SECTION 00 9112

ADDENDUM NUMBER 2

PARTICULARS

DATE: NOVEMBER 26, 2024

PROJECT: MEDFORD WATER OPERATION CENTER

ARCHITECT'S PROJECT NUMBER: 22085

OWNER'S PROJECT NUMBER: CIPW-22-00280

OWNER: MEDFORD WATER

ARCHITECT: SODERSTROM ARCHITECTS

TO: PROSPECTIVE BIDDERS:

THIS ADDENDUM FORMS A PART OF THE CONTRACT DOCUMENTS AND MODIFIES THE ORIGINALPROCUREMENT DOCUMENTS DATED 11/7/2024, WITH AMENDMENTS AND ADDITIONS NOTED BELOW.

ACKNOWLEDGE RECEIPT OF THIS ADDENDUM IN THE SPACE PROVIDED IN THE BID FORM AND BELOW. FAILURE TO DO SO MAY DISQUALIFY THE BIDDER.

CHANGES TO THE PROJECT MANUAL - INTRODUCTORY REQUIREMENTS, PROCUREMENT REQUIREMENTS AND CONTRACTING REQUIREMENTS:

SECTION 00 0102 – PROJECT INFORMATION

Revise Paragraph 1.02, Section A, sub paragraph 2 as follows:
Decant building of approximately 6,000 square foot one-story construction consisting of pre-engineered metal building structure on concrete slab-on-grade with ~~insulated~~ **standing seam** metal roof panels.

Revise Paragraph 1.02, Section A, sub paragraph 3 as follows:
Storage building of approximately 12,000 square foot one-story construction consisting of pre-engineered metal building system on concrete slab-on-grade with **standing seam** metal roof panels and no exterior walls.

Add Paragraph 1.02, Section B as follows:
B. All buildings to be designed to Risk Category IV structural design requirements.

Section re-issued in entirety

SECTION 00 0110 – TABLE OF CONTENTS

Add SECTION 21 2201 – HYBRID FIRE EXTINGUISHING SYSTEM

Section reissued in entirety

SECTION – CONTRACT DOCUMENTS / INFORMATION FOR BIDDERS

Revise Special Requirements, WIFIA Contract Language, Economic and Miscellaneous Authorities, Debarment and Suspension (page 57) as follows:

Contractor certifies that it will not knowingly enter into a contract with anyone who is ineligible under the 2 CFR part 180 and part 1532 **(per Executive Order 12549, 51 FR 6370, February 21, 1986) or who is prohibited under Section 306 of the Clean Air Act or Section 508 of the Clean Water Act** to participate in the Project. Suspension and debarment information can be accessed at http://www.sam.gov. Contractor represents and warrants that it has or will include a term or conditions requiring compliance with this provision in all of its subcontracts under this Agreement.

Revise Notice of Requirement for Affirmative Action to Ensure Equal Employment Opportunity (page 63) as follows:

Tabular value for Goals for female participation in each trade: **6.9%**

These two pages have been re-issued with this addendum.

Add Certification Regarding Lobbying Form

This page has been included with this addendum

CHANGES TO THE PROJECT MANUAL - SPECIFICATIONS:

SECTION 07 2100 – Thermal Insulation

Add to Paragraph 1.02 Related Requirements, new sub-paragraph B as follows:
B. Section 07 6110 - Sheet Metal Roofing - Alternate : Insulation requirements for board insulation at roof assembly

Revise Paragraph 2.01 Applications, Subparagraph C as follows:
C. Insulation over Roof Deck (Standing Seam Alternate): Polyisocyanurate board. **See Section 07 6110**

Section reissued in entirety

SECTION 07 6110 – SHEET METAL ROOFING – ALTERNATE

Revise Paragraph 2.05 Secondary Framing, Subparagraph A as follows:

A. **Support for Roofing and Continuous Insulation: Continuous thermal Z-girts.**
   1. **Fiberglass reinforced plastic (FRP) girts that provide roofing attachment support for standing seam roof.**
   2. **Depth: As required for thickness of insulation.**
   3. **Length: 96 inches for girts.**
   4. **Spacing: as recommended by girt manufacturer and roof attachment requirements, perpendicular to roof slope.**
   5. **Fasteners: As recommended by clip manufacturer.**
   6. **Products:**
      a. **Advanced Architectural Products, LLC; GreenGirt CMH Roof System**
      b. **Substitutions: See Section 01 6000 - Product Requirements**

Section reissued in entirety

SECTION 07 6200 – SHEET METAL FLASHING AND TRIM

Revise Paragraph 2.01 Sheet Materials, Sub Paragraph A as follows:
A. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 G90/Z275 zinc coating **or AZ-50 aluminum zinc alloy coating**; minimum 24-gauge, 0.0239-inch 24-gauge, 0.0239-inch thick base metal, shop pre-coated with modified silicone coating.

Revise Paragraph 2.03 Gutters and Downspouts, Sub Paragraph A as follows:
Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 G90/Z275 zinc coating **or AZ-50 aluminum zinc alloy coating**; minimum 22-gauge, 0.0313-inch thick base metal, shop pre-coated with modified silicone coating.

Section reissued in entirety

SECTION 07 7200 – ROOF ACCESSORIES

Revise Paragraph 2.01 Roof Curbs, Sub Paragraph B, section 2 as follows:
Insulate inside curbs with 1-1/2 inch thick fiberglass or **other** insulation **as specified in Section 07 2100 for a minimum R-value of R-5. Plastic insulation must comply with the requirements of OSSC Chapter 26**

Section reissued in entirety

SECTION 07 7300 – FALL PROTECTION DEVICES

Delete Paragraph 2.02 Manufactured Assemblies, Sub paragraph A

SECTION 13 3419 – METAL BUILDING SYSTEMS

Revise Paragraph 1.02 Related Requirements, Sub paragraph B as follows:
B. Section 07 **6110** – **Sheet** Metal Roofing

Revise Paragraph 2.01 Assemblies, Sub paragraph B as follows:
B. Primary Framing: Rigid frame of rafter beams and columns, canopy beams, intermediate columns, ~~**and braced end frames**~~, and wind bracing limited within the extents of wall and roof panel areas. Portal moment frames are acceptable for lateral resistance. Diagonal brace frames are not acceptable for lateral resistance.

Revise Paragraph 2.01 Assemblies, Sub paragraph E as follows:
E. Roof System: Insulated metal panels **at enclosed buildings, standing seam metal roof panels at un-enclosed buildings**, oriented parallel to slope, with sub-girt framing/anchorage assembly, and accessory components.

Section reissued in entirety.

SECTION 21 0500 COMMON WORK RESULTS FOR FIRE SUPPRESSION

Add 1.02, B, 8: Section 21 2201, Hybrid Fire Extinguishing System.

Section reissued in entirety

SECTION 21 1300 FIRE SUPPRESSION SPRINKLER SYSTEMS

Add 1.02, B, 7: Section 21 2201, Hybrid Fire Extinguishing System.

Section reissued in entirety

SECTION 21 2201 HYBRID FIRE EXTINGUISHING SYSTEM

Add Section in its entirety.

SECTION 26 0573 ELECTRICAL DISTRIBUTION SYSTEM STUDIES

Add Switching Transient Analysis Study throughout section.

Section reissued in entirety

SECTION 28 3100 FIRE DETECTION AND ALARM

Add additional inputs under Fire Safety Systems Interfaces, 3.01, N, 1, a/b/c.
Section reissued in entirety

CHANGES TO DRAWINGS:

DRAWING A.A0.01
1. At Detail R1-Alt, added R-value for insulation

DRAWING A.A2.01
1. Revised floor plan for removal of IT Sprinklers 143a.

DRAWING A.A2.13
1. Revised floor plan for removal of IT Sprinklers 143a.

DRAWING A.A2.14
1. Revised floor plan for removal of IT Sprinklers 143a.

DRAWING A.A3.11
1. Storefront Type L2 revised

DRAWING A.A6.01
1. Revised floor plan for removal of IT Sprinklers 143a.

DRAWING A.A6.11
1. Revised floor plan for removal of IT Sprinklers 143a.

DRAWING A.A6.12
1. Revised floor plan for removal of IT Sprinklers 143a.

DRAWING A.A8.03
1. Revised window types K and L2

DRAWING A.A8.04
1. Added notation for bullet resistant glazing at window types 1, 8, and 10

DRAWING A.A8.11
1. Revised Details 8 and 13 to eliminate reference to waterproofing and exterior underground insulation

DRAWING A.A9.01
1. Remove IT Sprinklers Room 143a
2. Revise floor finishes at Rooms 114 and 115
3. Add Finish Note #17

DRAWING A.M0.02
1. Revised Radiant Slab Embedded Tube Schedule for removal of wall at IT Sprinklers 143a.

DRAWING A.M2.11
1. Revised floor plan for removal of wall at IT Sprinklers 143a.

DRAWING A.M2.12
1. Revised duct layout for removal of soffit at Break 134.

DRAWING A.M3.11
1. Revised floor plan for removal of wall at IT Sprinklers 143a.

DRAWING A.P2.22

1. Revised Piping to Break room 134.

DRAWING A.E0.02

1. Revise type ‘B3’ light fixture

DRAWING A.E2.11

1. Revise lighting layout in IT Work 143.

DRAWING A.E2.12

1. Revise lighting layout in Break 134.

DRAWING A.E3.11

1. Revise power device layout in IT Work 143.

DRAWING A.E4.01

1. Add power connection to vortex system in IT/OT server 142.

DRAWING A.E6.03

1. Revise panel schedule 2UPS adding power connection to Vortex system.

DRAWING D.A2.01

1. Add wall at Grid 4 to match Structural

DRAWING D.A3.11

1. Revise details 4 and 5 to add wall at Grid 4 to match Structural

DRAWING V.A0.01

1. Revise Detail R1 to remove thermal break

DRAWING F.P0.01

1. Add Fuel Diesel Supply (FOS) and Fuel Diesel Return (FOR) piping system.

DRAWING F.P3.01

1. Add Fuel Diesel Return (FOR) piping from AST-2 to Generators.
2. Revised Fuel Handling System sequence of operation.

DRAWING F.P6.01

1. Revised Detail #5 Emergency Generator Day Tank Piping Schematic.

BIDDER QUESTIONS

Q1: Please clarify roof panel type on the open-wall buildings: Decant, Fuel Station, and Storage. 13 3419 spec only lists insulated roof panel but architectural roof plans state "standing seam metal panel roof by PEMB manufacturer", not insulated metal panel. Additionally, this contradicts 00 0102-1 section 1.02.A.2 which states IMP roof on Decant Bldg.

Answer: Insulated Metal Panels at enclosed buildings, standing seam roof by PEMB manufacturer at un-enclosed buildings. See revised Specification Sections 00 0102 and 13 3419.

Q2: Please provide specification for single-skin standing seam roof panel. 13 3419 references specification 07 4113 Metal Roof Panels but such section is not present in the bid documents.

Answer: This should reference Section 07 6110 – Specification Section 13 3419 has been updated.

Q3: No roof assemblies are shown in bid set plans for Decant, Fuel Station, or Storage buildings. Please provide roof assembly descriptions.

Answer: Roof assemblies at these buildings to be standing seam panels supported by framing/decking as required by PEMB manufacturer. No insulation is required.

Q4: Ref. bid set page V.A0.01 Vehicle building roof assembly RI: May we omit the thermal block shown here? Using a thermal block underneath an IMP roof is highly unusual, and a thermal block is not part of the manufacturer's tested roof assembly for determination of insulative properties.

Answer: Yes, thermal block can be eliminated from this assembly. See revised R1/V.A0.01

Q5: Does the Fuel Station building include metal soffit panel per spec 07 4123 section 2.04?

Answer: No soffit panels at the Fuel Station

Q6: On Fuel Station building, may we design the eave extension purlins (i.e. purlins north of F.L. A and south of F.L. B) as continuous across the rafter? In other words, may we use a rafter that is located below the purlin space at the eave extensions?

Answer: Yes, Fuel Station design is conceptual for size, roof slope, and clearance requirements. Structure design is adaptable as required to meet these conditions

Q7: On Fuel Station building, is the I-beam column member profile shown on the plans a strict requirement? For example, a square HSS column may result in a more efficient design.

Answer: Yes, Fuel Station design is conceptual for size, roof slope, and clearance requirements. Structure design is adaptable as required to meet these conditions

Q8: On Fuel Station building, may additional bracing members not shown on the bid set be added such as flange braces?

Answer: Yes, Fuel Station design is conceptual for size, roof slope, and clearance requirements. Structure design is adaptable as required to meet these conditions

Q9: What is the required R-value for the rigid board insulation of Admin roof assembly RI-ALT (A.A0.01)?

Answer: R-30 min - see revised R1-Alt

Q10: Ref. bid set page A.AO.01 R1-ALT roof assembly: What's the purpose of the additional zee purlins that are located above the roof deck? There are several issues with this:

a. This is not the typical way a standing seam roof with rigid board insulation would be installed. A more standard method would be to use 8” long screws to attach the SSR clips (plus steel bearing plates to prevent screw tension from deforming the insulation) through the insulation directly to the structural deck.
b. The zee purlins are cause for concern from an energy code compliance perspective. The steel members create significant thermal bridges which degrade the insulative properties of the roof assembly. This assembly is not covered by the standard tables in Normative Appendix A of ASHRAE 90.1; is there a testing data available that shows the effective U-value of the R1-ALT roof assembly for energy code compliance purposes?

c. R1-ALT does not qualify as continuous insulation if zee purlins interrupt the insulation as shown on R1-ALT/A.A0.01. If the zee purlins were removed, R1-ALT would then qualify as continuous insulation entirely above deck. Per ASHRAE 90.1-2019 prescriptive envelope requirements in Table 5.5-4, roof would only require R-30ci or 5.2” of the specified rigid board (2 x 2.6”).
d. Because the zee purlin direction runs parallel to the decking rib direction, there is no way to ensure that the bottom leg of the zee will always align with the high of the structural deck, so in some places you will have the zee supported partially or totally by the 1/4” dens glass sheathing only.

Answer: Z-girts to be thermally broken as noted in Detail R1-Alt and as noted in Revised Specification Section 07 6110 - this eliminates the thermal bridging issue. Z-girts are proposed because the team has experienced supply issues with the procurement of screws long enough to penetrate the coverboard/insulation/decking/structural assembly. Z-Girts can run perpendicular to structural deck - they are shown diagrammatically in referenced detail to indicate products used.

Q11: What is the module size of wall panel Type A? Based on wall elevations, panel module appears to scale to 36".

Answer: 36" inches. See Revised 07 4213.19

Q12: What is the module size of wall panel Type B? Based on wall elevations, panel module appears to scale to 36".

Answer: 36" inches. See Revised 07 4213.19

Q13: What is the module size of wall panel Type C?

Answer: 36" inches. See Revised 07 4213.19

Q14: What is the module size of wall panel Type D? Based on wall elevations, panel module appears to scale to 24".

Answer: 36" inches. See Revised 07 4213.19

Q15: Are braced frames allowed? Spec 13 3419 section 2.01.B is contradictory; defines primary framing in part as "braced end frames" but then states "diagonal brace frames are not acceptable for lateral resistance."

Answer: Due to programmatic needs, braced frames are not acceptable. The reference to braced frames has been removed. See revised Section 13 3419.

Q16: Are purlins allowed to overlap the skylight roof openings?

Answer: Openings in Admin building need to be clear of all framing members. In Vehicle building, purlins may overlap the openings.

Q17: Reference spec 07 07200 section 2.01.B: Is foam insulation acceptable at roof curb walls in lieu of fiberglass? What R-value is desired at curb walls?

Answer: Provide R-5 minimum insulation at all roof curbs, using any insulation type as allowed in Section 07 2100. Note that any plastic insulation will need to comply with the requirements of OSSC Chapter 26. See revised Specification Section 07 7200.

Q18: Ref. spec 07 7300: please clarify desired manufactured assembly for fall protection anchors. Does the spec describe the Guardian 10600 2-Way Standing Seam Roof Clamp? I was unable to find any reference to a Guardian CB-4 anchor.

Answer: Reference to the CB-4 anchor was in error and has been removed.

Q19: Ref. spec 07 6200. Is AZ50 galvalume material acceptable for trim including gutters and downspouts in lieu of G90 galvanized?

Answer: Galvalume is acceptable. See revised Section 07 6200

Q20: Sheet D.A2.01 calls for 8” slab on grade. Sheet D.S1.01 calls for 6” slab on grade. Please provide clarification on thickness.

Answer: 6" slab per structural. D.A2.01 has been revised

Q21: Sheet D.A2.01 (note) calls for 10” concrete wall at Gridline 4, but a wall is not drawn. Section details on D.A3.11 do not show concrete wall on Gridline 4. Structural sheets show a concrete wall at Gridline 4. Please advise.

Answer: There should be a concrete wall at Grid 4. See revised D.A2.01 and D.A3.11

Q22: Sheet S.A2.01 calls for 4’ high concrete wall at Gridline 2. Sheet S.S1.01 does not call out a concrete wall or detail a concrete wall. What is the thickness of the wall? Does the wall require a footing? Please provide detail.

Answer: There is a wall and footing at Grid 2. Revised drawings to be issued in a future addendum.

Q23: On A.A8.11, details 8 and 13 show “below grade waterproofing.” Please confirm the waterproofing is required, provide a specification for it (there is none in the spec book), and clarify the extent of installation of the product (plans are not clear).

Answer: Waterproofing is not required at these locations. See revised details

Q24: Will a list of the prequalified bidders be available Friday after the time window to prequalify has elapsed?

Answer: That information is available on the website - click on the Planholders list. Prequalified contractors will have a "Y" indicated.

Q25: We can provide a single standalone FACP in admin building where separate notification circuits will run for each building from the admin building panel. Will that work be fine? Or there is requirement multiple FACPs (one for each building). Please confirm.

Answer: This approach is fine

Q26: We are considering non-voice system. Please advise otherwise.

Answer: Voice not required

Q27: Please note, any interface (HVAC, ACS, fire protection etc) is not provided in the input documents. Do we need to include any?

Answer: All code required interfaces need to be provided per 283100 specs, e.g. HVAC over 2,000cfm, fire sprinkler/suppression systems, etc.

Q28: As per fire life safety plans (S.G3.01), we understand the building is fully sprinkled including area S-2. Please confirm if otherwise.

Answer: The Storage building is non-sprinklered. A revised S.G3.01 was included with ADD #1

Q29: We will be considering wall mount notification devices. Please advise otherwise.

Answer: Wall mount is fine.

Q30: Please confirm if we need to consider WP devices in loading area of administration and operations building (A.x series sheets).

Answer: If space is unconditioned and beyond the rating of the appliances, WP will need to be provided.

Q31: Please also share the height of the racks in warehouse for understanding the placement of devices

Answer: Racking in the warehouse is expected to be 12'-0" high. An updated A.AG3.01 with information on the high piled storage was issued with ADD #1

Q32: Do the contours on the bid set of documents reflect the removal of the 1 foot of contaminated material on the site that the Medford Water Commission had done?

Answer: Yes. Drawing C0.10 reflects actual current grade (after 12” has been removed).

Q33: Sheet A.EQ2.11 lists Dishwasher as item 4 to be OFOI and as item 15 to be CFCI. Please clarify if dishwashers are to be OFOI or CFCI. If CFCI, please provide a specification. Please clarify dishwasher item listing, if call out 4 or 15 should be followed.

Answer: Dishwashers to be OFOI. Provide rough-ins for water, sewer, and power

APPROVAL OF ADDITIONAL PRODUCTS/SYSTEMS:

ALL CONTRACT DOCUMENT SPECIFICATION REQUIREMENTS APPLY IN TOTAL TO ALL ADDITIONAL MANUFACTURERS AND PRODUCTS LISTED BELOW

23 1113 – FUEL HANDLING SYSTEM

Dover Fuel Systems “Wayne Reliance Dispenser” – added as an approved manufacturer/system for Fuel Dispensers

Fueling Technologies International “Model FTI-5A-1T” – added as an approved manufacturer/system for Fuel Polishing

23 7223 – PACKAGED AIR-TO-AIR ENERGY RECOVERY VENTILATORS

Greenheck – added as approved manufacturer.

Note – this Specification Section was added in ADD #1, and this manufacturer is included with several others as acceptable providers. This substitution request was received prior to issuance of ADD #1.

Bidders are reminded that all questions related to the Bid Documents or the project must be submitted in writing in accordance with Section 22 of the Information for Bidders. Received questions will only be answered by Addenda. After the stated December 4, 2024 deadline, no individual questions will be answered and bidders will be responsible for making their own interpretation of the bid documents.

ACKNOWLEDGEMENT: All Bidders shall acknowledge receipt and acceptance of this Addendum on the Bid Form. Bids submitted without acknowledgment may be considered informal.

BOARD OF WATER COMMISSIONERS

CITY OF MEDFORD, OREGON

By: 

Brad Taylor, General Manager

Receipt acknowledged and conditions agreed to this _____ day of _____, 2024.

Bidder: _____

By: _____

(Signature)

_____

(Print Name)

END OF SECTION

Certification Regarding Lobbying

(To be included with Bid)

Awards to Contractors and Subcontractors in Excess of $100,000

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 any 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.

