SECTION 05000
GENERAL METAL PROVISIONS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

This section specifies general requirements for all sections of *DIVISION 5 - METALS*.

1.02 RELATED WORK

Provisions of the *GENERAL CONDITIONS, SUPPLEMENTAL CONDITIONS*, and *DIVISION 1* of the Contract are by this reference a part of this division and shall govern work under this division where applicable.

1.03 REFERENCES

References listed in *DIVISION 5* are from the following organizations' latest editions of their publications and reference standards:

A.	*The Aluminum Association*	*Aluminum Design Manual*
B.	*AISC*	*American Institute of Steel Construction, Steel Construction Manual, ASD*
C.	*AISI*	*American Iron and Steel Institute*
D.	*ASTM*	*American Society of Testing and Materials*
E.	*AWS*	*American Welding Society*
F.	*MFMA*	*Metal Framing Manufacturers Association*
G.	*WABO*	*Washington Association of Building Officials*
H.	*IBC*	International Building *Code (current municipal standard)*

1.04 SUBMITTALS

Submit shop drawings for all metal fabrication items in all sections of *DIVISION 5* in accordance with the *GENERAL CONDITIONS*.

A. Product Data: Submit 5 copies of manufacturer's data for all items in *DIVISION 5* indicating shapes, sizes, and physical and structural properties.

B. Shop Drawings: Submit paper or electronic (pdf) copy of shop drawings including complete plan and profiles, size, details, schedules for fabrication, and assembly of members. Include material identification, details of cuts, connections, fastener types and material, fastener locations, and other pertinent data. Indicate welds by AWS symbols and show size, length, and type of weld. Identify details by reference to sheet and detail number on the Drawings.

1. Include erection drawings, elevations, and details. The Contractor shall verify field dimensions for all metal fabrications and provide shop drawings for the Engineer's review and acceptance for all fabricated items prior to shop fabrication.

2. Indicate welded connections using standard AWS welding symbols. Indicate weld lengths. Include data for welding materials and methods to be used. Waterproof welds shall be tested to ensure proper function for intended applications.

1.05 QUALITY ASSURANCE

A. All welders shall be qualified in accordance with AWS and be WABO certified within the past 12 months. Written certification for welders performing fabrication work shall be furnished to the Engineer.

B. Mill-spot markings of alloy and temper shall be on aluminum products. If such markings are obliterated or eliminated in fabrications, the fabricator shall furnish a certificate verifying the information.

C. Waterproof welds shall be tested to ensure proper function for intended applications.

PART 2 - PRODUCTS

2.01 MATERIALS

See Sections of *DIVISION 5*.

PART 3 - EXECUTION

See Sections of *DIVISION 5*.

END OF SECTION 05000

SECTION 05050
FASTENERS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. This work consists of furnishing and installing metal fasteners for fabrication of work described in *DIVISION 5* or as described in other divisions.

B. Provisions of the *GENERAL CONDITIONS, SUPPLEMENTAL CONDITIONS*, and *DIVISION 1* of the Contract are by this reference a part of this division and shall govern work under this division where applicable.

C. Work includes, but is not limited to embedded and nonembedded metal work and fabrication of the following:

1. General requirements;

2. Galvanized steel grating fasteners;

3. Fasteners for aluminum-fabricated items;

4. Anchor bolts and expansion anchors;

5. Bolts, nuts, washers, and sheet metal screws; and

6. Steel epoxy-grouted anchors.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Furnish all connectors, fasteners, welded metal, and miscellaneous items required to complete the scope of work.

B. Unless otherwise shown, the fasteners and connectors shall be of same material as the attached metal, except for aluminum where fasteners and connectors shall be stainless steel. All fasteners used for submerged or “wet” locations shall be stainless steel.

C. Furnish washers and lock washers for all bolted connections unless otherwise noted. This includes washers for flange bolts. Washers and lock washers shall be of the same material as fasteners and connectors.

D. Anchor bolts embedded in concrete and subjected to intermittent or continuous submergence during hatchery operations shall be stainless steel. Other anchor bolts shall be hot-dip galvanized unless otherwise noted.

E. Hot-Dip Galvanizing: Unless otherwise specified, shall be after fabrication.

2.02 FASTENERS FOR ALUMINUM FABRICATED ITEMS

A. All bolts, nuts, washers, and screws used for assembly or mounting of aluminum fabricated items shall be stainless steel *Type 304* or *316*. Do not use plated or galvanized assembly hardware with aluminum-fabricated items.

B. All bolts, washers, lock washers, etc. shall be *Type 304 (18-8)* stainless steel for assembly of head troughs and denil fishways. The Contractor shall furnish all hardware necessary to assemble the troughs and fishways.

2.03 ANCHOR BOLTS AND EXPANSION ANCHORS

Anchor bolts and studs shall be *ASTM A 307* carbon steel, 60,000 psi tensile strength. Anchor bolts, nuts, expansion anchors, bolts, and washers shall be hot-dip galvanized.

2.04 BOLTS, NUTS, WASHERS, AND SHEET METAL SCREWS

A. All bolts and nuts that will be continuously or intermittently in contact with water during hatchery or other facility operations shall be stainless steel conforming to *ASTM A193* and *ASTM A194* for the type approved. Type shall be *304* or *316*. All other general use bolts, nuts, and washers shall be *A307* and *A563* respectively, hot-dip galvanized, unless specifically identified as other materials, with the exception that all assembly hardware for aluminum fabrication shall be stainless steel. No galvanized, plated, or anodized materials shall be used with aluminum.

B. High-strength bolts, where specified, shall be used to fasten structural steel members and shall conform to *ASTM A 490*, 150 ksi tensile strength.

2.05 HEADED CONCRETE ANCHORS

ASTM A108 or *AISI Type 304*.

PART 3 - EXECUTION

3.01 CONSTRUCTION GENERAL REQUIREMENTS

A. Anchor Bolts: Expansion anchors set in holes drilled in the concrete after the concrete is placed will not be permitted in substitution for anchor bolts except with the prior written acceptance of the Engineer.

B. After anchor bolts have been embedded, their threads shall be protected by having the nuts screwed on or by other accepted means until the time of installation of the equipment or metalwork.

END OF SECTION 05050

SECTION 05091
WELDING

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

This work includes furnishing all necessary material, labor, and equipment for completing welding required for metal fabrications.

1.02 QUALITY ASSURANCE

A. Governing Specifications, Codes, and Standards:

1. American Welding Society, *ANSI/AWS D1.1*, "Structural Welding Code - Steel," referred to hereafter as *AWS D1.1*

2. American Welding Society, *ANSI/AWS A5*.

3. American Welding Society – *AWS D19.0*, "Welding Zinc-Coated Steel," referred to hereafter as *AWS D19.0*.

4. WABO Standard No. 27-13, “WABO Welder and Welding Operator Performance Qualification Standard for Structural Steel, Sheet Steel, and Reinforcing Steel”.

5. American Welding Society – *AWS D1.2*, “Structural Welding Code – Aluminum”.

6. American Welding Society – *AWS D1.6*; Structural Welding Code – Stainless Steel”

B. Qualifications:

1. Welder Qualifications: all welders are required to be currently certified by AWS and WABO for structural welding. Contractor shall submit proof of certification. Welders shall be qualified in accordance with *AWS D1.1* and WABO Standard 27-13 for the processes and positions to be performed for structural steel. Welders shall be qualified in accordance with *AWS D1.2* for Aluminum Welding. Welders shall be qualified in accordance with *AWS D1.6* for stainless steel.

2. The Contractor shall submit all Welding Procedure Specifications (WPSs) to be used by the Contractor on the project. For WPSs that are not prequalified per *AWS D1.1*, the supporting Procedure qualification Record (PQR) shall also be submitted with the WPS.

C. Certifications:

1. The Contractor supplying welding filler metal and shielding gas products shall submit copies of all Manufacturers' certifications for all electrodes, fluxes, and shielding gases to be used. Certifications shall satisfy the applicable *AWS A5* requirements. The Contractor shall also submit the manufacturer's product data sheets for all welding material to be used. The data sheets shall describe the product, limitations of use, recommended welding parameters, and storage and exposure requirements, including baking and rebaking, if applicable.

2. Certificate of Compliance: For all welding electrodes used on the project the contractor shall submit a Certificate of Compliance. The certificate of compliance shall be a letter stating that the Contractor has reviewed the submitted manufacturer's certifications and test reports, and that the materials being furnished for the project are in conformance with the applicable standards, specifications, and project documents.

D. Testing and Inspection: NDT and inspection of welds will be performed by the State in accordance with this section.

1. Verification Inspection

a. The State will engage an independent testing agency to perform verification inspection and testing on all field and shop welding. Field and shop welding will be considered all welding not performed at the manufacturing plant.

b. The independent testing agency will perform testing and inspection of 100% of all (field and shop) butt splice welds and 10% of all (field and shop) PJP welds.

c. The inspection procedures, techniques, and methods will be in accordance with *AWS D1.1, Section 6*.

d. All (field and shop) butt splice welds will be 100% tested by the following methods:

1) Full-time visual inspection.

2) Ultrasonic Inspection: *ASTM E 164*.

e. All (field and shop) PJP welds will have a minimum of 10% of the total length tested by the following methods:

1) Full-time visual inspection.

2) Magnetic Particle Inspection: *ASTM E 709*.

f. All (field and shop) butt splice and PJP welds shall meet the acceptance criteria set forth in *AWS D1.1, Section 6*.

g. The State's Welding Inspector shall have the authority to determine compliance with the above acceptance criteria and order repairs or replacements of unacceptable welds at no additional cost to the State. All welds whether made at the manufacturing plant, or in the shop or field shall be subject to the acceptance of the State's Welding Inspector.

h. All welds will be visually inspected.

1.03 SUBMITTALS

Prior to commencement of other Work in this Section, the Contractor shall submit the following items to the Engineer:

A. Welder qualifications/certifications.

B. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs).

C. Electrode manufacturer's certifications and data sheets.

D. Certificates of Compliance.

1.04 PRODUCT HANDLING

Welding electrodes shall be packaged, stored, and used in a manner consistent with AWS standards and the electrode manufacturer's specifications.

PART 2 - PRODUCTS

2.01 ELECTRODES

A. All electrodes, fluxes, and shielding gases shall meet the requirements of the applicable sections of *ANSI/AWS A5*.

B. Welding electrode classification for carbon steel shall be E70XX and shall be “low hydrogen” electrodes.

C. Welding electrode classification for stainless steel shall be E316L-XX.

PART 3 - EXECUTION

3.01 PREPARATION

A. Fabrication and joint preparation shall be in accordance with the applicable *AWS standard*.

B. Hold back or remove all galvanizing a sufficient distance from the joint to prevent inclusion of the material into the weld. Galvanizing shall be removed from the joint in accordance with *AWS D19.0*.

C. Protection

1. Work shall comply with all municipal, state, and federal regulations regarding safety, including all applicable portions of OSHA and State safety standards for construction work.

2. Conform to *ANSI Z49.1*, "Safety in Welding, Cutting, and Allied Processes," published by the American Welding Society.

3. Follow "Safe Practices" recommended in Annex R of *AWS D1.1*

3.02 WELDING PROCEDURES

A. Perform all work in accordance with procedures written and qualified in accordance with AWS requirements.

B. Use a prequalified welding process in accordance with AWS, whenever possible.

C. Use prequalified partial and complete joint penetration details in accordance with AWS, wherever possible.

D. Qualify non-prequalified welds in accordance with AWS. Prepare Procedure Qualification Records (PQR's) and Welding Procedure Specifications (WPS's) and complete all welding in conformance with the WPS's.

E. Qualify WPSs in accordance with *AWS D1.1, Section 4*.

3.03 FIELD QUALITY CONTROL

A. Field welding shall meet the requirements of AWS.

B. Verification Inspection will be performed by an independent testing agency provided by the State.

C. The Contractor shall provide access to the State's Welding Inspector at all times while the work is being performed.

3.04 SCHEDULING

The Contractor shall coordinate the work with the State's Welding Inspector. The Contractor shall provide the State with a proposed work schedule and shall coordinate the work to meet the contract delivery schedule.

3.05 CLEANING

Clean in accordance with AWS requirements.

3.06 REPAIR

A. Making weld repairs or replacements shall be the responsibility of the Contractor and shall be at no additional cost to the State.

B. Weld repairs or replacements on PJP welds shall be performed in accordance with *AWS D1.1, Section 6.*

C. Repair all galvanizing removed or damaged during welding in accordance with *SECTION 05126*, “Galvanizing," of these Specifications and as directed by the Engineer or replace damaged items at no additional cost to State.

END OF SECTION 05091

SECTION 05100
STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

This section specifies structural steel support members and required fasteners.

1.02 RELATED WORK

A. For connectors, fasteners, bolts, nuts, washers, anchor bolts, embedded bolts, welded studs, etc. see *SECTION 05050 - FASTENERS*.

B. Provisions of the *GENERAL CONDITIONS, SUPPLEMENTAL CONDITIONS*, and *DIVISION 1* of the Contract are by this reference a part of this division and shall govern work under this division where applicable.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Structural Steel Members: *ASTM A36*.

B. Steel Pipe: *ASTM A53, Grade B*.

C. *Structural Tubing*: *ASTM A500, Grade B*.

D. Welding Materials: Per *AWS D1.1* - Type required for materials being welded or *E70XX* electrodes.

2.02 FABRICATION

A. Fabricate structural steel members in accordance with *UBC* and *AISC* Specifications.

B. All ferrous elements shall be hot-dip galvanized after fabrication unless noted otherwise on the Drawings (reference *DIVISION 9*).

2.03 FINISH

A. Clean, prepare, and galvanize according to *ASTM A123* all structural steel members unless noted otherwise on the Drawings. Provide a minimum of 2.3 ounces per square foot galvanized coating (reference *DIVISION 9*).

B. Clean, prepare, and galvanize according to *ASTM A153* all iron and steel hardware unless completely embedded in concrete (reference *DIVISION 9*).

PART 3 - EXECUTION

3.01 ERECTION

A. Erect structural steel in accordance with *UBC* requirements and *AISC* specifications.

B. Do not field cut or alter structural members without approval of the Engineer.

C. For welding, use electrodes compatible with galvanized steel. Minimum fillet weld size shall be 3/16 inch unless noted otherwise.

D. After erection and welding repair scratches, gouges, cut edges, welds, and other bare areas with zinc-rich paint according to *ASTM A780*. Paint thickness at repaired areas to be minimum of 10 mils. Paint for repair to result in dried film containing minimum of 94% zinc dust by weight.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete.

F. All sharp edges, burrs, and protrusions shall be removed by the Contractor to the satisfaction of the Engineer. All edges and corners in potential contact with fish shall be radiused and ground smooth to the satisfaction of the Engineer

END OF SECTION 05100

SECTION 05126
GALVANIZING

PART 1 - GENERAL

1.01. DESCRIPTION OF WORK

The Work includes the requirements to provide a galvanized coating as specified with all handling, prefinishing, cleaning, pickling, rinsing, dipping, cooling, draining, vibrating, centrifuging, inspection, and other processes or materials required.

1.02. QUALITY ASSURANCE

A. Governing Specifications, Codes, and Standards:

1. *ASTM A 123* Standard Specification for Zinc (Hot-Dipped Galvanized) Coatings on Iron and Steel Products.

2. *ASTM A 153* Standard Specification for Zinc (Hot –Dipped Galvanized) Coatings on Iron and Steel Products.

3. *ASTM A 143* Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedures for Detecting Embrittlement.

4. *ASTM A 384* Practice for Providing High Quality Zinc Coating (Hot Dipped)

5. *ASTM A 384 780* Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings

B. The Manufacturer shall be required to test the finished product for thickness, uniformity of the coating, and adhesion in accordance with the applicable ASTM standard.

C. Conform to manufacturers' specifications, directions, and recommendations for best results in the use of each of their products for each condition. If results are at variance with these specifications, report the discrepancy to the Engineer for decision.

1.03 SUBMITTALS

Prior to commencement of other Work in this Section, the Contractor shall submit the following items:

Submit sample of galvanizing repair rod to be used, along with rod manufacturer’s product data sheets.

1.04 PRODUCT HANDLING

Replacements: Repair or replace damaged work, if any, as necessary to the approval of the Engineer and at no additional cost to the State.

PART 2 - PRODUCTS

2.01 GALVANIZING

A. All carbon steel elements, including fasteners, shall be hot-dip galvanized after fabrication in conformance with *ASTM A 123, A 143, A 153, A 384*, and *A 385* to a thickness Grade 100.

B. Galvanizing repair shall be performed with zinc-based alloy solder rods.

PART 3 - EXECUTION

3.01 FABRICATION

Any drain or vent holes required to produce a high quality galvanized coating with minimal warpage and distortion not indicated on the contract plans shall be identified by the coating manufacturer, clearly shown on the shop drawings, and shall be subject to approval by the Engineer. Fabrication shall be in accordance with *ASTM A 384* and *ASTM A 385*.

3.02 REPAIR OF GALVANIZED COATING

A. Repair all galvanized surfaces removed or damaged during welding, shipping, or erection in accordance with *ASTM A 780*, Annex A.1. The zinc-based solder repair rod shall be "Zaclon Repair Alloy" or approved equal. The minimum thickness of the coating shall be 4 mils.

B. Galvanized coating damaged or removed during welding on items that will have the galvanizing embedded in concrete shall be repaired by the application of a cold galvanizing compound in accordance with *ASTM A 780*, Annex A.2. The cold galvanizing compound shall be "ZRC Cold Galvanizing Compound" or approved equal. The final thickness of the coating shall be 3 mils.

END OF SECTION 05126

SECTION 05400
COLD-FORMED METAL FRAMING

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

The work of this Section shall include, but is not limited to, the following:

A. All labor, materials and equipment are required to complete the cold-formed metal framing work as shown on the Drawings and as specified herein.

B. Fabrication and erection of all cold-formed metal framing for partition walls, floors/ceilings, pipe enclosures, backing for attachment of toilet accessories, etc.

C. All bolts, screws, fasteners, power-actuated fasteners, welding, and appurtenances required for complete erection of cold-formed metal framing.

D. Related work specified in:

1. *SECTION 05500 MISCELLANEOUS METALS*

2. *SECTION 07200 THERMAL PROTECTION*

1.02 REFERENCES

A. *AISI* *American Iron and Steel Institute: Cold-Formed Steel Design Manual: Specification for the Design of Cold-Formed Steel Structural Members*

B. *ASTM A90* *Test Method for Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles*

C. *ASTM A153* *Zinc coating (Hot Dip) on Iron and Steel Hardware*

D. *ASTM A446* *Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Physical (Structural Quality)*

E. *ASTM A568* *Steel, Carbon and High Strength Low Alloy Hot-Rolled Sheet and Cold-Rolled Sheet*

F. *ASTM A611* *Steel, Cold-Rolled Sheet, Carbon, Structural*

G. *ASTM A780* *Practice for Repair of Hot-Dipped Galvanized Coatings*

H. *ASTM C954* *Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases to Steel Studs From 0.0333-inch to 0.112-inch Thick.*

I. *ASTM C1007* *Specification for Installation of Load-Bearing (Transverse and Axial) Steel Studs and Related Accessories*

J. *AWCI* *Specifications Guide for Cold-Formed Steel Structural Members (Association of Wall and Ceiling Industries)*

K. *AWS D1.1* *Structural Welding Code*

L. *AWS D1.3* *Welding Sheet Steel in Structures*

M. *ICBO* *Report No. 2388*

N. *MFMA* *Guidelines for the Use of Metal Framing (Metal Framing Manufacturers Association)*

O. *UBC* *Uniform Building Code, Latest Edition*

1.03 SUBMITTALS

A. Product Data: Submit 5 copies of manufacturer's data for all cold-formed metal framing indicating shapes, sizes and physical and structural properties.

B. Shop Drawings: Submit 5 copies of Shop Drawings including complete details and schedules for fabrication and assembly of members. Include details of cuts, connections, screw types, and locations and other pertinent data. Indicate welds by AWS symbols, and show size, length, and type of weld. Identify details by reference to sheet and detail number on the Drawings.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Cold-Formed Metal Framing: Shall be *Angeles Metal Systems (AMS*) or approved equal.

1. Fourteen (14) Gauge Metal Studs: Shall be *AMS Type 14XHD600G* steel studs, 2½ inch or 5 inch by 1 5/8 inch flange with 9/16 inch returns, corresponding to the minimum requirements of *ASTM A446, Grade A*, with a minimum yield of 33 ksi.

2. Twenty-four (24) Gauge Metal Studs: Shall be *AMS Type 24HDS400* steel studs, 2½ inch, 4 or 8 inch by 1 3/8 inch flange, with 1/4 inch returns, corresponding to the minimum requirements of *ASTM A446, Grade A,* with a minimum yield of 33 ksi.

3. Metal Joists: Shall be *AMS 14FG1200* steel joists, 12 by 2½ inch flange, with 1.0-inch returns, corresponding to the minimum requirements of *ASTM A446*, *Grade A*, with a minimum yield of 33 ksi. Joists shall be capable of supporting live load for spans shown of 50 pounds per square foot. Webs shall be unpunched.

