADING

A. Before Finish Grading:
   1. Verify building and trench backfilling have been inspected.
   2. Verify subgrade has been contoured and compacted.

B. Remove debris, roots, branches, stones, in excess of 1/2 inch in size. Remove soil contaminated with petroleum products.

C. In areas where vehicles or equipment have compacted soil, scarify surface to depth of 3 inches.

D. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.

E. Maintain stability of topsoil during inclement weather. Replace topsoil in areas where surface water has eroded thickness below specifications.

END OF SECTION 312200

SECTION 312316.13
TRENCHING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Backfilling and compacting for utilities outside the building to utility main connections.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete.

B. Section 312200 - Grading: Site grading.

C. Section 312316 - Excavation: Building and foundation excavating.

1.03 DEFINITIONS

A. Finish Grade Elevations: Indicated on drawings.

1.04 SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Materials Sources: Submit name of imported materials source.

C. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used.

D. Compaction Density Test Reports.

1.05 DELIVERY, STORAGE, AND HANDLING

A. When necessary, store materials on site in advance of need.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. Bedding Material for Pipe: WSDOT Standard Specifications Section 9-03.12(3), Gravel Backfill for Pipe Zone. Bedding: 100 percent passing 1 inch

B. B. Backfill for Utility Trenches; Utility trench backfill shall be in accordance with WSDOT Section 7-08.3(3).

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench marks and intended elevations for the work are as indicated.

3.02 TRENCHING

A. Notify Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

B. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored.

C. Do not interfere with 45 degree bearing splay of foundations.

D. Cut trenches wide enough to allow inspection of installed utilities.

E. Hand trim excavations. Remove loose matter.

F. Remove excavated material that is unsuitable for re-use from site.

G. Remove excess excavated material from site.

H. Provide temporary means and methods, as required, to remove all water from trenching until directed by the Architect. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.

I. Determine the prevailing groundwater level prior to trenching. If the proposed trench extends less than 1 foot into the prevailing groundwater, control groundwater intrusion with perimeter drains routed to sump pumps, or as directed by the Architect.

3.03 PREPARATION FOR UTILITY PLACEMENT

A. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.

B. Compact subgrade to density equal to or greater than requirements for subsequent fill material.

C. Until ready to backfill, maintain excavations and prevent loose soil from falling into excavation.

3.04 BACKFILLING

A. Backfill to contours and elevations indicated using unfrozen materials.

B. Employ a placement method that does not disturb or damage other work.

C. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.

D. Maintain optimum moisture content of fill materials to attain required compaction density.

E. Slope grade away from building minimum 2 inches in 10 feet, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.

F. Correct areas that are over-excavated.
   1. Other areas: Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.

G. Compaction Density Unless Otherwise Specified or Indicated: 95 percent of maximum dry density.

H. Reshape and re-compact fills subjected to vehicular traffic.

3.05 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for general requirements for field inspection and testing.

END OF SECTION 312316.13

SECTION 312316
EXCAVATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Excavating for footings, slabs-on-grade, and paving.

B. Trenching for utilities outside the building to utility main connections.

1.02 RELATED REQUIREMENTS

A. Section 015713 - Temporary Erosion and Sediment Control: Slope protection and erosion control.

B. Section 210553 - Identification for Fire Suppression Piping and Equipment: Underground warning tapes at underground fire suppression lines.

C. Section 220553 - Identification for Plumbing Piping and Equipment: Underground warning tapes at underground plumbing lines.

D. Section 230553 - Identification for HVAC Piping and Equipment: Underground warning tapes at underground HVAC lines.

E. Section 260553 - Identification for Electrical Systems: Underground warning tapes at underground electrical lines.

F. Section 312200 - Grading: Grading.

G. Section 312316.13 - Trenching: Excavating for utility trenches outside the building to utility main connections.

PART 2 PRODUCTS

2.01 MATERIALS

A. Underground Warning Tapes:
   1. See Division 22 for underground warning tapes at underground plumbing lines.
   2. See Division 26 for underground warning tapes at underground electrical lines.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench mark and intended elevations for the work are as indicated.