(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.

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 into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

Signed : _____

Company: _____

Title: _____

Date: _____

WIFIA Contract Language

Economic and Miscellaneous Authorities

Debarment and Suspension, Executive Order 12549, 51 FR 6370, February 21, 1986

Contractor certifies that it will not knowingly enter into a contract with anyone who is ineligible under the 2 CFR part 180 and part 1532 **(per Executive Order 12549, 51 FR 6370, February 21, 1986) or who is prohibited under Section 306 of the Clean Air Act or Section 508 of the Clean Water Act** to participate in the Project. Suspension and debarment information can be accessed at http://www.sam.gov. Contractor represents and warrants that it has or will include a term or conditions requiring compliance with this provision in all of its subcontracts under this Agreement.

New Restrictions on Lobbying, 31 USC 1352

FEDERAL LOBBYING RESTRICTIONS. Recipients of federal financial assistance may not pay any person for influencing or attempting to influence any officer or employee of a federal agency, a member of Congress, an officer or employee of Congress, or an employee of a member of Congress with respect to the award, continuation, renewal, amendment, or modification of a federal grant, loan, or contract. These requirements are implemented for USEPA in 40 CFR Part 34, which also describes types of activities, such as legislative liaison activities and professional and technical services, which are not subject to this prohibition. Upon award of this contract, Contractor shall complete and submit to Medford Water the certification and disclosure forms in Appendix A and Appendix B to 40 CFR Part 34. Contractor shall also require all subcontractors and suppliers of any tier awarded a subcontract over $100,000 to similarly complete and submit the certification and disclosure forms pursuant to the process set forth in 40 CFR 34.110.

Civil Rights, Nondiscrimination, EEO Authorities

General Introductory Language

CIVIL RIGHTS OBLIGATIONS. Contractor shall comply with the following federal non-discrimination requirements:

a. Title VI of the Civil Rights Act of 1964, which prohibits discrimination based on race, color, and national origin, including limited English proficiency (LEP).
b. Section 504 of the Rehabilitation Act of 1973, which prohibits discrimination against persons with disabilities.
c. The Age Discrimination Act of 1975, which prohibits age discrimination.
d. Section 13 of the Federal Water Pollution Control Act Amendments of 1972, which prohibits discrimination on the basis of sex.
e. 40 CFR Part 7, as it relates to the foregoing.
f. Executive Order No. 11246

Title VI of the Civil Rights Act of 1964, 42 USC 2000d et seq

Incorporated by reference in introductory language only. No additional language.

Section 504 of the Rehabilitation Act, 29 USC 794, supplemented by EO 11914, 41 FR 17871, April 29, 1976 and 11250, 30 FR 13003, October 13, 1965

Incorporated by reference in introductory language only. No additional language.

Age Discrimination Act, 42 USC 6101 et seq

Incorporated by reference in introductory language only. No additional language.

Segregated Facilities, 41 CRF 60-1.8

The contractor must ensure that facilities provided for employees are provided in such a manner that segregation on the basis of race, color, religion, sex, sexual orientation, gender identity, or national origin cannot result. The contractor may neither require such segregated use by written or oral policies nor tolerate such use by employee custom. The contractor's obligation extends further to ensuring that its employees are not assigned to perform their services at any location, under the contractor's control, where the facilities are segregated. This obligation extends to all contracts containing the equal opportunity clause regardless of the amount of the contract. The term "facilities," as used in this section, means waiting rooms, work areas, restaurants and other eating areas, time clocks, restrooms, wash rooms, locker rooms, and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing provided for employees; Provided, That separate or single-user restrooms and necessary dressing or sleeping areas shall be provided to assure privacy between the sexes.

Notice of Requirement for Affirmative Action to Ensure Equal Employment Opportunity (Executive Order 11246) located at 41 CFR § 60-4.2:

1. The Offeror's or Bidder's attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Specifications" set forth herein.
2. The goals and timetables for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the covered area, are as follows:

Time-tables	**Goals for minority participation for each trade**	**Goals for female participation in each trade**
	2.4%[1]	6.9 %[2]

These goals are applicable to all the Contractor's construction work (whether or not it is Federal or federally assisted) performed in the covered area. If the contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the work is actually performed. With regard to this second area, the contractor also is subject to the goals for both its federally involved and non-federally involved construction.

The Contractor's compliance with the Executive Order and the regulations in 41 CFR part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a), and its efforts to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade, and the contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, the Executive Order and the regulations in 41 CFR part 60-4. Compliance with the goals will be measured against the total work hours performed.

[1] Goals can be found at: https://www.dol.gov/agencies/ofccp/construction

[2] Nationwide goal for all covered areas

SECTION 00 0102 - PROJECT INFORMATION

PART 1 GENERAL

1.01 PROJECT IDENTIFICATION

A. Project Name: Medford Water Operation Center, located at:

1. 4677 Industry Drive.
2. Medford, Oregon 97501.

B. Architect's Project Number: 22085.

C. Owner's Project Number: CIPW-22-00280 .

D. The Owner, hereinafter referred to as Owner: Medford Water.

1.02 PROJECT DESCRIPTION

A. Summary Project Description: Construction to include, but limited to, the following buildings and associated site improvements on 10 acre open lot.

1. Administration and Operations building of approximately 36,000 square foot one-story construction consisting of steel structure with cold-formed metal bearing walls, curtain wall and storefront glazing, and insulated metal wall and roof panels, to include associated site work for larger operational campus.
2. Decant building of approximately 6,000 square foot one-story construction consisting of pre-engineered metal building structure on concrete slab-on-grade with ~~insulated~~ standing seam metal roof panels.
3. Storage building of approximately 12,000 square foot one-story construction consisting of pre-engineered metal building system on concrete slab-on-grade with standing seam metal roof panels and no exterior walls.
4. Vehicle Building and Maintenance Shop of approximately 14,000 square foot one-story construction of pre-engineered metal building system on concrete slab-on-grade with insulated metal wall and roof panels.
5. Fuel Island with associated tanks and fueling stations, including a small pre-engineered metal building of approximately 1,300 square foot which functions as a canopy at the fueling loction.
6. Approximately 60 foot tall communications tower and foundation.

B. All buildings to be designed to Risk Category IV structural design requirements.

1.03 PROJECT CONSULTANTS

A. The Architect, hereinafter referred to as Architect: Soderstrom Architects, Ltd.

1. Address: 1331 NW Lovejoy Street, Ste 775.
2. City, State, Zip: Portland, Oregon 97209.
3. Phone: (503) 228-5617.

B. Architect's Structural Engineer: ZCS Engineering & Architecture.

1. Address: 45 Hawthorne Street.
2. City, State, Zip: Medford, Oregon 97504.
3. Phone: (541) 500-8588.

C. Architect's Civil Engineer: ZCS Engineering & Architecture.

1. Address: 45 Hawthorne Street.
2. City, State, Zip: Medford, Oregon 97504.
3. Phone: (541) 500-8588.

D. Architect's Mechanical, Plumbing, and Electrical Engineer: Interface Engineering.

1. Address: 100 SW Main Street, Ste 1600.
2. City, State, Zip: Portland, Oregon 97204.
3. Phone: (503) 382-2266.

E. Architect's Landscape Architect: ZCS Engineering & Architecture.

1. Address: 45 Hawthorne Street.
2. City, State, Zip: Medford, Oregon 97504.
3. Phone: (541) 500-8588.

F. Owner's Communication Tower Engineer: Jacobs Engineering

1. Address: 1100 NE Circle Blvd
2. City, State, Zip: Corvallis, OR 97330
3. Phone: (541) 752-4271

1.04 PROCUREMENT DOCUMENTS

A. Availability of Documents: Complete sets of procurement documents may be obtained:

1. From the Owner online at separate link provided in invitation to Bidders.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 00 0110

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SECTION 07 2100 - THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Board insulation at underside of floor slabs at perimeter of foundation.

B. Batt insulation and separate vapor retarder in exterior wall construction.

C. Batt insulation for filling crevices in exterior wall and roof.

D. Foamed-in-place insulation for filling cavities not otherwise filled by batt insulation.

1.02 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 07 6110 - Sheet Metal Roofing - Alternate -: Insulation requirements for board insulation at roof assembly

C. Section 07 8400 - Firestopping: Insulation as part of fire-rated through-penetration assemblies.

D. Section 09 2116 - Gypsum Board Assemblies: Acoustic insulation at interior walls and partitions.

1.03 REFERENCE STANDARDS

A. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2023.

B. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2023.

C. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2023a.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

E. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 Degrees C; 2024.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

C. ABAA Field Quality Control Submittals: Submit third-party reports of testing and inspection required by ABAA QAP.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

F. ABAA Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.

1.05 QUALITY ASSURANCE

A. Air Barrier Association of America (ABAA) Evaluated Materials Program (EAP); www.airbarrier.org/#sle: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture. Use secondary materials approved in writing by primary material manufacturer.

1.06 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 at Perimeter of Foundation: Extruded polystyrene (XPS) board.

B. Insulation in Metal Framed Walls: Batt insulation with separate vapor retarder.

C. Insulation over Roof Deck (Standing Seam Alternate): Polyisocyanurate board. See Section 07 6110

2.02 FOAM BOARD INSULATION MATERIALS

A. Extruded Polystyrene (XPS) Board Insulation: Comply with ASTM C578 with either natural skin or cut cell surfaces.

1. Type and Compressive Resistance: Type IV, 25 psi (173 kPa), minimum.
2. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
4. Type and Thermal Resistance, R-value: Type IV, 5.0 (0.88), minimum, per 1 inch thickness at 75 degrees F mean temperature.
    a. Required total R-Value as indicated on Drawings.
5. Board Edges: Tongue-and-groove or shiplap.
6. Products:
    a. Kingspan Insulation LLC; GreenGuard GG25-LG XPS Insulation Board: www.kingspan.com/#sle.
    b. Owens Corning Corporation; FOAMULAR Type NGX 250 Extruded Polystyrene (XPS) Insulation: www.ocbuildingspec.com/#sle.
    c. Substitutions: See Section 01 6000 - Product Requirements.

2.03 MINERAL FIBER BLANKET INSULATION MATERIALS

A. Where batt insulation is indicated, either glass fiber or mineral fiber batt insulation may be used, at Contractor's option.

B. Thermal Resistance: As indicated on drawings.

C. Flexible Glass Fiber Blanket Thermal Insulation: Preformed insulation, complying with ASTM C665; friction fit.

1. Flame Spread Index: 25 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. Formaldehyde Content: Zero.
5. Facing: Unfaced.

6. Products:
    a. Johns Manville; Formaldehyde-Free Fiberglass Insulation: www.jm.com/#sle.
    b. Knauf Insulation; EcoBatt Insulation: www.knaufnorthamerica.com.
    c. Owens Corning Corporation; EcoTouch PINK FIBERGLAS Insulation: www.ocbuildingspec.com/#sle.
    d. Substitutions: See Section 01 6000 - Product Requirements.

D. Mineral Wool Blanket Thermal Insulation: Flexible or semi-rigid preformed insulation, complying with ASTM C665.

1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
3. Thermal Resistance: R-value as indicated on drawings.
4. Products:
    a. ROCKWOOL; COMFORTBATT: www.rockwool.com/#sle.
    b. Thermafiber, Inc; SAFB FF: www.thermafiber.com/#sle.
    c. Substitutions: See Section 01 6000 - Product Requirements.

2.04 ACCESSORIES

A. Interior Vapor Retarder: Modified polyethylene/polyacrylate (PE/PA) film reinforced with polyethylene terephthalate (PET) fibers, 12 mil, 0.012 inch 12 mil, 0.012 inch thick, vapor permeable. Single ply polyethylene is prohibited.

1. Width: 4.9 feet.
2. Products:
    a. SIGA Cover Inc; SIGA-Majrex 200: www.siga.swiss/global_en/#sle.
    b. Substitutions: See Section 01 6000 - Product Requirements.

B. Tape: Reinforced polyethylene film with acrylic pressure sensitive adhesive.

1. Application: Sealing of interior circular penetrations, such as pipes or cables.
2. Width: As required for application.
3. Products:
    a. SIGA Cover Inc; SIGA-Rissan: www.siga.swiss/global_en/#sle.
    b. Substitutions: See Section 01 6000 - Product Requirements.

C. Sill Plate Sealer: Closed-cell foam tape with rubberized adhesive membrane; bridges gap between foundation structure and sill plate or skirt board.

1. Width: 5-1/2 inches.
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; Energy Plate Liner: www.protectowrap.com/#sle.
    b. Substitutions: See Section 01 6000 - Product Requirements.

D. Foamed-in-Place Insulation, General: For use to fill cavities, penetrations, and cracks less than 2 inches at roof wall junctures, exterior hollow metal door frames, and around pipes and ducts.

1. Products:
    a. DuPont de Nemours, Inc; Froth-Pak Foam Insulation: www.building.dupont.com.
    b. Substitutions: See Section 01 6000 - Product Requirements.

E. Foamed-in-Place Insulation, Windows and Doors: Low pressure, minimal expanding foam, for filling caps and cracks around windows and doors.
   1. Products:
      a. DuPont de Nemours, Inc; Great Stuff Pro Series: www.building.dupont.com.
      b. Substitutions: See Section 01 6000 - Product Requirements.

F. Staples: Steel wire; galvanized; type and size to suit application.

G. Adhesive: Type recommended by insulation manufacturer for application.

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 fins, irregularities, or materials or substances that may impede adhesive bond.

3.02 PREPARATION

A. For spray foam insulation applications, mask and protect adjacent surfaces from over spray or dusting.

3.03 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.

3.04 BATT INSTALLATION

A. Install insulation and separate vapor retarder in accordance with manufacturer's instructions.
   1. Install vapor retarder as continuous airtight barrier over surfaces indicated, with sealed seams and sealed joints to adjacent surfaces.

B. Install in exterior wall 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. At metal framing, place vapor retarder on warm side of insulation; lap and seal sheet retarder joints over face of member

F. Tape seal tears or cuts in vapor retarder.

G. 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.
   1. Install vapor retarder in accordance with manufacturers instructions.
   2. Install vapor retarder with product name facing interior.
   3. Service and Other Penetrations: Form flashing around penetrating items and seal to surface of vapor retarder.
   4. Seal punctures, voids, and seams.

3.05 FOAMED-IN-PLACE INSULATION

A. Apply insulation in accordance with manufacturer's instructions.

B. Apply insulation by spray method, to a uniform monolithic density without voids.

C. Patch damaged areas.

D. Where applied to voids and gaps assure space for expansion to avoid pressure on adjacent materials that may bind operable parts.

E. Fill exterior door frames with spray foam insulation in accordance with Section 08 1113.

3.06 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Do not cover installed vapor retarders until required inspections have been completed.

C. Correct deficiencies in or remove vapor retarder that does not comply with requirements; repair substrates and reapply air-barrier components.

D. Take digital photographs of each portion of installation prior to covering up vapor retarders.

3.07 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

B. Do not permit subsequent construction work to disturb applied insulation.

END OF SECTION

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SECTION 07 6110 - SHEET METAL ROOFING - ALTERNATE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sheet metal roofing, associated flashings, and underlayment.

B. Secondary framing.

C. Insulation.

D. Counterflashings.

E. Integral fascias.

F. Sealants for joints within sheet metal fabrications.

1.02 RELATED REQUIREMENTS

A. Section 07 7200 - Roof Accessories: Manufactured accessories.

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; 2023.

C. 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; 2023.

D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

E. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2023a.

F. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2021.

G. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.

H. CDA A4050 - Copper in Architecture - Handbook; current edition.

I. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on metal types, finishes, characteristics.

C. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

D. AIS Certificate: Certify that products comply with American Iron and Steel (AIS) provision for the Consolidated Appropriations Act of 2017 (Section 746 Division A of Title VII), and subsequent statutes, mandating domestic preference.

1.06 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA (ASMM) requirements and standard details, except as otherwise noted.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years of similar type and scale project experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. See Section 01 7419 - Construction Waste Management and Disposal for packaging waste requirements.

B. Stack material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

C. Prevent contact with materials that could cause discoloration or staining.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Correct defective work within a 2 -year period after Date of Substantial Completion. Defective work includes failure of watertightness or seals.

C. Provide 20 -year manufacturer warranty for finishes. Warranty shall include degradation of metal finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Sheet Metal Roofing Manufacturers:

1. Taylor Metal Products; MS150: www.taylormetal.com/#sle.
2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 SHEET MATERIALS

A. Pre-Finished Galvanized Steel Sheet: ASTM A653/A653M, with G90/Z275 zinc coating; 24-gauge, 0.0239-inch minimum base metal thickness, shop precoated with polyvinylidene fluoride (PVDF) coating; color as selected.

2.03 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Fabricate cleats of same material as sheet, thickness to match roofing sheet, and at least 2 inch wide, interlockable with sheet.

C. Fabricate starter strips, interlockable with sheet.

D. Form pieces in longest practical lengths.

E. Hem exposed edges on underside 1/2 inch; miter and seam corners.

2.04 FINISHES

A. Polyvinylidene Fluoride (PVDF) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system.

B. Color: As selected by Architect from manufacturer's premium metallic colors.

C. Primer Coat: On coated sheets, finish concealed side of sheet with primer compatible with finish system as recommended by finish system manufacturer.

2.05 SECONDARY FRAMING

A. Support for Roofing and Continuous Insulation: Continuous thermal Z-girts.

1. Fiberglass reinforced plastic (FRP) girts that provide roofing attachment support for standing seam roof.
2. Depth: As required for thickness of insulation.
3. Length: 96 inches for girts.
4. Spacing: as recommended by girt manufacturer and roof attachment requirements, perpendicular to roof slope.
5. Fasteners: As recommended by clip manufacturer.
6. Products:
   a. Advanced Architectural Products, LLC; GreenGirt CMH Roof System
   b. Substitutions: See Section 01 6000 - Product Requirements

B. ~~Material: ASTM A1011/A1011M Designation SS steel sheet.~~

1. ~~Profile: Manufacturer's standard zee.~~
2. ~~Thickness: 16 gauge , 0.0598 inch.~~
3. ~~Finish: Galvanized in accordance with ASTM A653/A653M G90.~~

C. Connectors: Factory-made formed steel sheet, ASTM A653/A653M SS Grade 50, with G60/Z180 hot-dipped galvanized coating and factory-punched holes.

2.06 ACCESSORIES

A. Fasteners: Stainless steel, with soft neoprene washers.

B. Underlayment: Self-adhering butyl-rubber sheet complying with ASTM D1970/D1970M; strippable release film.

1. Top Sheet: Woven polypropylene top surface.
2. Sheet Thickness: 30 mil, minimum.
3. Self Sealability: Passing nail sealability test specified in ASTM D1970/D1970M.
4. Low Temperature Flexibility: Passing test specified in ASTM D1970/D1970M.
5. Water Vapor Permeance: 0.05 perm, maximum, when tested in accordance with ASTM E96/E96M, Procedure A (desiccant method).
6. Functional Temperature Range: Minus 45 degrees F to 300 degrees F.
7. Ultraviolet (UV) Resistance and Weatherability: Approved in writing by manufacturer for exposure to weather for minimum of six months.
8. Products:
   a. Protecto Wrap Company; Jiffy Seal Butyl Ice and Water Guard HT: www.protectowrap.com/#sle.
   b. Substitutions: See Section 01 6000 - Product Requirements.

C. Polyisocyanurate (ISO) Board Insulation: Complies with ASTM C1289, Type II, Class 1 - Faced with glass-reinforced felt on both surfaces of core foam.

1. Grade and Compressive Strength: Grade 2, 20 psi, minimum.
2. Board Thickness: Two layers, staggered joints, overall thickness as required achieve R-value indicated on drawings.
3. Product: Carlisle InsulBase.
   a. Carlisle InsulBase.
   b. Substitutions: See Section 01 6000 - Product Requirements.

D. Deck Sheating: Glass mat faced gypsum panels, ASTM C1177/C1177M, fire resistant type, 1/4 inch thick.
   1. Products:
      a. GP Dens-Deck Prime, distributed by Carlisle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

E. Vapor Retarder: Material approved by roof manufacturer complying with requirements of fire rating classification; compatible with roofing and insulation materials.

F. Concealed Sealants: Non-curing butyl sealant or butyl tape.

G. Exposed Sealants: ASTM C920 elastomeric sealant, with minimum movement capability as recommended by manufacturer for sealed substrates; color to match adjacent material.

H. Insulation Adhesive: Type as recommended by insulation manufacturer.

I. Eave Protection Sheet: Rubberized asphalt bonded to sheet polyethylene, 40 mil, 0.040 inch total thickness, with strippable treated release paper.

PART 3 EXECUTION

3.01 EXAMINATION

A. Inspect roof deck to verify deck is clean and smooth, free of depressions, waves, or projections, properly sloped to eaves.

B. Verify deck is dry and free of snow or ice.

C. Verify roof openings, curbs, pipes, sleeves, ducts, or vents through roof are solidly set, reglets are in place, and nailing strips located.