4. Track: Shall be formed steel, channel shaped, same width as studs, tight fit, 18 gauge minimum, solid web.

B. Electrodes for Welding: Shall comply with *AWS Code*, using *ASTM A233 E-70XX electrodes*.

C. Power-Actuated Fasteners: Shall be drive-pin fasteners, in sizes and configurations appropriate for connections in accordance with *Hilti/ICBO Research No. 2388*.

D. Screen Fasteners: Shall be *Hilti* or approved equal.

1. For light gauge to light gauge, fasteners shall be selected as recommended by manufacturer for gauges to be connected.

2. For light gauge to structural steel, use *Hilti KWIK-PRO* self-drilling fastener No. 12-24 with tip and thread lengths as recommended for materials to be connected.

2.02 ACCESSORIES

A. Bracing, Furring and Bridging: Shall be formed sheet steel, thickness determined for conditions encountered, manufacturer's standard shapes, same finish as framing members.

B. Plates, Gussets and Clips: Shall be sheet steel, thickness determined for conditions encountered, manufacturer's standard shapes, same finish as framing members.

2.03 FASTENERS

A. Self-Drilling, Self-Tapping Screws, Bolts, Nuts and Washers: Shall conform to *ASTM A90* and be hot-dip galvanized.

B. Anchorage Devices: Shall be drilled expansion bolts.

C. Welding: Shall be in conformance with *AWS D1.3*.

2.04 FINISHES

A. Galvanizing: Shall be *G60* coating.

B. Primer: Shall be *FS TT-P-645* touch-up for galvanized surfaces.

PART 3 – EXECUTION

3.01 GENERAL

A. General: Shall comply with *ASTM C1007*.

B. Job Conditions: Contractor shall examine the areas and conditions under which work of this Section will be performed and correct conditions detrimental to proper and timely completion of the work. Contractor shall not proceed until unsatisfactory conditions have been corrected.

C. Temporary Bracing: Shall be provided until erection is completed.

D. Corrections: Contractor shall correct deficiencies in cold-formed metal framing work, which inspections and test reports have indicated to be not in compliance with the specified requirements. Additional tests will be performed as required to confirm compliance of corrected work.

3.02 FABRICATION

A. All framing components shall be cut squarely for attachment to perpendicular members or as required for an angular fit against abutting members.

B. Prefabricated panels shall be square with components attached in a manner as to prevent racking and to minimize distortion while lifting.

3.03 ERECTION

A. Connections:

1. Screws and Power-Actuated Fasteners of all Types and Sizes required: Shall be provided for completion of all field erection.

2. Welded Construction: Shall comply with AWS Code for procedures, appearance and quality of welds and methods used in correcting welded work.

3. Reinforced Joist Bearing Connection: Joist-to-beam or joist-to-wall bearing connections shall be reinforced with a back-to-back joist doubler 36 inches long, centered on beam or wall, and welded to main joist per manufacturer's recommendations.

B. Field Assembly:

1. Set framing accurately to the lines and elevations indicated. Align and adjust the various members forming a part of a complete frame structure before fastening permanently.

2. Handling and lifting of prefabricated panels shall be done in a manner as to not cause distortion in any member.

3. Joist and stud bridging shall be provided as per manufacture's recommendation. Provide lateral bracing as required for the height, thickness and loading of each application as required by the manufacturer.

END OF SECTION 05400

SECTION 05500
METAL FABRICATION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. Work consists of furnishing all labor, materials, and equipment for the fabrication and erection of all metal fabrications shown on the drawings.

B. Work includes but is not limited to embedded and nonembedded metal work and fabrication of the loading platform railing.

1.02 RELATED WORK

A. Hot-Dip Galvanizing and Coatings: Unless otherwise specified, ferrous metals shall be hot-dip galvanized after fabrication. See *DIVISION 9 - FINISHES* for galvanizing requirements.

B. For connectors, fasteners, bolts, nuts, washers, anchor bolts, embedded bolts, welded studs, etc. see *SECTION 05050 - FASTENERS*.

C. Provisions of the *GENERAL CONDITIONS*, *SUPPLEMENTAL CONDITIONS*, and *DIVISION 1* of the Contract are by this reference a part of this division and shall govern work under this division where applicable.

PART 2 - PRODUCTS

2.01 ALUMINUM

A. Provide all aluminum fabricated items in the numbers, sizes, dimensions, and configuration as shown on the Drawings.

B. Structural aluminum shapes and plates shall be fabricated from aluminum alloy *6061-T6* unless otherwise noted or approved by the Engineer. Protect all surfaces from damage by weld splatter and accidental scratching. Grind and polish (120 grit, A203 abrasive) all exposed weld surfaces to provide a smooth, uniform polished surface. Welding shall conform to *WA-20*. Provide full-length or perimeter aluminum welding unless specifically directed not to on the Drawings. Protect items from heat warp and distortion. Maintain true and square metered joints for all frames and similar items. Test all waterproof welds and repair or replace any that leak.

C. Coat only aluminum items to be embedded or in surface contact with concrete with coal tar epoxy paint system as identified in *DIVISION 9 - FINISHES*. Do not paint the exposed portion of these aluminum items.

D. Aluminum, unless otherwise noted, shall have a smooth, polished finish and be cleaned of oils, chemicals, or other foreign matter using acid wash after fabrication. No rough grinding marks or welding splatters shall be permitted on aluminum items. In all cases, edges shall be radiused to remove sharp edges.

E. All bolts, nuts, washers, and screws used for assembly or mounting of aluminum-fabricated items shall be stainless steel *Type 304* or *316*. Do not use plated or galvanized assembly hardware with aluminum-fabricated items.

F. Supplier/Manufacturer: Structural aluminum shapes, plate, tubing, and perforated plate are available from Joseph T. Ryerson & Son, Inc., (206) 624-2300.

2.02 MISCELLANEOUS METALWORK

Material for miscellaneous metalwork shall be *ASTM A36* steel, unless otherwise shown on the Drawings. This includes items such as angles, brackets, frames, light structural framing, and related miscellaneous fabricated items. Steel pipe shall conform to *ASTM A53, Grade B*, and structural tubing shall conform to *A500, Grade B*. All work shall be galvanized after fabrication in accordance with the requirements of *DIVISION 9*. Work shall be completed in accordance with *AWS D1.1* and *AWS D1.0.72*. Qualification for this work shall be in accordance with *AWS B3.0-41.*

PART 3 - EXECUTION

3.01 CONSTRUCTION GENERAL REQUIREMENTS

A. Metalwork shall be carefully installed as shown on the Drawings or as directed by the Engineer. Metalwork that is bent, broken, or otherwise damaged shall be repaired or replaced by the Contractor to the satisfaction of the Engineer, at no additional cost to the State.

B. Metalwork to be embedded in concrete is to be placed accurately and held in the correct position while the concrete is placed, or if shown or accepted, recesses or blockouts shall be formed in the concrete and the metalwork shall be grouted in place. The surfaces of all metalwork in contact with or embedded in concrete shall be thoroughly cleaned of all rust, dirt, grease, loose scale, grout, mortar, and other foreign matter and coated with a coal tar epoxy coat. All metalwork shall have proper fit-up and shall be job-measured where necessary.

3.02 INSTALLATION

A. Bearing Plates, Guides, and Angles: Units shall be set so that edges are flush and square with the floor and/or wall. Use extreme care to ensure that embedded items are set at correct spacing and are perpendicular as shown. All metal shall be cut and/or ground to match chamfer of concrete.

B. After fabrication, metal items that are removable shall be tested in their intended location. Operation shall be verified fit by approval of the Engineer.

END OF SECTION 05500

SECTION 05990
MISCELLANEOUS METALS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. Work consists of furnishing all labor, materials and equipment for the fabrication and erection of all metal fabrications shown on the Drawings and as specified which are not part of structural steel or other metal systems specified in DIVISION 5.

B. Work includes, but is not limited to, embedded and non-embedded metal work and fabrication of the following:

1. Grating – aluminum and galvanized steel
2. Aluminum angles, brackets, hangers, frames, channels, and assemblies
3. Steel – angles, brackets, hanger, frame and channels, assemblies, and miscellaneous steel fabricated items
4. Anchor bolts and expansion anchors
5. Bolts, nuts and washers
6. Ladders and steps (rungs)
7. Stair assembly
8. Handrails
9. Guardrails
10. Guides and other embedded items
11. Metal Framing Systems

1.02 SUBMITTALS

A. Product Data: Contractor shall submit manufacturer's descriptive literature and installation instructions.

B. Shop Drawings: Contractor shall submit Shop Drawings that verify field dimensions for metal fabrications for the Engineer's review and acceptance (in accordance with the *GENERAL CONDITIONS*) of all fabricated items prior to shop fabrication. Contractor shall indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, welded connections (using standard AWS welding symbols), and weld lengths and shall included erection drawings, elevations, details and data for welding materials and methods to be used.

1.03 QUALITY ASSURANCE

A. All welders shall be qualified in accordance with *AWS 83.0-41* within the past 12 months. Written certifications for welders performing work shall be furnished to the Engineer.

B. Mill-spot markings of ally and temper shall be placed on aluminum products. If such markings are obliterated or eliminated in fabrication, the fabricator shall furnish a certificate verifying the information.

C. Waterproof welds shall be tested to ensure proper function for intended applications.

1.04 REFERENCE STANDARDS

A.	*A36*	*Structural Steel*
B.	*A53*	*Steel pipe, Grade B*
C.	*A123*	*Zinc (Hot-dip Galvanized) Coatings on Products Fabricated from Rolled, Pressed and Forged Steel Shapes, Plates, Bars and Strip*
D.	*A167*	*Stainless Steel Plate, Sheet and Strip, Type 302, 304 and 316*
E.	*A193*	*Stainless Steel Bolts*
F.	*A194*	*Stainless Steel Nuts*
G.	*A307*	*Carbon Steel Externally Threaded Standard Fasteners*
H.	*A386*	*Zinc Coating (Hot-dip) on Assembled Steel Products*
I.	*A526*	*Steel Sheet, Zinc-coated (Galvanized) by the Hot-dip Process, Commercial Quality*
J.	*B308*	*Aluminum-alloy, 6061-t6, Standard Structural Shapes, Rolled or Extruded*
K.	*F468*	*Nonferrous Bolts, Hexcap Screws and Studs for General Use*
L.	*AWS B3.0-41*	*Standard Qualification Procedure*
M.	*AWS D1.0.72*	*Code for Welding in Building Construction*
N.	*AWS D1.1.*	*Structural Welding Code – Steel*
O.	*WA-20*	*Welding Aluminum (Aluminum Association) Specifications for Aluminum Structures, April 1982 (Section 1 of Aluminum Construction Manual)*

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Furnish all connectors, fasteners, welded metal and miscellaneous items required to complete and construct the items shown on the Drawings.

B. Unless otherwise shown, the fasteners and connectors shall be of the same material as the attached metal, except for aluminum where fasteners and connectors shall be stainless steel. All fasteners used for submerged or "wet locations" shall be stainless steel.

C. Furnish washers and lock washers for all bolted connections unless otherwise noted. Washers and lock washers shall be of the same material as fasteners and connectors.

D. Anchor bolts embedded in concrete and subjected to intermittent or continuous submergence during hatchery operations shall be stainless steel. Other anchor bolts shall be hot-dip galvanized unless otherwise noted.

E. Hot-Dip Galvanizing: Unless otherwise specified, shall be after fabrication.

F. Welded Studs and Anchors: Provide anchor units or approved equivalent of diameter and length indicated on the Drawings. Install in accordance with manufacturer's recommendations and as shown on the Drawings.

2.02 GRATING

A. Galvanized Steel Grating:

1. Walkway grating shall be GS Metals Corporation *Grip Strut* Regular-Duty Safety Grating (12 gauge steel), 3 inch channel height in widths as shown on the Drawings.

2. All grating shall be field measured for proper cut-outs and fit, with all cuts banded and treated with a brush-applied, galvanizing protective coating as specified in *DIVISION 9– FINISHES*.

3. Grating to be anchored to grating supports with 5/16 inch carriage bolts and *Grip Strut* anchoring device, 4 bolts per panel minimum, unless otherwise noted.

4. All field cuts shall be cold galvanized.

2.03 ALUMINUM ANGLES, BRACKETS, FRAMES, LIGHT STRUCTURAL ALUMINUM FRAMING AND RELATED MISCELLANEOUS ALUMINUM FABRICATED ITEMS (NIC)

A. General: Work consists of providing all aluminum fabricated items shown on the Drawings in the numbers, sizes, dimensions and configuration as indicated on the Drawings.

B. Structural aluminum shapes and plates shall be fabricated from *aluminum alloy 6061-T6* unless otherwise noted or approved by the Engineer. Protect all surfaces from damage by weld splatter and accidental scratching. Grind and polish (120 grit, A203 abrasive) all exposed weld surfaces to provide a smooth, uniform, polished surface. Welding shall conform to *WA-20*. Provide full length or perimeter aluminum welding unless specifically directed not to in the Drawings. Protect items from heat warp and distortion. Maintain true and square mitered joints for all frames and similar items. Test all waterproof welds and repair or replace any that leak.

C. Screens: (Provided by Owner)

1. Screen guides fabricated from bent plates shall have all edges broken and rounded. All guides shall be trimmed and ground to match raceway wall bevel.

2. Aluminum screens shall have a welded framework of rectangular tubing with all welds ground smooth. Frames shall be faced on one side with a perforated aluminum plate 1/8 inch thick, with perforations to be in a 3/32 inch x 1¼ inches vertical slot offset pattern, 43% open, perforated plate aluminum alloy 5052. The die side of the slots (smooth side) shall face away from the frame, unless shown otherwise on Drawings.

D. Coat only aluminum items to be embedded or in surface contact with concrete with coal tar epoxy paint system as identified in *DIVISION 9*. Do not paint the exposed portion of these aluminum items.

E. All bolts, nuts, washers, and screws used for assembly or mounting of aluminum-fabricated items shall be *stainless steel Type 304 or 316*. Do not use plated or galvanized assembly hardware with aluminum-fabricated items.

2.04 STEEL ANGLES, BRACKETS, HANGERS, FRAMES, CHANNELS, ASSEMBLIES AND MISCELLANEOUS STEEL FABRICATED ITEMS

A. General: Work consists of providing all steel fabricated items shown on the Drawings in the numbers, sizes, dimensions, and configuration as indicated on the Drawings.

B. Structural steel shapes and plates shall be fabricated from *A36* steel unless otherwise noted or approved by the Engineer.

2.05 ANCHOR BOLTS, EXPANSION ANCHORS & ADHESIVE ANCHORS

A. Anchor bolts, nuts, expansion anchors, bolts and washers shall be hot-dip galvanized coated except where noted on the Drawings or when the application results in the bolts being continuously, or intermittently submerged in water or in contact with aluminum fabricated items. In such cases, the anchor assembly shall be stainless steel.

B. Structural steel shapes and plates shall be fabricated from *A36* steel unless otherwise noted or approved by the Engineer.

2.06 BOLTS, NUTS, WASHERS, AND SHEET METAL SCREWS

All bolts and nuts that will be continuously or intermittently in contact with water during hatchery operations shall be stainless steel conforming to *ASTM A193* and *ASTM A194* for the type approved. Type shall be *304-316*. All other bolts, nuts and washers shall be hot-dip galvanized unless specifically identified as other materials, with the exception that all assembly hardware for aluminum fabrication shall be stainless steel. No galvanized, plated or anodized material shall be used with aluminum as specified in Paragraph 2.03.

2.07 LADDERS AND STEPS

Ladders and steps may be fabricated from properly designed structural pieces to the dimensions and elevations shown on the Drawings, or they may be furnished by an industrial ladder/step manufacturer. Ladders and steps shall be designed and installed to meet or exceed all applicable *OSHA* and/or *ANSI* standards for industrial ladders.

2.08 HANDRAIL AND GUARDRAIL

Handrails and railings shall be fabricated as shown on the Drawings and shall be welded construction or other approved system. All welds shall be ground smooth after completion and the assembly galvanized as specified in *DIVISION 9* (see Sections of *DIVISION 5)*.

2.09 METAL TRASH RACK

A. Metal trash racks shall be fabricated as shown on the Drawings.

B. All trash racks members shall be fabricated from structural grade steel conforming to one of the following *ASTM* specifications*: A570 GR 33, A 446 GR A*.

C. All fittings shall be fabricated from steel conforming to one of the following *ASTM* specifications: *A575, A 576, A 36, or A 635*.

D. Steel rack members channel shall be hot-dip galvanized finish.

PART 3 – EXECUTION

3.01 CONSTRUCTION – GENERAL REQUIREMENTS

A. Metalwork shall be carefully installed as shown on the Drawings or as directed by the Engineer. Metalwork that is bent, broken, or otherwise damaged shall be repaired or replaced by the Contractor, to the satisfaction of the Engineer, at no additional cost to the State.

B Metalwork to be embedded in concrete is to be placed accurately and held in the correct position while the concrete is placed, or if shown or accepted, recesses or blockouts shall be formed in the concrete and the metalwork shall be grouted in place. The surfaces of all metalwork in contact with or embedded in concrete shall be thoroughly cleaned of all rust, dirt, grease, loose scale, grout, mortar and other foreign matter and coated with a coal tar epoxy coat. All metalwork shall have proper fit-up and shall be a job-measured where necessary.

3.02 SURFACE TREATMENT, SHOP APPLIED

A. Steel Galvanized Surfaces: Unless otherwise specified, all elements shall be hot-dip galvanized conforming to the applicable requirements of *ASTM A123, A153*, *A385* and *A525*. Provide minimum of 2.3 ounces per square foot galvanizing on all surfaces (reference *DIVISION 9*).

B. Aluminum: Unless otherwise specified, aluminum shall have a smooth, polished finish and be cleaned of oils, chemical or other foreign matter using acid wash after fabrication. No rough grinding marks or welding splatters shall be permitted on aluminum items. In all cases, edges shall be radiused to remove sharp edges.

C. Stainless Steel: Stainless steel shall have the standard mill finished and be cleaned of all foreign matter before delivery to the job. Stainless steel shall have smooth polished surfaces and edges.

3.03 INSTALLATION

A. Bearing Plates, Guides, and Angles: Units shall be set so that edges are flush and square with the floor and/or wall. Use extreme care to ensure the embedded items are set at correct spacing and are perpendicular as shown. All metal shall be cut and/or ground to match chamfer of concrete.

B. Anchor Bolts:

1. Unless noted on the Drawings, expansion anchors set in holes drilled in the concrete after the concrete is placed will not be permitted in substitution for anchor bolts except with the prior written acceptance of the Engineer.

2. After anchor bolts have been embedded, their threads shall be protected by having the nuts screwed on or by other accepted means until the time of installation of the equipment or metal work.

C. After fabrication, each screen, baffle and other miscellaneous metal items that are removable shall be tested in their intended location. Operation shall be verified fit by approval of the Engineer.

END OF SECTION 05990

SECTION 06000
GENERAL WOOD & PLASTICS PROVISIONS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

This section specifies general requirements for all sections of *DIVISION 6 - WOOD & PLASTICS*.

1.02 RELATED WORK

Provisions of the *GENERAL CONDITIONS, SUPPLEMENTAL CONDITIONS*, and *DIVISION 1* of the Contract are by this reference a part of this division and shall govern work under this division where applicable.

1.03 REFERENCES

References listed in *DIVISION 6* are from the following organizations:

A.	*IBC*	*International Building Code, latest approved edition*
B.	*AF&PA*	*American Forest & Paper Association, American Wood Council, National Design Specifications for Wood Construction*
C.	*AITC*	*American Institute Of Timber Construction, Timber Construction Manual, latest edition*
D.	*AASHTO*	*American Association of State Highway and Transportation Officials*
E.	*ANSI*	*American National Standards Institute*
F.	*ASTM*	*American Society of Testing and Materials*
G.	*AWS*	*American Welding Society (Standard Specifications For Welding Highway Bridges as Amended)*
H.	*RCW*	*Revised Code of Washington*
I.	*NER*	*National Evaluation Service Committee*
J.	*DOC*	*US Department of Commerce [National Institute of Standards and Technology (NIST)]*

1.04 SUBMITTALS

Submit shop drawings for wood and plastic items in all sections of *DIVISION 6* in accordance with the *GENERAL CONDITIONS,* unless modified by a section of *DIVISION 6.*

1.05 DELIVERY, STORAGE, AND HANDLING

A. All materials shall be stored and handled in a manner that will ensure that the material is undamaged. Any damaged materials shall be repaired or replaced by the Contractor as directed by the Engineer, at no additional expense to the State.

B. All materials shall be stored off the ground to ensure proper drainage, ventilation, and weather protection. Materials shall not be delivered to the site until approximate time of use. Finish lumber shall not be delivered until material can be stored inside the heated space.

1.06 QUALITY AND IDENTIFICATION

A. All lumber, wood structural panels, particle board, structural glued-laminated timber, end jointed lumber, piles, and poles shall conform to applicable standards and grading rules specified in the *IBC, latest approved edition*, and shall be so identified by the grade mark or certificate of inspection issued by an approved agency.