B. Survey existing adjacent structures and improvements and establish exact elevations at fixed points to act as benchmarks.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. Locate, identify, and protect utilities that remain and protect from damage.

C. Grade top perimeter of excavation to prevent surface water from draining into excavation. Provide temporary means and methods, as required, to maintain surface water diversion until no longer needed, or as directed by Architect.

3.03 EXCAVATING

A. Excavate to accommodate new structures and construction operations.

B. Notify Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

C. Do not interfere with 45 degree bearing splay of foundations.

D. Provide temporary means and methods, as required, to remove all water from excavations until directed by Architect. Remove and replace soils deemed suitable by classification and which are excessively moist due to lack of dewatering or surface water control.

3.04 FILLING AND BACKFILLING

A. Do not fill or backfill until all debris, water, unsatisfactory soil materials, obstructions, and deleterious materials have been removed from excavation.

B. Install underground warning tape at buried utilities according to Sections 210553, 220553, 230553, and 260553.

C. See Section 312316.13 for fill, backfill, and compaction requirements at utility trenches.

3.05 PROTECTION

A. Divert surface flow from rains or water discharges from the excavation.

B. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.

C. Protect open excavations from rainfall, runoff, freezing groundwater, or excessive drying so as to maintain foundation subgrade in satisfactory, undisturbed condition.

D. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

E. Keep excavations free of standing water and completely free of water during concrete placement.

END OF SECTION 312316

SECTION 321216
ASPHALT PAVING

PART 1 GENERAL

1.01 WORK INCLUDES

A. Sawcutting and removing existing asphalt concrete pavement

B. Removing unsuitable base and base in areas to become planters

C. Installation of new aggregate base course as required.

D. Patching areas of removed HMA as denoted on Civil draw.

E. Surface sealer entire asphalt outside of the gates (south of the building).

1.02 RELATED REQUIREMENTS

A. Section 321713 - Parking Bumpers: Concrete bumpers.

B. Section 321723 - Pavement Markings.

1.03 REFERENCE STANDARDS

A. WSDOT Standard Specifications for Road, Bridge, and Municipal Construction, 2023

B. AASHTO M 147 - Standard Specification for Materials for Aggregate and Soil–Aggregate Subbase, Base, and Surface Courses 2017 (Reapproved 2021).

C. AI MS-2 - Asphalt Mix Design Methods 2015.

D. AI MS-19 - Basic Asphalt Emulsion Manual 2008.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Comply with applicable code for paving work on public property.

2.02 MATERIALS

A. Aggregate: As specified in WSDOT Specification.

2.03 ASPHALT PAVING MIXES AND MIX DESIGN

A. Use dry material to avoid foaming. Mix uniformly.

B. Submit proposed mix design of each class of mix for review prior to beginning of work.

2.04 SOURCE QUALITY CONTROL

A. Test mix design and samples in accordance with AI MS-2.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that compacted subgrade is dry and ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

3.02 AGGREGATE BASE COURSE

A. Place and compact aggregate base course.

3.03 PLACING ASPHALT PAVEMENT - SINGLE COURSE

A. Install Work in accordance with State of WA Highways standards.

B. Place asphalt within 24 hours of applying primer or tack coat.

C. Compact pavement by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.

D. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.

3.04 SEAL COAT

A. Apply seal coat to asphalt surface course in accordance with AI MS-19.

3.05 SCHEDULE

A. Patched parking area and trenches: Single course of 3-1/2 inch compacted thickness, sand seal coat unless noted otherwise on Civil drawings.

END OF SECTION 321216

SECTION 321313
CONCRETE PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete sidewalks, integral curbs, gutters, and Embedded Trench Drain.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete.