3.02 METAL DECK PREPARATION

A. Install deck sheathing on metal deck:
   1. Lay with long side at right angle to flutes; stagger end joints; provide support at ends.
   2. Cut sheathing cleanly and accurately at roof breaks and protrusions to provide smooth surface.
   3. Mechanically fasten sheathing to roof deck, in accordance with Factory Mutual recommendations and roofing manufacturer's instructions.

3.03 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Back paint concealed metal surfaces and surfaces in contact with dissimilar metals with protective backing paint to a minimum dry film thickness of 15 mil, 0.015 inch.

C. Prior to secondary framing installation, apply vapor retarder to deck sheathing with adhesive in accordance with manufacturer's instructions.
   1. Install flexible flashing from vapor retarder to air seal material of wall construction, lap and seal to provide continuity of the air barrier plane.

D. Ensure vapor retarder is clean and dry, continuous, and ready for application of insulation.

3.04 INSTALLATION

A. Secondary Framing:
   1. Install secondary framing (subgirts) perpendicular to panel length, securely fastened to substrates and shimmed and leveled to uniform plane, and spaced at intervals as recommended by sheet metal roofing manufacturer.

B. Insulation:

1. Attachment of Insulation: Between secondary framing members, embed each layer of insulation in adhesive in full contact, in accordance with insulation manufacturers' instructions.
2. Do not install wet, damaged, or warped insulation boards.
3. Lay subsequent layers of insulation with joints staggered minimum 12 inch from joints of preceding layer.
4. Lay boards with edges in moderate contact without forcing, and gap between boards no greater than 1/4 inch. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.
5. Tape joints of insulation in accordance with roofing and insulation manufacturers' instructions.
6. Do not apply more insulation than can be completely waterproofed in the same day.

C. Eave Protection:

1. Apply eave protection sheet in accordance with manufacturer's instructions.
2. Extend eave protection sheet up roof slope at least 4 feet beyond exterior wall line of building.

D. Roofing:

1. Apply underlayment over entire roof area, as follows:
   a. Apply single layer of self-adhered membrane, laid perpendicular to slope; weather lap edges.
2. Apply slip sheet in one layer, laid loose.
3. Cleat and seam sheet metal roofing joints.
4. Use butyl tape to seal concealed joints between metal roofing surfaces.
5. Provide formed metal pans for protrusions through roof; fill pans watertight with roof cement.

E. Standing Seam Roofing:

1. Comply with SMACNA (ASMM) details.
2. Space standing seams at 17 inch on center.
3. Lay sheets with long dimension perpendicular to eaves. Apply pans beginning at eaves.
4. Lock cleats into seams and flatten.
5. Stagger transverse joints of roofing sheets.
6. At eaves and gable ends, terminate roofing by hooking over edge strip.
7. Finish standing seams 1-1/2 inch high on flat surfaces
8. Bend up one side edge 1-1/2 inches and other edge 1-3/4 inches.
9. Make first fold 1/4-inch wide single fold and second fold 1/2 inch wide, providing locked portion of standing seam, five plies in thickness.
10. Fold lower ends of seams at eaves over at 45 degree angle.
11. Terminate standing seams at ridge and hips by turning down with tapered fold.
12. Install snow guards upslope from eaves as indicated on drawings.

F. Built-In Gutters and Downspouts: See Section 07 6200.

1. Comply with SMACNA (ASMM) details.
2. At roof edges, extend gutter lining under metal roofing at least 6 inches, and terminate in 3/4-inch folded edge secured by cleats. Hook lower end of roofing into lock strip to form 3/4-inch wide loose-lock seam.

G. Flashing:

1. Comply with SMACNA (ASMM) details.
2. Secure flashings in place using concealed fasteners.

3. Cleat and seam each joint.
4. Apply roof cement compound between metal flashings and felt flashings.
5. Fit flashings tight in place, and make corners square, surfaces true and straight in planes, and lines accurate to profiles.
6. Seal metal joints watertight.

3.05 PROTECTION

A. Do not permit traffic over unprotected roof surface.

END OF SECTION

SECTION 07 6200 - SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings, counterflashings, gutters, and downspouts.

B. Sealants for joints within sheet metal fabrications.

1.02 RELATED REQUIREMENTS

A. Section 07 2500 - Weather Barriers: Flexible self-adhered membrane flashings.

B. Division 23 - Heating, Ventilating, and Air-Conditioning (HVAC): Flashing sleeves and collars for mechanical items protruding through roofing membrane.

C. Division 26 - Electrical: Flashing sleeves and collars for electrical items protruding through roofing membrane.

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; 2023.

C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.

D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

E. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007 (Reapproved 2018).

F. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

C. Samples: Submit two samples 3 by 3 inch in size illustrating metal finish color.

D. AIS Certificate: Certify that products comply with American Iron and Steel (AIS) provision for the Consolidated Appropriations Act of 2017 (Section 746 Division A of Title VII), and subsequent statutes, mandating domestic preference.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA (ASMM) requirements and standard details, except as otherwise indicated.

B. Fabricator and Installer Qualifications: Company specializing in sheet metal work with 5 years of documented experience.

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 G90/Z275 zinc coating or AZ-50 aluminum zinc alloy coating; minimum 24-gauge, 0.0239-inch 24-gauge, 0.0239-inch thick base metal, shop pre-coated with modified silicone coating.

1. Polyvinylidene Fluoride (PVDF) Coating: Superior performing organic powder coating, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system.
2. Color: As selected by Architect from manufacturer's premium metallic colors.
   a. Colors to match associated wall panels or roofing as selected by architect.

B. Stainless Steel: ASTM A666, Type 304 alloy, soft temper, 28 gauge, 0.0156 inch thick; smooth No. 4 - Brushed finish.

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; 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 long legs; seam for rigidity, seal with sealant.

F. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.

G. Fabricate flashings to allow toe to extend 2 inches over roofing gravel. Return and brake edges.

2.03 GUTTERS AND DOWNSPOUTS

A. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 G90/Z275 zinc coating or AZ-50 aluminum zinc alloy coating; minimum 22-gauge, 0.0313-inch thick base metal, shop pre-coated with modified silicone coating.

1. Polyvinylidene Fluoride (PVDF) Coating: Superior performing organic powder coating, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system.
2. Color: As selected by Architect from manufacturer's premium metallic colors.

B. Gutters: Profile and size as indicated on drawings.

C. Downspouts: Profile and size as indicated on drawings.

D. Accessories: Profiled to suit gutters and downspouts.

1. Gutter Supports: As detailed.
2. Downspout Supports: Straps.

E. Downspout Boots: Cast iron.

F. Seal metal joints.

2.04 FLASHING

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. Protective Backing Paint: Zinc molybdate alkyd.
D. Concealed Sealants: Non-curing butyl sealant.
E. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.
F. Asphalt Roof Cement: ASTM D4586/D4586M, Type I, asbestos-free.
G. Reglets: Surface-mounted type, galvanized steel; face and ends covered with plastic tape.

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 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.
B. Install surface mounted reglets true to lines and levels, and seal top of reglets with sealant.
C. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil, 0.015 inch.

3.03 INSTALLATION

A. Comply with drawing details.
B. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted..
C. Apply plastic cement compound between metal flashings and felt flashings.
D. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.
E. Seal metal joints watertight.
F. Connect downspouts to downspout boots, and grout or seal connection watertight.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for field inspection requirements.
B. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

END OF SECTION

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SECTION 07 7200 - ROOF ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Roof curbs.

B. Roof penetrations mounting curbs.

C. Snow guards.

1.02 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements 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.

PART 2 PRODUCTS

2.01 ROOF CURBS

A. 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 minimum thickness, with 3003 alloy, and H14 temper.
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.
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 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 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.

B. 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 thick fiberglass or other insulation as specified in Section 07 2100 for a minimum R-value of R-5. Plastic insulation must comply with the requirements of OSSC Chapter 26
3. Height Above Finished Roof Surface: 8 inches, minimum.

C. Pipe, Duct, or Conduit Mounting Curbs: Vertical posts, minimum 8 inches square unless otherwise indicated.

2.02 SNOW GUARDS

A. Fence Type Snow Guard: Continuous snow guard; manufacturer's standard dual pipe, bar, channel, or solid rod, set in brackets or posts, with optional plates and metal trim to match roof.

1. Solid Rod: Aluminum, mill finish.
   a. Outside Diameter: 3/8 inch.
   b. Ice Flags: Manufacturer's standard material.
2. Clamps for Standing Seam Roof: Aluminum clamps attached to standing seams of roof panels; for attachment of fence type snow guard.
   a. Seam Profile: Selected by Architect from manufacturer's standard range; match profile of metal roof.
   b. Finish: Mill finish.
3. Products:
   a. Alpine SnowGuards; ASG4025-AL Standing Seam Two-Pipe Snow Guard: www.alpinesnowguards.com/#sle.
   b. LMCurbs; SnowGuard System: www.lmcurbs.com/#sle.
   c. Metal Roof Innovations, Ltd. S-5! Attachment Solutions; SnoRail/SnoFence: www.s-5.com/#sle.
   d. Substitutions: See Section 01 6000 - Product Requirements.

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.

1. Confirm roof placement with manufacturer.

3.04 CLEANING

A. Clean installed work to like-new condition.

END OF SECTION

SECTION 07 7300 - FALL PROTECTION DEVICES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Roof tie-down system of fall restraint and fall arrest for worker safety.

1.02 REFERENCE STANDARDS

A. 29 CFR 1910 - Occupational Safety and Health Standards; Current Edition.

B. 29 CFR 1926 - Safety and Health Regulations for Construction; Current Edition.

C. 29 CFR 1926.502 - Fall protection systems criteria and practices; Current Edition.

D. ANSI/ASSP Z359.1 - The Fall Protection Code; 2020.

E. ANSI/ASSP Z359.6 - Specifications and Design Requirements for Active Fall Protection, 2016.

1.03 SYSTEM DESCRIPTION

A. General: Provide structural fall restraint and fall arrest system capable of withstanding loads and stresses within limits and under conditions specified in OSHA and ANSI/ASSP Z359.1. Provide fall protection system is secured to ribs of standing seam metal roof. Provide cable lifeline system to allow continuous travel between anchor points.

B. Design Requirements: Anchors and accessories comprising system of following types:

1. Guardian Standing Seam Roof Anchors, spaced as indicated by manufacturer, for safety snap connection by individual workers capable of withstanding a 5,000 pound load or safety factor of 2 meeting the requirements of 29 CFR 1926.502.
2. Cable lifeline to pass through intermediate anchor attachment points, restrained at either end by steel shackle and cable fist grips; detaching and reattaching to the system at intermediate anchors required.
3. In-line shock absorber; One each, minimum, for total lifeline span length up to 60 feet and two each, minimum, for total lifeline span length greater than 60 feet and up to 100 feet.
4. Performance Requirements: System and components tested for the resistance of the following loads:
    a. Fall Restraint: Four users
    b. Design fall protection anchors to resist a 5,000 pound load applied in any direction at maximum anchor height or provide engineered system designed meeting the requirements of 29 CFR 1926.502.
    c. Design system to limit loads on horizontal lifeline anchors to 2,500 pounds.

1.04 SUBMITTALS

A. Product Data: For each type of device specified, including manufacturer’s standard fabrication details and installation instructions.

B. Shop Drawings and Structural Calculations: Show layout, profiles, and anchorage details with any required substructure to form complete operational system. Engineering to be fully coordinated with other pre engineered elements such a roof trusses if required for system operation. Shop drawings and calculations to be stamped by a Professional Engineer registered in the State of Oregon.

C. Maintenance Data: Written instructions for maintenance of fall prevention safety devices to be included in the operation and maintenance manual.

D. In-house Test Reports: Indicate anchor fabrication compliance with performance requirements.

E. Signage: Provide laminated sign showing system layout and usage notes, to be installed at roof access locations.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Firm having at least 10 years continuous experience in manufacturing fall safety equipment similar to systems specified and exhibiting records of successful in-service acceptability and performance. Firm must employ personnel dedicated to provide regularly scheduled Authorized and Competent Person Training courses as mandated by 29 CFR 1910 and 29 CFR 1926 for owner's authorized safety personnel.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the jurisdiction where the Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of roof anchors.

C. Source Limitations: Obtain all roof anchors through one source from a single manufacturer.

D. Testing: Perform quality control tests for each system per manufacturer's requirements.

1.06 COORDINATION

A. Contractor to coordinate installation of the metal structural deck and the roof anchor system.

B. Manufacturer/Submittal Engineer to coordinate installation requirements of roof anchor system with standing seam specifications and standing seam manufacturer requirements.

C. Manufacturer/Submittal Engineer to coordinate design of structural deck reinforcements and anchorages to receive fall protection anchors.

1.07 WARRANTY

A. Provide manufacturer's standard warranty to guarantee products will be free from defects for a period of 12 months. Warranty period shall become effective on date of substantial completion.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Basis of Design: Guardian Fall : www.guardianfall.com.

B. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MANUFACTURED ASSEMBLIES

A. ~~Guardian CB-4 Standing Seam Galvanized Roof Anchors.~~

B. Guardian Absorbinator Horizontal Lifeline Kit: Each kit consisting of 1 or 2 shock absorbers, 1 turnbuckle, 2 or 3 shackles, 6 cable fist grips, 2 thimbles, and 2 O-rings. Provide additional O-rings as recommended by manufacturer.

C. Lifeline: Continuous wire rope as tested by fall protection device manufacturer to permit worker mobility and safety.

2.03 FABRICATION

A. Fabricate work true to dimension, square, plumb, level, and free from distortions or defects detrimental to appearance and performance.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine framing and substrate and verify conditions comply with submittal structural requirements for proper system performance.

B. Proceed with installation of roof anchors only after verifying conditions are satisfactory.

3.02 INSTALLATION

A. General: Installation of Anchor Posts and Absorbinator Lifeline system to be performed by contractor according to manufacturer’s instructions and recommendations.

3.03 ADJUSTMENT AND INSPECTION

A. Ensure all manufactured anchors have been installed in accordance with fall protection manufacturer’s engineering documentation and specifications.

B. Provide plan drawings with any deviations in anchor locations as installed.

END OF SECTION

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SECTION 13 3419 - METAL BUILDING SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufacturer-engineered, shop-fabricated structural steel building frame.

1.02 RELATED REQUIREMENTS

A. Section 07 4213.19 - Insulated Metal Wall Panels: Exterior wall panels.

B. Section 07 ~~4113~~ 6110 - Sheet Metal Roofing~~Panels~~.

C. Section 07 6200 - Sheet Metal Flashing and Trim.

D. Section 09 9123 - Interior Paiting: Field finishing of interior steel building frame and components.

E. Section 09 9113 - Exterior Painting: Field finishing of steel building frame and components.

1.03 REFERENCE STANDARDS

A. AISC 360 - Specification for Structural Steel Buildings; 2022.

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

D. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2021.

E. ASTM A529/A529M - Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality; 2019.

F. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2020.

G. 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; 2023.

H. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.

I. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).

J. IAS AC472 - Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems; 2018, with Editorial Revision (2019).

K. MBMA (MBSM) - Metal Building Systems Manual; 2019.

L. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

M. UL 580 - Standard for Tests for Uplift Resistance of Roof Assemblies; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on profiles, component dimensions, fasteners.

C. Shop Drawings: Indicate assembly dimensions, locations of structural members, connections, attachments, cambers, and loads; wall and roof system dimensions, panel layout, general construction details, anchors and methods of anchorage, and installation; framing anchor bolt settings, sizes, locations from datum, and foundation loads; indicate welded connections with AWS A2.4 welding symbols; indicate net weld lengths; provide professional seal and signature.

D. Manufacturer's Instructions: Indicate preparation requirements, anchor bolt placement.

E. Erection Drawings: Indicate members by label, assembly sequence, and temporary erection bracing.

F. Project Record Documents: Record actual locations of concealed components and utilities.

G. AIS Certificate: Certify that products comply with American Iron and Steel (AIS) provision for the Consolidated Appropriations Act of 2017 (Section 746 Division A of Title VII), and subsequent statutes, mandating domestic preference.

1.06 QUALITY ASSURANCE

A. Designer Qualifications: Design structural components, develop shop drawings, and perform shop and site work under direct supervision of a Professional Structural Engineer experienced in design of this type of work.

1. Design Engineer Qualifications: Licensed in the State in which the Project is located.
2. Comply with applicable code for submission of design calculations and reviewed shop and erection drawings as required for acquiring permits.
3. Coordinate with Architect's building design intent and account for loads from any adjoining structures.
4. Cooperate with regulatory agency or authorities having jurisdiction (AHJ), and provide data as requested.

B. Perform work in accordance with AISC 360 and MBMA (MBSM).

C. Perform welding in accordance with AWS D1.1/D1.1M.

D. Manufacturer Qualifications: Company specializing in the manufacture of products similar to those required for this project.

1. Not less than three years of documented experience.
2. Accredited by IAS in accordance with IAS AC472.

E. Erector Qualifications: Company specializing in performing the work of this section with minimum ten years documented experience.

F. 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.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Provide ten year manufacturer warranty for pre-engineered building systems and components.

PART 2 PRODUCTS

2.01 ASSEMBLIES

A. Single span rigid frame.

B. Primary Framing: Rigid frame of rafter beams and columns, canopy beams, intermediate columns, ~~and braced end frames~~, and wind bracing limited within the extents of wall and roof panel areas. Portal moment frames are acceptable for lateral resistance. Diagonal brace frames are not acceptable for lateral resistance.

C. Secondary Framing: Purlins, Girts, and Clips, and other items detailed.

D. Wall System: Insulated metal panels of vertical profile, with sub-girt framing/anchorage assembly, and accessory components.

E. Roof System: Insulated metal panels at enclosed buildings, standing seam metal roof panels at un-enclosed buildings, oriented parallel to slope, with sub-girt framing/anchorage assembly, and accessory components.

F. Roof Slope: Per plans.

2.02 PERFORMANCE REQUIREMENTS

A. Design structural members to withstand dead load, applicable snow load, and design loads due to pressure and suction of wind calculated in accordance with applicable code.

B. Design structural members to withstand Class 60 wind uplift in accordance with UL 580.

C. Exterior wall and roof system shall withstand imposed loads with maximum allowable deflection of 1/180 of span.

D. Provide drainage to exterior for water entering or condensation occurring within wall or roof system.

E. Permit movement of components without buckling, failure of joint seals, undue stress on fasteners or other detrimental effects, when subject to temperature range of 100 degrees F.

F. Size and fabricate wall and roof systems free of distortion or defects detrimental to appearance or performance.

2.03 MATERIALS - FRAMING

A. Structural Steel Members: ASTM A36/A36M.

B. Structural Tubing: ASTM A501/A501M hot-formed.

C. Plate or Bar Stock: ASTM A529/A529M, Grade 50.

D. Anchor Bolts: ASTM A307, Grade A, with hot dip type for protective coatings.

E. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1; galvanized to ASTM A153/A153M.

F. Welding Materials: Perform in accordance with AWS D1.1/D1.1M.

G. Primer: SSPC-Paint 20 zinc rich.

H. Grout: ASTM C1107/C1107M; Non-shrink; premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.

1. Minimum Compressive Strength at 48 Hours: 2,000 pounds per square inch.
2. Minimum Compressive Strength at 28 Days: 7,000 pounds per square inch.

2.04 FABRICATION - FRAMING

A. Fabricate members in accordance with AISC 360 for plate, bar, tube, or rolled structural shapes.

B. Anchor Bolts: Formed with bent shank, assembled with template for casting into concrete.

C. Provide wall opening framing for doors, windows, and other accessory components.

2.05 FABRICATION - WALL AND ROOF PANELS

A. Wall panels per Section 07 4213.19 - Insulated Metal Wall Panels.

B. Roof panels per Section 07 4123 - Insulated Metal Roof Panels.

2.06 FINISHES

A. Framing Members: Clean, prepare, and prime to SSPC Manual requirements. Do not prime surfaces to be field welded.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that foundation, floor slab, mechanical and electrical utilities, and placed anchors are in correct position

3.02 ERECTION - FRAMING

A. Erect framing in accordance with AISC 360.

B. Provide for erection and wind loads. Provide temporary bracing to maintain structure plumb and in alignment until completion of erection and installation of permanent bracing. Locate braced bays as indicated.

C. Set column base plates with non-shrink grout to achieve full plate bearing.

D. Do not field cut or alter structural members without approval.

E. After erection, prime welds, abrasions, and surfaces not shop primed.

3.03 ERECTION - WALL AND ROOF PANELS

A. Install in accordance with manufacturer's instructions.

B. Exercise care when cutting prefinished material to ensure cuttings do not remain on finish surface.

C. Fasten cladding system to structural supports, aligned level and plumb.

D. Locate end laps over supports. End laps minimum 2 inches. Place side laps over bearing.

E. Provide expansion joints where indicated.

F. Use exposed fasteners.

G. Install sealant and gaskets, providing weather tight installation.

3.04 TOLERANCES

A. Framing Members: 1/4 inch from level; 1/8 inch from plumb.

B. Siding and Roofing: 1/8 inch from true position.

END OF SECTION

SECTION 21 0500 - COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:

1. Buried Ductile Iron Pipe and Fittings
2. Buried Stainless Steel Pipe
3. Joint Restraints
4. Aboveground Black Steel Pipe and Fittings
5. Wall and Floor Penetrations and Sleeves
6. Switches, Valve Supervisory
7. Switches, Water Detector
8. Hangers and Supports
9. Struts and Strut Clamps
10. Sway Braces and Restraints
11. Seismic Separation Assembly
12. Anchors and Attachments
13. Pipe Stands
14. Gauges
15. Alarm Bells
16. Valves
17. Post Indicator Valve Assemblies
18. Pipe, Valve, and Fire Protection Equipment Identification
19. Signs
20. Drains

1.02 RELATED SECTIONS

A. Contents of Division 21, Fire Suppression and Division 01, General Requirements apply to this Section.

B. In addition, reference the following:

1. Division 22, Plumbing
2. Division 23, Heating, Ventilating and Air Conditioning
3. Division 26, Electrical
4. Division 28, Electronic Safety and Security
5. Division 31, Earthwork
6. Section 21 00 00, Fire Suppression Basic Requirements
7. Section 21 13 00, Fire Suppression Sprinkler Systems
8. **Section 21 22 01, Hybrid Fire Extinguishing System**

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 21 00 00, Fire Suppression Basic Requirements and Division 01, General Requirements.