B. All preservative treated wood required to be treated shall be identified by the quality mark of an inspection agency that has been accredited by an accreditation body that complies with the American Lumber Standard Committee Treated Wood Program.

1.07 ENVIRONMENTAL REQUIREMENTS

A. The use of creosote as a preservative shall not be allowed.

B. Follow manufacturer's recommendations and instructions for the care, use, storage, and handling of wood preservative products.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION 06000

SECTION 06100
ROUGH CARPENTRY

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. Lumber

B. Wood Structural Panels

C. Wood Decking

D. Timber Trusses

E. Wood Treatment

F. Prefabricated Structural Timber

G. Hardware, Fasteners, Accessories, and Anchors

H. Stop Logs

I. Fiberglass Products

PART 2 - PRODUCTS

2.01 MATERIALS

A. Lumber:

1. The moisture content of all lumber shall be 19 percent or less at the time of manufacture.

2. Unless specifically shown on the Drawings or specified elsewhere, the minimum standards for lumber shall be:

TABLE 06100 - 2.01A

ITEM	SPECIES	GRADE
Framing	Hem-Fir	#2 and Better
Structural Members (Beams, Posts)	Doug-Fir	#1 and Better
Blocking and Backing	Hem-Fir	#2 and Better
Sills	Hem-Fir	#2 and Better, Pressure Treated
Decking	Hem-Fir	#2 and Better
Exterior Trim & Fascia	Doug-Fir	#1 and Better
Stop Logs	Doug-Fir	#2 and Better
Post for Pole-Type Construction	Doug-Fir	#1 and Better

B. Wood Structural Panels: Wood structural panels, unless noted otherwise on the Drawings, shall be plywood and meet the requirements of *DOC VPS PSI-95*, Construction and Industrial Plywood. There specified or as shown on the Drawings, all other wood based structural use panels shall meet the requirements of *DOC VPS PS2-04*.

C. Wood Decking: See Drawings.

D. Timber Roof Trusses (Metal Plate Connected):

1. Pre-manufactured, pre-engineered timber roof trusses shall be designed and manufactured in accordance with the more stringent of the *IBC, latest approved edition*, as modified by local codes and the *American National Standard "National Design Standard for Metal Plate Connected Wood Truss Construction," ANSI/TPI 1*.

2. Provide truss design drawings for all truss types, including gable end trusses with summary calculations, including information required per IBC 2303.4.1, prepared by a professional engineer, licensed under *Title 18 RCW*, State of Washington, carrying the professional engineer's signature and seal. Truss design shall be based on the Contract Drawings, incorporating all pertinent features such as knee braces, mechanical equipment, and any exterior or interior auxiliary loads. Required permanent truss member bracing locations shall be included on the truss design drawing.

3. Provide a truss placement plan delineating the location for each truss type and permanent bracing member type, size, and location.

E. Wood Treatment:

1. All preservatively treated wood required to be treated shall be identified by the quality mark of an inspection agency that has been accredited by an accreditation body that complies with the American Lumber Standard Committee Treated Wood Program.

2. Unless noted on the Drawings or specified elsewhere in these Specifications, for the use indicated and type of preservative, the retention shall be at a minimum as follows:

TABLE 06100 – 2.01E

	ACQ (PCF)	CBA-A (PCF)	CA-B (PCF)
Above Ground – not in contact with soil	.25	.20	.10
Ground Contact – contact with soil	.40	.41	.21

For actual retention levels greater than those listed for ground contact, use stainless steel fasteners and connectors.

ACQ= Alkaline Copper Quat
CBA-A, CA-B= Copper Azole

F. Prefabricated Structural Timber:

1. Glued Laminated Components: Not Used.

2. Plywood Web Joists: Not Used.

2.02 HARDWARE, FASTENERS, ACCESSORIES, AND ANCHORS

A. Unless noted otherwise on the Drawings or specified elsewhere, all fasteners, connectors, and miscellaneous hardware shall be hot-dipped, zinc coated galvanized.

B. Staples will not be allowed unless approved by the Engineer.

2.03 STOP LOGS

See *SECTION 06147 – STOPLOGS*.

PART 3 - EXECUTION

3.01 GENERAL

A. Installation:

1. Materials shall be installed as shown on the Drawings, as shown on the approved shop drawings, or as required by the *IBC, latest approved edition,* or as required by local authority and/or as directed by the Engineer. In the case of conflicts, the more stringent requirements shall be met.

2. Preparation, fabrication, and installation of wood members and their fastenings shall conform to accept engineering practices and to the requirements of the *IBC, latest approved edition*, and state or local jurisdiction codes. All members shall be framed, anchored, tied, and braced to develop the strength and rigidity necessary for the purposes for which they are used.

B. Fasteners:

1. Unless noted on the Drawings or specified elsewhere in these Specifications, the number and size of nails connecting wood members shall not be less than that set forth in the *IBC, latest edition, Table 2304.9.1 "Fastening Schedule," and Table 2306.3.1 "Recommended Shear (Pounds Per Foot) For Wood Structural Panel Diaphragms With Framing of Douglas Fir-Larch, or Southern Pine For Wind or Seismic Loading."*

2. Unless noted on the Drawings or specified elsewhere in these Specifications, all pneumatically or mechanically driven nails connecting wood members shall not be less than that set forth in *NER-272, latest edition*.

END OF SECTION 06100

SECTION 06147
STOPLOGS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. This section specifies the supply and installation of stoplogs for water-control structures. Stoplogs shall be provided for each pair of guides shown whether stoplogs are shown in the guides on the drawings or not.

B. The Contractor shall calculate the quantity and length of stoplogs required from the dimensions and elevations on the Drawings. Unless otherwise noted provide stoplogs to fill the full height of each guide.

PART 2 - PRODUCTS

2.01 STOPLOGS

A. Stoplogs shall be double tongue and groove, S2S, **Doug-Fir#2** and better, and shall not be pressure treated. Stoplogs actual height shall be 5½ inches unless otherwise specified.

1. As provided by Disdero Lumber Products – Mill Grade Doug-Fir Select Deck EV1S Double Tongue and Groove:

a. Size 3 inches x 6 inches (actual 2.5” x 5.5”) Pattern 305-A

b. Size 4 inches x 6 inches (actual 3.5” x 5.5”) Pattern 405-A

2. Or Approved Equal.

B. Stoplog wedges to secure submerged boards shall be provided for each location. 4 wedges shall be provided at each location.

C. The nominal width and thickness are as shown on the Drawings. If not indicated board width shall be based on the nominal width of the guide less 1 inch and the thickness shall be based on the nominal guide width inside the stoplog guide.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install at locations where shown on the Drawings to the height indicated.

B. Excess boards for locations where not shown to be installed to the top of the guide or not shown to be installed shall be bound and marked to indicate their location. Furnish extra boards on a pallet to the Owner as spare parts with an itemized listing of items provided.

END OF SECTION 06147

SECTION 06200
FINISHED CARPENTRY

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

Fabrication and installation of site built and site finished molding and trim, and installation of finish hardware.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Finished Lumber:

1. The moisture content of all lumber shall be 19 percent or less at the time of manufacture.

2. Unless specifically shown on the Drawings or specified elsewhere, the minimum standards for lumber shall be per *TABLE 06200 - 2.01B*.

B. Interior Trim:

1. The moisture content of all lumber shall be 19 percent or less at the time of manufacture.

2. Unless specifically shown on the Drawings or specified elsewhere, the minimum standards for lumber shall be per *TABLE 06200 - 2.01B*.

3. Window and door wood wrap shall be stained to match cabinets and trim throughout the house. Photo finish wood grain will not be accepted on any surface in the house.

TABLE 06200 – 2.01B

ITEM	SPECIES	GRADE
Finished Lumber	Hemlock	Clear
Interior Trim	Hemlock	Clear

PART 3 - EXECUTION

A. General:

1. Materials shall be installed as shown on the Drawings, as shown on the approved shop drawings, or as required by the *UBC, latest approved edition,* or as required by local authority and/or as directed by the Engineer. In the case of conflicts, the more stringent requirements shall be met.

2. Preparation, fabrication, and installation of wood members and their fastenings shall conform to accept engineering practices and to the requirements of the *UBC, latest approved edition*, and state or local jurisdiction codes. All members shall be framed, anchored, tied, and braced to develop the strength and rigidity necessary for the purposes for which they are used.

END OF SECTION 06200

SECTION 06300
CASING TRIM, BASE MOLDING, AND FASCIAS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. This section specifies the materials and installation of interior casing trim and base moldings around windows and doors, etc.

B. This section also specifies the materials and installation of exterior casing trim and fascias. *NOTE: Some pre-hung metal door types do not require casing trim. For these items exterior casing trim is to be deleted.*

1.02 REFERENCES

SECTION 09900 - PAINTING

PART 2 - PRODUCTS

2.01 WOOD CASING TRIM, BASE MOLDINGS, AND FASCIAS

Unless specifically shown on the Drawings the minimum standards for wood casings, base moldings, and fascias shall be:

TABLE 06300 - 2.01A

Item	Species	Grade	Style	Size	Location
Fascia	Hem-Fir	#1 or Better	Dimensional	2 by 8 Inches	Exterior
Casing Trim	Cedar	Clear	Dimensional	1 Inch by 4 Inches	Exterior
Casing Trim	Hemlock	Clear	Streamline	9/16 Inch by 2⅛ Inches	Interior
Bases	Hemlock	Clear	Streamline	½ Inch by 2¼ Inches	Interior

END OF SECTION 06300

SECTION 07100
MOISTURE PROTECTION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

Work included in this section includes supply and installation of waterproofing, vapor barriers, caulking, and sealant for the project as called for on the Drawings.

PART 2 - PRODUCTS

2.01 CONCRETE WATERPROOFING

Exterior concrete wall surfaces shall be sealed with a waterproofing coating. The coating shall extend from the foundation footing to final grade. Coatings shall be Siliconate Penetrating Sealer applied in accordance with manufacturer's instructions.

2.02 VAPOR BARRIER

All building slabs, floor slabs, and pond floor slabs shall be placed over a polyethylene vapor barrier. The vapor barrier shall be 6-mil minimum polyethythylene.

2.03 CAULKING AND SEALANT

All interior work shall be sealed with caulking compound or sealant as noted on the Drawings. All exterior work and wet interior work shall be sealed with a sealant. Caulking shall be acrylic latex caulk. Sealant shall be a paintable siliconized formula. Colors shall match surrounding finish.

PART 3 - EXECUTIVE

3.01 INSTALLATION

A. Waterproofing shall be installed only on cleaned and properly prepared surfaces. Manufacturer's instructions shall be followed for all applications.

B. Vapor barrier shall be installed without tears or punctures. Damaged areas shall be repaired as directed by the Engineer. All joints shall overlap a minimum of 4 feet in all directions.

C. Caulking and sealant shall be installed after all cleaning and preparation has been completed. Install per manufacturer's instructions.

END OF SECTION 07100

SECTION 07200
THERMAL PROTECTION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

This section includes insulation for thermal protection as shown on the Drawings. Contractor shall supply and install all insulation as shown.

PART 2 - PRODUCTS

2.01 FIBERGLASS INSULATION

Fiberglass Insulation shall fit snugly into all framing spaces of walls and ceilings, over heated spaces, and as otherwise called for on the Drawings. Insulation shall be roll or batt form fiberglass with foil back and an R-value as shown on the Drawings. Insulation products such as *Owens-Corning* or *Johns-Mannville* may be used.

2.02 MASONRY UNIT INSULATION

Not Used.

PART 3 - INSTALLATION

3.01 EXECUTION

A. Install insulation only after areas are protected from moisture damage. Any insulation damaged from moisture shall be completely dried or replaced as directed by the Engineer prior to covering.

B. Support insulation and fasten securely in place as codes and best practice require. No stretching or bunching shall be allowed where such action shall greatly impair the intended function.

C. All masonry walls shall be free of foreign objects prior to placing insulation and protected from being saturated with moisture before final cover can be achieved.

D. Inside of newly constructed building shall have a neat, finished appearance.

END OF SECTION 07200

SECTION 07400
METAL ROOFING, SIDING, AND ACCESSORIES

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

This section covers the fabrication and installation of metal roofing systems and metal wall siding, along with accessories.

PART 2 - PRODUCTS

2.01 STANDING SEAM CONCEALED FASTENER ROOFING SYSTEM

A. Panel Description: The roofing panels shall be manufactured from a nominal .021 inch thickness, which relates to 26 gauge (G.S.G.). All sheets shall be produced with a 50 KSI minimum yield strength, *ASTM A653 Grade 50*. Steel sheets are to be full decimal thickness before color coating. The panels shall have a minimum nominal standing seam height of 1 inch spaced at 12 inches on center.

B. Panel Finish: All panels are to be zinc coated *ASTM A653 G90*, then painted with a minimum 1 mil (.001") on the exposed surface, and .5 mil (.0005") on the reverse side. Color to be selected by the Engineer from contractor supplied color sample swatches.

C. Panel Fasteners: As per manufacturer's recommendations.

D. Accessories: Closures, sealants, and fasteners will be provided as required for weathertight installation. Integral components such as ridge covers, perimeter trim and flashing will be furnished as required. Accessories shall be of the same manufacturer as panels and fully compatible with panel model type.

E. Uplift Rating: UL 90.

F. Warranty: The roofing product manufacturer shall provide written warranty that the roof panels will not rupture, fail structurally, or perforate for a 50 year period following the date of product acceptance.

G. Gutters and Downspouts: Gutters and downspouts shall be continuous, roll-formed aluminum "K-Style" (.032 inches thick gutter, and 0.19 inches thick downspout) with a factory-applied finish consisting of an epoxy primer baked with a silicon polyester coating. Gutter shall be 4 inch channel for residential applications and 5 inch for commercial building applications. Color to be selected by the Engineer from Contractor supplied color sample swatches.

H. Touch-up Paint: Provide touch-up paint that matches the shop-applied paint to repair minor scratches for use during construction.

I. Insulation: As identified in *SECTION 07200 – THERMAL PROTECTION.*

J. Snow Guard System: Fully compatible with roofing.

2.02 STANDING SEAM ROLL FORMED METAL ROOFING SYSTEM

Not Used.

2.03 EXPOSED FASTENER WALL PANELS

A. Panel Description: The metal panels shall be manufactured from a nominal .021 inch thickness which relates to 26 gauge (G.S.G.). All sheets shall be produced with a 50 KSI minimum yield strength *ASTM A653 Grace 50*. Steel sheets are to be full decimal thickness before color coating. *Champion Metal "Hi-Rib"* metal siding system meets these specifications.

B. Panel Finish: All panels are to be zinc coated *ASTM A653 G90*, then painted with a minimum 1 mil (.001") on the exposed surface, and 5 mil (.0005") on the reverse side. Color to be selected by the Engineer.

C. Panel Fasteners: As per manufacturer's recommendations.

D. Accessories: Closures, sealants, and fasteners will be provided as required for weathertight installation. Integral components such as perimeter trim, gutter, and flashing will be furnished as required.

E. Warranty: The siding product manufacturer shall provide written warranty that the panels will not rupture, fail structurally, or perforate for a 50 year period following the date of product acceptance.

F. Gutters and Downspouts: Gutters shall be continuous, roll-formed aluminum with a factory-applied finish. Color to be selected by the Engineer.

G. Touch-up Paint: Provide touch-up paint that matches the shop-applied paint to repair minor scratches for use during construction.

H. Insulation: As identified in *SECTION 07200 – THERMAL PROTECTION*.

PART 3 - EXECUTION

3.01 FABRICATION AND INSTALLATION

A. The standing-seam metal roof system and wall siding shall be installed per the manufacturer's recommendations.

B. Insulation where required shall fit snugly into all framing spaces of the roof and walls and shall be applied over the framing before panels are installed. Support shall be provided between frames as necessary to limit sagging.

C. Unless noted otherwise, roofing panels shall be placed over *ASTM D 226 #30 (Type 2)* asphalt felt, and wall (siding) panels shall be placed over *ASTM D 226 #15 (Type 1)* asphalt felt.

D. Touch-up paint that matches the shop-applied finish shall be provided and used by the Contractor to repair any minor scratches occurring during construction.

END OF SECTION 07400

SECTION 07712
GUTTERS AND DOWNSPOUTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Gutters and Downspouts.

B. Related Accessories.

1.02 RELATED SECTIONS

SECTION 07400 – METAL ROOFING, SIDING, AND ACCESSORIES

1.03 REFERENCES

A. *ASTM B209* – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

B. *SMACNA* – Architectural Sheet Metal Manual.

1.04 DESIGN/PERFORMANCE REQUIREMENTS

A. Conform to applicable code for size and method of rainwater discharge.

B. American Architectural Manufacturers Association (AAMA) Specification 1405.1 “Specification for Aluminum Raincarrying Systems”.

1.05 SUBMITTALS

A. Submit under provisions of *SECTION 01300.*

B. Product Data: Manufacturer’s catalog data, detail sheets, and specifications.

C. Shop Drawings: Prepared specifically for this project; showing dimensions of metal gutters and accessories, fastening details and connections and interface with other products.

D. Selection Samples: For each finish product specified, two complete sets of color ships representing Manufacturer’s full rand of available colors and patterns.

E. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150mm) square, representing actual product, color and patterns.

F. Manufacturer’s Certificates: Certify products meet or exceed specified requirements.

G. Manufacturer's Warranties.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications.

B. Installer Qualifications: Certified and approved installer of the sheet metal roofing manufacturer Englert, Inc.

C. Perform work in accordance with [SMACNA Manual] [CDA Handbook].

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store products to prevent twisting, bending, and abrasion, and to provide ventilation. Slope stored materials to drain.

C. During storage prevent contact with materials capable of causing discoloration, staining or other damage.

1.08 PROJECT CONDITIONS

Coordinate installation with installation of adjacent roofing, siding and related materials.

1.09 WARRANTY

Provide the Manufacturer's Limited 20 Year, warranty covering finish.

1.10 COORDINATION

Coordinate work with other operations and installation of floor finish materials to avoid damage to installed underlayment and membrane materials.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer: Englert, Inc., or approved equal.

B. Substitutions: Per Engineer's Discretion.

C. Request for substitutions will be considered in accordance with provisions of *Section 01600*.

2.02 COMPONENTS

A. Gutters: Aluminum Sheet, *ASTM B209*, Alloy 3105-H24. Minimum tensile strength 26,000 psi, minimum yield strength 25,000 psi or equivalent. Continuous and seamless sheet aluminum, roll formed.

1. Thickness:

   a. 0.032 inch (0.81mm)

2. Size:

   a. 5 inches

B. Downspouts: Aluminum sheet, *ASTM B209*, Alloy 3105-H24. Minimum tensile strength 26,000 psi, minimum yield strength 25,000 psi or equivalent.

1. Thickness:

   a. 0.019 inch (0.48 mm)

2. Size:

   a. 3 inches by 4 inches (76 mm by 102 mm)

C. Endcaps: Aluminum sheet, *ASTM B209*, Alloy 3105-H24, thickness 0.027 inch (0.69mm).

D. Inside and Outside Mitres: Aluminum sheet, *ASTM B209*, Alloy 3105-H24, thickness 0.027 inch (0.69mm).

E. Gutter Hangers and Anchors: Aluminum sheet, *ASTM B209*, Alloy 3105-H24, thickness 0.063 inch (1.60 mm). Provide types required to suit project requirements.

F. Downspout Anchors: Aluminum. Provide types required to suit project requirements.

G. Elbows: Aluminum sheet, *ASTM B209*, Alloy 3105-H24. Minimum tensile strength 26,000 psi, minimum yield strength 25,000 psi or equivalent.

1. Thickness:

   0.19 ch (0.48 mm)

2. Size: To match downspout

H. Gutter Guard:

Size:

1. Aluminum mesh, 5 inch (127 mm) by 3 foot (914 mm)

I. Gutter Screen:

Size:

1. Aluminum screen, brown, 5 inch (127 mm) by 3 foot (914 mm)

J. Aluminum Finish: Two-coat system applied in a continuous baked-on process in a single operation, comprising of an acid-based primer and baked-on high performance linear polyester topcoat on exposed surfaces. Concealed surfaces finished with a polyester gold backer or wash coat. Color to be selected by Engineer from Contractor supplied color sample swatches.

K. Sealant: Sealant shall be a tripolymer single component per *ASTM C-920*.

L. Fasteners: Same material and finish as gutters and downspouts.

2.03 FABRICATION

A. Continuously form seamless gutters to the profiles and sizes specified.

B. Form downspouts of profiles and sizes specified.

C. Hem exposed edges of metal.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. Verify governing dimensions at building.

C. Verify surfaces are ready to receive gutters and downspouts.

D. If substrate preparation is the responsibility of another installer, notify Engineer of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Clean and repair if necessary, any adjoining work on which this work is in any way dependent for its proper installation.

C. Prepare surfaces using methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install gutters using appropriate hangers to allow normal expansion and contraction.