B. Section 079200 - Joint Sealants: Sealing joints.

C. Section 312200 - Grading: Preparation of site for paving and base and preparation of subsoil at pavement perimeter for planting.

D. Section 321216 - Asphalt Paving: Asphalt wearing course.

E. Section 321713 - Parking Bumpers: Precast concrete parking bumpers.

F. Section 321723 - Pavement Markings.

1.03 REFERENCE STANDARDS

A. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete 2022a.

B. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types) 2018.

1.04 SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Product Data: Provide data on joint filler, admixtures, and curing compound.

PART 2 PRODUCTS

2.01 PAVING ASSEMBLIES

A. See Civil Drawings

2.02 FORM MATERIALS

A. Wood form material, profiled to suit conditions.

B. Joint Filler: Preformed; non-extruding bituminous type (ASTM D1751).

2.03 REINFORCEMENT

A. As indicated on Civil Drawings

2.04 CONCRETE MATERIALS

A. Obtain cementitious materials from same source throughout.

2.05 ACCESSORIES

2.06 CONCRETE MIX DESIGN

A. See Civil Drawings

2.07 MIXING

A. Transit Mixers: Comply with ASTM C94/C94M.

PART 3 EXECUTION

3.01 SUBBASE

3.02 FORMING

A. Place and secure forms to correct location, dimension, profile, and gradient.

3.03 PLACING CONCRETE

A. Ensure reinforcement, inserts, embedded parts, formed joints and ____ are not disturbed during concrete placement.

3.04 JOINTS

A. See Civil Drawings

END OF SECTION 321313

SECTION 321713
PARKING BUMPERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Precast concrete parking bumpers and anchorage.

1.02 RELATED REQUIREMENTS

A. Section 321723 - Pavement Markings.

1.03 REFERENCE STANDARDS

A. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement 2022.

B. ASTM C150/C150M - Standard Specification for Portland Cement 2022.

C. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete 2010a (Reapproved 2016).

D. ASTM C330/C330M - Standard Specification for Lightweight Aggregates for Structural Concrete 2017a.

1.04 SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Product Data: Provide unit configuration, dimensions.

PART 2 PRODUCTS

2.01 MATERIALS

A. Parking Bumpers: Precast concrete, complying with the following:
   1. Cement: ASTM C150/C150M, Portland Type I - Normal; white color.
   2. Concrete Materials: ASTM C330/C330M aggregate, water, and sand.
   3. Reinforcing Steel: ASTM A615/A615M, deformed steel bars; unfinished, strength and size commensurate with precast unit design.
   4. Air Entrainment Admixture: ASTM C260/C260M.
   5. Concrete Mix: Minimum 5,000 psi compressive strength after 28 days, air entrained to 5 to 7 percent.
   6. Use rigid molds, constructed to maintain precast units uniform in shape, size and finish. Maintain consistent quality during manufacture.
   7. Embed reinforcing steel, and drill or sleeve for two dowels.
   8. Cure units to develop concrete quality, and to minimize appearance blemishes such as non-uniformity, staining, or surface cracking.
   9. Minor patching in plant is acceptable, providing appearance of units is not impaired.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install units without damage to shape or finish. Replace or repair damaged units.

B. Install units in alignment with adjacent work.

C. Fasten units in place with 2 dowels per unit.

END OF SECTION 321713

SECTION 321723
PAVEMENT MARKINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Painted pavement markings.

1.02 RELATED REQUIREMENTS

A. Section 321216 - Asphalt Paving.

B. Section 321313 – Concrete Paving

C. Section 321713 - Parking Bumpers.

1.03 REFERENCE STANDARDS

A. AASHTO MP 24 - Standard Specification for Waterborne White and Yellow Traffic Paints 2015 (Reapproved 2020).

1.04 SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used.

C. Manufacturer's Instructions:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

D. Installer's qualification statement.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience and approved by manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver paint in containers of at least 5 gallons accompanied by batch certificate.