B. Meet requirements of ASCE 7, Minimum Design Loads for Buildings and Other Structures, by American Society of Civil Engineers, latest adopted edition.

1.04 SUBMITTALS

A. Submittals as required by Section 21 00 00, Fire Suppression Basic Requirements and Division 01, General Requirements.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 21 00 00, Fire Suppression Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:

1. Material and Equipment: Listed for its intended fire protection use in current UL Fire Protection Equipment Directory, or UL Online Certifications Directory for Fire Protection, FM Global Approval Guide, and International Code Council Evaluation Service Reports. All material and equipment to be new and from a current manufacturer.
2. Provide per AHJ requirements.
3. References to product Specifications for materials are listed according to accepted ANSI, ASTM, ASME, AWWA and other base standards. Materials to meet latest approved versions of these standards.
4. Fire Suppression Screw-Thread Connections: Comply with local fire department/fire marshal regulations for sizes, threading and arrangement of connections for fire department equipment to fire department connections.
5. Manufacturers: Unless an item is marked "No substitutions", submit substitution request for materials of other than named manufacturers.
6. Noise and Vibration:
   a. Install vibration isolators and measures required to prevent noise and vibration from being transmitted to occupied areas. Select equipment to operate within noise coefficient (NC) design level for particular type of installation in relation to its location.
   b. After installation, make proper adjustments to reduce noise and vibration to acceptable levels as defined by Architect.
   c. In acoustically sensitive areas, design system in a manner that minimizes the number of wall penetrations.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 21 00 00, Fire Suppression Basic Requirements and Division 01, General Requirements.

1.07 FLOW TEST

A. If flow test information provided below has been conducted less than 12 months prior to working plan submittal, utilize for design of NFPA 13 fire sprinkler and NFPA 14 standpipe systems.

B. If flow test information provided below has been conducted greater than 12 months prior to working plan submittal, the information provided is advisory only and not to be used for design. Provide materials and labor for a new water supply test on the closest nearby fire hydrants per NFPA 13 and NFPA 291. Utilize new flow test results for design of NFPA 13 fire sprinkler and NFPA 14 standpipe systems.

C. Flow Test:

1. Flow: 3000 GPM at a residual pressure of 33 PSI.
2. Static Pressure: 65 PSI.
3. Location: 4677 Industry Dr.
4. Elevation: N/A.
5. Date: 06/05/2024.
6. Information Provided By: Medford Water.

D. Provide materials and labor for a new water supply test on the closest nearby fire hydrants per NFPA 13 and NFPA 291. Base hydraulic calculations on new flow test.

1.08 SYSTEM IMPAIRMENT

A. When returning a water-based fire protection system to service after impairment or control valve closure, verify the system is in working order by performing a main drain test per NFPA 25.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Buried Ductile Iron Pipe and Fittings:

1. American Cast Iron Pipe Co.
2. Atlantic States Cast Iron Pipe Co.
3. Clow Water Systems Co.
4. EBAA Iron, Inc.
5. Griffin Pipe Products Co.
6. McWane Cast Iron Pipe Co.
7. Pacific States Cast Iron Pipe Co.
8. United States Pipe & Foundry Co.
9. Star Pipe Products
10. Tyler Union
11. Or approved equivalent.

B. Buried Stainless Steel Pipe; In Building Riser:

1. Ames
2. Zurn Wilkins
3. Or approved equivalent.

C. Joint Restraints:

1. Star Pipe Products
2. Tyler Pipe Co.
3. EBAA Iron, Inc.
4. Uni-Flange Corp.
5. Union Foundry Co.
6. United States Pipe and Foundry Co.
7. Or approved equivalent.

D. Aboveground Black Steel Pipe and Fittings:

1. Pipe:
    a. Bull Moose Tube
    b. Wheatland Tube Co.
    c. Youngstown Tube Co.
    d. Tex-Tube Co.
    e. State Pipe and Supply, Inc.
    f. Or approved equivalent
2. Fittings, Mechanical and Grooved Couplings:
    a. Victaulic
    b. Gruvlok
    c. Shurjoint Piping Products Inc.
    d. Smith-Cooper International
    e. Tyco Fire & Building Products
    f. Viking Corp.
    g. ARGCO
    h. Anvil International
    i. Dixon Valve & Coupling
    j. Or approved equivalent.
3. Fittings, Threaded:
    a. Ward Mfg.
    b. Anvil International
    c. Smith-Cooper International
    d. Aegis Technologies
    e. Or approved equivalent.
4. Fittings, Rubber Gasketed:
    a. Victaulic
    b. Anvil International
    c. AnvilStar
    d. EBAA Iron, Inc.
    e. Shurjoint Piping Products, Inc.
    f. Smith-Cooper International
    g. Tyco Fire & Building Products
    h. Viking Corp.
    i. Ward Mfg.
    j. ARGCO
    k. Dixon Valve & Coupling
    l. Or approved equivalent.
5. Fittings, Welded:
    a. Anvil International
    b. Shurjoint Piping Products Inc.
    c. Smith-Cooper International
    d. State Pipe & Supply, Inc.
    e. Or approved equivalent.
6. Fittings, Flanged:
    a. Victaulic

b. United Brand Fittings
c. U.S. Pipe
d. Anvil S.P.F.
e. Iowa Fittings Co.
f. Tyco Fire Products
g. Or approved equivalent.

E. Wall and Floor Penetrations and Sleeves:
1. ARGCO
2. Fire Protection Products Inc. (FPPI)
3. Or approved equivalent.

F. Switches, Valve Supervisory:
1. Potter Electric Signal Co.
2. System Sensor
3. Or approved equivalent.

G. Switches, Water Detector:
1. Water Flow Switches; Wet Sprinkler Systems:
a. Potter Electric Signal Co.
b. System Sensor
c. Or approved equivalent.
2. Pressure Operated Alarm Switches; Dry Pipe Sprinkler Systems:
a. Detection of Water Flow:
1) Potter Electric Signal Co.
2) System Sensor
3) Or approved equivalent.
b. Detection of Low Pressure:
1) Potter Electric Signal Co.
2) System Sensor
3) Or approved equivalent.

H. Hangers and Supports:
1. Cooper B-Line Tolco
2. Anvil International
3. ITW Buildex Sammys
4. Erico International
5. PHD Mfg. Inc.
6. Or approved equivalent.

I. Struts and Strut Clamps:
1. Cooper B-Line Tolco
2. Or approved equivalent.

J. Sway Braces and Restraints:
1. Cooper B-Line Tolco
2. Anvil International
3. Erico International
4. PHD Mfg. Inc.
5. Or approved equivalent.

K. Seismic Separation Assembly:
    1. Metraflex Fireloop
    2. Anvil International
    3. Unisource Mfg. Inc.
    4. Mason Industries
    5. Twin Cities Hose
    6. Or approved equivalent.
L. Anchors and Attachments:
    1. Concrete:
        a. Cast-In Place Anchors for Hangers:
            1) Cooper B-Line Tolco
            2) Erico International
            3) Or approved equivalent.
        b. Cast-In Place Anchors for Braces:
            1) Cooper B-Line Tolco
            2) Anvil International
            3) Erico International
            4) Or approved equivalent.
        c. Attachments as specified or described by structural. If not specified or described by structural, then as follows:
            1) Hilti
            2) Powers
            3) Simpson Strong-Tie
            4) DeWalt
            5) Or approved equivalent.
M. Pipe Stands:
    1. Cooper B-Line Tolco
    2. Anvil International
    3. Or approved equivalent.
N. Gauges:
    1. Ashcroft
    2. US Gauge
    3. Brecco
    4. Reliable Automatic Sprinkler Co.
    5. Fire Protection Products, Inc. (FPPI)
    6. ARGCO
    7. Wika Instrument Corp.
    8. Or approved equivalent.
O. Alarm Bells:
    1. Potter
    2. System Sensor
    3. Or approved equivalent.

P. Valves:
   1. Wafer Check:
      a. Nibco
      b. Mueller
      c. Viking
      d. Tyco
      e. Or approved equivalent.
   2. Butterfly Valves:
      a. Victaulic
      b. Nibco
      c. Tyco
      d. Use lug body next to pumps; Nibco.
      e. Reliable
      f. Or approved equivalent.
   3. Pressure Relief:
      a. Watts
      b. United Brass Works
      c. AGF
      d. Or approved equivalent.
   4. Automatic Ball Drip Drain Valve:
      a. Tyco
      b. Reliable Automatic Sprinkler Co.
      c. Or approved equivalent.
   5. Three-Way Gauge Valve:
      a. Fire Protection Products Inc. (FPPI)
      b. AGF Mfg. Inc.
      c. Nibco
      d. Or approved equivalent.
   6. Automatic Air Release Valve:
      a. Potter Electric Signal Co.
      b. Or approved equivalent.
   7. Ball Valve:
      a. Victaulic
      b. Apollo Valves
      c. Fire Protection Products Inc. (FPPI)
      d. Nibco
      e. Or approved equivalent.

Q. Post Indicator Valve Assemblies:
   1. General:
      a. Victaulic
      b. Nibco
      c. Kennedy Valve
      d. Mueller
      e. Viking
      f. United Water Products
      g. Or approved equivalent.

2. Butterfly Valve Indicator Post Assemblies; Grooved butterfly valve with internal supervisory switch, steel wall plate, wall post assembly.
    a. Nibco
    b. Or approved equivalent.

R. Pipe, Valve, and Fire Protection Equipment Identification:

1. Fire Protection Products, Inc. (FPPI)
2. ARGCO
3. Or approved equivalent.

S. Signs:

1. Tyco Fire Products
2. Reliable Automatic Sprinkler
3. Viking Corp.
4. ARGCO
5. Or approved equivalent.

T. Drains:

1. Reference Aboveground Black Steel Pipe and Fittings.
2. AGF
3. Victaulic
4. Or approved equivalent.

2.02 BURIED DUCTILE IRON PIPE AND FITTINGS

A. Pipe:

1. Thickness: Class 52 ductile iron, AWWA C151.
2. Pressure: 150 psi or 10.34 bar.
3. Cement mortar lined per AWWA C104, field encased with 8 mil polyethylene bag per AWWA C105. Coat all bolts, restraining rods, and the like with bitumastic prior to encasement in the polyethylene bag.

B. Fittings: AWWA C110, 350 psi or 24.13 bar. Cement mortar lined per AWWA C104, field encased with 8 mil polyethylene bag per AWWA C105. Coat all bolts, restraining rods, and the like with bitumastic prior to encasement in the polyethylene bag.

C. Fittings restrained with thrust blocks or restraining rods per NFPA 24.

D. Underground Valves: Factory coated with powdered epoxy or equivalent corrosion resistant coating. Bolts coated with bitumastic in the field. Encase the entire valve in 8-mil polyethylene bag in accordance with AWWA C-105.

E. Flexible Underground Expansion Joints:

1. AWWA C153, AWWA C116, AWWA C105.
2. Expansion joint designed and cast as an integral part of a ball and socket type flexible joint.
3. Internal and external epoxy lined.
4. Sealing Gasket: EPDM.
5. Polyethylene sleeve.

2.03 BURIED STAINLESS STEEL PIPE

A. Single extended 90 degree fitting of fabricated stainless steel tubing, maximum working pressure 200 PSI. Grooved-end connection on building outlet side and CISPI coupler on underground inlet side.

2.04 JOINT RESTRAINTS

A. Mechanical joint wedge action for ductile iron pipe.

B. Gland: Ductile Iron.

C. Wedges: Ductile iron.

D. Full restraint pressure rating of pipe with minimum safety factor of 2:1.

2.05 ABOVEGROUND BLACK STEEL PIPE AND FITTINGS

A. Wet Pipe Systems:

1. Pipe Size 2-inch Diameter and Smaller: ASTM A53, ASTM A135, or ASTM A795; minimum of Schedule 40 when installed with threaded fittings, minimum Schedule 10 when installed with grooved fittings.
2. Pipe Size 2-1/2-inch Diameter and Larger: ASTM A53, ASTM A135, or ASTM A795; minimum of Schedule 10.
3. Exposed pipe 8-feet or less above finished floor: A minimum of Schedule 40.

B. Dry Pipe Systems:

1. Pipe Size 2-inch Diameter and Smaller: ASTM A53, ASTM A135, or ASTM A795; minimum of Schedule 40 when installed with threaded fittings, minimum Schedule 10 when installed with grooved fittings.
2. Pipe Size 2-1/2-inch Diameter and Larger: ASTM A53, ASTM A135, or ASTM A795; minimum of Schedule 10.

C. Joints:

1. Threaded, flanged or bevel welded.
2. Piping installed in plenums or shafts to have welded joints.

D. Fittings:

1. Threaded:
   a. Malleable or Ductile Iron: Class 150 and Class 300, ANSI B16.3.
   b. Cast Iron: Class 125 and 250, ANSI B16.3.
2. Flanged:
   a. Cast iron; Class 125 and 250, ASME B16.1.
   b. Raised ground face, bolt holes spot faced.
3. Welded:
   a. Carbon Steel: Long radius, standard weight or extra strong.
   b. Factory Wrought Steel Buttweld Fittings: ASME B16.9.
   c. Buttwelding Ends for Pipe, Valves, Flanges and Fittings: ASME B16.25.
   d. Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures: ASTM A234.
   e. Steel Pipe Flanges and Flanged Fittings: ASME B16.5.
   f. Forged Steel Fittings, Socket Welded and Threaded: ASME B16.11.

4. Mechanical Fittings and Grooved Couplings:
    a. Couplings: UL 213, AWWA C606, ASTM A536 ductile iron or ASTM A47 malleable iron, with enamel finish and grooves or shoulders designed to accept grooved couplings. Synthetic-rubber gasket with central-cavity, pressure-responsive design and ASTM A183 carbon-steel bolts and nuts.
    b. FM Global approved.

E. Anti-Microbial Coating: Factory-applied coating to inhibit corrosion from microbiological organisms.

2.06 WALL AND FLOOR PENETRATIONS AND SLEEVES

A. Below Grade and High Water Table Areas: Waterproof elastomeric compound.

2.07 SWITCHES, VALVE SUPERVISORY

A. Provide to mount on applicable, compatible valve (OS&Y gate, or PIV), with SPDT switches to match requirements of fire alarm system.

B. Provide with cover tamper switch where required by AHJ.

2.08 SWITCHES, WATER DETECTOR

A. Provide with cover tamper switch where required by AHJ.

B. Water Flow Switches:

1. Vane-type; SPDT switches; electronic retard, adjustable time delay (0 to 75 seconds).
2. Wet Sprinkler Systems: 450 PSI, 18-feet per second, 4-10 gpm.

C. Pressure Operated Alarm Switches: Pressure actuated with SPDT electrical switches and adjustable time delay (0 to 75 seconds).

2.09 HANGERS AND SUPPORTS

A. General: Select size of hangers and supports to exactly fit pipe size for bare piping.

B. Hangers: Ferrous.

C. Hanger Rods: Zinc electroplated carbon steel.

D. Finishes: Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

E. Materials: Use carbon steel pipe hangers and supports, metal trapeze pipe hangers and attachments for general service applications.

2.10 STRUTS AND STRUT CLAMPS

A. Electro-galvanized steel.

B. Designed for supporting pipe runs from strut supports.

2.11 SWAY BRACES AND RESTRAINTS

A. Sway Bracing: From a single manufacturer and compatible with sway brace calculation program.

2.12 SEISMIC SEPARATION ASSEMBLY

A. Flexible expansion loop, designed for seismic movement for sprinkler pipe passing through or crossing building seismic joints. Impart no thrust loads to building structure.

B. Two flexible sections of hose and braid, two 90 degree elbows and 180 degree return. Factory supplied, center support nut located at the bottom of the 180 degree return, drain/air release plug. Provide materials of construction and end fitting type consistent with pipe material and equipment/pipe connection fittings.

2.13 ANCHORS AND ATTACHMENTS

A. General: Anchor supports to masonry, concrete and block walls per anchoring system manufacturer's recommendations, or as modified by project Structural Engineer.

B. Materials: Ferrous.

C. Cast in Place Anchors for Hangers: Verify listing is for hangers, braces, or both.

D. Attachments in Concrete:

1. Suitable for hanging and bracing fire protection systems in concrete which is subject to cracking in a seismic event.
2. Seismic Design Areas C, D, E and F:
    a. Compatible with International Code Council Evaluation Service Acceptance Criteria AC-193 and AC308 for expansion, screw and adhesive anchors. Meet requirements of ACI 355.2, Qualification of Post-Installed Mechanical Anchors in Concrete and Commentary.
    b. All models of Hilti HDI and ITW Red Head Multi-Set II anchors are not approved for attaching fire protection systems in Seismic Design Areas C, D, E and F. No Exceptions.

E. ITW Buildex Sammys with FM Approval only are not allowed in certain seismic zones. Verify with FM that FM Approval is effective in project's seismic zone.

2.14 PIPE STANDS

A. Adjustable Pipe Saddle Support with Yoke:

1. Designed to support horizontal pipe from floor stanchion.
2. U-bolt and hex nuts to hold pipe securely to saddle or pipe clamp type.
3. ANSI/MSS SP-69; SP-58. Type 37.
4. Steel pipe with steel saddle.

B. Base Stand:

1. Steel pipe welded to steel base plate.
2. Meet requirements of 12X anchor diameter hole spacing for seismic applications.

2.15 GAUGES

A. Pressure Gauges: 3.5-inch, dial type, bronze bourdon tube or spring type, stainless steel case. 0 to 300 PSI.

2.16 ALARM BELLS

A. Minimum weatherproof backbox, typical 90 dBA at 10-feet.

B. Provide sign that reads, "When Bell Rings - Call 911".

2.17 VALVES

A. Butterfly Valves: Ductile iron body with factory-installed tamper switches. Use lug body next to pumps.

B. Pressure Relief: Bronze body, stainless steel spring.

C. Automatic Ball Drip Drain Valve: Bronze, spring-type.

D. Three-Way Gauge Valve: Brass; rated to 300 psi.

E. Automatic Air-Release Valve for Wet Systems:

1. Rated to 175 psi.
2. Automatic float-type with shutoff mounted in a water retention pan.
3. Single set 24VAC@2A for electronic supervision.
4. Ball valve switch with cover tamper.

F. Ball Valves: Brass body, brass stem; forged brass ball disc.

2.18 POST INDICATOR VALVE ASSEMBLIES

A. Vertical Indicator Post for Non-Rising Stem Valve:

1. Indicates if valve is in open or shut position.
2. Telescoping barrel type.
3. Fixed length type.
4. Flanged base.
5. Mount for padlock.
6. Mount for supervisory switch.

B. Horizontal Indicator Post for Non-Rising Stem Valve:

1. Indicates if valve is in open or shut position.
2. Used to operate a valve installed behind a wall.
3. With a post flange to mount on a wall.
4. Operated by a handwheel.
5. Cast iron body.
6. Mount for padlock.
7. Mount for supervisory switch.

C. Butterfly Valve Indicator Post Assemblies: Grooved butterfly valve with internal supervisory switch, steel wall plate, wall post assembly.

2.19 PIPE, VALVE, AND FIRE PROTECTION EQUIPMENT IDENTIFICATION

A. Engraved plastic laminate or corrosion resistant metal sign or plastic equipment marker.

B. Corrosion-resistant chain or permanent adhesive.

2.20 SIGNS

A. Engraved plastic laminate or corrosion resistant metal sign or plastic equipment marker.

B. Corrosion-resistant chain or permanent adhesive.

2.21 DRAINS

A. Reference Aboveground Black Steel Pipe and Fittings.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Install in conformance with UL Listing, FM Approval or ICC-ES requirements and restrictions.

3.02 BURIED DUCTILE IRON PIPE AND FITTINGS

A. Pipe Sleeves:

1. Lay out work in advance of pouring concrete and furnish and set sleeves necessary to complete work.
2. Floor Sleeves: Provide sleeves on pipes passing through concrete or masonry construction. Extend sleeve 1-inch above finished floor. Caulk pipes passing through floor with nonshrinking firestopping, smokestopping and water stopping grout or approved equivalent caulking compound.
3. Wall Sleeves: Provide sleeves on pipes passing through concrete or masonry construction. Provide sleeve flush with finished face of wall. Caulk pipes passing through walls with nonshrinking caulking compound. Caulk/seal piping passing through fire-rated building assemblies with UL Listed or FM approved fire-rated firestopping compound. Provide fire-rated assemblies per local AHJ requirements.
4. Coordinate with trades for locations of pipe sleeves in reinforced concrete and steel beams. Penetrations must be indicated on structural shop drawings. See Drawings and Specifications for specific sleeve location limitations.