C. Install gutter hangers using two 1¼ inch (32 mm) screw shank nails and fastened into solid lumber.

D. All gutters shall be in continuous length for each elevation (run). No end laps are allowed.

E. Exercise care in placing aluminum in contact with other dissimilar metals or materials that are not compatible with aluminum.

F. Providing adequate installation/separation wherever necessary, such as by painting or otherwise protecting when they are in contact with aluminum or when drainage from them passes over aluminum surfaces.

G. Install sealants where indicated to clean dry surfaces only without skips or voids.

H. Discharge to splash block per Drawings.

3.04 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 07712

SECTION 07720
ROOF ACCESSORIES

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

This Section describes labor, materials, and equipment necessary to furnish and install ridge ventilators, cupolas, and snow breaks.

PART 2 - PRODUCTS

2.01 PRODUCTS

A. Roof ventilators shall:

1. Be a manufactured ridge mount with opening and closing features;

2. Have remote damper control;

3. Have a 4.0 inch throat width;

4. Be approximately 10 feet long;

5. Have bird screens of 1/2 inch mesh by 19 gauge galvanized wire.

B. *Romlair, Model RV-4 Ridge Ventilator* as manufactured by the *Romla Manufacturing Company* meets this specification.

C. Cupolas shall:

1. Be approximately 3 feet 3 inches wide by 3 feet 3 inches long by 2 feet 8 inches tall;

2. Match the appearance of the building;

3. Have 24 inch by 24 inch galvanized louvers with screens;

4. Have a pre-manufactured roof curb; and

5. Have a 3 inch overhang.

D. Snow breaks shall:

1. Be installed in accordance with the Drawings.

PART 3 – EXECUTION

3.01 INSTALLATION

Ventilators, cupolas, and snow breaks shall be installed per the manufacturer's recommendations or as directed by the Engineer.

END OF SECTION 07720

SECTION 08000
GENERAL DOORS AND WINDOWS PROVISIONS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

This section specifies the provisions common to all the sections within *DIVISION 8* specifying doors, windows, and frames.

1.02 RELATED WORK

Provisions of the *GENERAL CONDITIONS, SUPPLEMENTAL CONDITIONS*, and *DIVISION 1* of the Contract are by this reference a part of this division and shall govern work under this division where applicable.

1.03 REFERENCES

References listed in *DIVISION 8* are from the following organizations' latest editions of their publications and reference standards:

A. *AAMA* *American Architectural Manufacturer's Association*

B. *AIA* *Architectural Institute of America*

C. *ANSI* *American National Standards Institute*

D. *ASTM* *American Society for Testing and Materials*

E. *AWI* *Architectural Woodwork Institute*

F. *NBHA* *National Builders' Hardware Association*

G. *NFPA* *National Fire Protection Association*

H. *SDI* *Steel Door Institute*

I. *UL* *Underwriter's Laboratories*

1.04 SUBMITTALS

A. Manufacturer's Literature and Data:

1. Description of each product to be provided.

2. Application and installation instructions.

B. Shop Drawings:

1. Show frame details, elevations, tolerances, details of construction, location of finish hardware, and glazing (for doors).

2. Provide schedules of doors or windows and frames using the same reference numbers for details and openings as those on the Drawings.

3. Provide shop drawings to hardware supplier and coordinate fabrication of doors and frames for hardware reinforcing placement.

C. Samples: Submit complete samples of finish materials for color and pattern selection by the Engineer.

D. Warrantees: Submit specified warrantees with product literature.

1.05 QUALITY ASSURANCE

A. All installation shall be according to the manufacturer's written instructions.

B. Protect adjoining surfaces before work begins.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect all materials from exposure to moisture, sunlight, and other excessive weather conditions.

B. Deliver in unopened packages.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION 08000

SECTION 08100
HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

The work of this section shall include all labor, materials, equipment, and appliances required to complete the hollow metal door and framework as indicated on the Drawings and as specified herein.

PART 2 - PRODUCTS

2.01 HOLLOW METAL DOORS

A. Hollow metal doors shall be *S.D.I. Type I*, *Standard Duty, Steelcraft Series L*, 18-gauge face sheet, or approved equal conforming to the following specifications:

B. Nominal door sizes are shown on the Drawings; however, minimum clear opening through all personnel access doors shall be 32 inches as required by *WAC 51-10* for barrier free access. These doors shall have no raised thresholds greater than 1/2 inch high.

2.02 METAL FRAMES

A. Pressed-steel frames, where required, shall be constructed of minimum 16 gauge steel with 8 gauge steel hinge reinforcements. Miters shall be welded their entire length including reinforcement, stops, and trim, and cleaned and ground to present a smooth surface. Welding of trim face miters only is not acceptable. All joints shall be dressed to make them invisible, and all fastenings shall be concealed. *Steelcraft Series F16, FE16*, or Engineer approved equal.

B. Frames shall come delivered with temporary floor spreaders.

C. See SECTION 08710 for silencer requirements.

2.03 FABRICATION - GENERAL

A. Fabricated hollow metal door and frame units shall be rigid, neat in appearance, and free from defects, warp, or buckle. Metal shall be accurately formed to required sizes and profiles. Wherever practicable, units shall be fit and assembled in the manufacturer's plant.

B. Shop-Applied Finish: All doors and frames shall be cleaned, phosphatized, and finished with 1 coat of baked-on rust-inhibitive enamel or paint in accordance with *ANSI A224.1* and suitable as a base for specified finish paints.

C. Exposed fasteners shall be countersunk flat.

D. Glazing Where Noted on the Drawings:

1. Nonremovable, minimum 20 gauge glazing stops shall occur on the outside of exterior doors and on the secure side of interior doors. Glazing beads on the inside of glass shall be removable.

2. Glazing shall be a minimum of 1/4 inch thick safety glass (interior) or wire safety glass (exterior). Glazing on exterior doors shall be caulked for weather tightness.

2.04 CAULK

Caulk shall be paintable, siliconized latex with life expectancy of 25 years or more.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install doors and frames in accordance with manufacturer's instructions.

B. All door and frame units shall be placed, wedged, shimmed, and blocked accurately in the rough-in opening, and fastened with sufficient anchors to securely attach the unit to the building frame.

C. Contractor shall test and adjust all units until they operate correctly and close tightly, to the satisfaction of the Engineer.

D. Contractor shall caulk, and trim door units as required for a neat and finished appearance.

E. Contractor shall weather-strip the entire perimeter on all doors that are exposed to outside weather.

END OF SECTION 08100

SECTION 08360
OVERHEAD DOORS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

Install overhead roll up doors as shown on Drawings in accordance with manufacturer's instructions.

1.02 SUBMITTALS

A. Submit product data and shop drawings showing each type of door and electric operators, including power and control wiring diagrams.

B. 10 year warranty.

PART 2 - PRODUCTS

2.01 OVERHEAD DOOR, TRACK, AND OPERATOR

A. The overhead door will secure an opening in the building for loading and unloading material that has the dimensions of 10 feet tall x 10 feet wide.

1. Performance Criteria:

a. Maximum defection of door in open (horizontal) position: 1/120th of the door width.

b. Wind Loads: Comply with *ANSI/DASMA 102-2011*

2. Doors will be constructed with a minimum 24 gauge galvanized steel or color determined by Engineer to match outside finish of building.

3. Doors are insulated with two inch Polyurethane and back skinned with 25 gauge steel.

4. Weather-stripping:

a. Vinyl, U-shaped loop type; retains sealing properties in sub-freezing and high heat temperatures.

b. Jamb and head shall be flexible cold weather vinyl in continuous contact at perimeter of door exterior when door is in closed position.

c. Bottom weather-seal shall be compressible vinyl in continuous contact with floor when door is closed.

5. Locks: Install a slide lock to secure the door from the outside.

6. Exterior door finish shall be galvanized steel, or color determined by Engineer to match outside finish of building.

B. Track:

1. Tracks shall be galvanized steel 2 inches wide or 3 inches wide as required by door size. Track support at jambs shall be continuous steel angels, adjustable for sealing door to jamb.

2. Springs must provide a safe and durable conversion of spring torque to lifting power for balancing the weight of the sectional overhead door. Springs shall be torsion type, low stress, and helical wound, oil-tempered to *ASTM A229/A229M* with the high use life cycle. Torsion tubes shall be 25 mm (1 inch) diameter.

3. Hardware including hinges, brackets, and corner-lift brackets shall be galvanized steel. Track rollers shall be hardened steel, ball-bearing rollers.

C. Operation:

1. Doors shall be operated by electric motor door openers. Door openers shall be capable of manual override operation. Size and model of the door openers shall be appropriate for the door size as recommended by the manufacturer.

2. Door opener shall be mounted inside the building and include remote units.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine openings to receive overhead doors for dimensions, square, plumb, and finish.

B. Starting of installation constitutes acceptance of conditions.

3.02 INSTALLATION

A. Install overhead doors and track in accordance with approved shop drawings and manufacturer's printed instructions and as specified.

B. Coordinate installation with adjacent work to ensure proper clearances and allow for maintenance after installation.

C. Anchor door assembly to wall and building using anchors for the proper weight and size of door as well as area wind load requirements. Securely brace door tracks suspended from structure. Vertical lift track that breaks away from wall more than 12 inches to be supported with angle to wall or structural members for support.

D. Adjust hardware and moving parts to function smoothly so that doors operate easily and locking mechanism functions properly. Adjust doors and seals to provide weather-tight fit around entire perimeter.

E. At completion of installation, the Contractor shall clean all surfaces and adjust door for proper operation.

END OF SECTION 08360

SECTION 08520
VINYL WINDOWS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

The work covered by this section consists of furnishing all labor, materials, and equipment for the installation of vinyl windows, sliding glass doors, frames, screens, and sliding screen doors as shown and/or scheduled in the Drawings.

PART 2 - PRODUCTS

2.01 WINDOWS AND SLIDING DOORS

A. Performance:

1. Air Infiltration: No more than 0.25 cfm per foot of sash crack at test pressure of 1.57 PSF, per *ASTM E283*.

2. Water Penetration: No water penetration at 3 psf test pressure, per *ASTM E547*.

B. Frames: White extruded tubular PVC, conforming to *AAMA 101/I.S.2* and *ASTM D4216*. Joints shall be welded. Frames shall have perimeter weatherstop/nailing flange.

C. Glass:

1. Conforming to *ASTM E774*, *Class A*, dual glazed, 1 inch overall thickness, low-E, argon filled. Units shall be factory glazed.

2. Windows noted in the schedule as requiring tempered glass or safety glass shall utilize safety glazing material. Each unit of tempered glass shall be permanently identified as such by the manufacturer.

D. Hardware:

1. Rollers shall be heavy-duty, noncorrosive material, rolling on raised track integral or attached to the frame. Mechanism shall be easily adjustable with screwdriver.

2. Lock shall be positive action locking mechanism. Lock for sliding door shall be a 2 point locking mechanism with anti-lift device

E. Weather Stripping (for operable vent) shall be manufacturer's standard type and shall be water repellent, rot proof, and resilient.

F. Warrantee: Executed by the window manufacturer to repair or replace units that fail in materials or workmanship for 10 years. Materials and labor shall be covered in full by the manufacturer.

2.02 SCREENS

A. Window and door screen frames shall be extruded aluminum, colored to match window frame, rigidly joined at corners.

B. Screen cloth shall be fiberglass, 18 by 16 mesh.

C. Screens shall be mounted on exterior side of vents.

2.03 CAULK

Caulk shall be paintable, 100 percent silicone with a life expectancy of 25 years or more.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install vinyl windows in accordance with manufacturer's recommendations.

B. Install sufficient corrosion-resistant anchorage devices to securely and rigidly fasten windows to building without causing detrimental effects to shape or performance.

C. Caulk around all edges of window frame.

D. Place batt insulation in shim spaces around perimeter to maintain continuity of thermal barrier.

END OF SECTION 08520

SECTION 08710
FINISH HARDWARE

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

Work includes furnishing and delivering all finish hardware to complete the buildings, except such items specifically excluded. The schedules in these Specifications are intended to indicate the various combinations desired and are not guaranteed as to quantity. Check the door schedule and Drawings for counts, and any door omitted from this schedule shall be furnished with hardware as scheduled for a door with a similar location elsewhere in the building. If a door is not included in this schedule, and there is not a similar door elsewhere in the building, as a minimum each leaf shall be provided with 1½ pair of ball bearing butts, a door closer, a cylinder lockset, and a doorstop.

1.02 SUBMITTALS

A. The Contractor shall, before ordering hardware, coordinate keying with Engineer and furnish to the Engineer an itemized schedule giving the manufacturer's name, catalog number, material, finish, keying arrangements of locks, hands of doors, etc. of every item that will be furnished. The Engineer's approval shall not relieve the Contractor of responsibility for incorrect count or quality.

B. The Contractor shall supply to the Engineer 1 set of all wrenches, adjustment tools, etc., for proper maintenance of hardware to be installed in the building.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Equivalent hardware may be substituted with approval of submittal by Engineer.

B. The Contractor shall provide hardware for fire-rated openings in compliance with *AIA (NBFU) Pamphlet No. 80* and *NFPA Standard No. 80.* These requirements take precedence over other requirements for such hardware.

C. The Contractor shall provide only hardware that has been tested and listed by *UL* for the types and sizes of doors required and that complies with the requirements of the door and door frame labels.

2.02 MATERIALS

A. General: Materials and finishes for all hardware steel, aluminum, brass, bronze, or stainless steel shall be dull chrome, satin chrome, or satin stainless unless otherwise specified or scheduled.

B. Astragal: Primed steel 3/16 inch minimum thickness, drilled and countersunk for screws.

C. Closers:

1. Door closers shall be equipped with arms for the full swing with hold open arm and delayed action cylinder.

2. Closers for fire rated doors shall be provided with a 160 fusible link.

3. Drop plates shall be provided if the top rail will not accept the closer without a plate.

4. Closers shall comply with the opening force requirements of the *Americans with Disabilities Act* and *ANSI A156, Grade 1*.

5. Provide 10 year warranty on materials and workmanship.

6. Acceptable manufacturers are *LCN, Norton, Yale, Rixson-Firemark*, or Engineer approved equal.

D. Deadbolt:

1. Exterior Residential Doors:

   a. Keyed to match lockset, interior thumb turn.

   b. Strikes shall be curve lipped and provided with wrought box.

   c. Acceptable manufacturer is *Best Access Systems* or Engineer approved equal.

2. Restrooms (Non-Residential): Non-keyed, manual throw deadbolt with green and red “vacant/occupied” annunciator on public side of door.

E. Door Holder: Kick-down type, rubber-tipped leg held in “up” position when not in use. Acceptable manufacturers are *Glyn Johnson, Hager, Stanley*, or Engineered approved equal.

F. Exit Device: Rim device, *UL* listed for accident hazard installations, cylinder dogging, with exterior pull handle and lock set. Acceptable manufacturers are *Von Duprin, Yale, Norton*, or Engineer approved equal.

G. Flush Bolts:

1. Each pair of flush bolts for the inactive leaf of double doors shall be provided with mortise guides to be set in door head and rail and bottom rail, mortise strikes to set in frame head, and dustproof mortise strike to set in floor.

2. Acceptable manufacturers are *Ives, Baldwin, Sargent, Yale, Russwin, Corbin, Hager, Stanley*, or Engineer approved equal.

H. Hinges:

1. Hinges shall be bronze or steel. Unless specified otherwise, all hinges shall be plated, 5 knuckle ball bearing.

2. Residential: Butt hinges for doors shall have non-rising loose pin with button tips. Hinges for exterior opening doors shall have non-removable pins held by a set screw in the barrel.

3. Acceptable manufacturers are *Stanley, Hager*, or Engineer approved equal.

I. Keying and Key Control System: Contractor shall provide a construction master key system and 2 construction master keys for the period of construction. Upon completion of the project, the Engineer shall be responsible for changing the construction master key system to the permanent system. Permanent cores will be furnished by the Owner.

J. Kick Plate: Stainless steel, 8 inches high, beveled edges on 3 sides. Acceptable manufacturers are *Stanley, Hager*, or Engineer approved equal.

K. Locksets:

1. Locksets and latch sets shall be *Best 9K Series* with a minimum of 9/16 inch throw conforming to *ANSI A156.2, Series 4000, Grade 1*.

2. All lock hardware shall be compatible with *Best Access Systems (Best Lock) Key Core Control System.*

3. Strikes for all locks shall be curve lipped and provided with wrought boxes.

4. Lock face bevels shall be rounded or rabbeted where required.

5. Residential master bedroom and bathrooms shall be privacy function.

6. Manufacturer is *Best Access Systems (Best Lock)*. No substitution allowed.

L. Silencers:

1. All single doors with hollow metal frames shall have 3 silencers installed in the stop of the frame. Double doors shall be provided with 2 silencers installed in the stop of the frame.

2. Exterior doors shall not be provided with door silencer.

3. Acceptable manufacturers are *Hager, Stanley*, or Engineer approved equal.

M. Sweeps: Extruded aluminum with replaceable “cold weather” vinyl bulb gasket conforming to *ASTM D746*. Acceptable manufacturer is *Hager* or Engineer approved equal.

N. Thresholds:

1. Thresholds shall be extruded aluminum of size and type scheduled.

2. Thresholds shall not be greater than 1/2 inch in height.

3. Acceptable manufacturers are *Hager, Stanley*, or Engineer approved equal.

O. Wallstop: Rubber concave bumper, screwed or toggled into wall. Acceptable manufacturers are *Stanley, Hager*, or Engineer approved equal.

P. Weatherstripping:

1. All exterior doors shall be provided with press-on adhesive applied, bulb type weatherstripping applied to door stops at jambs and head. Color shall be the closest match to finished frame color offered by the manufacturer.

2. Acceptable manufacturers are *Zero, Reese, National Guard, Pemko, Hager, Stanley*, or Engineer approved equal.

Q. Miscellaneous Hardware: Acceptable manufacturers are *Stanley, Baldwin, Hager, Pemko*, or Engineer approved equal.

2.03 HARDWARE SCHEDULE

TABLE 08710 - 2.03

		COMMERCIAL				RESIDENTIAL	
	Quantity Per Door	**Group SLE (Single Leaf Exterior)**	**Group DLE (Double Leaf Exterior)**	**Group SLI1 (Single Leaf Interior)**	**Group SLI2 (Single Leaf Interior)**	**Group RE (Exterior)**	**Group RI (Interior)**
Astragal	1		Hager, 835S				
Closer	1	LCN,4011	LCN,4011	LCN,4011*			
Deadbolt	1				Falcon**	Best, 73T	
Door Holder	1	Hager, 270F	Hager, 270F				
Exit Device	1	Von Duprin, 35NL-OPx550	Von Duprin, 35NL-OPx550				
Flushbolt	1 pr.		Hager, 281D				
Hinges	1 ½ pr.	Hager, BB1279	Hager, BB1279	Hager, BB1279	Hager, BB1279	Hager, 1279	Hager, 1279
Kickplate	1	Hager, 190S	Hager, 190S	Hager, 190S			
Lockset	1	Best, 93K7AB15DSTK	Best, 93K7AB15DSTK	Best, 93K7B15DSTK	Best, 93K7B15DSTK	Best, 93KAB14CSTK	Best, 93KN14CSTK & 93KL14CSTK
Silencer	3			Hager, 307D	Hager, 307D		
Sweep	1	Hager, 781S	Hager, 781S			Hager, 781S	
Threshold	1	Hager, 417S	Hager, 417S			Hager, 417S	
Wall Stop	1	Hager, 230W	Hager, 230W	Hager, 230W	Hager, 230W	Hager, 211	Hager, 211
Weatherstrip	1	Hager, 726S	Hager, 726S			Hager, 726S	

* *with fusible link for fire rated doors*

** *on restroom doors*

Quantity of hardware listed under hardware group indicates amount of hardware required for each door under that group unless noted otherwise.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Fastenings and Anchorages:

1. Hardware shall be installed in accordance with the instructions of the manufacturer of the hardware used. All surface-applied hardware on labeled and unlabeled doors shall be installed with through bolts.

2. Contractor shall furnish the proper fastenings that shall harmonize with the material and finish.

B. Contractor shall ensure the use of accurate templates for preparation of all parts of the building construction to receive finish hardware. Any costs due to inaccurate templates furnished will be borne by the Contractor.

C. Contractor shall mount hardware units at height recommended in *Recommended Locations for Builders Hardware* by *NBHA*, unless specified or indicated otherwise.

3.02 ADJUSTMENT

Contractor is responsible for ensuring all necessary final adjustments are made to finish hardware.

END OF SECTION 08710

SECTION 09000
GENERAL FINISHES PROVISIONS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

This section specifies general requirements for all sections of *DIVISION 9 - FINISHES*.

1.02 RELATED WORK

Provisions of the *GENERAL CONDITIONS*, *SUPPLEMENTAL CONDITIONS*, and *DIVISION 1* of the Contract are by this reference a part of this division and shall govern work under this division where applicable.