B. Store products in manufacturer's unopened packaging until ready for installation.

1.07 FIELD CONDITIONS

A. Do not install products under environmental conditions outside manufacturer's absolute limits.

B. Do not apply paint if temperature of surface to be painted or the atmosphere is less than 50 degrees F or more than 95 degrees F.

1.08 SEQUENCING

A. Allow new pavement surfaces to cure for a period of not less than 14 days before application of markings.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Painted Pavement Markings:
   1. Kelly-Moore Paints; 1254 Waterborne Fast Dry Traffic Interior/Exterior Paint, Flat.
   2. Substitutions: See Section 012500 – Substitution Procedures

2.02 PAINTED PAVEMENT MARKINGS

A. Painted Pavement Markings: As indicated on drawings.
   1. Marking Paint: In accordance with AASHTO MP 24.
      a. Parking Lots: White.

b. Symbols and Text: White.
c. Wheelchair Symbols: Provide blue and white.

PART 3 EXECUTION

3.01 EXAMINATION

A. Identify existing markings for removal.

B. Verification of Conditions: Verify that pavement is dry and ready for installation.

C. Notify Architect of unsatisfactory conditions before proceeding.

3.02 PREPARATION

A. Place barricades, warning signs, and flags as necessary to alert approaching traffic.

B. Clean surfaces prior to installation.
1. Remove dust, dirt, and other debris.

C. Apply paint stencils by type and color at necessary intervals.

3.03 INSTALLATION

A. General:
1. Position pavement markings as indicated on drawings.
2. Field location adjustments require approval of Architect.

B. Painted Pavement Markings:
1. Apply in accordance with manufacturer's instructions.
2. Marking Paint: Apply uniformly, with sharp edges.
a. Applications: One coat.
b. Wet Film Thickness: 0.015 inch, minimum.
c. Stencils: Lay flat against pavement, align with striping, remove after application.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Allow the pavement marking to set at least the minimum time recommended by manufacturer.

3.05 PROTECTION

A. Prevent approaching traffic from crossing newly applied pavement markings.

B. Replace damaged or removed markings at no additional cost to Owner.

END OF SECTION 321723

SECTION 323113
CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Posts, rails, and frames.

B. Wire fabric.

C. Barbed wire.

D. Concrete.

E. Manual gates with related hardware.

F. Cantilelever Slide Gate

G. Automatic gate operators.

H. Pre-Hung Pedestrian Gate

I. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete anchorage for posts.

B. Section 087100 - Door Hardware: Gate locking device.

1.03 REFERENCE STANDARDS

A. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete 2022a.

B. ASTM F567 - Standard Practice for Installation of Chain-Link Fence 2014a (Reapproved 2019).

C. ASTM F2200 - Standard Specification for Automated Vehicular Gate Construction 2020.

D. CLFMI CLF-SFR0111 - Security Fencing Recommendations 2014.

E. FS RR-F-191/1D - Fencing, Wire and Post Metal (Chain-Link Fence Fabric) 1990.

F. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.

G. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations Current Edition, Including All Revisions.

I. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations Current Edition, Including All Revisions.

J. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Product Data: Provide data on fabric, posts, accessories, fittings and hardware.

C. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, and schedule of components. See CLFMI CLF-SFR0111 for planning and design recommendations.