B. Buried Pipe:

1. Hydraulically calculated pipe to be of sufficient size as to deliver the required flow while not exceeding a flow velocity of 15-feet per second or as required in accordance with the water department requirements, whichever is less.
2. Excavation and Backfill:
   a. General: Perform necessary excavation and backfill required for installation of mechanical work. Repair piping or other work damaged by Contractor's operations.
   b. Water: Keep excavations free of standing water. Re-excavate and fill back excavations damaged or softened by water or frost to original level with sand, crushed rock or other approved material at no expense to Owner.
   c. Tests: During progress of work for compacted fill, Owner reserves right to request compaction tests made under direction of a testing laboratory.
   d. Trench Excavation: Excavate trenches to necessary depth and width, removing rocks, unstable soil (i.e., muck, peat and the like), roots and stumps. Excavation material is classified as "base fill" and "native." Base fill excavation material consisting of placed crushed rock may be used as backfill above "Pipe Zone." Remove and dispose off site native excavation material at no expense to Owner. Adequate width of trench for proper installation of piping or conduit.
   e. Support Foundations:
      1) Foundations: Excavate trenches located in unstable ground areas below elevation required for installation of piping to a depth which is determined by Architect as appropriate for conditions encountered. Place and compact approved foundation material in excavation up to "Bedding Zone." Dewatering, placement, compaction and disposal of excavated materials to conform to requirements contained in other Sections of Specifications or Drawings.

2) Over-Excavations: Where trench excavation exceeds required depths, provide, place and compact suitable bedding material to proper grade or elevation at no additional cost to Owner.
3) Foundation Material: Where native material has been removed, place and compact necessary foundation material to form a base for replacement of required thickness of bedding material.
4) Bedding Material: Full bed site piping on sand, pea gravel or 3/4-inch minus crushed rock. Place a minimum 4-inch deep layer of sand or crushed rock on leveled trench bottom for this purpose. Remove bedding to necessary depth for piping bells and couplings to maintain contact of pipe on bedding for its entire length. Provide additional bedding in excessively wet, unstable, or solid rock trench bottom conditions as required to provide a firm foundation.

f. Backfilling:
1) Following installation and successful completion of required tests, backfill piping in lifts.
(a) In "Pipe Zone," place backfill material and compact in lifts not to exceed 6-inches in depth to a height of 12-inches above top of pipe. Place backfill material to obtain contact with entire periphery of pipe, without disturbing or displacing pipe.
(b) Place and compact backfill above "Pipe Zone" in layers not to exceed 12-inches in depth.
2) Backfill Material:
(a) Backfill Material in "Pipe Zone": 3/4-inch minus crushed rock, sand or pea gravel.
(b) Crushed rock, fill sand or other backfill material approved elsewhere in Specifications may be used above "Pipe Zone."

g. Compaction of Trench Backfill:
1) Where compaction of trench backfill material is required, use one of following methods or combination thereof:
(a) Mechanical tamper,
(b) Vibratory compacter, or
(c) Other approved methods appropriate to conditions encountered.
2) Architect to have right to change methods and limits to better accommodate field conditions. Compaction sufficient to attain 95 percent of maximum density at optimum moisture content unless noted otherwise on Drawings or elsewhere in Specifications. Water "puddling" or "washing" is prohibited.

C. Keep pipe openings closed by means of plugs or caps to prevent entrance of foreign matter. Protect piping and fittings against dirty water, chemicals, and mechanical damage both before and after installation. Restore to original condition or replace damaged pipe and fittings prior to final acceptance of work.

3.03 BURIED STAINLESS STEEL PIPE

A. Underground Steel Piping Corrosion Protection: Factory wrap uninsulated underground stainless steel piping systems with protective coating composed of a coal-tar saturated wrapping tape over a 20 mil thick coal-tar epoxy coating, equivalent to "Republic X-Tru-Coat." Wrap joints spirally with a minimum overlap of 1/2 tape width. Extend wrap not less than 3-inches above grade. Provide cathodic protection to meet requirements of governing authorities and servicing utility.

B. Buried Pipe:

1. Hydraulically calculated pipe to be of sufficient size as to deliver the required flow while not exceeding a flow velocity of 15-feet per second or as required in accordance with the water department requirements, whichever is less.
2. Excavation and Backfill:
   a. General: Perform necessary excavation and backfill required for installation of mechanical work. Repair piping or other work damaged by Contractor's operations.
   b. Water: Keep excavations free of standing water. Re-excavate and fill back excavations damaged or softened by water or frost to original level with sand, crushed rock or other approved material at no expense to Owner.
   c. Tests: During progress of work for compacted fill, Owner reserves right to request compaction tests made under direction of a testing laboratory.
   d. Trench Excavation: Excavate trenches to necessary depth and width, removing rocks, unstable soil (i.e., muck, peat and the like), roots and stumps. Excavation material is classified as "base fill" and "native." Base fill excavation material consisting of placed crushed rock may be used as backfill above "Pipe Zone." Remove and dispose off site native excavation material at no expense to Owner. Adequate width of trench for proper installation of piping or conduit.
   e. Support Foundations:
      1) Foundations: Excavate trenches located in unstable ground areas below elevation required for installation of piping to a depth which is determined by Architect as appropriate for conditions encountered. Place and compact approved foundation material in excavation up to "Bedding Zone." Dewatering, placement, compaction and disposal of excavated materials to conform to requirements contained in other Sections of Specifications or Drawings.
      2) Over-Excavations: Where trench excavation exceeds required depths, provide, place and compact suitable bedding material to proper grade or elevation at no additional cost to Owner.
      3) Foundation Material: Where native material has been removed, place and compact necessary foundation material to form a base for replacement of required thickness of bedding material.
      4) Bedding Material: Full bed site piping on sand, pea gravel or 3/4-inch minus crushed rock. Place a minimum 4-inch deep layer of sand or crushed rock on leveled trench bottom for this purpose. Remove bedding to necessary depth for piping bells and couplings to maintain contact of pipe on bedding for its entire length. Provide additional bedding in excessively wet, unstable, or solid rock trench bottom conditions as required to provide a firm foundation.

f. Backfilling:
   1) Following installation and successful completion of required tests, backfill piping in lifts.
      (a) In "Pipe Zone," place backfill material and compact in lifts not to exceed 6-inches in depth to a height of 12-inches above top of pipe. Place backfill material to obtain contact with entire periphery of pipe, without disturbing or displacing pipe.
      (b) Place and compact backfill above "Pipe Zone" in layers not to exceed 12-inches in depth.
   2) Backfill Material:
      (a) Backfill Material in "Pipe Zone": 3/4-inch minus crushed rock, sand or pea gravel.
      (b) Crushed rock, fill sand or other backfill material approved elsewhere in Specifications may be used above "Pipe Zone."

g. Compaction of Trench Backfill:
   1) Where compaction of trench backfill material is required, use one of following methods or combination thereof:
      (a) Mechanical tamper,
      (b) Vibratory compacter, or
      (c) Other approved methods appropriate to conditions encountered.
   2) Architect to have right to change methods and limits to better accommodate field conditions. Compaction sufficient to attain 95 percent of maximum density at optimum moisture content unless noted otherwise on Drawings or elsewhere in Specifications. Water "puddling" or "washing" is prohibited.

C. Keep pipe openings closed by means of plugs or caps to prevent entrance of foreign matter. Protect piping and fittings against dirty water, chemicals, and mechanical damage both before and after installation. Restore to original condition or replace damaged pipe and fittings prior to final acceptance of work.

3.04 JOINT RESTRAINTS

A. Install per manufacturer's instructions and recommendations.

B. Reference 3.01, General Installation Requirements.

3.05 ABOVEGROUND BLACK STEEL PIPE AND FITTINGS

A. Piping Routing:
   1. Orient horizontal routes parallel with walls and beam lines.
   2. Install piping as shown or described by diagrams, details and notations on Drawings or, if not indicated, install piping to provide the shortest route which does not obstruct usable space or block access for servicing the building and its equipment.
   3. Install piping in concealed spaces above finished ceilings. Prior to design and installation. obtain pre-approval by Architect for exposed piping.
   4. In open-to-structure areas which are open to public view, route exposed piping to minimize visual impact. Obtain Architect's and Engineer's approval of exposed piping installation.

5. Coordinate installation with other trades. Route piping as required to avoid building structure, equipment, plumbing piping, HVAC piping, ductwork, lighting fixtures, electrical conduits and bus ducts and similar work. Final location of lighting will have priority over final sprinkler locations. Provide drains to trapped sections of system which result from such routing. Other trades take precedence for installation space.
6. Support piping adjacent to walls, overhead construction, columns and other structural and permanent enclosure elements of the building. Limit clearance to 2-inches wherever furring is indicated for concealment of piping. Allow for insulation thickness. Locate insulated piping to provide minimum 1-inch clearance outside insulation.
7. Wherever possible in finished and occupied spaces, conceal piping from view by locating within column or beam enclosures, hollow wall construction, or above suspended ceilings. Do not encase horizontal routes in solid partitions, except where approved.
8. General Electrical Equipment Clearances: Do not route piping through electrical rooms, transformer vaults, elevator equipment rooms and other electrical or electronic equipment spaces and enclosures. Do not route piping above electric power or lighting panel, switchgear, low voltage panel, or similar electric device.
9. Rooms Protected by Alternative Systems: Route water filled and dry system piping around rooms protected by pre-action systems, clean agent systems, gaseous suppression systems and other alternative fire suppression systems.
10. Install pipe runs to minimize obstruction to other work.
11. Pitch all dry and pre-action system piping 1/4-inch per 10-feet for mains and 1/2-inch per 10-feet for branch lines, including pipe passing through both warm and cold areas.

B. Couplings:

1. Install where indicated on Drawings and on each side of pieces of equipment to permit easy removal of equipment.
2. Deburr cut edges.

C. Pipe Penetrations: Wire pipe cutout coupon at point of pipe penetration.

D. Pipe and Pipe Fittings:

1. Expansion and Flexibility: Install work with due regard for expansion and contraction to prevent damage to the piping, equipment, building and its contents. Provide piping offsets, loops, approved type expansion joints, sway bracing, wire restraints, vertical restraints, flexible couplings or other means to control pipe movement and to minimize pipe forces.
2. Coordinate support of pipe 4-inches and larger with Structural Engineer.
3. Provide clearances around piping per NFPA 13.
4. Install dry and pre-action welded pipe with welds facing vertically up, or where this is not possible, as close as possible to vertical between 46 degrees and 234 degrees. Intent is to minimize corrosion caused by moisture in the bottom of pipes.

3.06 WALL AND FLOOR PENETRATIONS AND SLEEVES

A. Escutcheons: Install on exposed pipes passing through walls or floors.

1. Pipe Sleeves: Lay out work in advance of pouring concrete and furnish and set sleeves necessary to complete work.

2. Floor Sleeves: Provide sleeves on pipes passing through concrete or masonry construction. Extend sleeve 1-inch above finished floor. Caulk pipes passing through floor with nonshrinking fire and water resistant grout or approved equivalent caulking compound. Caulk/seal piping penetrations through fire rated building walls and floors with listed, fire-rated assemblies. Provide fire-rated assemblies per local AHJ requirements.
3. Wall Sleeves: Provide sleeves on pipes passing through concrete or masonry construction. Provide sleeve flush with finished face of wall. Caulk pipes passing through walls with non-shrinking caulking compound. Caulk/seal piping penetrations through fire rated building walls and floors with listed, fire-rated assemblies. Provide fire-rated assemblies per local AHJ requirements.
4. Beam Sleeves:
    a. Coordinate with trades for locations of pipe sleeves in reinforced concrete and steel beams. Penetrations must be indicated on structural shop drawings. See Drawings and Specifications for specific sleeve location limitations. Pipe sleeve locations must be indicated on reinforced concrete and steel beam shop drawings.
    b. Field cutting of beams not allowed without written approval of structural engineer. No extra costs allowed for failure to coordinate beam penetrations prior to reinforced concrete and steel beam shop drawing submittal.
5. Penetrations in Fire-Rated Wall/Floor Assemblies:
    a. Reference Division 07, Thermal and Moisture Protection.
    b. Coordinate with Drawings location of fire rated walls, ceilings and floors. When these assemblies are penetrated, seal around piping and equipment with approved firestopping material.
    c. Provide proper sizing when providing sleeves or core-drilled holes to accommodate the penetration. Firestop voids between sleeve or core-drilled hole and pipe passing through to meet the requirements of ASTM E814 and NFPA.
    d. Install firestopping material complete as directed by manufacturer's installation instructions. Meet requirements of ASTM E814.

3.07 SWITCHES, VALVE SUPERVISORY

A. Coordinate with Division 28, Electronic Safety and Security.

3.08 SWITCHES, WATER DETECTOR

A. Wire pipe cutout coupon at point of connection of switch to pipe.

B. Flow switches: Connect to system side of valves and drain connections.

C. Coordinate with Division 28, Electronic Safety and Security.

3.09 HANGERS AND SUPPORTS

A. Installation of pipe hangers, inserts and supports to conform to NFPA 13. Provide adjustable hangers, inserts, brackets, clamps, supplementary steel and other accessory materials required for proper support of pipe lines and equipment. Provide supplementary materials for proper support and attachment of hangers.

3.10 STRUTS AND STRUT CLAMPS

A. Install per manufacturer's listed orientation.

3.11 SWAY BRACES AND RESTRAINTS

A. Locate per orientation and spacing as required by sway brace calculations.

B. Attach sway bracing directly to pipe or equipment being braced.

C. Do not attach sway bracing to bottom of truss members.

3.12 SEISMIC SEPARATION ASSEMBLY

A. Provide four-way sway braces upstream and downstream within 6-feet of the seismic separation assembly, attached to structure on opposite sides of the seismic joint. Do not attach bracing to seismic separation assembly.

3.13 ANCHORS AND ATTACHMENTS

A. In post-tension construction, determine location of post-tension cables and install anchors to avoid contact or interference with post-tension cables. Coordinate with Structural.

B. Do not use powder-driven attachments.

C. Building Attachments and Inserts: Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves and flanges, for sizes NPS 2-1/2 and larger. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

D. Hanger and Support Attachments:

1. Concrete:
    a. Where supports in slabs are required after concrete has been poured, provide drilled-in threaded inserts (mechanical-expansion anchors), installed in accordance with manufacturer's recommendations.
    b. Install mechanical-expansion anchors after concrete is completely cured and in accordance with manufacturer's installation instructions.
    c. Where anchors are to be installed in post-tension construction, determine and avoid locations of post-tension cables prior to drilling.
2. Metal Floor Deck: Support hangers per UL Listing or FM Approval for selected concrete insert before pouring of concrete topping, or from beam clamps fastened to structural steel.
3. Steel Joists: Support hangers from beam clamps fastened to bar joists or to auxiliary steel between bar joists as required.
4. C-Clamp Hangers: Do not attach to one side of double-angle bottom members.
5. Locate and install hangers, supports and attachments connecting to I-joists, structural insulated panels (SIPs), cross laminated timber and similar engineered structural products according to the structural product manufacturer specifications.

E. Make available to the Architect information required to verify the anchorage, sway bracing and restraint of fire protection systems.

3.14 PIPE STANDS

A. Secure to floor.

B. Install to maintain pipe level and plumb.

C. Securely attach to supported pipe by u-bolt.

3.15 GAUGES

A. Install gauges conveniently and accessibly located with reference to finished building for repairs, removal and service.

B. Install with dial positioned for maximum visibility.

3.16 ALARM BELLS

A. Locate exterior alarm bells at 8-feet above finished grade. Coordinate with Architect.

B. Coordinate with Division 26, Electrical and Division 28, Electronic Safety and Security.

3.17 VALVES

A. Provide post indicator on buried control valves.

B. Inspect valves for leaks. Adjust or replace packing to stop leaks. Replace valve if leak persists.

C. Install valves where required for proper operation, testing and drainage. Locate valves so as to be accessible and so that separate support can be provided when necessary. Install conveniently and accessibly located with reference to finished building for repairs, removal and service.

D. Pressure Relief Valves: Provide piping to permanent drain.

3.18 POST INDICATOR VALVE ASSEMBLIES

A. Install plumb and conveniently and accessibly located with reference to finished building for repairs, removal and service.

B. Provide post indicator on buried control valves. Orient so “Open” and “Shut” signs are visible from street, or as required by AHJ.

C. Provide supervisory switch connected to fire alarm system.

3.19 PIPE, VALVE, AND FIRE PROTECTION EQUIPMENT IDENTIFICATION

A. Install engraved plastic laminate or corrosion resistant metal sign or plastic equipment marker, secured with corrosion-resistant chain or permanent adhesive on or near each Item of fire suppression equipment and each operational device, as specified in this specification if not otherwise specified for each Item or device.

B. Provide signs for the following general categories of equipment and operational devices: Valves, drains, pumps, standpipes, tanks and similar equipment.

C. Each new piece of equipment to bear a permanently attached identification plate, listing manufacturer's name, capacities, sizes and characteristics.

D. Piping to bear the manufacturer's name, schedule of thickness, size and ASTM identification number

E. Provide valve tag on every valve, control device, main drain, auxiliary drain, and drum drip in each system. Exclude check valves and valves within factory fabricated equipment units. List each tagged valve in valve schedule for each piping system.

F. List each tagged item and its location in valve schedule; identify on fire suppression drawings.

G. Install framed, glass or rigid transparent plastic covered, mounted valve schedule and valve location drawing in main riser or fire pump room.

H. Provide identification sign on ceiling tile below valve location.

I. Provide permanent identification sign at pressure regulating valves stating required setting of pressure regulator.

J. Adjusting: Relocate fire suppression identification device which has become visually blocked.

K. Cleaning: Clean face of identification devices and glass frames of valve charts.

3.20 SIGNS

A. General Information Signs: Provide a general information sign used to determine system design basis and information relevant to the inspection, testing and maintenance requirements required by NFPA 25, Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems. Such general information is to be provided with a permanently marked weatherproof metal or rigid plastic sign, secured with corrosion-resistant wire, chain, or other acceptable means. Such signs are to be placed at each system control rise loop and auxiliary system control valve.

B. The sign is to include the following information:

1. Name and Location of the Facility Protected
2. Presence of High-Piled and/or Rack Storage
3. Maximum Height of Storage Planned
4. Flow Test Data
5. Location of Auxiliary Drains and Low Point Drains
6. Original Results of Main Drain Flow Test
7. Name of Installing Contractor or Designer
8. Indication of presence and location of other auxiliary systems.

3.21 DRAINS

A. Locate drain connections within 7-feet of floor. Provide piping capable of being fully drained.

B. Provide a drain vent at top of vertical drains. Coordinate with Division 22, Plumbing.

C. Coordinate location of auxiliary drains with Architect. Architect to approve location before drain is installed.

D. Protect drains from tampering and accidental operation.

E. Protect drain discharge at the exterior with a turned-down 45 degree elbow.

END OF SECTION

SECTION 21 1300 - FIRE SUPPRESSION SPRINKLER SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:

1. Sprinklers
2. Flexible Sprinkler Hose Fitting Assembly - For fire sprinklers in suspended ceilings which are supplied by a wet pipe system.
3. Riser Manifold
4. Inspector's Test Connection
5. Dry-Pipe Valve
6. Dry System Drum Drip Drains
7. Nitrogen System
8. Wet System Air Vent
9. Spare Sprinkler Cabinet
10. Sprinkler Guards

B. This is a contractor designed system. Contact AHJ prior to bid to verify fire system requirements. Provide design compliant with codes as interpreted by AHJ.

C. Scope:

1. Wet-Pipe Sprinkler System for Vehicle Building and New Campus Building.
2. Dry-pipe sprinkler system and/or dry barrel sprinklers for areas subject to 40 degrees F or less.
3. Private fire service main running from 5-feet outside the buildings to the inlet connection inside the buildings. Provide required valves and appurtenances.

D. Coordinate location and type of tamper, flow and pressure switches and fire alarm system.

E. Provide electrical connections and wiring as required for a complete and operable system. Includes but is not limited to bells, air compressors, sump pumps, fire pumps, jockey pumps and pump controllers.

1.02 RELATED SECTIONS

A. Contents of Division 21, Fire Suppression and Division 01, General Requirements apply to this Section.

B. In addition, reference the following:

1. Division 22, Plumbing
2. Division 23, Heating, Ventilating and Air-Conditioning
3. Division 26, Electrical
4. Division 28, Electronic Safety and Security
5. Section 21 00 00, Fire Suppression Basic Requirements
6. Section 21 05 00, Common Work Results for Fire Suppression
7. **Section 21 22 01, Hybrid Fire Extinguishing System**

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 21 00 00, Fire Suppression Basic Requirements and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 21 00 00, Fire Suppression Basic Requirements and Division 01, General Requirements.