1.03 REFERENCES

References listed in *DIVISION 9* are from the following organizations' latest editions of their publications and reference standards:

A. *ANSI* *American National Standards Institute*

B. *ASTM* *American Society of Technical Materials*

C. *AWWA* *American Waterworks Association*

D. *FS* *Federal Specification*

E. *GA* *Gypsum Association*

F. *NSF* *National Sanitation Foundation*

G. *SSPC* *Steel Structures Painting Council*

H. *TCA* *Tile Council of America*

I. *IBC* *International Building Code*

1.04 QUALITY ASSURANCE

A. All installation shall be according to the manufacturer's written instructions.

B. Protect adjoining surfaces before work begins.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect all materials from exposure to moisture, sunlight, and other excessive weather conditions.

B. Deliver in unopened packages.

C. Store flat on edge or rolled as recommended by the manufacturer.

PART 2 - PRODUCTS

See other Sections of *DIVISION 9*.

PART 3 - EXECUTION

See other Sections of *DIVISION 9.*

END OF SECTION 09000

SECTION 09250
GYPSUM WALLBOARD

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

This section specifies gypsum board on walls and ceilings, taped and standard joint treatment, and metal corner beads and edge trim.

1.02 QUALITY ASSURANCE

Perform gypsum board work in accordance with the recommendations of *ASTM C954* and *GA 216* unless otherwise specified in this section. Keep a copy of *GA 216* in field office for duration of the project.

PART 2 - PRODUCTS

2.01 GYPSUM BOARD

A. Regular Wallboard shall conform to *ASTM C36*. *Type X* (fire resistive) shall be used where shown on the Drawings.

B. Water-resistant gypsum backing board shall conform to *ASTM C630*. *Type X* (fire resistive) shall be used where shown on the Drawings.

C. Thickness Unless Otherwise Noted on the Drawings:

1. Walls shall be 1/2 inch;

2. Ceilings shall be 5/8 inch; and

3. Type X wall and ceilings shall be 5/8 inch.

2.02 FASTENERS

Fasteners shall be bugle-head, power-driven screws of sufficient length to penetrate 5/8 inch into wood studs or bugle-head power-driven screws conforming to *ASTM C954* when screwing to metal studs.

2.03 JOINT COMPOUND

Taping or embedding and finishing compound shall conform to *ASTM C475*.

2.04 ACCESSORIES

A Provide gypsum wallboard accessories in accordance with *ASTM C840*.

B. Corner beads shall be metal or metal and paper combination.

C. Edge trim shall be metal U-bead.

PART 3 - EXECUTION

3.01 PREPARATION FOR COLD AND DAMP WEATHER CONDITIONS

Provide heat in spaces to be covered with wallboard as necessary to maintain a temperature of at least 50ºF, but not more than 70ºF, for 48 hours prior to and during application of boards and joint treatment, and for at least 4 days thereafter or until the compounds have completely dried.

3.02 GYPSUM BOARD INSTALLATION

A. Install gypsum board in accordance with recommendations of *GA 214, GA 216, ASTM C954,* and the *UBC*.

B. Erect single layer, standard gypsum board with ends and edges occurring over firm bearing.

C. For fire-rated walls or ceilings, erect double layer of Type X gypsum board with staggered seams in direction conforming to *UBC*, unless noted or shown otherwise on the Drawings.

D. Provide edge trim at ends of wall assemblies that abut an adjacent wall assembly of dissimilar materials.

E. Tape, fill, and sand exposed joints, edges, corners, and openings 3 times to a Level 4 finish (*GA 214*) to produce surfaces ready to receive finishes.

F. Install water resistant gypsum board in accordance with *GA 216* with joints taped. Caulk and seal all cuts and cutouts before adhesive application.

3.03 TEXTURE FINISH

A. Surfaces to receive texture finish shall be primed with one (1) coat of primer as specified in *DIVISION 9 - FINISHES* prior to application of texture. After texture has dried for at least 24 hours, additional prime and finish coats shall be applied per *DIVISION 9*.

B. Except where otherwise noted, texture shall be “orange peel” on walls and ceilings and shall be applied uniformly without starved spots or runs.

C. No texture shall be applied in kitchens, bathrooms, laboratories, or garages.

END OF SECTION 09250

SECTION 09660
RESILIENT FLOORING

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

This section specifies application of vinyl-sheet and vinyl-composition tile (VCT) flooring and resilient base, including preparation of substrate surfaces.

1.02 PROJECT CONDITIONS

A. Maintain temperature of flooring and rooms where flooring work occurs above 65ºF for 48 hours before and during installation. After installation, maintain temperature at or above 55ºF.

B. Wet construction in or near areas to receive flooring shall be complete, dry, and cured.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Commercial Vinyl Flooring:

1. Sheet: *FS L-F-475, Type II, Grade A*.

2. Vinyl sheet shall be commercial grade, pattern and color extend completely through the wear layer, .085 inch overall gauge, .05 inch vinyl color chips in vinyl-matrix-wear layer, minimum 100 pounds per square inch load limit. Rolls shall be 6 feet minimum width of *Armstrong Standard Corlon* or Engineer approved equal.

3. Tile: *FS SS-T-312B(1), Type IV, Comp. 1*.

4. VCT shall have pattern and color extend through the wear layer, 12 by 12 inches, 1/8 inch thick, minimum 50 pounds per square inch load limit, *Armstrong Standard Excelon Imperial Texture* or Engineer approved equal.

5. Each color and pattern of flooring shall be of the same production run.

6. Color and pattern shall be selected by Engineer.

B. Adhesives shall be type recommended by the sheet flooring manufacturer for the conditions of use.

C. Primer (for concrete subfloors) shall be as recommended by the adhesive or flooring manufacturer.

D. Leveler shall be cementitious.

E. Base shall be:

1. Rubber;

2. 4 inches high is standard, 6 inches high in restrooms;

3. 1/8 inch thick;

4. Top set coved;

5. Pre-molded external corners and end stops; and

6. Manufactured by Burke or Engineer approved equal, color as selected by the Engineer.

F. Mastic Underlayment (for Concrete Subfloors): Provide products with latex or polyvinyl acetate resins in the mix. The conditions to be corrected shall determine the type of underlayment selected. Contractor shall comply with flooring manufacturer's recommendation.

G. Polish: As recommended by the flooring manufacturer.

H. Edge Strips: Edge strips shall be extruded aluminum, mill finish, and mechanically cleaned.

PART 3 - EXECUTION

3.01 SUBFLOOR PREPARATION

A. Subfloor shall be prepared and, in a condition, before vinyl installation, in accordance with the vinyl manufacturer's recommendations. Commencing installation constitutes acceptance of substrate conditions for warranty purposes.

B. Examine surfaces on which sheet flooring is to be installed. Correct conditions that will impair proper installation.

1. Variation of 1/8 inch in 10 feet (noncumulative) is the maximum wave acceptable.

2. Trowel marks, pits, dents, protrusions, cracks, or joints are unacceptable and shall be corrected.

C. Fill cracks, joints, and other irregularities in concrete with mastic underlayment.

1. Do not use adhesive for filling or leveling purposes.

2. Do not use mastic to correct imperfections that can be corrected by spot grinding.

D. Clean floor of oil, paint, dust, and deleterious substances. Floor shall be dry and cured.

3.02 SHEET AND VINYL COMPOSITION TILE FLOORING INSTALLATION

A. Method of installation shall be full coverage adhesive. Installation shall be in accordance with manufacturer's instructions.

B. Air pockets or loose edges will not be accepted.

C. Trim sheet materials to touch in the length of intersection at pipes and vertical projections. Seal joints at pipe with waterproof cement.

D. Sheet joints shall be held to a minimum. Avoid small filler pieces or strips.

E. Joints shall be butted, and sheet edges shall be solvent welded. Open joints will not be accepted. Joints shall not be readily visible from a standing position.

3.03 EDGE STRIP INSTALLATION

A. Where flooring edge is exposed, butt 1/8 inch thick strips to touch along entire length. Set strips in adhesive and anchor with stainless steel screws.

B. Locate edge strips under center lines of doors unless otherwise indicated.

C. Drill and counter-sink edge strips for stainless steel, flat head Phillips head screws. Set screws into lead anchors where subfloor is concrete. Space holes near ends and approximately 9 inches on center in between.

3.04 BASE MATERIAL INSTALLATION

A. Fit joints tight and vertical, maintaining a minimum measurement of 18 inches between joints.

B. Miter internal corners. At external corners and exposed ends use pre-molded units.

C. Base in Restrooms: Sheet vinyl shall be run up walls 6" in restrooms.

3.05 CLEANING AND PROTECTION

A. Clean small adhesive marks from exposed surfaces during the application of flooring and base before the adhesive sets. Excessive adhesive smearing will not be permitted.

B. Keep traffic off flooring for 24 hours after installation.

C. Where construction traffic is anticipated, cover flooring with reinforced Kraft paper properly secured and maintained until Substantial Completion.

D. Clean and polish flooring prior to Substantial Completion.

END OF SECTION 09660

SECTION 09870
COATING SYSTEM FOR BURIED STEEL PIPING

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

This section specifies application of exterior coating of buried steel pipe, joints, and fittings greater than 4 inches nominal diameter.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Pipe: Factory-applied; 3 part system consisting of primer; minimum 20 mil butyl, rubber adhesive, polyethylene backed corrosion barrier tape; 30 mil butyl rubber adhesive; and high density polyethylene backed outer wrap of contrasting color to corrosion barrier tape, conforming to *AWWA C214*. Pipe to receive shop applied coating shall receive an *SSPC-SP6* blast finish prior to priming. *Polyken YGIII System*, or Engineer approved equal.

B. Joints, Fittings, Ells, Tees: Field-applied, single wrap of protective coating, conforming to *AWWA C209, Polyken #930-35*, or Engineer approved equal.

C. Primer: As recommended in the coating manufacturer's literature; *Polyken #1019* for factory applications, *Polyken #1027* for field applications, or Engineer approved equal.

D. Filler Tape: Pure butyl rubber designed by the manufacturer to build up around irregular shapes at fittings to provide a smooth transition for wrapping. *Polyken #939* filler tape or Engineer approved equal.

E. Cutback on pipe ends shall be tapered and be 6 inches from ends for welded joints.

PART 3 - EXECUTION

3.01 FIELD COATING APPLICATION

A. Handling of wrapped pipe and field application of protective tape shall be in accordance with tape manufacturer's written instructions.

B. All surfaces to receive coating shall be clean, dry, and prime coated. Allow prime to dry.

C. Apply filler tape as necessary at fittings to ease transition at irregularities for wrapping. Apply filler tape so that no voids are under the wrap tape.

D. Apply tape system; wrap with 50 percent overlap to achieve 70 mil overall thickness.

3.02 PROTECTION

Protect lining and coating from damage. Repair damage immediately to minimize possibility of corrosion. Place pipe in trench and backfill carefully, ensuring large rocks are not dropped on coating.

END OF SECTION 09870

SECTION 09900
PAINTING

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. Work under this section includes painting work as shown on the Drawings and schedules and as follows:

1. Painting and finishing of interior and exterior exposed items and surfaces designated in *Table 09900 - 3.07*, except as otherwise specified or as shown on Drawings.

2. Painting of exposed bare and covered pipes and ducts, hangers, exposed steel and iron work, and primed metal surfaces of equipment installed under the mechanical and electrical work, except as otherwise indicated. All metal and piping that emerges from the ground shall be prepared and finished to 1 foot below grade. Work in this Section should be coordinated with installers for color coding, if any, for work performed related to *DIVISIONS 15* and *16*.

3. Painting of mechanical grilles, registers, louvers (except aluminum), and panel covers and frames for electrical work and systems.

4. Painting roof and exterior wall-mounted equipment excluding aluminum and factory-finished items.

5. “Paint” as used herein means all coating systems, materials, including primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate, or finish coats.

6. Painting all exposed surfaces whether or not colors are designated in schedules, except where the natural finish of the material is specifically noted as a surface not to be painted.

7. Where items or surfaces are not specifically mentioned, paint these the same as adjacent similar materials or areas. If finish is not designated, the Engineer will select the materials or system.

8. Steel shall be hot-dip galvanized unless otherwise noted.

B. The following categories of work are not included as part of the field-applied finish work, or are included in other sections of these Specifications:

1. Shop Priming: Unless otherwise specified, surface preparation and shop priming of ferrous metal items is included under the various sections for the work.

2. Mechanical and Electrical Work: Pipe and raceway identification taping, or stenciled painting is specified in *DIVISIONS 15* and *16.*

3. Prefinished Items: Unless otherwise indicated, do not include painting when factory finishing or installer finishing is specified for such items as (but not limited to) exterior concrete, metal toilet enclosures, acoustic materials, factory-finished casework, finished mechanical and electrical equipment including light fixtures, main switchgear, and distribution cabinets.

4. PVC Pipe shall not be painted.

5. Finished Metal Surfaces: Metal surfaces of anodized aluminum, factory-painted aluminum, stainless steel, chromium plate, copper, bronze, and similar finished materials will not require finish painting, unless otherwise indicated.

6. Operating Parts and Labels: Moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sinkages, sensing devices, motor, and fan shafts will not require finish painting unless otherwise indicated.

7. Unfinished Areas: Do not paint floors, walls, or ceilings of rooms or spaces scheduled as unfinished.

8. Do not paint exterior exposed concrete unless noted otherwise.

9. Do not paint exterior exposed masonry unless noted otherwise.

1.02 QUALITY ASSURANCE

A. Standard: Where not otherwise specified, follow recommendations of *Painting Specifications by Painting & Decorating Contractors of America, "Type 1, Recommended Jobs."*

B. Single-Source Responsibility: Provide primers and other undercoat paint produced by same manufacturer as finish coats. Use only thinners approved by paint manufacturer and only within recommended limits.

C. Coordination of Work: Review other sections of these Specifications in which prime paints are to be provided to ensure compatibility of total coatings system for various substrates. Upon request from other trades, furnish information or characteristics of finish materials provided for use to ensure compatible prime coats are used.

D. Completed work shall be free from disfiguring marks, blemishes, or damages due to faulty work or handling of the completed work.

E. Dry-film thickness of the applied coatings shall conform to manufacturer's minimum recommended total dry-film thickness. Film thickness may be determined when dry by Engineer with a magnetic thickness gauge. Deficiencies in film thickness may be corrected by application of additional coat(s) of paint.

1.03 PROJECT CONDITIONS

A. Do not apply paints and varnishes when surface temperature is below 50ºF unless otherwise specified. Do not paint exterior surfaces during damp, frosty, or rainy weather, or until surface has thoroughly dried from such weather except by prior approval of the Engineer. Such approval, however, shall not relieve Contractor of the responsibility to conform with these Specifications and manufacturer's recommendations. Avoid painting surfaces exposed to hot sun.

B. Provide adequate, continuous ventilation and sufficient heating in the facility to maintain temperatures above 50ºF for 24 hours before, during, and 48 hours after application of finishes.

C. Provide adequate lighting on surfaces while painting and after drying for inspection.

1.04 EXTRA STOCK

Furnish 1 gallon each of building interior and exterior finishes. Containers shall be tightly sealed and clearly labeled for identification.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

These Specifications are based on products of *Sherwin-Williams* and *Wasser High-Tech Coatings*.

2.02 MATERIALS AND SYSTEMS

A. Paint Schedule: Refer to schedule at the end of this section. Proprietary names are listed to establish materials and quality required.

B. Color Pigments: Pure, nonfading, applicable types to suit the substrates and services indicated. Limit lead content as required by law.

C. Paint Coordination: Provide finish coats that are compatible with prime paint used. Provide barrier coats over incompatible primers or remove and reprime as required. Notify the Engineer in writing of any anticipated problems using specified coating systems with substrates primed by others.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Thoroughly examine surfaces scheduled to be painted prior to commencement of work. Report in writing to the Engineer any condition that may potentially affect proper application. Do not begin until such defects have been corrected.

B. Correct defects and deficiencies in surfaces that may adversely affect the work of this section.

3.02 PROTECTION

A. Adequately protect other surfaces from paint and damage. Repair damage as a result of inadequate or unsuitable protection.

B. Place cloths and material that may constitute a fire hazard in closed metal containers and remove daily from site.

C. Remove electrical plates, surface hardware, fittings, and fastenings prior to painting operations. These items are to be carefully stored, cleaned, and replaced on completion of work in each area. Do not use solvent to clean hardware that may remove permanent lacquer finish.

3.03 PREPARATION OF SURFACES

A. Surfaces shall be prepared in strict accordance with the paint manufacturer's recommendations and these Specifications.

B. General:

1. Remove mildew by scrubbing with solution of trisodium phosphate and bleach. Rinse with clean water and allow surface to dry completely.

2. Unpainted work (especially plywood) that has been allowed to water stain or weather, shall be sanded to a fresh surface before priming.

C. Concrete/Masonry:

1. Remove contamination, acid etch, and rinse new concrete floors with clear water. Ensure required acid-alkali balance is achieved. Allow to dry thoroughly.

2. Remove dirt, loose mortar, scale, powder, and other foreign matter from concrete and concrete-block surfaces that are to be painted or to receive a clear seal. Remove oil and grease with a solution of trisodium phosphate, rinse well, and allow to thoroughly dry.

3. Remove stains from concrete and concrete-block surfaces caused by weathering of corroding metals with a solution of sodium metasilicate after being thoroughly wetted with water. Allow to dry thoroughly per manufacturer's recommendations.

D. Metals:

1. Galvanized Surfaces: Unless otherwise specified, all elements shall be hot-dip galvanized conforming to the applicable requirements of *ASTM A123, A153, A385, and A525*. Provide minimum of 2.3 ounces per square foot galvanizing on all surfaces.

2. Remove grease, rust, scale, dirt, and dust from steel surfaces. Where heavy coatings of scale are evident, remove by wire brushing, sandblasting or any other necessary method. Ensure steel surfaces are satisfactory before paint finishing. Provide *SSPC-SP* surface where specified.

3. Clean unprimed steel surfaces by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Prime surfaces to indicate defects, if any. Paint after defects have been remedied.

4. Sand and scrape shop-primed steel surfaces to remove loose primer and rust. Feather out edges to make touchup patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.

5. Remove surface contamination and oils from galvanized surfaces to receive paint and wash with solvent. Apply coat of etching type primer.

6. Remove surface contamination from aluminum surfaces requiring a paint finish by steam, high-pressure water, or solvent washing. Apply etching primer or acid etch. Apply paint immediately if acid etching.

E. Gypsum Wallboard: Remove contamination from gypsum board surfaces and prime prior to texturing to show defects, if any. Paint after defects have been remedied (refer to *SECTION 09250*).

F. Wood: Wipe off dust and grit from miscellaneous wood items and millwork prior to priming. Spot coat knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried and sand between coats. Back prime interior and exterior woodwork.

3.04 APPLICATION

A. Paints shall be applied in accordance with the manufacturer's recommendations. When applied by sprayer, as a minimum each coat of paint shall be backrolled.

B. Where more than 1 coat of paint is to be applied, each undercoat shall be tinted so as to make a visible difference from succeeding coats. The finish coat shall be of the color chosen by the Engineer.

C. All new painting adjacent to existing painting shall be distinctly cut or blended in to make a neat appearing cut-offline or transition. All damaged portions of existing paint due to this Contract shall be repainted in a matching color to existing surfaces.

D. Allow each coat of finish to dry before following coat is applied, unless directed otherwise by manufacturer.

E. Where clear finishes are required, ensure tint fillers match natural wood color. Work fillers well into the grain before set. Wipe excess from the surface.

3.05 MECHANICAL AND ELECTRICAL EQUIPMENT

A. Refer to *DIVISIONS 15* and *16* with respect to painting and finishing requirements, color coding, identification banding of equipment, ducting, piping, and conduit.

B. Remove grilles, covers, and access panels for mechanical and electrical systems from location and paint separately to match adjoining wall or ceiling.

C. Furnish and install new identification markings for mechanical or electrical equipment if existing markings are painted over or spattered.

D. Paint exposed conduit and electrical equipment occurring in finished areas. Color shall match adjacent surfaces.

3.06 CLEANING

A. As work proceeds and upon completion, promptly remove paint where spilled, splashed, or spattered.

B. Upon completion of work, leave premises neat and clean to the satisfaction of the Engineer.

3.07 PAINT SCHEDULE

Paint for surfaces shall follow *Table 09900-3.07* shown below.