D. Manufacturer's Qualification Statement.

E. Fence Installer Qualification Statement.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Fence Installer: Company with demonstrated successful experience installing similar projects and products, with not less than five years of documented experience.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Chain Link Fences and Gates:
   1. Master-Halco, Inc; www.masterhalco.com/#sle.
   2. Merchants Metals; www.merchantsmetals.com/#sle.
   3. Substitutions: See Section 012500 – Substitution Procedures

B. Chain Link Cantilever Slide Gate
   1. Basis of Design:
      a. Merchants Metals; Secure-Trac
   2. Substitutions: See Section 012500 – Substitution Procedures

C. Automatic Gate Operators:
   1. Tymetal Corp; www.tymetal.com/#sle.
   2. Substitutions: See Section 012500 – Substitution Procedures

D. Pre-hung Pedestrian Gate:
   1. Basis of Design:
      a. Merchants Metals; Tuf-Guard
   2. Substitutions: See Section 012500 – Substitution Procedures

2.02 COMPONENTS

A. Line Posts: 1.9 inch diameter. Unless otherwise indicated on Drawings

B. Corner and Terminal Posts: 2.38 inch diameter. Unless otherwise indicated on Drawings

C. Gate Posts: diameter. As indicated on Drawings

D. Fabric: 2 inch diamond mesh interwoven wire, 6 gauge, 0.1920 inch thick, top selvage knuckle end closed, bottom selvage twisted tight.

E. Tension Wire: 6 gauge, 0.1920 inch thick steel, single strand.

F. Tie Wire: Aluminum alloy steel wire.

2.03 MATERIALS

A. Posts, Rails, and Frames:
   1. Line Posts: Type I round in accordance with FS RR-F-191/1D.
   2. Terminal, Corner, Rail, Brace, and Gate Posts: Type I round in accordance with FS RR-F-191/1D.

B. Wire Fabric: As indicated on Drawings

C. Concrete:
   1. Ready-mixed, complying with ASTM C94/C94M; normal Portland cement; 2,500 psi strength at 28 days, 3 inch slump;

2.04 MANUAL GATES AND RELATED HARDWARE

A. Hardware for Double Swinging Gates: 180 degree hinges, 2 for gates up to 60 inches high, 3 for taller gates; drop bolt on inactive leaf engaging socket stop set in concrete, active leaf latched to inactive leaf preventing raising of drop bolt, padlock hasp; keepers to hold gate in fully open position.

B. Hinges: Finished to match fence components.
   1. Brackets: Round.

2. Mounting: Center.
3. Closing: Manual.
4. Products:
    a. D&D Technologies USA, Inc; SHUT IT, www.ddtech.com/#sle.

C. Latches: Finished to match fence components.
1. Brackets: Round.
2. Products:
1. Substitutions: See Section 012500 – Substitution Procedures

2.05 CHAIN LINK CANTILEVER SLIDE GATE

A. Product
1. SECURE-TRAC® CHAIN LINK CANTILEVER SLIDE GATE
    a. manufactured in accordance with ASTM F 1184 Type II Class 2, and in compliance with UL-325, and ASTM 2200 (No substitution). Gate to be made of Aluminum Alloy 6005-T61. All square members are 2” sq. weighing 0.94 lb. /ft. (139 kg/m). Complete frame welded to one piece track and 4” x 2” bottom rail weighing 1.71 lbs. /ft. (2.54 kg/m). Supply 2 truck assemblies that are swivel type having lubricated and sealed ball bearing wheels.
    b. Gates 31’0” (9449 mm) thru 40’0” (12192 mm) dual top tracks member weighing 6.36 lb./ft. (9.45kg/m). The bottom rail 4” x 2” weighing 1.71 lb. /ft. (2.54 kg/m). Top tracks require two additional truck assemblies. Diagonal adjustable 1/4” (6 mm) stainless steel truss cables (2) provided inside each panel of the gate.
    c. Chain Link 9 gauge wire 2” fabric options choose one: Galvanized before Weaving (GBW)
    d. Finish – choose one: Natural Aluminum or Polymer coated horizontal slide gates and posts shall match the coating type and color as that specified for the fence framework. Finish shall comply with Corrosion Resistance Salt Spray Test per ASTM B117, Impact Resistance per ASTM D2794, and Adhesion per ASTM D3359
    e. Gateposts, 4” O.D. (101.6 mm) schedule 40 weighing 9.11 lb. /ft. (13.6 kg/m). Single gates with single tracks require 3 gate posts. (1 latch post and 2 support posts)
    f. Electrically operated horizontal slide gates must be manufactured and installed to comply with the safety requirements of ASTM F2200 and UL 325.
2. Setting Materials:
    a. Concrete: Minimum 28 day compressive strength of 3,000 psi.