B. In addition, provide:

1. Hydraulic calculations.
2. Sway brace calculations.
3. Details of sway bracing.
4. Details of interval and end of branch line restraints.
5. Details of flexible sprinkler hose fitting assembly, including number and radius of bends, corresponding to equivalent feet used in hydraulic calculations. Provide details of sign to be installed at each flexible sprinkler hose fitting assembly.
6. Trapeze hanger details and calculations, including size, length and material. Additionally, provide size, weight and number of pipes to be carried on the trapeze.
7. On submittal and As-Built drawings, provide text of sprinkler list to be installed in the spare sprinkler cabinet.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 21 00 00, Fire Suppression Basic Requirements and Division 01, General Requirements.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 21 00 00, Fire Suppression Basic Requirements and Division 01, General Requirements.

1.07 SYSTEM DESCRIPTION

A. Provide coverage for the entirety of both buildings. Field verify field conditions prior to submittal of bid. Adjust bid to provide protection features in accordance with applicable codes and interpretations by AHJ. Provide design and installation based on more stringent requirements if this specification and AHJ requirements differ from Code.

B. Design Parameters:

1. New Campus Building:
   a. Building Areas: Hall, Restrooms, Offices, Common spaces, and similar areas.
      1) Occupancy Classification: Light.
   b. Building Areas: Mechanical rooms, Electrical, Storage, and similar areas.
      1) Occupancy Classification: Ordinary Group I
   c. Building Areas: Warehouse with High-Piled Storage and Loading.
      1) Occupancy Classification: Ordinary Group 2.
      2) Provide NFPA 13 compliant coverage in accordance with NFPA 13 high-piled storage chapters via CMDA sprinklers.
2. Vehicle Building:
   a. Building Areas: Bathrooms, Mudroom, Dry Room
      1) Occupancy Hazard: Light
   b. Building Areas: Electrical, Telecom, and similar areas.
      1) Occupancy Classification: Ordinary Group I

c. Building Areas: Conditioned Truck Parking and Welding
1) Occupancy Classification: Ordinary Group 2.

3. Design parameters above are NFPA 13 minimums. Provide increased design densities, design areas and hose allowances to meet requirements of AHJ

C. Sprinkler system design to include a 10 percent pressure and flow cushion between system demand point and available water supplies.

D. Extend hydraulic calculations from hydraulically most remote design area back to location of pressure hydrant of flow test or effective point of water supply where characteristics of water supply are known.

1.08 EXTRA STOCK

A. Provide extra sprinklers per code.

B. Provide suitable wrenches for each sprinkler type and metal storage cabinet in riser room.

1.09 CONTROL VALVES

A. Sprinkler system control valves to be OS&Y or butterfly valves located inside buildings in a room with outside door.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Sprinklers:

1. Finished Areas:
a. Victaulic
b. Viking
c. Tyco
d. Reliable
e. Globe
f. Senju
g. Or approved equivalent.

2. Nonfinished Areas:
a. Victaulic
b. Viking
c. Tyco
d. Reliable
e. Globe
f. Or approved equivalent.

3. Storage:
a. Victaulic
b. Viking
c. Tyco
d. Reliable
e. Or approved equivalent.

4. Dry Sprinklers:
a. Victaulic
b. Viking
c. Tyco

d. Reliable
e. Or approved equivalent.

B. Flexible Sprinkler Hose Fitting Assembly:

1. Victaulic; VicFlex.
2. Flexhead Industries
3. SprinkFLEX
4. Allied Rubber and Gasket Company, Incorporated, dba ARGCO
5. Reliable Automatic Sprinkler Company
6. Tyco Fire and Building Products
7. Viking Corporation
8. Or approved equivalent.

C. Riser Manifold:

1. Viking
2. Reliable
3. AGF
4. Tyco
5. Or approved equivalent.

D. Inspector's Test Connection:

1. Combination Test and Drain:
   a. Victaulic; with pressure relief valve.
   b. AGF; with pressure relief valve.
   c. Or approved equivalent.
2. Dry System Inspector's Test Connection:
   a. AGF
   b. Or approved equivalent.

E. Dry-Pipe Valve:

1. Victaulic
2. Viking
3. Tyco
4. Or approved equivalent.

F. Dry System Drum Drip Drains:

1. Custom Piping and Valves per NFPA 13.
2. AGF; Collect an Drain
3. Or approved equivalent.

G. Nitrogen System:

1. Engineered Corrosion Solutions (ECS)
2. Potter Electrical Signal
3. South-Tek
4. Or approved equivalent.

H. Wet System Air Vent:

1. Engineered Corrosion Solutions (ECS)
2. Potter Electric Signal Company; Model PAV
3. Or approved equivalent.

I. Spare Sprinkler Cabinet:

1. Victaulic
2. Fire Protection Products, Inc. (FPPI).
3. Tyco Fire & Building Products
4. Allied Rubber and Gasket Co.
5. Potter Roemer Fire Pro.
6. Or approved equivalent.

J. Sprinkler Guards:

1. Victaulic
2. Viking
3. Tyco
4. Reliable
5. Globe
6. Senju
7. Or approved equivalent.

2.02 SPRINKLERS

A. Finished Areas:

1. Type: Glass-Bulb
2. Style: Concealed
3. Response: Quick-Response
4. Finish: White Polyester
5. Escutcheon: White Polyester
6. Coverplate for Concealed Sprinklers: Match Ceiling Color.

B. Nonfinished Areas:

1. Type: Glass-Bulb
2. Response: Quick-Response
3. Finish: Brass

C. Storage

1. Type: Glass-Bulb
2. Style: Upright
3. Response: Standard Response
4. Finish: Brass
5. Temperature: High

D. Dry Sprinklers:

1. Type: Glass-Bulb
2. Style: Recessed
3. Response: Quick-Response
4. Finish: Chrome
5. Escutcheon: Chrome
6. Dry Sprinkler Boot: Manufactured for use with the dry sprinkler it protects.

E. Pendent sprinklers supplied by dry or preaction piping: Dry pendent type.

2.03 FLEXIBLE SPRINKLER HOSE FITTING ASSEMBLY

A. Fully welded non-mechanical fittings, stainless steel, braided, leak-tested with minimum 1-inch true-bore internal corrugated hose diameter. 175 psi.

B. Ceiling Bracket: Galvanized steel, direct attachment type, with integrated snap-on clip ends and removable flexible hose attachment with set screw. FM1637, UL 2443.

C. Affix permanent sign, label or decal at each flexible sprinkler hose fitting assembly anchoring component limiting the relocation of the sprinkler.

2.04 RISER MANIFOLD

A. Water-flow alarm, gauge, integral pressure relief valve connected to drain, pressure gauge with 3-way gauge control valve and drain valve, integral pressure relief valve connected to drain, sight glass, smooth bore orifice union of same size as smallest orifice sprinkler installed. Provide cover tamper switch when required by AHJ.

2.05 INSPECTOR'S TEST CONNECTION

A. Combination Test and Drain: Bronze body, brass stem, impregnated Teflon seat, chrome coated brass ball, steel handle with positive stops, tamper resistant test orifice, integral tamper resistant sight glasses, tapped and plugged port for system access, steel identification plate. Provide with pressure relief valve and drainage piping with bronze body and stainless steel spring.

B. Dry System Inspector’s Test Connection: Bronze, brass stem, steel handle, chrome-plated bronze ball, Teflon valve seat, tamper and corrosion resistant orifice equivalent to smallest sprinkler orifice, sight flow connection.

2.06 DRY-PIPE VALVE

A. Differential or low pressure actuator type.

B. Trim as recommended by manufacturer for variable pressure service, including air maintenance device, electric low pressure alarm switch, priming valves and test, main drain and pressure gauges.

C. External reset.

2.07 DRY SYSTEM DRUM DRIP DRAINS

A. Normally open upper ball valve with lever handle.

B. Normally closed lower ball valve with lever handle.

2.08 NITROGEN SYSTEM

A. Complete system package from one manufacturer, consisting of: Nitrogen Generation System, Oilless Air Compressor, Building Monitoring System, Alarm Integration, Auto Purge System, Auto Purge Remote Annunciator and Supervisory Gas Monitoring and Air Maintenance Device. All components to be compatible with each other.

2.09 WET SYSTEM AIR VENT

A. Brass, UL 2573 with ball valve supervisory switch.

2.10 SPARE SPRINKLER CABINET

A. NFPA 13 Systems: Sized to accommodate a minimum of two spare sprinklers of each Sprinkler Identification Number (SIN), manufacturer, model, orifice, deflector type, temperature and thermal sensitivity, or a minimum of six sprinklers for facilities having under 300 sprinklers, or a minimum of 12 sprinklers for facilities having 300 to 1000 sprinklers, or a minimum of 24 sprinklers for facilities having over 1000 sprinklers, whichever is more.

B. Welded steel with hinged steel cover.

C. Red enamel or polyester coated finish inside and out.

2.11 SPRINKLER GUARDS

A. Metal.

B. Listed for use with sprinkler model to which it is attached.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Install per manufacturer's requirements and recommendations.

3.02 SPRINKLERS

A. Center sprinklers in center or quarter points of suspended ceiling tile.

B. Align sprinklers with architectural column lines, lighting, diffusers and other ceiling features. In unfinished ceilings, route piping to minimize visual impact. Sprinklers and piping not so aligned are to be removed and replaced at no additional cost to Owner.

C. Install dry sprinklers in a manner which does not trap water.

3.03 FLEXIBLE SPRINKLER HOSE FITTING ASSEMBLY

A. Install flexible sprinkler hose fitting assemblies where pendent sprinkler heads are located in acoustic ceiling tiles.

B. Install with no more bends than are included in equivalent footage used in hydraulic calculations.

C. Maintain manufacturer's recommended bending radius as included in equivalent footage used in hydraulic calculations.

D. Affix permanent sign, label or decal at each flexible sprinkler hose fitting assembly anchoring component limiting the relocation of the sprinkler.

3.04 RISER MANIFOLD

A. Install so valves and gauges are conveniently and accessibly located with reference to finished buildings for repairs, removal and service.

B. Provide connection to drain.

C. Pipe pressure relief valve to drain.

D. Install with supervised control valve(s) and check valve.

3.05 INSPECTOR'S TEST CONNECTION

A. Locate where full flow discharge or pressure relief valve discharge will not do damage, including damage to landscaping and will not cause dangerous conditions to walking surfaces or discoloration to buildings' surfaces.

B. Locate within 5-feet of finished floor.

3.06 DRY-PIPE VALVE

A. Install with sufficient access for ease of reset.

3.07 DRY SYSTEM DRUM DRIP DRAINS

A. Locate within 7-feet of finished floor.

B. Coordinate drain locations with architect prior to design and installation of dry sprinkler system.

3.08 NITROGEN SYSTEM

A. Install per manufacturer's recommendations.

B. Provide a nitrogen purge valve at farthest point from nitrogen generator.

3.09 WET SYSTEM AIR VENT

A. Locate at a point in the system that will vent the most air.

B. Connect at top of pipe.

C. Locate so as not to interfere with sprinkler spray pattern.

D. Locate where it can be easily accessed for inspection and cleaning.

E. Pipe output of air vent to drain with an indirect connector or to exterior where it will not cause damage.

3.10 SPARE SPRINKLER CABINET

A. Attach to wall at the main sprinkler system riser.

B. Locate so cover is easy to open and readily accessible.

C. Locate in an area with a temperature between 40 and 100 degrees Fahrenheit.

D. Locate sprinkler wrenches inside cabinet.

E. Inside the cabinet, provide a list of sprinklers installed in the property, including sprinkler identification number, manufacturer, model, orifice, deflector type, thermal sensitivity and pressure rating, quantity of each type to be contained in the cabinet and issue or revision date of the list.

3.11 SPRINKLER GUARDS

A. Install per manufacturer's instructions and recommendations.

END OF SECTION

SECTION 21 2201 - HYBRID FIRE EXTINGUISHING SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included: Victaulic Vortex Hybrid Extinguishing System

B. Coordinate with Division 28, Electronic Safety and Security, for releasing control panel, initiating devices and controls for the Vortex system.

1.02 RELATED SECTIONS

A. Contents of Division 21, Fire Suppression and Division 01, General Requirements apply to this Section.

B. In addition, reference the following:

1. Division 22, Plumbing
2. Division 23, Heating, Ventilating and Air Conditioning
3. Division 26, Electrical
4. Division 28, Electronic Safety and Security
5. Section 21 00 00, Fire Suppression Basic Requirements
6. Section 21 12 00, Fire Suppression Standpipes
7. Section 21 13 00, Fire Suppression Sprinkler Systems

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 21 00 00, Fire Suppression Basic Requirements and Division 01, General Requirements.

B. Meet requirements of ASCE 7, Minimum Design Loads for Buildings and Other Structures, by American Society of Civil Engineers, latest adopted edition.

1.04 SUBMITTALS

A. Submittals as required by Section 21 00 00, Fire Suppression Basic Requirements and Division 01, General Requirements.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 21 00 00, Fire Suppression Basic Requirements and Division 01, General Requirements.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 21 00 00, Fire Suppression Basic Requirements and Division 01, General Requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. General: All tubing, piping, and fittings for the complete system to be stainless steel, galvanized, or other corrosion resistant materials. Fittings that do not have wetted surfaces may be ductile iron or equivalent.

B. Victaulic Vortex Extinguishing System: Victaulic, no substitutions permitted.

2.02 SYSTEM DESCRIPTION

A. Unless otherwise specified, protection to be by an engineered hybrid, high velocity, low pressure, Victaulic Vortex dual fluid system capable of making water particles less than 10 microns in size.

B. System to be designed, installed and tested in accordance with Victaulic Vortex performance based design intent as described in the Victaulic's Vortex Design, Installation and Maintenance Manual. The Victaulic Vortex System to incorporate separate pressurized streams of nitrogen and water which are combined and discharged as a hybrid inert gas fog into the fire hazard.

C. The combination of the nitrogen gas and water to be at the emitter, where the nitrogen stream to be at approximately 25 psig, and water component to be at a minimum of 30 psig.

1. Water to be introduced into the nitrogen flow downstream of the nitrogen exit orifice to atmosphere.
2. Provide a self-regulating flow cartridge for each emitter to ensure a specific water flow of less than one gallon per minute per emitter.
3. Provide a strainer upstream of each flow cartridge to ensure no clogging is permitted.

D. The mixture of the two components (hybrid) to be in a shock front, allowing shear forces to atomize the water, creating the hybrid inert gas micro mist of water droplets less than 10μm in diameter, with the majority being less than 10μm in diameter.

E. Application to protect via total flooding or as a local application hazard protection.

F. System to be activated automatically upon detection of a fire and capable of being manually activated.

G. A release signal shall be provided to discharge the system and a supervisory signal is used to confirm the hybrid inert gas fog has discharged.

2.03 EXTINGUISHMENT MECHANISM AND TEST METHODOLOGY

A. The fire extinguishing system's primary extinguishing mechanism to be reduction of atmosphere to 12.5 percent to 14 percent oxygen.

B. Secondary to be by heat absorption via the fine water particles vaporization from liquid phase to vapor phase.

C. Test protocol acceptance criteria to be in accordance with that set by Victaulic Vortex Design, Installation and Maintenance Manual.

D. Documented approval agency testing for machined spaces up to 3500 cubic meters with scalability beyond 3500 cubic meters, is required.

E. No ozone depletion potential or Global Warming Characteristic to be accepted.

2.04 SPECIFICATION NEEDS

A. When an engineered system is required or specified, design to include the following:

1. Engineered systems to utilize proven fire test data from a recognized international testing agency (e.g., IMO or Factory Mutual) as a minimum for the design basis of the proposed system design.

2. The testing referenced to be based on the specific hazards, equipment packages and the associated enclosure type.
3. The design of engineered systems must clearly demonstrate function and NFPA 750 performance based design intent based on the referenced test data considering volume and water volume density and extinguishing performance for the design when comparing to the test data.

B. The following items as detailed in the I-VORTEX Installation and Maintenance Manual systems:
1. Victaulic Vortex fire suppression system installation and verification procedure.
2. Points of contact and discharge actuation eyewitness.
3. Acceptance and testing procedure.
4. I-VORTEX General Design, Installation, and Maintenance Manual.

C. Provide Victaulic Vortex customer information sheets for the hazards and provide detailed drawings to assist in the design and layout of the emitters and submitted to the owner’s stakeholders. Any further requirements for the system not covered in this specification to be relayed to the Victaulic Vortex project engineers for their consideration and requisite actions in laying out the proposal.

D. Owner's stakeholder approval is required for all fire suppression systems.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Install in conformance with UL Listing, FM Approval or ICC-ES requirements and restrictions.

B. Post clear instruction signs outside the system hazard area or adjacent to an unenclosed system to ensure correct operation of the system. Additionally, post recharge and basic maintenance instructions inside the system cabinet or adjacent to the system. Signs and instructions to be provided on engraved or etched material in English.

C. Submit completed points of contact, discharge, activation, eyewitness, acceptance testing procedure.

D. Provide details of test results to Owner's stakeholders.

3.02 EMITTER REQUIREMENTS

A. The Victaulic Vortex System does not require tight enclosures such as with gaseous alternatives.

B. Designs to include emitters to ensure proper coverage of the enclosure. Designs incorporating doorway manifold emitters are not allowed.

C. Locate all emitters in the protected space in accordance with the fire suppression system manufacturer's recommendation and the approved pre-engineered system design. Position emitter to ensure the hybrid inert gas fog is uninterrupted and does not directly impinge on adjacent enclosure equipment (e.g., monorails) or mounting supports.

D. Emitter covers to be fitted to all discharge emitters to prevent blockage from corrosion deposits in a marine environment. Emitter covers to be designed so as to not interfere with the normal discharge.

3.03 WATER SUPPLY REQUIREMENTS

A. Unless approved otherwise, pre-engineered fire suppression system to provide a connected reserve of fluids equal in volume to the initial discharge supply per Victaulic Vortex performance based design intent and will be used for backup. The backup system for engineered systems to be equal in volume to the initial discharge supply.

B. Shutoff control valves for all fluid paths to be monitored for proper operative position.

C. A supply of water to be confirmed for refilling the water cylinders. Make provisions to simplify the task of periodically draining and refilling water cylinders as required by NFPA 750 performance based design intent. Provide filters or strainers with mesh no larger than 80 percent of the smallest orifice or fluid channel in the system or 100 micrometers, whichever is smaller. Provide a system to rapidly verify the water cylinders are full by continual monitoring of facilities to enable rapid level confirmation during periodic maintenance.

D. Design water cylinders to prevent corrosion. When requested, install tanks and cylinders on metal or fiberglass grating inside optional cabinets to raise the cylinders above the cabinet floor and avoid corrosion underneath of the cylinders and/or cabinets.

3.04 NITROGEN SUPPLY REQUIREMENTS

A. Cylinders are to be retained in position by metal bands with rubber or synthetic strips fitted to prevent corrosion of the cylinders or metal bands. Special consideration to be given to FPSO applications due to additional motion induced forces.

B. Primary nitrogen cylinder to have a pressure gauge with display and be continually monitored with a low pressure alarm transmitted to an attended location.

C. Provide DOT 150 or ASME approved cylinder tubes.

3.05 TESTING

A. A pressure test of the complete system (discharge pipe, tubing and fittings) to be carried out in accordance with the requirements of Victaulic Vortex performance based design intent to ensure the system is free of leaks prior to a final discharge test.

B. A final discharge test is required on every individual system prior to any machine testing or operation to ensure piping and fittings do not come loose due to system shock, and that emitters have been positioned correctly with suitable, unobstructed spray patterns.

END OF SECTION

SECTION 26 0573 - ELECTRICAL DISTRIBUTION SYSTEM STUDIES

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:

1. Protective Devices
2. Short Circuit Study
3. Arc Flash Risk Assessment
4. **Switching Transient Analysis Study**
5. Arc Flash Labels

1.02 RELATED SECTIONS

A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this Section.

B. In addition, reference the following:

1. Section 26 22 00, Low Voltage Transformers
2. Section 26 24 14, Switchboards
3. Section 26 28 00, Overcurrent Protective Devices
4. Section 26 28 16, Enclosed Switches and Circuit Breakers
5. Section 26 32 13, Engine Generators

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:

1. IEEE 242, Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems.
2. IEEE 399, Recommended Practice for Industrial and Commercial Power Systems Analysis.
3. IEEE 1584, Guide for Performing Arc Flash Calculation.