TABLE 09900 – 3.07
PAINT SCHEDULE

		Coats/Paint				
Surface	**Paint Type**	**# Coats, Primer**	**# Coats, Finish**	**Gloss**	**Preparation**	**Notes**
Concrete floor	Epoxy (office only; no epoxy in storage bays)	N/A	1/ArmorSeal 1000	N/A	Acid etch. Rinse	A; no cure agents; light-broom finish only for storage bay floors
Galvanized metal, hot dip touchup	Zinc Polystyrene	N/A	1/Zinc Clad 5	N/A	Wire brush, no rust	B
Gypsum wallboard	Latex Enamel	2/ProMar 200	2/ProMar 200	Eggshell	Clean, dry	D
Interior, repaint (offices and storage bays)	Latex Enamel	Spot/ProMar 200	2/ProMar 200	Eggshell	Clean, dry	H
Interior, repaint (restrooms)	Latex Enamel	Spot/ProMar 200	2/ProMar 200	Semi	Clean, dry	H
Metal, ferrous (non shop-primed)	MC-Urethane	1/MC-Zinc 1/MC-Ferrox B	1/MC-Luster	Low	SSPC-SP6	
Metal, ferrous (shop-primed)	MC-Urethane	1/MC-Ferrox B	2/MC-Luster	Low	SSPC-SP6	
Pipe and fittings, steel, exposed	MC-Urethane	1/MC-Zinc	2/MC-Luster	Low	Clean, dry	
Wood, interior, paint	Alkyd Enamel	1/ProMar 200	2/ProMar 200	Semi	Fill, sand, clean	F, G

NOTES

A = Apply with sprayer, brush, or roller
B = For damaged hot-dip galvanizing field repair
D = One prime coat prior to texture, second after texture application, if textured
F = Putty fill nail holes, dowel plug countersunk holes
G = Spot prime/shellac knots, pitch streaks
H = Verify original paint compatible with new paint

Other paints are Sherwin Williams designations

END OF SECTION 09900

SECTION 10200
LOUVERS

PART 1- GENERAL

1.01 DESCRIPTION OF WORK

A. The work of this section shall include all labor, materials, equipment, and appliances required to complete the louver work as indicated on the Drawings and as specified herein.

B. Related Work:

1. *SECTION 05400 - COLD-FORMED METAL FRAMING*

2. *SECTION 09900 - PAINTING*

3. *SECTION 13121 - PRE-ENGINEERED METAL BUILDING*

1.02 QUALITY ASSURANCE

A. Provide louvers manufactured by a firm with not less than 5 years of successful experience in the production of this type of work as listed herein.

B. References:

1. *AAMA 605.2* *Voluntary Standard for High-Performance Coatings on Architectural Extrusion and Panels*

2. *AMCA* *Standard 500 Air Movement and Control Association*

C. Comply with specific performance requirements and unit performance ratings determined in compliance with *AMCA Standard 500*.

1.03 SUBMITTALS

A. Submit shop drawings for the fabrication and installation of louvers. Include details of each type, elevations, conditions at openings, tolerances, details of construction, location, and installation requirements. Show anchorage and accessory items.

B. Certification: Where performance requirements are included, provide *AMCA* Certified Rating Seal indicating that louvers comply with requirements.

PART 2 - PRODUCTS

2.01 THROUGH-WALL LOUVERS

A. Approved Products: The following products are approved, subject to the specified requirements:

1. *Ruskin*, Grandview, Missouri

2. *Construction Specialties, Inc.*, San Marcos, California

3. *Airolite Company*, Marietta, Ohio

B. General: Conform to *SMACNA ASSM, Plates 137* and *138 Figure C*.

C. Materials: *ASTM A526* galvanized to *G90* zinc coating.

D. Metal Gages: *6063T5* extruded aluminum, .081 inch nominal wall thickness.

E. Frame: *ASSM, Plate 138 (Figure A1)*.

F. Blades: *ASSM, Plate 138 (Figure D*).

G. Air Performance and Water Penetration: Louvers shall bear *AMCA* certified ratings seals for air performance and water-penetration ratings. Manufacturer shall submit *AMCA* licensed test data on a 3 foot high by 4 foot wide louver, showing that it provides a minimum of 5.12 square feet of free area and 450 FPM free air velocity at a pressure drop not exceeding 0.05 W.G, and test data on a 18 inch high by 30 inch wide louver showing that it provides a minimum of 1.09 square feet of free area and 460 FPM free-air velocity at a pressure drop not exceeding 0.05 W.G. Water penetration shall not exceed 0.01 ounce per square foot of free area at an airflow of 500 FPM free-area velocity when tested for 15 minutes per *AMCA Standard 500*.

H. Screens shall be 1/2 inch mesh, 0.041 diameter galvanized steel wire in galvanized steel frame.

I. Louver panel thickness shall be 4 inches deep with face dimensions as required to fit openings.

J. Finish shall be shop coat of primer, zinc chromate alkyd type, for field painting.

K. Louvers shall be designed to resist wind loading in accordance with live loads as indicated on the Drawings and in the Specifications, but in no case less than a uniform load of 25 pounds per square foot acting perpendicular to the plane of the louver assembly. Design for maximum deflection of L/180 the span.

L. Anchorage systems shall be designed to resist live loads as indicated on the Drawings and as specified.

2.02 FABRICATION

A. Louvers: Manufacturer's standard fabrication for types specified.

B. Accessories: Fabricate sill extension, flashings, wall anchors, structural supplementary subframing and accessories, as required for complete system.

C. Shop fabricate units to maximum extent possible and disassemble as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation.

1. Fabricate frames, including integral sill, to suit adjacent construction with tolerances for installation.

2. Provide sill extensions and loose sills of same finish and materials as louvers.

D. Join frame members and louver blades by welding, maintaining equal blade spacing including separation between frame head and sill and uniform appearance.

E. Shop miter and weld blades into prefabricated units to align with straight sections, include concealed bracing.

PART 3 - EXECUTION

3.01 SITE CONDITIONS

A. Inspection:

1. Prior to installation of the work of this section, carefully inspect the installed work of all other trades, and verify that all such work is complete to the point where this installation may properly commence.

2. Take site dimensions affecting this work prior to fabrication.

3. Do not proceed with installation in areas of discrepancies until all such discrepancies have been resolved.

3.02 INSTALLATION

A. Ensure openings affecting this work are properly prepared and flashings are correctly located to divert moisture to exterior. Install sealant in accordance with manufacturer's instructions.

B. Protect adjacent surfaces, finishes, and materials from damage during installation of louvers.

C. Install louvers in openings, properly aligned and level.

D. Secure louver rigid with concealed fasteners of noncorrosive metals to suit materials being encountered.

E. Coordinate installation method with application of adjacent backing, structural elements, and mechanical work.

F. Set and tie into flashing to ensure diversion of moisture to exterior.

G. Hinge screens for access.

3.03 CLEANING

When installation is complete, touch up all scuffs and abrasions in accordance with the manufacturer's recommendations.

END OF SECTION 10200

SECTION 10426
SIGNS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

The work of this section shall include all labor, materials, and equipment required to complete the sign work as shown on the Drawings and as specified herein.

1.02 REFERENCES

Not Used.

1.03 SUBMITTALS

Submit 5 copies of manufacturer's literature for all items of this section for the Engineer's approval.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Restroom Signs shall be engraved, plastic laminate (white on blue background) signs, 2½ inches by 8 inches, with international symbol of access, and 1 inch high Helvetica medium letters. Lettering to read "RESTROOM" (2 required).

B. Fire Extinguisher sign shall be white lettering on red background, 2½ inches high by 8 inches wide, with 1 inch high Helvetica medium letters. Location to be selected by the Engineer.

C. Hatchery Office Entry Sign shall be engraved, plastic laminate (white on blue background) signs, 2½ inches by 8 inches, with international symbol of access, and 1 inch high Helvetica medium letters. Lettering to read "Hatchery Office" (1 required).

D. Office Signs shall be engraved, plastic laminate (white on blue background) signs, 2½ inches by 8 inches, with international symbol of access, and 1-inch high Helvetica medium letters. Lettering to read "Office" (3 required).

E. Break Room Sign shall be engraved, plastic laminate (white on blue background) signs, 2½ inches by 8 inches, with international symbol of access, and 1 inch high Helvetica medium letters. Lettering to read "Break Room" (1 required).

F. Conference Room Sign shall be engraved, plastic laminate (white on blue background) signs, 2½ inches by 8 inches, with international symbol of access, and 1 inch high Helvetica medium letters. Lettering to read "Conference Room" (1 required).

G. Locker Room Sign shall be engraved, plastic laminate (white on blue background) signs, 2½ inches by 8 inches, with international symbol of access, and 1 inch high Helvetica medium letters. Lettering to read "Locker Room" (1 required).

H. Disabled Reserved Parking Sign shall be a sign posted on an adjacent wall of the new Office building, with the International Symbol of Access and the phrase "State Disabled Parking Permit Required." Sign dimensions shall be 12 inches wide by 18 inches high and comply with WSDOT sign R7-801. It shall also include a 12 inches wide by 4 inches high sign with the phrase “Van Accessible.”

I. No Parking Do Not Block Access Aisle Sign shall be red lettering on white background. Sign dimensions shall be 12 inches wide by 18 inches high.

PART 3 - EXECUTION

3.01 INSTALLATION

Exact sign locations shall be approved by the Engineer before installation of any signage.

END OF SECTION 10426

SECTION 10500
LOCKERS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

The Contractor shall provide steel lockers and all appurtenant work, all in accordance with the Contract Documents.

1.02 CONTRACTOR SUBMITTALS

A. Shop Drawings: The Contractor shall provide shop drawings of all products in accordance with the requirements in SECTION 01300 - Contractor Submittals.

B. Samples: The Contractor shall submit to the Engineer for approval, samples of all the materials and colors proposed for use on the Work. The samples shall be clearly marked to show the manufacturer's name and product identification and shall be submitted along with the manufacturer's technical data and application instructions. All sample submittals shall conform to the requirements for "Samples" in SECTION 01300.

1.03 QUALITY ASSURANCE:

A. Uniformity: Provide each type of metal locker as produced by a single manufacturer, including necessary accessories, fittings and fasteners.

B. Job Conditions: Do not deliver metal lockers until building is enclosed and ready for locker installation. Protect from damage during delivery, handling, storage and installation

PART 2 - PRODUCTS

2.01 GENERAL

A. Lockers shall be as manufactured by Republic Steel Corporation or approved equal. Sizes shall be as shown on the Drawings. Colors shall be selected by the Engineer from manufacturer's standard colors. Shop Drawings and color selections shall be submitted for each product.

B. All major steel parts shall be made of mild cold rolled steel, free from imperfections and capable of taking a high-grade enamel finish.

C. Construction: Lockers shall be pre-assembled of welded construction in multiple groups conforming to job requirements. All welds shall be smooth and without burrs. No nuts, bolts or rivets shall be allowed in assembly of main locker groups.

D. Door Frames: Door frames shall be 16 gauge formed into 1 inches wide face channel shapes with a continuous vertical door strike, integral with the frame on both sides of the door opening.

Cross frame members of 16 gauge channel shapes, including intermediate cross frame on double, triple or four tier lockers shall be securely welded to vertical framing members to ensure a square and rigid assembly. Intermediate cross frame members are not required on box lockers.

E. Reinforced Door: Doors shall be reinforced with a 16 gauge channel welded to the inside side of the door. Channel shall be 7/8 inches wide and shall be placed vertically in the center of the door to provide maximum stiffness. The diamond pattern shall be shifted to be a vertical band on the hinge side of the door.

F. Latching: Latching shall be a one-piece, pre-lubricated spring steel latch, completely contained within the lock bar under tension to provide rattle-free operation. The lock bar shall be of pre-coated, double-channel steel construction. The lock bar shall be securely contained in the door channel by self-lubricating polyethylene guides that isolate the lock bar from metal-to-metal contact with the door. There shall be three latching points. The lock bar travel is limited by contacting resilient high-quality elastomeric cushioning devices concealed inside the lock bar. Frame hooks to accept latching shall be of heavy gauge steel, set close in and welded to the door frame. Continuous vertical door strike shall protect frame hooks from door slam damage. A soft rubber silencer shall be securely installed on each frame hook to absorb the impact caused by closing of the door. A Latch Guard steel plate shall be welded on each frame hook on tiered lockers.

G. Hinges: Hinges to be 2 inches high, 5-knuckle, full loop, tight pin style, securely welded to frame and double riveted to the inside of the door flange. Hinges are attached with two rivets. Locker doors shall have four hinges.

H. Body: Locker body components shall be made of cold rolled steel specially formed for added strength and rigidity and to ensure tight joints at fastening points. 16 gauge side uprights are perforated with diamond-shaped openings 3/4 inches wide by 1½ inches high for maximum ventilation. Locker back shall be fabricated from 16 gauge cold rolled sheet steel and formed in combination with the 16 gauge upright to provide a one-piece uniform structure. Tops, bottoms, shelves and compartment dividers shall be 16 gauge steel, fully flanged on all sides for added stiffness. Shelves shall have an additional return flange on the front edge creating a channel shape to rigidize the impact surface. All body parts are finished in the same color selected for doors and frames.

I. Interior Equipment: Lockers shall have one hat/bookshelf. All hooks shall be made of steel, formed with ball points, zinc-plated and attached with two bolts or rivets.

J. Number Plates: Each locker shall have a polished aluminum number plate with black numerals not less than 1/2 inches high. Plates shall be attached with rivets to the lower surface within the recessed handle pocket.

K. Color: Doors, frames and all body parts shall be finished in color selected from Republic's collection of twenty-five colors.

L. Assembly: Assembly of all locker components shall be accomplished by the use of zinc plated, low round head, slotless, fin neck machine screws with hex nuts, producing a strong mechanical connection.

PART 3 - EXECUTION

3.01 INSTALLATION:

Lockers must be installed in accordance with manufacturer's approved drawings and assembly instructions. Installation shall be level and plumb with flush surfaces and rigid attachment to anchoring surfaces. Space fasteners at 36 inches O.C. or less as recommended by manufacturer. Use fasteners appropriate to load and anchoring substratum. Use reinforcing plates wherever fasteners could distort metal. Various trim accessories where shown, such as fillers, bases, recess trim, etc., shall be installed using concealed fasteners. Flush, hairline joints shall be provided at all abutting trim parts and at adjoining surfaces.

3.02 ADJUSTMENT, CLEANING, FINISHING, AND PROTECTION

A. Repair damaged and defective work wherever possible to eliminate defects functionally and visually; where not possible to repair properly, replace. Adjust joinery for uniform appearance.

A. Clean hardware, lubricate and make final adjustments.

B. Clean exposed and semi-exposed surfaces. Touch-up shop-applied finishes to restore damaged or soiled areas.

C. Complete the finishing work specified as work of this Section, to whatever extent not completed at the shop or prior to installation of lockers.

3.03 PROTECTION

The Installer of lockers shall advise Contractor of final protection and maintained conditions necessary to ensure that the work will be without damage or deterioration at the time of acceptance.

END OF SECTION 10500

SECTION 10520
PORTABLE FIRE EXTINGUISHERS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

The work of this section shall include all labor, materials, equipment, and appliances required to complete the portable fire extinguishers work as indicated on the Drawings and as specified herein.

1.02 QUALITY ASSURANCE

A. Unless otherwise acceptable to the Engineer, furnish fire extinguishers and accessories by only one manufacturer.

B. Provide portable fire extinguishers as specified below or as manufactured by one of the following: *W.D. Allen Mfg. Co.*, *Elkhart Brass Mfg. Co., Inc., General Fire Extinguisher Corp., Norris Industries*, or approved equal.

1.03 SUBMITTALS

For information only, submit 3 copies of manufacturer's technical data and installation instructions for all portable fire extinguishers and signs required.

PART 2 - PRODUCTS

2.01 MATERIALS

Provide 1 extinguisher for each location shown on Drawings of the following types:

A. Dry Chemical Type: *UL*-rating 2-A; 10-B:C, enamel steel, *KIDDE*, or approved equal (3 required).

B. Fire Extinguisher Wall Mounting Bracket shall be B-2 fire extinguishing bracket as manufactured by *Larsen's Manufacturing Co*. or approved equal (3 bracket assemblies required).

PART 3 - EXECUTION

3.01 GENERAL

A. Installation: Install in locations shown on the Drawings at mounting height to comply with governing authorities. Securely fasten to structure, square and plumb, in accordance with manufacturer's instructions. Wherever exact location of surface-mounted units is not shown, locate as directed by the Engineer.

B. Identification: After installation and finishing (if any) is completed, apply red sign indicating "FIRE EXTINGUISHER."

END OF SECTION 10520

SECTION 12000
FURNISHINGS – GENERAL PROVISIONS

PART 1 - GENERAL

1.01 SUMMARY

A. Provisions of the *GENERAL CONDITIONS, SUPPLEMENTAL CONDITIONS,* and *DIVISION 1* of these Specifications are by this reference a part of this division and shall govern work under this division where applicable.

B. The Contractor shall furnish all labor, materials, product services, equipment, tools, and other items necessary and incidental for the complete installation of all interior furnishings indicated on the Drawings and specified herein.

1.02 RELATED SECTIONS

See *SECTION 12300 – MANUFACTURED CABINETS.*

1.03 SUBMITTALS

A. Shop Drawings: Complete shop drawings shall be submitted for approval in accordance with *DIVISION 0 - GENERAL CONDITIONS*. Shop drawings shall show layouts, dimensions, construction details, and connection diagrams.

B. Catalog Cut Sheets: Provide complete catalog cut sheets for each item specified.

C. Failure to obtain submittal approval may result in rejection of the items supplied.

1.04 DELIVERY, STORAGE, AND HANDLING

All materials shall be handled and stored in a manner that will ensure that the material is undamaged. Any damaged materials shall be repaired or replaced as directed by the Engineer at the Contractor's expense.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION 12000

SECTION 12300
MANUFACTURED CABINETS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

This section describes cabinets, cabinet doors, drawers, shelves, and associated hardware.

1.02 RELATED SECTIONS

Not Used.

1.03 SUBMITTALS

A. Shop Drawings: Submit 5 copies of shop drawings for all manufactured cabinets. The manufacturer is responsible for details and dimensions not controlled by job conditions and shall show on the shop drawings all required field measurements beyond the manufacturer's control. The Contractor and the manufacturer shall cooperate to establish and maintain these field dimensions.

B. Colors and Finishes: Submit 3 samples of plastic laminate colors and finishes for selection by the Engineer.

1.04 QUALITY ASSURANCE

Except as otherwise shown or specified, comply with specified provisions of the following:

A. *Architectural Woodwork Institute (AWI)*

B. *"Quality Standards*"

C. *Architectural Woodwork*

PART 2 - PRODUCTS

2.01 CABINETS

A. Cabinets shall be "*Quest" Cabinets, Q-70* laminate style with metal C-channel pulls, by *Crystal Cabinets, Inc.*, (612) 389-4187, or approved equal.

B. Sides:

1. Unfinished cabinet sides shall be 3/4 inch thick particleboard substrate, with white vinyl laminate on the interior and a white seal coating on the exterior.

2. Finished cabinet sides shall be 3/4 inch thick particleboard substrate with white melamine laminate on the interior, and another layer of laminate on the exterior.

C. Top and Bottom shall be 3/4 inch thick particleboard substrate with white vinyl laminate on the interior and exterior. Exposed front edges of cabinet tops and bottoms shall be edge banded in white polyvinyl chloride (PVC) to match the cabinet interior, as well as to ensure moisture resistance. The top and bottom shall be doweled to the sides, dadoed to receive the back and attached to both with adhesive.

D. Doors shall be 5/8 inch thick melamine-impregnated panels, 11/16 inch thick high-pressure laminate, or 3/4 inch thick solid wood raised panel construction all with full overlay styling.

E. Backs shall be 1/2 inch thick particleboard substrate, with a white vinyl laminated interior and an unfinished exterior. The back shall be rabbeted on all edges to fit in the dadoed sides, bottom and top or stretcher. All joints shall be attached with an adhesive.

F. Hinges shall be mounted to a winged base plate attached to the cabinet side and be fully concealed, spring loaded, and self-closing with a maximum opening of 110 degrees. Depth and horizontal adjustment shall be built into hinge arm. Height adjustment shall be built into a winged mounting plate.

G. Adjustable Shelf Standards and Supports shall be flush mounted in *Knape & Vogt, No. 255ZC* with *No. 256ZC* support or approved equal.

H. Cabinet Pulls shall be *Stanley Hardware No. 4484 (ANSI B12012)*, 4 inch, *US28,* or approved equal.

I. Drawer Slides shall be full extension 100-pound capacity type, with ball bearing nylon rollers. Acceptable models are *Grant Hardware Co. No. 529*, *Knape & Vogt No. 1429, Accuride No. 4017,* or approved equal.

J. Plastic Laminate Countertops:

1. Provide maximum sizes available and locate butt joints at least 2 feet from cutouts where more than one-piece countertops are required.

2. Make corners and joints hairline, with slightly bevel rises.

3. Provide cutouts for inserts, fixtures, and fittings. Verify locations from onsite dimensions.

4. Seal cut edges of countertop at openings for sinks and other "wet" equipment using waterproofing compound recommended by the plastic manufacturer that is compatible with laminating adhesive.

5. Backsplash and endsplash shall be top-mounted square butt joint, fully covered with matching plastic laminate with eased edges.

2.02 MISCELLANEOUS

A. Use exposed fastening devices or nails only when approved and unavoidable, arranged neatly.

B. Shop assemble woodwork in sizes easily to handle and to ensure passage through building openings.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Verify existing cabinets to ensure fit and compatibility with new work. Scribe and match new work to fit existing work where required. Install the work plumb, level, true, and straight. Install without distortion so that doors and drawers will fit openings properly and be accurately aligned. Shim as required using concealed shims.

B. Install to a tolerance of 1/8 inch in 8 feet for plumb and level, and with 1/16 inch maximum offset in flush adjoining surfaces, and 1/8 inch maximum offsets in revealed adjoining surfaces.