2.06 AUTOMATIC GATE OPERATORS

A. Sliding Gates: Pre-wired, hi-low pedestal mounted gate operator for horizontal sliding gates, per ASTM F2200 and UL 325.
1. Operating type: drive belt.
2. Pedestal: Intercoms Online part PD1005 or similar
3. Control Functions: Open, Pause, Close.
4. Maximum Open/Close Time: 10 seconds.
5. Access: Card Readers/keypad (hi-lo) Opticom IR Emergency Vehicle Detector, Fire Department Knox Box Gate Switch.
6. Egress: In-Ground exit vehicle sensor
7. Maximum gate weight: 1,000 pounds (373 kilograms).
8. Horsepower Rating: Suitable for connected load.
9. Entrapment Protection Devices: Provide sensing devices and safety mechanisms complying with UL 325.
    a. Primary Device: Provide electric sensing edge, wireless sensing, NEMA 1 photo eye sensors, or NEMA 4X photo eye sensors as required with momentary-contact control device.
    b. Secondary Device: Provide electric sensing edge with wireless edge kit or non-monitored safety edge as an option along with continuous-constant control device.

10. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
    a. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:

2.07 PRE-HUNG PEDESTRIAN GATE

A. Product
1. Tuf-Guard Pre-Hung Gate with Chain link fabric - factory assembled - ready to install
2. Gate frame: Galvanized steel tubular members manufactured per ASTM F2408, with a minimum yield strength of 45,000 psi; with minimum 2” square 14 gauge per ASTM F900.
3. gate height: 7’-0”
4. Width: 4’-0” between gate posts
5. Chain Link: 2" GBW
6. Posts: Galvanized square steel tubular members manufactured per ASTM F2408, having minimum yield strength of 45,000 psi; with minimum post size per ASTM F900.
    a. Gate Panel posts shall be 3” square; 12 gauge.
    b. Hinges: Pressed steel hinges shall be securely attached to post to prevent slippage and allow gate leaf to swing 180°.
    c. Color: Galvanized or Gray

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Verify that areas are clear of obstructions or debris.

3.02 PREPARATION

A. Removal: Obstructions or debris.

3.03 FENCE AND VEHICULAR GATE INSTALLATION

A. Install framework, fabric, accessories and gates in accordance with ASTM F567.

B. Place fabric on outside of posts and rails.

C. Set intermediate posts plumb , in concrete footings with top of footing 2 inches above finish grade. Slope top of concrete for water runoff.

D. Line Post Footing Depth Below Finish Grade: ASTM F567.

E. Corner, Gate and Terminal Post Footing Depth Below Finish Grade: ASTM F567.

F. Brace each gate and corner post to adjacent line post with horizontal center brace rail. Install brace rail one bay from end and gate posts.

G. Provide top rail through line post tops and splice with 6 inch long rail sleeves.

H. Install center brace rail on corner gate leaves.

I. Do not stretch fabric until concrete foundation has cured 28 days.

J. Stretch fabric between terminal posts or at intervals of 100 feet maximum, whichever is less.

K. Position bottom of fabric 2 inches above finished grade.

L. Fasten fabric to top rail, line posts, braces, and bottom tension wire with tie wire at maximum 15 inches on centers.

M. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips.