1.04 SUBMITTALS

A. Submittals as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

B. In addition provide:

1. Power system studies required under this Section with submittals for electrical equipment, including overcurrent protective devices.
2. Electrical equipment ordered prior to submittal of power system studies are not compliant with these specifications, and are subject to removal and replacement at no cost to Owner where not in compliance with Code and Contract Documents for selective coordination.
   a. Provide written verification with Stamp or Seal and signature of preparing Engineer.
3. Provide samples of NFPA 70E compliant arc flash hazard labeling for electrical equipment.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:

1. Study Preparer Qualifications: Qualified engineer of switchgear manufacturer or approved professional engineer.
   a. Experienced in preparation of studies of similar type and magnitude.
   b. Familiar with software analysis products specified.
2. Computer Software for Study Preparation: Use latest edition of commercially available software utilizing specified methodologies.
   a. Acceptable Software Products:
      1) EasyPower
      2) Operation Technology, Inc; ETAP.
      3) SKM Systems Analysis, Inc; Power Tools for Windows.
   b. The above manufacturers are known to be acceptable for study purposes. At the completion of the study, provide an electronic EasyPower file of the project to the Owner/Engineer. The file is to include all files required to edit and evaluate the electronic model, including libraries, one-lines, scenarios, TCC curves and all reports.
3. Contractor Responsibility: Provide project-related data needed by study preparer, including equipment, wire sizes, insulation types, conduit types, actual circuit lengths and available fault currents from utility. Provide information in a timely matter to allow studies to be completed prior to release of equipment.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

PART 2 - PRODUCTS

2.01 GENERAL

A. Analyze specific electrical and utilization equipment (according to NEC definition), actual protective devices to be used, and actual feeder lengths to be installed.

1. Scope of Studies: New distribution wiring and equipment, from primary source to buses, branch circuit panelboards and equipment rated 50A or larger at utilization voltage.
2. Primary Source, for Purposes of Studies: Utility company transformer secondary.
3. Study Methodology: Comply with requirements and recommendations of NFPA 70, IEEE 399, and IEEE 242.
4. Report: State methodology and rationale employed in making each type of calculation; identify computer software package(s) used.

B. One-Line Diagrams: Prepare schematic drawing of electrical distribution system, with electrical equipment and wiring to be protected by protective devices; identify nodes on diagrams for reference on report that includes:

1. Calculated fault impedance, X/R ratios, utility contribution, and short circuit values (asymmetric and symmetric) at main switchboard bus and downstream devices containing protective devices.
2. Breaker and fuse ratings.
3. Generator kW and voltage ratings, percent impedance, X/R ratios, and wiring connections.
4. Transformer kVA and voltage ratings, percent impedance, X/R ratios, and wiring connections.

5. Identification of each bus, with voltage.
6. Conduit materials, feeder sizes, actual lengths, and X/R ratios.

2.02 PROTECTIVE DEVICES

A. Provide protective devices of ratings and settings as required so that protective device closest to fault will open first.

B. Replace existing protective devices to achieve specified performance.

C. Analyze and determine ratings and settings of protective devices to minimize damage caused by fault and so that protective device closest to fault will open first.

1. Required Ratings and Settings: Derive required ratings and settings of protective devices in consideration of upstream protective device settings and optimize system to ensure selective coordination.
2. Motors with Solid-State Protective Modules: Select settings for best possible motor protection, taking into consideration actual installed motor torque and current and thermal characteristics.
3. Identify any equipment, both new and existing, that is underrated.
4. Identify specified protective devices that will not achieve required protection or coordination but with minor changes can be made to do so; provide such modified devices at no additional cost to Owner and identify them on submittals as "revised in accordance with Protective Device Coordination Study"; minor changes include different trip sizes in same frame, time curve characteristics of induction relays, CT ranges, etc.
5. Identify specified protective devices that will not achieve required protection or coordination and cannot be field adjusted to do so, and for which adequate devices would involve change to contract sum.
6. In all cases where adequate protection or coordination cannot be achieved at no extra cost to Owner, provide a discussion of alternatives and logical compromises for best achievable coordination.
7. Do not order, furnish, or install protective devices that do not meet performance requirements unless specifically approved by Engineer.

D. Protective Device Rating and Setting Chart: Summarize in tabular format required characteristics for each protective device based on analysis; include:

1. Device identification.
2. Relay CT ratios, tap, time dial, and instantaneous pickup.
3. Circuit breaker sensor rating, long-time, short-time, and instantaneous settings, and time bands.
4. Fuse rating and type.
5. Ground fault pickup and time delay.
6. Input level and expected response time at two test points that are compatible with commonly available test equipment and ratings of protective device.
7. Highlight devices that as furnished by Contractor will not achieve required protection.

E. Specified equipment has been designed and selected to achieve specified performance; ensure that equipment actually installed provides that performance.

F. In addition to requirements specified elsewhere, provide overcurrent protective devices having ratings and settings in accordance with results of system studies.

2.03 SHORT CIRCUIT STUDY

A. Calculate fault impedance to determine available 3-phase short circuit and ground fault currents at each bus and piece of equipment during normal conditions, alternate operations, emergency power conditions, and other operations that could result in maximum fault conditions.
   1. Show fault currents available at key points in system down to fault current of 1,000 A at 480 V and 208 V.
   2. Include motor contributions in determining momentary and interrupting ratings of protective devices.
   3. Primary Fault Level Assumptions: Obtain data from utility company.

2.04 ARC FLASH RISK ASSESSMENT

A. Calculate arc flash incident energy (AFIE) levels and flash protection boundary distances to determine required level of personal protective equipment (PPE) at each bus and piece of equipment during normal conditions, emergency power conditions, and other operations that could result in maximum arc flash incident energy levels.
   1. Show flash protection boundary distance.
   2. Include incident energy levels.

2.05 ARC FLASH LABELS

A. Provide label compliant with NFPA 70E guidelines indicating personal protective equipment (PPE) recommended for servicing of electrical equipment while energized, as well as calculated incident energy levels and arc flash protective boundary distance.

PART 3 - EXECUTION

3.01 FIELD QUALITY CONTROL

A. Provide services of qualified field engineer and necessary tools and equipment to test, calibrate, and adjust installed protective devices to conform to requirements determined by coordination analysis.

B. Adjust installed protective devices having adjustable settings to conform to requirements determined by coordination analysis.

C. Submit report showing final adjusted settings of protective devices.

3.02 ELECTRICAL POWER SYSTEM STUDIES

A. Short Circuit Analysis Study:
   1. Provide complete short circuit study, equipment interrupting and withstand evaluation. Study to include complete electrical distribution system, including contributions from normal source of power without alternative sources of power. Include complete low voltage distribution systems as specified in this Section.
   2. Study Basis: thoroughly cover normal and alternative operation modes that can produce maximum fault conditions, including simultaneous motor contributions.
   3. Perform study in accordance with applicable ANSI/IEEE Standards.

4. Study Input Data: Utility company short circuit single and three phase contribution, and X/R ratio; resistance and reactance components of each feeder, busway and branch impedance; motor and generator contributions; applicable circuit parameters and contribute to short circuit duty.
5. Calculate short circuit momentary duties and interrupting duties on basis of maximum available fault current at each switchgear bus, switchboard, motor control center, panelboard, transfer switch, busway plug, dry-type transformer primary and secondary and other significant locations throughout system affected by available fault current (including large equipment, disconnects, control panels, uninterruptible power supplies, etc.).
6. Perform equipment evaluation study to determine adequacy of overcurrent protection devices by tabulating and comparing short circuit ratings of these devices with available fault current. Notify Owner in writing where problem areas or inadequacies appear in electrical equipment.
7. Study Report: In bound final report, include sheets listing tabulated information from study, including feeder impedances, motor, utility and generator impedances and fault contributions, and resulting short circuit current including asymmetrical, symmetrical, three, five and eight cycle fault current levels, and line-to-neutral and three-phase-bolted-fault current levels at each calculated point in electrical distribution system.

B. Arc Flash Risk Assessment:

1. Perform arc flash risk assessment with aid of computer software intended for this purpose.
2. Perform arc flash risk assessment in conjunction with short-circuit analysis and time-current coordination analysis.
3. Submit results of assessment in tabular form, and include device or bus name, bolted fault and arcing fault current levels, flash protection boundary distances, personal-protective equipment classes and AFIE levels.
4. Perform analysis under worst-case arc flash conditions, and final report describes, when applicable, how these conditions differ from worst-case bolted fault conditions.
5. Arc flash risk assessment includes recommendations for reducing AFIE levels and enhancing worker safety.
6. Proposed vendor demonstrates experience with arc flash risk assessment by submitting names of at least ten actual arc flash risk assessments it has performed in past year.
7. Proposed vendor demonstrates capabilities in providing equipment, services, and training to reduce arc flash exposure and train workers in accordance with NFPA 70E and other applicable standards.
8. Proposed vendor demonstrates experience in providing equipment labels in compliance with NEC and ANSI Z535.4 to identify AFIE and appropriate Personal Protective Equipment classes.

C. **Switching Transient Analysis Study:**

1. **Make switching transient analysis study to determine transient overvoltages for various switching conditions and their effect on operation of electrical system.**
2. **Evaluate various system conditions so that proper overvoltage protection specifications may be developed.**
3. **Perform transient simulations using digital computer in order to determine transient voltage levels at low voltage buses within electrical system.**
4. **Vary electrical system parameters to in order to determine their effect on transient voltages.**

5. **Consider various solutions to excessive transient voltage levels and additional computer simulations made to determine their validity.**
6. **Evaluation must consider solutions to power factor and harmonic concerns with respect to transient overvoltage levels.**
7. **Evaluate nuisance tripping of electronic power equipment (e.g., adjustable speed drives) and corrective or preventive techniques suggested.**

END OF SECTION

SECTION 28 3100 - FIRE DETECTION AND ALARM

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:

1. Fire Alarm Control Panel
2. Notification Appliance Circuit Panels
3. Fire Alarm Transmitters
4. Fire Alarm Annunciators
5. Manual Pull Stations
6. Fixed Temperature Heat Detectors
7. Rate-of-Rise and Fixed Temperature Heat Detectors
8. Photoelectric Type Detectors
9. Duct-Mounted Smoke Detectors
10. Relay Modules
11. Control Modules
12. Input Modules
13. Fault Isolation Modules
14. Combination Horn/Strobes
15. Strobes
16. Horns
17. Weatherproof/Surface Backboxes
18. Protective Guards
19. Circuit Conductors
20. Surge Protection
21. Batteries
22. Locks and Keys
23. Document Storage Cabinet
24. Instruction Charts
25. Framed Floor Map

B. Scope:

1. Provide new fire alarm systems.
2. Provide a new fire alarm transmitter communication system.

C. In addition, provide design for the following as required in these Contract Documents:

1. Fire Alarm System
2. Fire Alarm Transmitter Communication System

D. System Design:

1. Design Criteria:
    a. These are Contractor designed systems. Contact AHJ prior to bid to verify systems' requirements. Design systems in compliance with code as interpreted by the AHJ.
    b. In addition to code requirements, provide a remote annunciator at building entrance.
    c. Fire Alarm Sequence of Operation: Activation of manual fire alarm box, automatic fire detector, or fire extinguishing system causes system to enter “alarm” mode including the following operations:
        1) Local English language annunciation of device location, address and condition and audible and visual alarm signal at control panel and remote annunciators.

2) Manual "acknowledge" function at control panel and remote annunciators to silence audible alarm signal, visual signal remains displayed until initiating alarm is cleared.
3) Transmit “alarm” signal to off-premises equipment, i.e., to local fire department or Owner's selected vendor. Provide necessary connections to transmitter.
4) Activate fire alarm notification appliances.
5) Activate Emergency Control Functions as required by code.
(a) Transmit signal to fire/smoke dampers.
(b) Transmit signal to initiate shutdown of air handling equipment.
(c) Transmit signal to release fire doors.
(d) Transmit signals to elevator control equipment to initiate elevator recall and shunt trip.

d. Supervisory Sequence of Operation: Fire sprinkler tamper or supervisory pressure switch activation, or duct-mounted smoke detector activation causes system to enter "supervisory" mode including the following operations:
1) Local English language annunciation of device location, address and condition and audible and visual supervisory signal at control panel and remote annunciators.
2) Manual "acknowledge" function at control panel and remote annunciators to silence audible supervisory signal, visual signal remains displayed until initiating supervisory is cleared.
3) Transmit "supervisory" signal to off-premises equipment.
4) Transmit signal to fire/smoke dampers (duct detector only).
5) Transmit signal to initiate shutdown of air handling equipment (duct detector only).

e. Trouble Sequence of Operation: System trouble, including single ground or open of supervised circuit, or power or system failure, causes system to enter "trouble" mode including the following operations:
1) Local English language annunciation of device location, address and condition and audible and visual trouble signal at control panel and remote annunciators.
2) Manual "acknowledge" function at control panel and remote annunciators to silence audible trouble signal, visual signal remains displayed until initiating trouble is cleared.
3) Transmit "trouble" signal to off-premises equipment.

2. Design of Fire Alarm Transmitter Communication System: Provide design of the fire alarm transmitter communication system as required by code.

1.02 RELATED SECTIONS

A. Contents of Division 28, Electronic Safety and Division 01, General Requirements apply to this Section.

B. Division 26, Electrical requirements apply to this section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Division 28, Electronic Safety and Division 01, General Requirements.

B. In addition, meet the following:

1. NFPA 72, National Fire Alarm and Signaling Code, adopted edition.

2. NFPA 70, National Electrical Code, adopted edition.

1.04 SUBMITTALS

A. Submittals as required by Division 28, Electronic Safety and Division 01, General Requirements.

B. Shop Drawings:

1. Submit shop drawings which include documentation required per NFPA 72; Shop Drawings.
2. In addition, provide the following:
   a. Provide system designer NICET certification number or Engineer's signature and seal on shop drawings.
   b. Identification of system designer and evidence of qualification or certification of designer as required by AHJ.

C. Operation and Maintenance Manuals:

1. Provide manuals containing the documentation required in NFPA 72; Completion Documentation.
2. In addition, provide the following:
   a. One year warranty agreement including parts and labor. Warranty period begins upon date of substantial completion.
   b. Instruction chart.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Division 28, Electronic Safety and Division 01, General Requirements.

B. In addition, meet City of Medford, Oregon requirements, ordinances and amendments.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Division 28, Electronic Safety and Division 01, General Requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Fire Alarm Control Panel:

1. Autocall
2. EST
3. Farenhyt
4. Gamewell-FCI
5. Notifier
6. Potter
7. Siemens
8. Silent Knight
9. Simplex
10. Or approved equivalent.

B. Notification Appliance Circuit Panels:

1. Same manufacturer as fire alarm control equipment.
2. Alarmsaf

3. Altronix
4. Federal Signal
5. Wheelock
6. Or approved equivalent.

C. Fire Alarm Transmitters:

1. Same manufacturer as fire alarm control equipment.
2. AES Corporation
3. DSC
4. Telguard
5. Or approved equivalent.

D. Fire Alarm Annunciators:

1. Same manufacturer as fire alarm control equipment.
2. No substitutions permitted.

E. Manual Pull Stations:

1. Same manufacturer as fire alarm control equipment.
2. No substitutions permitted.

F. Fixed Temperature Heat Detectors:

1. Same manufacturer as fire alarm control equipment.
2. No substitutions permitted.

G. Rate-of-Rise and Fixed Temperature Heat Detectors:

1. Same manufacturer as fire alarm control equipment.
2. No substitutions permitted.

H. Photoelectric Type Detectors:

1. Same manufacturer as fire alarm control equipment.
2. No substitutions permitted.

I. Duct-Mounted Smoke Detectors:

1. Same manufacturer as fire alarm control equipment.
2. No substitutions permitted.

J. Relay Modules:

1. Same manufacturer as fire alarm control equipment.
2. No substitutions permitted.

K. Control Modules:

1. Same manufacturer as fire alarm control equipment.
2. No substitutions permitted.

L. Input Modules:

1. Same manufacturer as fire alarm control equipment.
2. No substitutions permitted.

M. Fault Isolation Modules:

1. Same manufacturer as fire alarm control equipment.
2. No substitutions permitted.

N. Combination Horn/Strobes:

1. Same manufacturer as fire alarm control equipment.
2. Federal Signal
3. Gentex

4. System Sensor
5. Wheelock
6. Or approved equivalent.

O. Strobes:

1. Same manufacturer as fire alarm control equipment.
2. Federal Signal
3. Gentex
4. System Sensor
5. Wheelock
6. Or approved equivalent.

P. Horns:

1. Same manufacturer as fire alarm control equipment.
2. Federal Signal
3. Gentex
4. System Sensor
5. Wheelock
6. Or approved equivalent.

Q. Weatherproof/Surface Backboxes:

1. Same manufacturer as fire alarm detection devices or notification appliances.
2. Or approved equivalent.

R. Protective Guards:

1. Wire Guard:
    a. Same manufacturer as fire alarm control equipment.
    b. American Wire Guards
    c. Chase Security Systems
    d. Safety Technology International
    e. Shaw-Perkins
    f. Or approved equivalent.
2. Protective Cover:
    a. Safety Technology International
    b. SIGCOM
    c. Or approved equivalent.

S. Circuit Conductors:

1. Allied Wire and Cable
2. Belden
3. CCI
4. West Penn Wire
5. Or approved equivalent.

T. Surge Protection:

1. Ditek
2. Transtector
3. Or approved equivalent.

U. Batteries:

1. Same manufacturer as fire alarm control equipment.
2. Power-Sonic

3. Werker
4. Or approved equivalent.

V. Locks and Keys:

1. Same manufacturer as fire alarm control equipment.
2. Or approved equivalent.

W. Document Storage Cabinet:

1. Same manufacturer as fire alarm control equipment.
2. Meir Products
3. Space Age
4. Or approved equivalent.

X. Instruction Charts: Confirm make and model with architect prior to ordering.

Y. Framed Floor Map: Confirm make and model with architect prior to ordering.

Z. Substitutions:

1. For other acceptable manufacturers of specified control units, submit product data showing equivalent features and compliance with Contract Documents.
2. For substitution of products by manufacturers not listed, submit product data showing features and certification by Contractor that the design will comply with contract documents.

AA. Equipment to be supplied by a certified manufacturer representative.

2.02 FIRE ALARM CONTROL PANEL

A. Provide flush mounted units where installed in finished areas; in unfinished areas, surface mounted units are acceptable, unless otherwise noted.

B. Multiprocessor Based: Configurable as an addressable, point identified system.

C. Network Module: Provide system network modules to facilitate peer-to-peer communications between fire alarm control units and network annunciators.

D. Central Processing Unit (CPU):

1. CPU continuously monitors the communications and data processing cycles of microprocessor. CPU failure generates an audible and visual trouble signal on control panel and remote annunciators.
2. House the CPU in fire alarm cabinet with sufficient space to allow maximum system expansion and to enclose alphanumeric display.
3. Retain basic life safety software in field programmable non-volatile memory. Provide CPU with minimum capacity of 50 addressable points.
4. Equip CPU with software to provide a control-by-event feature, whereby receipt of an alarm point is programmed to operate control points within system. Provide control-by-event actions for life safety functions in programmable non-volatile memory. CPU software programming for control of systems defined in this Section is installed as part of this Section.

E. System Capabilities:

1. System capable of addressing and operating smoke detectors, manual pull stations, open contact devices and addressable auxiliary control relays on the same communication loop.

2. System capable of displaying sensitivity of each smoke detector, address and condition of fire alarm monitoring points.

F. Program Software:

1. Field configuration program provides programmable operating instructions for system. Store resident program in non-volatile memory.
2. Devices meet criterion specified under materials.
3. Verification and display of sensitivity of each addressable smoke detector can be read using the operating software.

G. Control Panel Display Modules:

1. Provide keyboard display module with minimum 80-character backlit LCD. Each alarm/trouble condition appears in English language with description and location of alarm/supervisory/trouble.
2. Alarm/supervisory/trouble may be acknowledged, silenced and system reset from control panel or remote annunciator(s).

H. Power Supply: Provide power supply(s), adequate to serve control panel modules, remote annunciators, addressable devices, notification appliances and other connected devices.

I. Power Requirements:

1. Loss of 120VAC power automatically causes system to transfer to secondary power. Indicate battery power operation by yellow lamp and audible annunciation at control panel and remote annunciator panels. Upon return of 120VAC power, unit recharges batteries to full capacity and maintains battery on float charge. Provide trickle charge adequate capacity to maintain battery fully charged with automatic rate charge.
2. Provide batteries in locking cabinet manufactured for purpose.

J. Auxiliary Relays: Provide sufficient SPDT auxiliary relay contacts for each function in this portion of the Specifications and for equipment interconnections required under electrical and mechanical specifications.

K. Auxiliary Switches: Provide auxiliary equipment control switches with labeled status indicating lights for each switch.

L. System Reset:

1. Key-accessible control function returns system to normal, non-alarm state, if initiating circuits have cleared.
2. Provide reset on both main fire alarm control panel and remote annunciators.

M. Addressing: Provide each initiating device with its own discrete address.

2.03 NOTIFICATION APPLIANCE CIRCUIT PANELS

A. Provide power supply(s), adequate to serve modules, remote annunciators, initiating devices, notification appliances and other connected devices or appliances.

B. Provide batteries in locking cabinet manufactured for purpose.

2.04 FIRE ALARM TRANSMITTERS

A. Provide flush mounted units where installed in finished areas; in unfinished areas, surface mounted units are acceptable, unless otherwise noted.

B. Electrically supervised, capable of transmitting alarm, supervisory and trouble signals over Radio Alarm Transmitter (RAT), Cellular, or Ethernet lines to off-premises receiver. Signal transmitter interfaces fully with receiver station of local fire department or Owner's selected vendor.

C. For radio and cellular transmitters, provide exterior antenna where required to facilitate communication with supervising station.