C. Complete the finishing work specified as work of this section, to whatever extent not completed at the shop or prior to installation of cabinets.

3.02 REPAIR/RESTORATION

Repair damaged and defective wood, and laminate work wherever possible to eliminate defects functionally and visually. Where it is not possible to repair properly to the satisfaction of the Engineer, damaged items shall be replaced at no cost to the State.

3.03 ADJUSTING/CLEANING

A. Adjust joinery for uniform appearance. Adjust hardware to center doors and drawers in openings to provide unencumbered operation.

B. Clean hardware, lubricate, and make final adjustments.

C. Clean woodwork on exposed and semi-exposed surfaces. Touch up shop applied finishes to restore damaged or soiled areas.

3.04 PROTECTION

The installer of the cabinets shall advise the Contractor of final protection and maintain conditions necessary to ensure that the work will be without damage or deterioration at the time of acceptance.

END OF SECTION 12300

SECTION 13121
PRE-ENGINEERED METAL BUILDING

PART 1 - GENERAL

1.01 SUMMARY

A. The work of this section shall include all labor, materials, equipment, and appliances required to provide a complete pre-engineered metal building and foundation as indicated on the Drawings and as specified herein.

B. The following is a partial list of work included in this section, but shall not be limited to the following:

1. Foundation and anchor bolt design.

2. Pre-engineered metal building and components including two cantilevered canopies (length of 3-feet 10-inches), all as shown on the Drawings.

1.02 RELATED WORK:

A. *SECTION 03300 – CAST-IN-PLACE CONCRETE*

B. *SECTION 05100 – STRUCTURAL METAL FRAMING*

C. *SECTION 05400 – COLD-FORMED METAL FRAMING*

D. *SECTION 07200 – THERMAL PROTECTION*

E. *SECTION 08100 – HOLLOW METAL DOORS AND FRAMES*

F. *SECTION 08360 – OVERHEAD DOORS*

G. SECTION 08520 – *VINYL WINDOWS*

H. *SECTION 10200 – LOUVERS*

I. *DIVISION 15 – MECHANICAL*

J. *DIVISION 16 – ELECTRICAL*

1.03 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

A. American Institute of Steel Construction (AISC) Publication: *Steel Construction Manual, Current Edition.*

B. American Iron and Steel Institute (AISI) Publication: *Cold-Formed Steel Design Manual, 1986 Edition, Including Addendum No. 1*.

C. Metal Building Manufacturers Association (MBMA) Publication: *Recommended Design Practices Manual, 1974 Edition.*

D. International Conference of Building Officials: *International Building Code, 2012 Edition.*

E. *ASCE* 7-10 Minimum Design Loads for Buildings and Other Structures.

1.04 SUBMITTALS

A. Descriptive Data: Submit 4 copies of all requested information for approval on all materials to be provided under this section. Provide sufficient data to indicate conformance to all specified requirements.

B. Geotechnical Design: Contractor may use the attached geotechnical report (*ATTACHMENT 2*) for their design and may contact the report's author to gain specific design criteria for design. The Contractor shall pay for such consultancy at no cost to the State.

C. Foundation Design: Submit for approval 4 copies of the stamped engineering design calculations and detailed plans for the footing design of the pre-engineered metal building. Footing design shall be preformed by a structural engineer licensed in the State of Washington. The foundation design may include spread footing design and concrete columns. Footing design shall be based on *ACI 318-89*, *Ultimate Strength*. The structural engineer shall contact the local building officials for appropriate loading requirements. Design foundation design can be submitted in conjunction with the metal building design calculations.

D. Erection Instructions and Diagrams: Submit instructions and diagrams as necessary to erect the building and install all components for approval containing, but not limited to the following:

1. Anchor bolt layouts and sizes;

2. Structural connections;

3. Roofing and siding connections;

4. Joint sealing and caulking;

5. Flashing;

6. Accessory installation details;

7. All details and instructions necessary for complete assembly; and

8. Shop drawings necessary to supplement the instructions, and drawings as required for the proper erection and installation of the building and components.

E. Certificates of Conformance or Compliance: Submit certificates from the manufacturer attesting that materials conform to the requirements of these specifications and reference documents.

F. Colors: Color of the office/storage building shall match the existing feed storage building located on the hatchery property. Submit not less than 8 different samples of manufacturer's standard colors for selection by the Engineer.

G. Metal Building Design Calculations: Submit 4 copies for approval of the engineering design calculations and stress diagrams of the following components: rigid frames, purlins, girts, end frame, columns, bracing, eave brackets, end wall brackets, and footing reactions. Verify the loads and reactions are suitable for the foundation.

PART 2 - PRODUCTS

2.01 METAL BUILDING

A. Description of Office/Storage Building:

1. Clear span, gabled, rigid-frame framing system, utilizing by-inset girts on sidewalls and inset girts on end walls, with a reference plate height of approximately 11 feet. Roof purlins shall be designed to a minimum depth of 9½ inches. Monitor style roof shall include clerestory windows and cupolas to match the style of the existing feed storage building on the property. Roof slope shall be 3 inches per foot. All exterior building walls (those covered with wall panels) have been assumed to have braced-bay or rigid frames (in wall plane) for lateral loads. Roof and wall coverings, accessories, and flashing shall be of such design and installed so that they will be completely weather tight, and free of abrasions, loose fasteners, and deformations. Storage bay interior walls shall be sheathed with ½ inch plywood to 8 feet above finish floor as specified in Finish Schedule shown on the Drawings.

2. Building Manufacturer: The Contractor shall propose a building manufacturer to meet the building details as shown on the Drawings and described herein the Specifications and shall be approved by the Engineer.

B. Design Requirements: *MBMA Recommended Design Practices Manual*, except as specified otherwise herein.

1. Normal Design Loads: As indicated. Apply the vertical live loads, in addition to the applicable dead loads on the horizontal projection of the roof structure. Proportion the wind load on the building and apply as horizontal and uplift velocity pressures. Do not exceed the maximum deflection in roofing or roof panels 1/180 of their spans, and in siding or wall panels, 1/90 of their spans.

a. Snow Load: 25 PSF

b. Wind Load: Basic Wind Speed = 85 MPH
Ultimate Wind Speed = 110 MPH with 3 second gust
Exposure site specific (by location and topography)

c. Seismic Zone: D-2

d. Dead Load: Determined by building manufacturer

2. Auxiliary Loads: Piping, ducts, and mechanical equipment hangers constitute the auxiliary loads for this structure. All members and systems shall be designed to accommodate these loads in addition to the standard (distributed) loads. In addition to the loads shown, all purlins shall be designed for a single concentrated load of 200 pounds located anywhere along the span.

C. Roof and wall coverings, accessories, and flashing shall be of such design and installed so that they will be completely weather tight, and free of abrasions, loose fasteners, and deformations.

D. Minimum Thicknesses: Materials shall be of the necessary thickness to conform to design requirements, but in addition shall conform to the following:

TABLE 13121 - 2.01D

Items	Minimum Thickness - Uncoated
Steel Structural Members (other than wall and roof covering)	14 MFG STD (Mfg. Standard) Gauge
Wall Covering	24 MFG STD (Mfg. Standard) Gauge
Roof Covering	26 FG STD (Mfg. Standard) Gauge

E. Steel Framework: In accordance with *AISC Steel Construction Manual*, except in accordance with *AISI Cold Formed Steel Design Manual* for members less than 3/16 inch thick. Structural members having cross-sectional areas other than that indicated, and connections that differ from the connections indicated may be used, provided they conform to all design requirements and shop drawings indicating all such changes are submitted and approved.

F. Roof panels shall be manufactured to provide 40 inch wide net coverage and insulated with a minimum R-Value of 38. The Contractor may propose alternative roof panels to be approved by the Engineer. The panels shall be 26 gauge metal skins bonded or securely fastened to a polyurethane foam insulation core. Rolled insulation or vinyl faced batt insulation may be allowed in the roof. Blown insulation may be allowed in the space above the office if approved by the building manufacturer. Panels shall be of maximum length to minimize end laps. The panel sheets shall be connected to the purlins by means of a concealed galvanized steel clip that shall be bolted to the purlin and crimped firmly to the panel sheet during installation.

G. Exterior wall panels shall be manufactured to provide 42 inch wide net coverage and insulated with a minimum R-Value of 21. The Contractor may propose alternative exterior wall panels to be approved by the Engineer. The panels shall be 24 gauge metal exterior skins and 26 gauge metal interior skins, bonded or securely fastened to a polyurethane foam insulation core. Vinyl faced batt insulation may be allowed in the wall. Panels shall be of maximum length to minimize end laps. The panel sheets shall be connected to the supporting structure at each panel joint with concealed galvanized steel clips. Include all sealants as required by the panel manufacturer for a complete watertight joint.

H. Hollow Metal Doors and Frames: See *SECTION 08100*. Coordinated keying with *SECTION 08710*. All exterior hollow metal doors and frames shall be flashed at the head with drip flashing as required. Return sidewall panels at door openings and trim out at wall penetrations.

I. Closure Strips: Formed and approved compressed rubber, synthetic rubber, bituminous impregnated materials, or metal of the same respective type as the roof and wall panels, and as standard with the manufacturer. Molded closure strips shall be free of open voids and shall not absorb or retain water. Closure strips shall be formed to match the corrugations or configurations of the roofing or siding being used and shall be provided where necessary to provide weather tight construction.

J. Joint Sealing: Seal all side and end laps with *Type II*, *Class B*, ribbon-form sealant conforming to *Federal Spec. TT-C-1796*. Do not use bituminous-type materials. Minimum size of ribbons shall be 3/32 by 1/2 inch for rectangular areas and 1/4 inch diameter for circular areas. Seal all joints at accessories and flashing in a manner similar to the sealing of sheets and panels.

K. Fasteners: Fasteners for attachment to structural supports and fasteners for attachment to adjoining sheets or panels shall be as approved and in accordance with the manufacturer's recommendations. Unless specified otherwise herein, the fasteners shall be either self-tapping screws, bolts and nuts, self-locking rivets, self-locking bolts, end-welded studs, bolted or riveted studs, or step rivets held by aluminum straps. Other types of fasteners of the building manufacturer's standard type may be used if prior approval of the Engineer is obtained. Design the fastening system to withstand the design loads according to the *UBC*, *1991 edition*, for cladding systems as indicated prior herein. Fasteners shall be stainless steel, cadmium plated steel, or aluminum. All fasteners, with the exception of those having integral hex washer heads and those having aluminum drive caps, shall have composite-metal and neoprene washers. Heads of screws or bolts exposed on exterior face of factory-finished wall coverings shall be nylon headed to match color of coverings.

2.02 FINISH

A. Shop Painting: Clean of all dirt, rust, scale, loose particles, grease, oil, and other deleterious substances, all ferrous metalwork (except factory-finished work), zinc-coated work, aluminum-coated work, and work specified prior herein to be painted, then give a coat of pretreatment primer conforming to *Mil. Spec. DOD-P-15328* applied to a dry-film thickness of 0.3 to 0.5 mil or chemically treated with a phosphoric-type cleaner, and then give one coat of an approved rust-inhibiting primer paint of the type standard with the metal building manufacturer.

B. Panel Finish for roof panels and wall panels shall be a multi-layer coating system approved by the building manufacturer. Panel finish shall be warranted by the manufacturer not to peel, chip, crack, blister, or rust through, nor shall chalking exceed *ASTM 8*, all for a period of 20 years or approved equal. Color shall be as selected by the Engineer from manufacturer's standard color selection.

PART 3 - EXECUTION

3.01 Delivery and Storage: Deliver, store, and handle prefabricated components, panels, and other manufactured items in such a manner that they will not be damaged or deformed. Stack materials stored onsite before erection on platforms or pallets and cover with tarpaulins or other suitable weather-tight covering. Store all metal sheets or panels so that water that might have accumulated during transit or storage will drain off. Do not store the sheets or panels in contact with materials that might cause staining. Upon arrival on the jobsite, inspect the sheets or panels. If found wet, remove the moisture, restack the sheets or panels, and protect them until used.

3.02 ERECTION

A. General: Erect building in accordance with the manufacturer's approved erection instructions and diagrams, except as specified otherwise. Correct defects or errors in the fabrication of building components in an approved manner. Replace defects or errors in fabrication of components that cannot be corrected in an approved manner. Plumb columns in both directions, guyed and stayed, and space all framing elements accurately to ensure the proper fitting of prefabricated wall and roof panels.

B. Dissimilar Materials: Where aluminum surfaces come in contact with ferrous metal or other incompatible metals, keep the aluminum surfaces from direct contact by one of the following methods:

1. Method (a): Painting the incompatible metal with a coating of heavy-bodied bituminous paint conforming to *Fed. Spec. TT-C-520*.

2. Method (b): Painting the incompatible metal with a prime coat of zinc-chromate primer conforming to *Fed. Spec. TT-P-645*, followed by 1 or 2 coats of aluminum metal and masonry paint, or other suitable protective coating, excluding those containing lead pigmentation.

3. Method (c): An approved nonabsorptive gasket.

4. Method (d): An approved caulking placed between the aluminum and the incompatible metal.

5. If drainage from incompatible metal passes over aluminum, paint the incompatible metal by Method (a) or Method (b). Paint aluminum surfaces in contact with concrete materials by Method (a). Paint green or wet wood or wood treated with incompatible wood preservatives by Method (a) or give 2 coats of aluminum paint.

C. Column Bases and Sill Members: Set accurately, using a nonshrinking grouting mortar to obtain uniform bearing on the concrete and maintain a level baseline elevation. Anchors and anchor bolts for securing columns or sill members to foundations shall be steel, unpainted, set accurately to template, and of proper size to adequately resist all applicable design loads at the base. Grouting mortar shall be an approved nonshrink grouting product (see *SECTION 03300*). Clean surfaces to receive the mortar and moisten thoroughly immediately before placement of mortar. Water-cure exposed surfaces of mortar with wet burlap for 7 days.

D. Wall Construction: Apply all panels with the configurations in a vertical position. Supply panels in full-wall heights, from base to eave, with no horizontal joints. Seal all side and end laps with the joint-sealing material specified herein before. Flash or seal all walls at the base and at the top. Accomplish the placement of closure strips, flashing and sealing material in an approved manner that will assure complete weather tightness. Flashing will not be required where approved self-flashing sheets or panels are used. Minimum end laps for all types of panels shall be 2½ inches. Minimum side laps for all types of panels shall be one corrugation or one configuration. Wall girt shall be positioned as shown on the Drawings.

E. Roof Construction: Apply all roofing panels with the configurations parallel to the slope of the roof. Supply the roofing panels in full lengths from ridge or ridge panel to eaves with no transverse joints. Lay all side laps away from the prevailing wind and seal all side and end laps with the joint-sealing material specified in *Paragraph 2.01 H*. Flash the roof and seal at the ridge, at eaves and rakes, the placement of closure strips, flashing, and sealing material in an approved manner that will assure complete weather tightness. Minimum side lap shall be 1.0 corrugation or interlocking rib. Provide continuous ridge venting.

3.03 WARRANTY

Furnish in writing 1 year warranties providing for repairs to roof and wall coverings, accessories, and flashing. Correct all leaks occurring within 1 year from the date of acceptance by the Owner.

END OF SECTION 13121

SECTION 15000
GENERAL MECHANICAL REQUIREMENTS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

This Section describes the various mechanical systems such as piping, valves, pumps, and miscellaneous appurtenances described in *DIVISION 15*. The Contractor shall furnish all labor, materials, services, product accessories, equipment, tools, and other incidentals necessary, whether specifically shown and/or mentioned, for the completed and fully-operational mechanical system(s) shown on the Drawings.

1.02 RELATED WORK

A. Provisions of the *GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS AND DIVISION 1* of the contract are by this reference a part of this Division and shall govern work under this Division where applicable.

B. Additional requirements specific to the Building HVAC and Plumbing designed by the Contractor are described in other sections in *DIVISION 15*.

1.03 CODES AND PERMITS

The Contractor shall comply with applicable local, state, and national codes, ordinances, and regulations affecting materials and methods of installation of mechanical systems. Recommended practices as set down by *ASME, ASTM, NFPA, UBC, UMC, UPC,* and *NEC* shall be followed. The Contractor shall be responsible to obtain any permits (Federal, State and Local) to complete the project.

1.04 SUBMITTALS

A. As-Built Drawings: In addition to the as-built drawing requirements of *DIVISION 0 - GENERAL CONDITIONS*, the Contractor shall maintain one (1) set of blue-line drawings on the job site. This set shall be marked to indicate current job progress and show deviations from the construction drawings. In addition, these drawings shall show depths and routing of all concealed, below-grade installations. This set of drawings shall be available to the Engineer during construction. After final inspection, but before acceptance of the work, the Contractor shall deliver to the Engineer a set of neatly marked plans showing these as-built changes and conditions. Refer to SECTION 00704.02 Project Records.

B. Shop Drawings and Submittals: All submittals required by this Division shall be made complete and receive favorable review from the Engineer before manufacture of equipment. These drawings shall show layouts, dimensions, construction details, and connection diagrams and include catalog cuts, bulletins, brochures, or copies thereof as supplements to the shop drawings. Failure to obtain prior approval of the drawings may result in rejection of equipment supplied. Refer to SECTION 00704.03 Shop Drawings.

C. Operation and Maintenance:

1. Manuals: The Contractor shall submit bound sets of equipment manuals and operating instructions to the Engineer. The manuals will consist of complete descriptive data pertinent to all fixtures, equipment, valves, and automatic controls as well as diagrams, including a complete list of repair and replacement parts essential to maintenance and general servicing of all equipment. A pump-performance curve showing head, quantity, NPSHR, BPH and efficiency shall be included in equipment manuals. The operating instructions, in conjunction with the maintenance manuals, shall include written step-by-step detail of start-up and shut-down procedures.

2. Operation Instructions: Before final acceptance, the Contractor shall instruct the Engineer on the proper operation and maintenance of all mechanical systems, equipment, and controls under this Contract. A qualified technician for each component of this installation shall be made available by the Contractor for this instruction.

D. Delegated-Design Submittal: For Office Building HVAC and plumbing systems.

1. Include analysis data indicating compliance with performance requirements, design data, design drawings and other required documentation signed and sealed by the qualified professional engineer, registered in Washington State, responsible for their preparation.

1.05 QUALITY ASSURANCE

A. Materials: All materials shall be new, full weight, standard materials of specified or approved quality in first-class condition. Materials of similar type shall be of the same manufacturer. Promptly after award of contract, the Contractor must submit full information on all materials proposed for use on the project. No materials shall be installed or purchased until approved for use by the Engineer.

B. Handling: Pipe, fittings, and other equipment shall be handled and stored in a manner that will ensure that the material is undamaged. Any unit of equipment damaged beyond repair shall be replaced at the Contractor's expense. Damage to pipe coating or dropping of fittings may be cause for rejection. Any materials damaged but repairable may be repaired in the field or, at the direction of the Engineer, returned to the manufacturer for repair, all at the Contractor's expense.

1.06 IDENTIFICATION

Each valve, actuator, motor, or mechanical equipment shall have a nameplate designating the function of the unit. Nameplates shall be of 1/16 inch thick, machine-engraved, laminated phenolic plastic with white letters not less than 3/16 inch high on black or red background. Nameplates shall be secured to the equipment with stainless steel screws and to valves with stainless steel wire.

1.07 TESTING

A. Inspection and Testing:

1. The project will be subject to continual inspection by the Engineer during construction. In addition, inspection by jurisdictions or special inspections will be performed as required. The Contractor shall schedule, obtain, and pay for all fees and/or services required to test the mechanical systems. All equipment and installation shall have an operational performance test receiving the approval of the Engineer before acceptance. The Contractor shall be responsible for final adjustment of all equipment under actual loaded conditions and shall guarantee all equipment and work for a period of 1 year after acceptance.

2. The Contractor shall furnish all labor, tools, and equipment for testing, including pressure pumps, piping, gates, temporary caps, and supports. Contractor shall make all arrangements and pay all costs incidental to furnishing and conveying water for testing purposes. Any damage resulting from or caused by these tests shall be repaired at the Contractor's expense.

B. Request for Tests: The Contractor shall notify the Engineer a minimum of 48 hours in advance of when planning to test. In the event the Engineer chooses not to witness the test, the Contractor shall certify in writing that all tests have been made as required by these Specifications.

C. Deficiencies: All deficiencies evidenced during the tests shall immediately be corrected and tests repeated until the system is approved. No piping, equipment, or other portions of the mechanical installations shall be covered or concealed until satisfactory tests are made and approved.

D. Operating Tests: The Contractor shall, upon request from the Engineer, place the entire mechanical installation, and/or any portion thereof, in operation for such a period of time as is necessary to demonstrate satisfactory operations.

E. Completion: Upon completion of the mechanical installation, the Contractor shall demonstrate that the systems have been installed in a satisfactory manner in accordance with the Drawings, Specifications, and applicable codes. The final testing will be conducted in the presence of the Engineer.