N. Install bottom tension wire stretched taut between terminal posts.

O. Install support arms sloped inward and attach barbed wire; tension and secure.

P. Do not attach the hinged side of gate to building wall; provide gate posts.

Q. Install hardware and gate with fabric to match fence.

R. Provide concrete center drop to footing depth and drop rod retainers at center of double gate openings.

S. Install gate locking device specified in Section 087100.

T. Peen all bolts upon installation.

U. Install operator in accordance with manufacturer's instructions and in accordance with NFPA 70.

3.04 CANTILEVER GATE

A. Framework Installation
   1. Posts: Posts shall be set plumb in concrete footings. Minimum footing diameter four times the largest cross section of the post up to a 4.00” (101.6 mm) dimension and three times the largest cross section of post greater than a 4.00” (101.6 mm) dimension. Top of concrete footing to be [at grade crowned to shed water away from the post or 6 inches (152 mm) below grade] crowned to shed water away from the post

B. Cantilever Gate Installation
   1. Horizontal Slide Gates: Install according to manufacturer’s instructions and in accordance with ASTM F567. Gates shall be plum in the closed position, installed to slide with an initial pull force no greater than 40 lbs. (18.14 kg). Ground clearance shall be 3 in. (76 mm), grade permitting. Electrically operated gate installation must conform to ASTM F2200 and UL 325.

C. Electrical Grounding
   1. Grounding: A licensed electrical contractor shall install grounding when required.

3.05 PRE-HUNG PEDESTRIAN GATE

A. Installation
   1. Install Pre-hung Gate manufactured with a welded brace below grade to help prevent shipping damages.
   2. Attach all hardware to gate in such a way that it cannot be removed by unauthorized persons.
   3. Set posts in concrete. Dig holes having a diameter 4 times the diameter of the post, and 6” deeper than the bottom of the post. Crown concrete at top to shed water.

3.06 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch.

B. Maximum Offset From True Position: 1 inch.

3.07 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals, for closeout submittals.

B. See Section 017900 - Demonstration and Training, for additional requirements.

C. Demonstrate proper operation of equipment to Owner's designated representative.

D. Training: Train Owner's personnel on operation and maintenance of system.
   1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
   2. Provide minimum of two hours of training.

END OF SECTION 323113

SECTION 334211
STORMWATER GRAVITY PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Stormwater drainage piping.

B. Stormwater pipe accessories.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete for cleanout base pad construction.

B. Section 312316 - Excavation: Excavating of trenches.

C. Section 312316.13 - Trenching: Excavating, bedding, and backfilling.

D. Section 334230 - Stormwater Drains.

1.03 REFERENCE STANDARDS

A. ASTM A48/A48M - Standard Specification for Gray Iron Castings 2022.

B. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications 2020.

C. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings 2021.

1.04 SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Product Data: Provide data indicating pipe, pipe accessories.

PART 2 PRODUCTS

2.01 STORMWATER PIPE MATERIALS

A. Plastic Pipe: ASTM D2729, Poly Vinyl Chloride (PVC) material; inside nominal diameter of 4 inches , bell and spigot style solvent sealed joint end.

2.02 PIPE ACCESSORIES

A. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.

B. Trace Wire: Magnetic detectable conductor, clear plastic covering, imprinted with "Stormwater Service" in large letters.

C. Downspout Boots: Smooth interior without boxed corners or choke points; include integral lug slots and on-body cleanout and cover with neoprene gaskets.
   1. Configuration: Angular.
   2. Material: Cast iron; ASTM A48/A48M; casting thickness 3/8 inch (9.5 mm), minimum.
   3. Accessories: Manufacturer's standard stainless steel fasteners, stainless steel building wall anchors, and rubber coupling.
   4. Manufacturers:

2.03 BEDDING AND COVER MATERIALS

A. Bedding: As specified in Section 312316.13.

B. Cover: As specified in Section 312316.13.

PART 3 EXECUTION

3.01 TRENCHING

A. See Section 312316.13 - Trenching for additional requirements.

B. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

3.02 INSTALLATION

A. Install pipe, fittings, and accessories in accordance with manufacturer's instructions. Seal watertight.
   1. Plastic Pipe: Also comply with ASTM D2321.