2.05 FIRE ALARM ANNUNCIATORS

A. Provide flush mounted units where installed in finished areas; in unfinished areas, surface mounted units are acceptable, unless otherwise noted.

B. Alphanumeric Remote Annunciator with Controls: Back lit LCD alphanumeric annunciator minimum 80 characters long. Provide under locking cover test switch, alarm and trouble buzzer, buzzer silence switch and buzzer silence message and reset switch, flush mount with finished cover, vandal-resistant UV stabilized Lexan (or approved equivalent) overlay and required modules, control panel, etc., to drive annunciator. Self-contained, suitable for wet location where located exterior.

2.06 MANUAL PULL STATIONS

A. Provide flush mounted units where installed in finished areas; in unfinished areas, surface mounted units are acceptable, unless otherwise noted.

B. Semi-flush, red finish, nongrasping operation; maximum pull strength as allowed per ADA criteria.

C. Stations do not allow closure without keyed reset.

2.07 FIXED TEMPERATURE HEAT DETECTORS

A. Provide flush mounted units where installed in finished areas; in unfinished areas, surface mounted units are acceptable, unless otherwise noted.

B. Rated 135 degrees F or 190 degrees F as required by space use.

C. Provide off-white, low-profile detectors.

2.08 RATE-OF-RISE AND FIXED TEMPERATURE HEAT DETECTORS

A. Provide flush mounted units where installed in finished areas; in unfinished areas, surface mounted units are acceptable, unless otherwise noted.

B. Responding to 15 degrees F temperature rise per minute and to 135 degrees F fixed temperature as required by space use.

C. Provide off-white, low-profile detectors.

2.09 PHOTOELECTRIC TYPE DETECTORS

A. Provide flush mounted units where installed in finished areas; in unfinished areas, surface mounted units are acceptable, unless otherwise noted.

B. Panel adjustable sensitivity, LED source, multiple cell, 360 degree smoke entry, visual latching operation indicator, insect screen, functional test switch, two-wire operation and vandal-resistant locking feature.

2.10 DUCT-MOUNTED SMOKE DETECTORS

A. Photoelectric type. Duct sampling tubes extending width of duct, visual indication of detector actuation, direct housing mount. Detector powered from control panel, power on indicator light. Detector rated for air velocity, humidity and temperature of duct and environment where installed.

2.11 RELAY MODULES

A. Signaling line circuit interface module that connects to other building systems for control of fire/life safety functions, e.g., air-handler shutdown, fire/smoke damper closure, elevator recall.

B. Module powered from control panel.

2.12 CONTROL MODULES

A. Signaling line circuit interface module that provides notification appliance circuits or system control outputs.

B. Module powered from control panel.

2.13 INPUT MODULES

A. Signaling line circuit interface module that provides initiating device circuits for connection to contact closure initiating devices.

B. Module powered from control panel.

2.14 FAULT ISOLATION MODULES

A. Signaling line circuit interface modules that provide isolation of wire-to-wire shorts on a signaling line circuit with automatic reconnection upon correction of short circuit.

B. Provide module with status indicator LED.

2.15 COMBINATION HORN/STROBES

A. Multi-candela, flush wall and ceiling mount, white finish, insect-proof.

B. Provide horn/strobes that meet the latest requirements of NFPA 72, ANSI 117.1 and UL 1971. Candela rating as required by NFPA 72.

C. Must be compatible with fire alarm control equipment and notification appliance circuit panels.

2.16 STROBES

A. Multi-candela, flush wall and ceiling mount, white finish, insect-proof.

B. Provide strobes that meet the latest requirements of NFPA 72, ANSI 117.1 and UL 1971. Candela rating as required by NFPA 72.

C. Must be compatible with fire alarm control equipment and notification appliance circuit panels.

2.17 HORNS

A. Flush wall and ceiling mount, white finish, insect-proof.

B. Provide horns that meet the latest requirements of NFPA 72.

C. Must be compatible with fire alarm control equipment and notification appliance circuit panels.

2.18 PROTECTIVE GUARDS

A. Wire Guard: Steel wire guard.

B. Protective Cover: Polycarbonate construction.

2.19 CIRCUIT CONDUCTORS

A. Copper or optical fiber; color code and label. Type FPL, FPLR and FPLP. Cable type as required by the NEC and the manufacturer.

B. Minimum signaling line circuit and initiating device circuit wire size: AWG18.

C. Minimum notification appliance circuit wire size: AWG14, or as approved by Engineer.

2.20 SURGE PROTECTION

A. Install per manufacturer's instructions and recommendations.

B. In accordance with IEEE C62.41 B3 combination waveform and NFPA 70; except for optical fiber conductors.

C. Provide for alternating current circuits powering fire alarm equipment.

D. Initiating Device Circuits, Notification Appliance Circuits and Communications Circuits: Rated to protect applicable equipment; for 24V(dc) maximum dc clamping voltage of 36V(dc), line-to-ground and 72V(dc), line-to-line.

2.21 BATTERIES

A. Provide additional cabinet, if required due to space limitations in control panels.

2.22 LOCKS AND KEYS

A. Deliver keys to Owner.

B. Provide same standard lock and key for each key operated switch and lockable panel and cabinet; provide five keys of each type.

2.23 DOCUMENT STORAGE CABINET

A. Suitable for as-built drawings, operation and maintenance manual, system data file disk and tools.

B. Constructed from steel with baked enamel finish; size adequate for full size drawings, operation and maintenance manual, spare parts and tools.

2.24 INSTRUCTION CHARTS

A. Printed instruction chart for operators, showing steps to be taken when signal is received (normal, alarm, supervisory and trouble); easily readable from normal operator's station.

B. Frame: Stainless steel or aluminum with polycarbonate or glass cover.

2.25 FRAMED FLOOR MAP

A. Provide framed floor plan of facility.

B. Frame: Stainless steel or aluminum with polycarbonate or glass cover.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Provide a complete and operable system compliant with all applicable codes and standards.

B. Obtain Architect's approval of locations of devices, appliances and annunciators before installation.

C. Circuits:

1. Signaling Line Circuits (SLC): Class B
2. Notification Appliance Circuits (NAC): Class B.

D. Spare Capacity:

1. New Notification Appliance Circuits:
   a. Minimum 25 percent spare current capacity.
   b. Maximum 10 percent voltage drop.
   c. Utilize UL maximum current draw value for notification appliances in calculations.
2. New Signaling Line Circuit: Minimum 25 percent spare device capacity.

E. Power Sources:

1. Primary: Dedicated branch circuits of facility power distribution system.
2. Secondary: Storage batteries.
3. Capacity: Sufficient to operate fire alarm system under normal supervisory condition for 24 hours and operate alarm signals for five minutes at end of standby period.

F. Obtain approval of system design from AHJ prior to installation. Do not begin installation without approval from AHJ and submittal review comments from Engineer.

G. Install in accordance with applicable codes, NFPA 72, NFPA 70 and the Contract Documents.

H. In accordance with manufacturer's instructions, provide wiring, conduit and outlet boxes required for the erection of a complete system as described in these specifications, as shown on Drawings and as required by AHJ.

I. Conceal wiring, conduit, boxes and supports where installed in finished areas.

J. Provide raceway system for cabling concealed in walls and hard ceilings and in locations where cabling is exposed. Where exposed, provide surface raceway in finished areas and surface mounted EMT in non-finished areas.

K. Provide cabling and conduits system suitable for wet locations for below grade systems.

L. At junction boxes and termination points, provide identification tags on wires and cables.

M. Route wiring to avoid blocking access to equipment requiring service, access, or adjustment.

N. Fire Safety Systems Interfaces:

1. Provide conduit, wiring, boxes and terminations from fire alarm system to monitored components. Provide a separate input module for each switch or relay to be monitored.
   a. Alarm Inputs: Provide connection in accordance with NFPA 72 for the following systems and components:
      1) Fire sprinkler water flow switches.
      2) Fire sprinkler dry-pipe alarm pressure switches.
      3) Fire sprinkler preaction system alarm condition.

4) **Special hazard fire suppression system alarm condition.**
5) Kitchen hood fire suppression activation.
6) Other alarm inputs.

b. Supervisory Inputs: Provide connection in accordance with NFPA 72 for the following systems and components:
1) Fire sprinkler water control valve tamper switches.
2) Fire sprinkler dry-pipe system low air pressure switches.
3) **Fire sprinkler preaction system supervisory condition.**
4) **Special hazard fire suppression system supervisory condition.**
5) **Other supervisory inputs.**

c. Trouble Inputs: Provide connection in accordance with NFPA 72 for the following systems and components:
1) **Fire sprinkler preaction system trouble condition.**
2) **Special hazard fire suppression system trouble condition.**
3) Other trouble inputs.

2. Fire Safety Functions: Provide power and control conduit, wiring, boxes and terminations to power devices and interface to fire alarm system.
a. Doors:
1) Provide smoke detectors and addressable control relays to release magnetic hold open devices and roll-down fire doors and door locks. Verify requirements and quantities prior to bidding.
2) Smoke Barrier Door Magnetic Holders: Release upon activation of smoke detectors in smoke zone on either side of door.
3) Electronic Locks or Electromagnetic Door Locks on Egress Doors: Unlock smoke zone egress doors upon activation of any alarm initiating device or suppression system in smoke zone.
4) Overhead Coiling Fire Doors: Release upon activation of smoke detectors on either side of door.

b. HVAC Systems:
1) Fire/Smoke Dampers and Smoke Dampers:
(a) Provide required smoke detectors, relays, wiring and the like.
(b) Connect control and power wiring to dampers per manufacturer's instructions.
(c) Verify quantities, location and requirements of dampers with Division 23, HVAC Drawings and Specifications and mechanical system installer.
2) Air Moving Systems:
(a) Provide duct-mounted smoke detector for air systems with air flow rates exceeding 2000 CFM. Coordinate with Division 23, HVAC.
(b) Install duct-mounted smoke detector(s) on return side of air system.
(c) Provide control wiring from addressable relay contacts to air handling equipment controller.
(d) Provide duct-mounted smoke detectors rated for air velocity, temperature and humidity of duct. Verify quantities, locations and requirements with Division 23, HVAC Drawings and mechanical system installer.
(e) Where duct-mounted smoke detectors are mounted in inaccessible building void spaces provide access hatch. Provide access hatch with fire rating equivalent to rating of wall, ceiling, or shaft being penetrated.

(f) Provide control wiring from addressable relay contacts to HVLS fan equipment controller.

O. Inspection and Testing for Completion:

1. System testing and commissioning to be performed by a certified manufacturer representative.
2. Perform inspection and testing in accordance with NFPA 72 and requirements of local authorities; document each inspection and test.
3. Document audibility measurements and verify intelligibility for each space on record drawings.
4. Provide the services of the installer's supervisor or person with equivalent qualifications to supervise inspection and testing, correction and adjustments.
5. Provide tools, software and supplies required to accomplish inspection and testing.
6. Prepare for testing by ensuring that work is complete and correct; perform preliminary tests as required to test system.
7. Correct defective work, adjust for proper operation and retest until entire system complies with Contract Documents.
8. Notify Owner seven days prior to beginning completion inspections and tests.
9. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.
10. Diagnostic Period: After successful completion of inspections and tests, operate system in normal mode for at least 14 days without any system or equipment malfunctions.
    a. Record all system operations and malfunctions.
    b. If a malfunction occurs, start diagnostic period over after correction of malfunction.
    c. Replace devices with readings outside of allowed value at time of system check out.
    d. Owner will provide attendant operator personnel during diagnostic period; schedule training to allow Owner personnel to perform normal duties.
    e. At end of successful diagnostic period, complete and submit NFPA 72 "Inspection and Testing Form."

P. Owner Personnel Instruction:

1. Provide the following instruction to designated Owner personnel:
    a. Hands-On Instruction: On-site, using operational system.
    b. Classroom Instruction: Owner furnished classroom, on-site or at other local facility.
2. Basic Operation: One-hour sessions for attendant personnel, security officers and engineering staff; combination of classroom and hands-on:
    a. Initial Training: One session pre-closeout.
    b. Refresher Training: One session post-occupancy.
3. Detailed Operation: Two-hour sessions for engineering and maintenance staff; combination of classroom and hands-on:
    a. Initial Training: One session pre-closeout.
    b. Refresher Training: One session post-occupancy.
4. Furnish the services of instructors and teaching aids; have copies of operation and maintenance data and record drawings available during instruction.
5. Provide means of evaluation of trainees suitable to type of training given; report results to Owner.

Q. Closeout:

1. Closeout Demonstration:

a. Demonstrate proper operation of functions to Owner.
b. Be prepared to conduct any of the required tests.
c. Have at least one copy of operation and maintenance data, copy of project record drawings, input/output matrix and operator instruction chart(s) available during demonstration.
d. Have authorized technical representative of control unit manufacturer present during demonstration.
e. Demonstration may be combined with inspection and testing required by AHJ. Notify AHJ in time to schedule demonstration.
f. Repeat demonstration until successful.

2. Substantial Completion of the project cannot be achieved until inspection and testing is successful and:
a. Specified diagnostic period without malfunction has been completed.
b. Approved operating and maintenance data has been delivered.
c. Spare parts, extra materials and tools have been delivered.
d. All aspects of operation have been demonstrated to Architect.
e. Final acceptance of the fire alarm system has been given by authorities having jurisdiction.
f. Occupancy permit has been granted.
g. Specified pre-closeout instruction is complete.

3. Perform post-occupancy instruction within three months after date of occupancy.

3.02 FIRE ALARM CONTROL PANEL

A. Reference 3.01, General Installation Requirements.

B. Install per manufacturer's instructions and recommendations.

C. Provide control panels with 120VAC dedicated circuit per NFPA requirements.

D. Do not install cabinets or equipment below the battery cabinet. Do not locate battery and charging system cabinets in ceiling space.

E. Provide instruction charts at each control panel where system operations are performed. Obtain approval from the Architect prior to mounting.

F. Perform system programming at the fire alarm control panel. Program the system without shutting the system down. Programming is done off line. Provide copy of site-specific program on electronic storage media. Locate in document enclosure.

G. Room Name Labeling: Control panel schedules, programming and labeling for electrical equipment, to use the room names and room numbers that the Architect adopts at the date of substantial completion of construction. This work is to be done at no added cost to the Owner.

H. Programmable Function Keys: Provide control panel accessible function keys for the notification bypass, fire drill, fire door bypass, and supervising station bypass.

I. Programmed control point activation includes selective control of HVAC, fire door release, and other fire safety and auxiliary functions.

J. Provide machine printed labels on switches and indicators.

3.03 NOTIFICATION APPLIANCE CIRCUIT PANELS

A. Reference 3.01, General Installation Requirements.
B. Install per manufacturer's instructions and recommendations.
C. Provide notification appliance circuit panel power supplies with 120VAC dedicated circuit per NFPA requirements.
D. Do not install cabinets or equipment below the battery cabinet. Do not locate battery and charging system cabinets in ceiling space.

3.04 FIRE ALARM TRANSMITTERS

A. Reference 3.01, General Installation Requirements.
B. Install per manufacturer's instructions and recommendations.
C. Provide conduit and wiring for connections to the transmitter as required for fire alarm system off site supervision.
D. Verify and provide call sequence and message as directed by Owner and the AHJ.

3.05 FIRE ALARM ANNUNCIATORS

A. Reference 3.01, General Installation Requirements.
B. Install per manufacturer's instructions and recommendations.
C. When required by the manufacturer, provide fire alarm annunciator with 120VAC dedicated circuit per NFPA requirements.
D. Provide machine printed labels on switches and indicators.
E. Verify location with AHJ before installation.

3.06 MANUAL PULL STATIONS

A. Reference 3.01, General Installation Requirements.
B. Install per manufacturer's instructions and recommendations.
C. Provide machine printed address labels on addressable devices.
D. Provide protective guard where device is subject to abuse and where required by AHJ.

3.07 FIXED TEMPERATURE HEAT DETECTORS

A. Reference 3.01, General Installation Requirements.
B. Install per manufacturer's instructions and recommendations.
C. Provide machine printed address labels on addressable devices. Labels to be visible from the floor without magnification.
D. Provide protective guard where device is subject to abuse and where required by AHJ.

3.08 RATE-OF-RISE AND FIXED TEMPERATURE HEAT DETECTORS

A. Reference 3.01, General Installation Requirements.
B. Install per manufacturer's instructions and recommendations.
C. Provide machine printed address labels on addressable devices. Labels to be visible from the floor without magnification.

D. Provide protective guard where device is subject to abuse and where required by AHJ.

3.09 PHOTOELECTRIC TYPE DETECTORS

A. Reference 3.01, General Installation Requirements.

B. Install per manufacturer's instructions and recommendations.

C. Provide machine printed address labels on addressable devices. Labels to be visible from the floor without magnification.

D. Provide protective guard where device is subject to abuse and where required by AHJ.

3.10 DUCT-MOUNTED SMOKE DETECTORS

A. Reference 3.01, General Installation Requirements.

B. Install per manufacturer's instructions and recommendations.

C. Provide machine printed address labels on addressable devices. Labels to be visible from the floor without magnification.

3.11 RELAY MODULES

A. Reference 3.01, General Installation Requirements.

B. Install per manufacturer's instructions and recommendations.

C. Provide machine printed address labels on addressable devices. Labels to be visible from the floor without magnification. Labels to include description of controlled function.

3.12 CONTROL MODULES

A. Reference 3.01, General Installation Requirements.

B. Install per manufacturer's instructions and recommendations.

C. Provide machine printed address labels on addressable devices. Labels to be visible from the floor without magnification. Labels to include description of controlled function.

3.13 INPUT MODULES

A. Reference 3.01, General Installation Requirements.

B. Install per manufacturer's instructions and recommendations.

C. Provide machine printed address labels on addressable devices. Labels to be visible from the floor without magnification. Labels to include description of monitored input.

3.14 FAULT ISOLATION MODULES

A. Reference 3.01, General Installation Requirements.

B. Install per manufacturer's instructions and recommendations.

C. Provide machine printed address labels on addressable devices. Labels to be visible from the floor without magnification.

D. Provide Fault Isolator Modules for signaling line circuit per code requirements and manufacturer instructions.

3.15 COMBINATION HORN/STROBES

A. Reference 3.01, General Installation Requirements.

B. Install per manufacturer's instructions and recommendations.
C. Provide machine printed labels on notification appliances with appliance circuit number and sequence. Labels to be visible from the floor without magnification.
D. Provide protective guard where device is subject to abuse and where required by AHJ.

3.16 STROBES

A. Reference 3.01, General Installation Requirements.
B. Install per manufacturer's instructions and recommendations.
C. Provide machine printed labels on notification appliances with appliance circuit number and sequence. Labels to be visible from the floor without magnification.
D. Provide protective guard where device is subject to abuse and where required by AHJ.

3.17 HORNS

A. Reference 3.01, General Installation Requirements.
B. Install per manufacturer's instructions and recommendations.
C. Provide machine printed labels on notification appliances with appliance circuit number and sequence. Labels to be visible from the floor without magnification.
D. Provide protective guard where device is subject to abuse and where required by AHJ.

3.18 WEATHERPROOF/SURFACE BACKBOXES

A. Reference 3.01, General Installation Requirements.
B. Install per manufacturer's instructions and recommendations.
C. Provide manufacturer's weatherproof backbox listed for use in areas where the device or appliance is subject to humidity in excess of listed rating. Provide manufacturer surface backboxes where devices cannot be installed recessed.

3.19 PROTECTIVE GUARDS

A. Reference 3.01, General Installation Requirements.
B. Install per manufacturer's instructions and recommendations.
C. Wire Guard.
D. Protective Cover.

3.20 CIRCUIT CONDUCTORS

A. Reference 3.01, General Installation Requirements.
B. Install per manufacturer's instructions and recommendations.
C. Provide wiring to meet the requirements of national, state and local electrical codes. Provide color coded wiring as recommended and specified by the fire alarm and detection system manufacturer. Provide Type FPLR cable when in a riser application or FPLP cable when installed in plenums.

3.21 SURGE PROTECTIONS

A. Reference 3.01, General Installation Requirements.

B. Install per manufacturer's instructions and recommendations.

3.22 BATTERIES

A. Reference 3.01, General Installation Requirements.

B. Install per manufacturer's instructions and recommendations.

C. Provide machine printed label with installation date, and date of month and year of battery manufacture (MM/YYYY).

3.23 LOCKS AND KEYS

A. Deliver to Owner.

3.24 DOCUMENT STORAGE CABINET

A. Reference 3.01, General Installation Requirements.

B. Install per manufacturer's instructions and recommendations.

C. Provide document storage cabinet adjacent to fire alarm control panel.

3.25 INSTRUCTION CHARTS

A. Reference 3.01, General Installation Requirements.

B. Install per manufacturer's instructions and recommendations.

C. Install chart adjacent to fire control panel.

3.26 FRAMED FLOOR MAP

A. Reference 3.01, General Installation Requirements.

B. Install per manufacturer's instructions and recommendations.

C. Provide framed floor plan of facility adjacent to the annunciator panel identifying room names/numbers, device/addresses or fire zone number and description as utilized on the annunciator panel, as required by local AHJ. Check with the local fire department for size and approved mounting location.

END OF SECTION