B. Lay pipe to slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch in 10 feet.

C. Connect to building storm drainage system, foundation drainage system, and utility/municipal system.

D. Install continuous trace wire 6 inches above top of pipe; coordinate with Section 312316.13.

3.03 PROTECTION

A. Protect pipe and bedding cover from damage or displacement until backfilling operation is in progress.

END OF SECTION 334211

SECTION 334230
STORMWATER DRAINS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Prefabricated trench drains.

B. Frames and grates.

1.02 RELATED REQUIREMENTS

A. Section 334211 - Stormwater Gravity Piping.

1.03 REFERENCE STANDARDS

A. AASHTO HB - Standard Specifications for Highway Bridges 2005, with Errata.

B. ACI CODE-318 - Building Code Requirements for Structural Concrete and Commentary 2019 (Reapproved 2022).

C. ACI PRC-305 - Guide to Hot Weather Concreting 2020.

D. ACI PRC-306 - Guide to Cold Weather Concreting 2016.

E. ACI SPEC-301 - Specifications for Concrete Construction 2020.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Installation of stormwater drains with piping and other structures.

B. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.05 SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Product Data: Weight rating for catch basins, drop inlets, trench drains, and frame and grates.

C. Shop Drawings: Indicate stack assembly, invert elevations, opening sizes, and pipe angles.

D. Manufacturer's Installation Instructions: Indicate special procedures for assembly.

E. Manufacturer's qualification statement.

1.06 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI SPEC-301 and ACI CODE-318.

B. Follow recommendations of ACI PRC-305 when concreting during hot weather.

C. Follow recommendations of ACI PRC-306 when concreting during cold weather.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Trench Drains:
   1. Dura Trench a brand of Eric'sons, Inc; www.duratrench.com/#sle.
   2. MIFAB, Inc; www.mifab.com/#sle.
   3. Substitutions: See Section 016000 - Product Requirements.

B. Trench Drain Grates:
   1. EJ; www.ejco.com/#sle.
   2. SLIPNOT Metal Safety Flooring; Drain Covers: www.slipnot.com/#sle.
   3. Substitutions: See Section 012500 – Substitution Procedures

2.02 CATCH BASIN, TRENCH DRAIN, CLEANOUT, AND AREA DRAIN COMPONENTS

A. Lids and Drain Covers: Cast iron
   1. Trench Drain:
      a. Lid Design: See Civil Drawings

2.03 PREFABRICATED TRENCH DRAINS

A. Prefabricated Trench Drain: Polymer concrete, glass fiber reinforced, metal installation brackets.
   1. Weight Rating: Pedestrian according to AASHTO HB.
   2. Frames and Grates: Galvanized steel support, steel grate, linear pattern, match drain opening size.
   3. Products:
      a. Dura Trench a brand of Eric'sons, Inc; Prefabricated Trench Drains: www.duratrench.com/#sle.
      b. MIFAB, Inc; T1400-PB-13: www.mifab.com/#sle.
      c. Substitutions: See Section 012500 – Substitution Procedures

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify items provided by other sections of work are properly sized and located.

B. Verify built-in items are in proper location and ready for roughing into work.

C. Verify excavation location and depth are correct.

3.02 EXCAVATION AND FILL

A. Hand trim excavation for accurate placement to indicated elevations.

B. Backfill with cover fill, tamp in place and compact, then complete backfilling.

3.03 INSTALLATION

A. Establish elevations and pipe inverts for inlets and outlets as indicated in drawings.

B. Prefabricated Drop Inlets or Trench Drains:
   1. Place base section plumb and level.
   2. Install according to manufacturer's instructions.
   3. Secure installation brackets.
   4. Protect trench drain from foreign material entrance.

C. Frames and Grates:
   1. Place frame plumb and level.
   2. Mount frame on prefabricated drop inlets or trench drains according to manufacturer's instructions.
   3. Place grate in frame securely.

END OF SECTION 334230