F. Pipe Tests:

1. See *SECTION 15430 PLUMBING, PIPING, AND SPECIALTIES* for building plumbing pipe testing requirements.

2. Upon completion of the piping installation, fittings, valves, and gates, the Contractor shall test each system as specified later herein. All thrust blocks shall be in place with at least 7 days allowed for the concrete to cure before testing. The Contractor shall install adequate blocking or other means of resisting test pressure. It shall be the Contractor's responsibility to adequately block or otherwise support all caps whether temporary or permanent and whether attached in the field or by the fabricator.

3. Supply pipes and fittings shall be tested to 20 psig. The test pressure shall be maintained for a period of 4 hours, and the amount of makeup water required to maintain this pressure shall be carefully measured. The allowable leakage rate shall not exceed 5 gallons of water per inch of inside diameter of pipe per 1,000 feet in 24 hours. All tests shall be witnessed by the Engineer. Where the leakage exceeds the allowable, the Contractor shall locate and repair the defects and then retest the pipeline. Any individual defects shall be corrected to the satisfaction of the Engineer regardless of the allowable leakage.

3. Venturi water piping and sprinkler system piping shall be tested to 100 psig and remain leak tight for a period of 1 hour. Domestic water piping shall be tested to 100 psig and remain leak tight for a period of 2 hours. After final testing, the entire domestic water system, including all domestic lines and appurtenances, shall be completely disinfected as required by the Washington State Department of Health's regulations.

G. Valve Tests: Gates, valves, and operators shall be tested by operation through a complete cycle of opening, closing, and opening. Gates shall be adjusted so they operate freely with leakage around the perimeter held to a quantity which is satisfactory to the Engineer.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

Not Used.

END OF SECTION 15000

SECTION 15050
BASIC HVAC REQUIREMENTS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

This Section describes the various mechanical requirements for a complete workable HVAC System for only the office portion of the new pre-engineered metal building. The office space will be approximately 1,500 square feet. The Contractor shall design the system and furnish all labor, materials, services, product accessories, equipment, tools, and other incidentals necessary, whether specifically shown and/or mentioned, for the completed and fully operational mechanical system.

1.02 JOB SITE CONDITIONS

The Contractor shall inspect the job site before submitting a bid to become familiar with existing conditions affecting the work. The layouts indicated are generally diagrammatic. Locations of equipment and devices are approximate unless dimensioned. Actual location(s) of equipment and routing of connections may be governed by structural conditions, physical interferences, and location of interconnecting terminations on equipment. Minor relocations ordered by the Engineer or required for actual installation may be made without added costs to the State. All work required to obtain a safe, workable installation, shall be included without direct reference.

1.03 SUBMITTALS

General: Submittals in this section are in addition to the requirements in *SECTION 15000 GENERAL MECHANICAL REQUIREMENTS*.

A. Submittal Requirements:

1. Product Data: For each type of HVAC equipment provide cutsheets showing performance data for each piece of equipment. Cutsheets should at minimum include rated capacities, operating characteristics, any specialties and accessories that are specified to accompany the equipment. Provide fan and pump curves for all fans and pumps

2. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field duct or pipe connection. Include wiring diagrams for equipment requiring power.

3. Operation and Maintenance Data: Provide operations and maintenance manuals for all HVAC equipment

1.04 WARRANTIES

A. Labor: One-year warranty on all labor.

B. Electric Heaters: Electric heaters shall have a 5 year warranty on the heating elements and motor.

C. Fans: Fans shall have a warranty of at least 1 year.

D. Louvers: Louvers shall have a warranty of at least 1 year.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

3.01 TESTING ADJUSTING AND BALANCING

A. Quality Assurance/Control Submittals:

1. Qualifications - Within 30 days after contract award, submit the name(s) of the professional engineer and/or the NEBB or AABC certified supervisor who will be supervising this work. Submit the name(s) of the TAB technician(s) who will be performing the work.

B. Closeout Submittals:

1. TAB Report: After all balancing is complete, and all coordination with the Owner or his representative is complete, the balancing firm shall furnish four bound reports that shall contain the following information:

   a. Belt and drive sheave information (as installed and as changed), fan nameplate information, motor nameplate information, and amperage and voltage to all motors (in various operating modes where applicable). Also, maximum and minimum rpm settings on VFD units.

   b. Static pressure drops across all components of the air systems. Static pressure profile for each air handling unit system.

   c. Required and final balanced cfm at each system terminal unit. Include the terminal size, inlet size, inlet static pressure, temperature, and velocities read to attain the required cfm.

   d. Pump and motor nameplate information, amperage and voltage to all motors, flow and pressure drop across all system terminals, pressure rise across the pump in psi and feet of head, both operating and shut-off, and maximum operating gpm.

   e. Refrigerant system operating amperages, pressures, and temperatures.

   f. Overload protection data for all motors shall be recorded. Starter and/or VFD brand, model, enclosure type, installed overload devices, original ratings and set points (and revised device ratings and set points when applicable) shall be recorded. If the starters (and/or VFDs) were furnished by the Mechanical Contractor, the overloads shall be verified and changed to the correct size when necessary, and so noted in the report.

If the starters were furnished by the Electrical Contractor, the correct overload device sizes and settings shall be noted in the report and the Electrical Contractor shall be advised of all discrepancies.

g. The method of balance, the instruments used with calibration history, the project altitude, and any correction factors used in the calculations shall be reported.

h. A reduced-size set of Drawings (11 inches x 17 inches) shall be included in the report with all terminals (VAV boxes, air outlets, inlets, coils, unit heaters, etc.) clearly marked, all equipment designated, and all referenced to the device test reports. The contract Drawings may be reduced in size and used for this purpose, if they remain legible.

i. The TAB Contractor shall submit bound copies of the final testing and balancing report to the Owner or his representative at least 15 days prior to the Mechanical Contractor's request for final inspection. All data shall be recorded on applicable reporting forms. The report shall include all operating data as previously listed; a list of all equipment used in the testing and balancing work and shall be signed by the supervising registered engineer or certified TAB supervisor and certified TAB technician and affixed with his certification seal. Final acceptance of this project will not take place until a satisfactory report is received.

2. Balance report shall not be submitted until all improperly configured or installed systems are corrected and improperly installed or missing balance devices are corrected, and tested reports submitted with incomplete information will be returned unreviewed.

C. Quality Assurance:

1. Qualified firms desiring to furnish services for this project shall submit for written approval, during bid time, a brochure listing the qualifications of personnel in the organization, instruments available to be used, an outline of system balancing procedures that is intended to be followed, and a list of projects successfully balanced within the last two years. Information regarding additional qualifications listed below must be in the office of the Engineer at least 14 calendar days prior to the date set for receiving bids.

2. The balancing work shall be performed by the same firm having total professional responsibility for the final testing, adjusting, and balancing of the entire system.

3. TAB firm shall:

a. Have had previous experience with at least one project of similar type and size in the State of Washington. Provide the project(s) name, owner, general contractor, mechanical contractor, and references with phone numbers for each.

b. Have a permanent place of business and phone number within a 200-mile radius of the job site.

c. Have been actively engaged in balancing work within the State of Washington for at least 3 of the past 5 years. Provide at least 3 project references with phone numbers.

d. Have a minimum of two permanent employees who have been actively engaged in balancing work for a minimum of 3 years. Provide names, certifications, and experience resumes.

4. The TAB field work shall be performed under the direct supervision of a registered Professional Engineer who has had at least 5 years of balancing experience in the state in which the work is being done or a NEBB or AABC certified TAB supervisor. The PE or certified supervisor may:

   a. Perform the TAB work or be on-site at least 33% of the total time the TAB work is in progress, or

   b. Be on site a minimum of 10% of the total time the TAB work is in progress with the work performed by a full-time certified TAB Technician who has been certified by the Sheet Metal Industry National Certification Board.

D. Certifications:

1. Testing, adjusting, and balancing shall be done by a firm using NEBB or AABC certified supervisors, or by an independent firm specializing in this work. A definition of independent shall mean the firm is not associated with the Mechanical Contractor performing work under DIVISION 15; the firm derives its income solely from testing, adjusting, and balancing and/or commissioning mechanical systems, and the work is performed in a professional manner.

2. TAB firm shall own or rent and have available for this project all necessary balancing instruments as required to maintain NEBB or AABC certification. Instrument calibration shall have been checked and verified as per NEBB requirements. Provide instrument list with calibration date for each instrument listed.

E. Regulatory Requirements:

1. Comply with procedural standards for testing, adjusting, and balancing of environmental systems as outlined in the latest edition of SMACNA, NEBB, and/or AABC procedural manuals.

2. Applicable sections and paragraphs as published in ASHRAE 1995 Applications Handbook, Chapter 34, Testing, Adjusting, and Balancing, and Standard 111-1988.

F. Scheduling:

1. Coordinate scheduling of work with the General Contractor, the appropriate subcontractors.,

2. Schedule TAB work to coincide with testing and verification of control systems where practical.

3. Provide written notification (within 24 hours) to General Contractor, Engineer, and Owner or his representative of any component and/or system deficiencies.

G. Examination:

1. Air testing and balancing shall not begin until the system to be tested has been cleaned and flushed and is in full working order.

2. Preliminary TAB requirements shall be ascertained prior to the commencement of work through a review of available plans and specifications for the project. In addition, visual observations at the site during construction shall have been made to determine the location of required balancing devices that they are being installed properly, and that proper access is provided

3. Prior to and during testing and balancing, TAB subcontractor shall immediately notify the Sub Contractor of all balancing devices not yet installed and those portions of the system unable to be balanced. The Sub Contractor shall correct the deficiencies and shall notify the Engineer of situations requiring additional instruction.

4. Before any air balance work is done, the system shall be checked for:

   a. Excessive duct leakage.

   b. Dirt and debris in ducts.

   c. Filters are installed (and changed if they are dirty).

   d. Correct motor rotation.

   e. Excessive vibration.

   f. Equipment lubrication.

   g. Manual control dampers, and air outlet dampers are wide open.

   h. Duct end caps installed, and access doors closed.

   i. Grilles, registers, and diffusers are properly installed.

5. Put heating, ventilating, and air conditioning systems and equipment into full operation and continue operation of same during each working day of testing and balancing.

3.02 REQUIREMENTS OF WORK

A. Adjust air handling systems to the following tolerances:

1. Supply systems shall be balanced so that:

   a. The total quantity to each space is within -5% to +10% of design values.

   b. If 2 outlets in space, each outlet is within -10% to +10% of design value.

   c. If 3 or more outlets in space, each outlet is within -15% to +15% of design value.

2. Exhaust and return systems shall be balanced so the total quantity from each space is -10% to +10% of design values.

B. Air Balance:

1. Air supply, return, and exhaust systems with air quantities for each air device.

   a. Fan data including cfm, static pressure, fan rpm, motor running amperage; (and full load amperage) before and after final balance.

2. Air diffuser patterns shall be set to minimize objectionable drafts and noise.

3. The supply, return, and exhaust fan static pressures shall be set by the balancing firm (and the Controls subcontractor if the systems have fan volume control).

   a. The pitot tube traverse method for determining main duct cfm shall be used and recorded; flow hood measurements at registers and diffusers may be totalized for branch duct quantities.

   b. After balancing is completed, check fan motor amperage with the filters clean.

   c. System static pressure profiles and fan motor amperages shall be recorded in all modes.

   d. The lowest fan speed resulting in satisfactory system performance shall be determined at full design delivery. Any inlet or outlet fan volume (balancing) dampers shall be in the wide-open position and one path presenting the greatest resistance to flow shall be fully open and unobstructed.

   e. After balancing, all adjustable speed sheaves 7½ hp and larger shall be replaced with fixed-speed sheaves by the TAB subcontractor.

4. Building static pressure adjacent to entries shall be measured and recorded. Adjust systems to maintain a positive pressure of 0.05-inch w.c. when possible. Note any discrepancies.

5. Final adjustments shall include but not be limited to the following:

   a. Fans:

      1) Belt Drive: RPM - Include sheave and belt exchange as required to deliver airflow within limits of installed motor horsepower and mechanical stress limits of the fan. Determine the limiting fan tip speed before increasing rpm. Final fan speed setting shall allow for predicted filter loading and shall provide proper duct pressures for operation of zone cfm regulators where used.

         Note: Fan rpm shall not be increased more than 10% from the factory setting without prior authorization by the Engineer.

2) VFD Drive: Coordinate VFD startup with the applicable DIVISION 15 vendor. Adjust maximum and minimum rpm settings as necessary to obtain design cfm. Verify that ramp-up and down adjustments are made as necessary to prevent overshoot and "hunting."

3) Direct Drive:

a) RPM with Speed Taps: Set fan speed on tap that most closely approaches design cfm. Report tap setting on equipment data sheet.

b) RPM with Speed Control Rheostat: Set output of fan to design cfm by adjusting the SCR. After adjustment, check fan's ability to restart after powering down. Increase SCR setting if required for proper starting.

c) CFM with Variable Pitch Blades: Variable fixed pitch fan blades and variable in-motion pitch fan blades shall be adjusted initially by the manufacturer at pitch required to provide design output. Check and readjust if necessary to obtain design cfm. Pitch angle adjustment shall not exceed recommended maximum to prevent "stall."

b. Registers and Diffusers: Registers, diffusers, etc., are to be adjusted to deliver design air quantities per the “Requirements of Work” paragraph in this specification.

c. Motor Starter – Overload Trip Devices:

1) VFD, Magnetic, and Manual Starters furnished by the Sub Contractor: Exchange or reset overload devices as required for proper motor protection.

2) Motor Control Center (MCC) Magnetic Starters furnished by the Electrical subcontractor: Check overload devices for correct sizing and/or setting. Notify the Electrical subcontractor of any discrepancies.

6. When air balancing is done and manual dampers are set, all test holes shall be plugged, and all manual damper positions shall be marked. The following information shall be recorded in the final report: Design inlet or outlet size, actual inlet or outlet size, and design cfm (velocity) through the orifice for each terminal in the system.

C. Electric Heat:

1. Record full load and part load (when staged) amperage and voltage of all electric heating elements.

2. Verify that electric heat is locked out when flow rate drops below minimum requirements.

D. Smoke Systems:

1. If installed, test all smoke management systems per Chapter 4 of latest version of NFPA 92A.

2. Refer to the applicable section of DIVISION 15 for smoke management sequences.

E. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

FIELD QUALITY CONTROL

A. Upon request of the Engineer, a representative of the balancing firm performing the work shall demonstrate to him fluid flow quantities shown in the report by reading back outlets or terminals selected at random by the Engineer. It is understood that the operating mode of the system shall be the same for readback as it was during balancing, and the number of readings verified will not exceed 10% of the total in the report.

B. When deemed necessary by the Engineer or Contractor, the balancing firm shall run temperature, pressure, and/or humidity recordings, and shall be prepared to verify any of the report test results in the presence of the Contractor and/or Engineer when requested.

C. When deemed necessary by the Engineer and/or Contractor, a 24 hour space temperature recording shall be taken, and any required partial rebalance of the system shall be performed without any additional cost.

END OF SECTION 15050

SECTION 15060
PIPE, FITTINGS, AND ACCESSORIES

PART I - GENERAL

1.01 DESCRIPTION OF WORK

This Section describes the various piping systems including fittings, supports, and accessories as shown on the Drawings, described in the Specifications, and as required to completely interconnect all equipment with piping to provide a complete and operable system.

1.02 QUALITY ASSURANCE

All materials and equipment furnished under this Section shall:

A. Be of a manufacturer who has been regularly engaged in the design and manufacture of the materials and equipment; and

B. Be demonstrated to the satisfaction of the Owner that the quality is equal to the materials and equipment made by those manufacturers specifically named herein, if an alternate product manufacturer is proposed.

1.03 SUBMITTALS

Product Information Shop Drawings: In addition to the requirements of submittals in *SECTION 15000*, detailed installation drawings of all piping and connected equipment shall include all:

A. Pipes, fittings, supports, and accessories;

B. Flexible couplings and flanged adapters; and

C. Locations, types, and appurtenances.

PART 2 - PRODUCTS

2.01 GENERAL

A. Pipe sizes are nominal inside diameter unless otherwise noted.

B. All material delivered to the job site shall be new, free from defects, and marked to identify the material, class, and other appropriate data, such as thickness for piping.

2.02 WELDED STEEL PIPE AND FITTINGS

A. Welded steel pipe and fittings:

1. Welded steel pipes and fittings shall be fabricated of sheet steel of the gauge and diameter specified. Pipes shall be *AWWA C200* steel pipe and have slip-type rubber 0-ring seals unless otherwise indicated on the Drawings. Fittings shall be constructed per *AWWA C208,* latest revision. Flanges for pipes and fittings shall be *AWWA C207-94*, *Table 2, Class B* or *D* to match mating surfaces.

Flange gaskets shall be *AWWA C207-94, SBR* (red), *8-Duro*, and 1200 pounds-per-square-inch neoprene rubber. The pipe shall be furnished in lengths as determined by the Contractor. Welding shall be done by *AWS*-qualified welders and shall conform to *AWS* standards for the type of weld involved. The minimum pipe material grade shall be *ASTM A570, Grade 36*, with a minimum yield point of 36,000 pounds per square inch.

2. All welded steel pipe and fittings shall be finished according to usage as detailed in *DIVISION 9 - FINISHES*.

B. Large diameter steel pipe:

1. Large diameter steel pipe with slip-type rubber 0-ring seals shall have the joints, after assembly, strapped at 3 places around the pipe circumference. Steel pipe above grade shall be installed as shown on the Drawings or, where details are not shown, in accordance with the best trade practices.

2. Unless otherwise shown, minimum wall thickness shall be:

TABLE 15060 - 2.02-B2

Outside Pipe Diameter	Minimum Wall Thickness
8 to 10 inches	12 gauge
12 to 14 inches	10 gauge
18 inches	3/16 inch
24 to 30 inches	1/4 inch
36 inches	3/8 inch

3. Manufacturer: *Northwest Pipe Company* or Engineer-approved equal.

2.03 STAINLESS STEEL GROVET COMPRESSED AIR PIPING

A. Pipe (Above and Below Ground):

Schedule 40 316 L Stainless Steel conforming to *ASTM A312*.

B. Grooved Couplings:

1. Housing shall be Type 316 Stainless Steel conforming to *ASTM A351, ASTM A743, and ASTM A744*. Grade CG8M

2. Housing shall be Type 316

3. Gasket shall be Nitrile-rated for -20° F to +180°F

4. Provide with 316 stainless steel hardware in accordance with *ASTM F593* and *ASTM F594*

5. Approved Manufacturer: Victaulic Style 489, or prior approved equivalent

C. Grooved Fittings:

316L Stainless Steel press fittings conforming to *ASTM A312*.

D. Press Fittings:

1. 316L Stainless steel press fittings conforming to *ASTM A312*.

2. O-rings for stainless steel press fittings shall be Grade “H” HNBR or EPDM rated for compressed air with oil vapor.

3. Approved Manufacturers: Victaulic VicPress

2.04 STANDARD STEEL PIPE AND FITTINGS

A. Standard steel pipe shall be *Schedule 40 ASA B36.10* with threaded ends and flanges as required. Fittings shall be malleable iron, *Class 150,* conforming to *ASA B16.3*. Flanges, where shown, shall be steel, *Class 150*.

B. In general, standard steel pipe and fittings 4 inches and smaller in nominal diameter will be galvanized. Standard steel pipe and fittings larger than 4 inches nominal diameter will be black iron and will be finished according to usage as detailed in *DIVISION 9 - FINISHES*.

2.05 PVC PIPE AND FITTINGS

Unless indicated otherwise on the Drawings, all *PVC* pipe and fittings will be *ASTM D1785, Schedule 40* and *80* as shown on the Drawings, manufactured from *Type I, Grade I* material. Joints will be plain end, solvent-welded, flanged or threaded as shown on the Drawings.

2.06 POLYETHYLENE PIPE AND FITTINGS

A. High-density polyethylene pipe and fittings shall conform to *ASTM D3350, Cell Classification 34544C*. The outside diameter and wall thickness shall conform to the *SDR* number and nominal pipe size called for in the Drawings.

B. All polyethylene pipe shall be joined by the thermal-butt fusion method in accordance with *ASTM D2657* and be performed according to the pipe manufacturer's procedure. The polyethylene pipe shall be connected to other piping materials and metal fittings by pre-manufactured flange adapters butt-fused to the pipe, complete with slip-on metal flanges.

C. The entire length of all polyethylene pipe runs shall contain a 12 gauge, direct-bury, *UF*, single-conductor tracer wire, and a warning tape at 4 inches below the finished surface. The tracer wire shall be accessed by 1 inch *PVC* pipe stubbed out of the ground complete with cap and identifying label. The PVC stubs shall be located as shown on the Drawings.

2.07 CAST-IRON PIPE AND FITTINGS

Cast-iron pipe and fittings shall conform to *Federal Specification WW-P-401E* and *ASTM A74*. Gaskets shall be rubber conforming to *ASTM C564*.

2.08 COPPER TUBING AND FITTINGS

Use *Type L* copper pipe where exposed and *Type K* copper pipe below ground. Copper tubing shall conform to *ASTM B88*. Fittings shall be formed from corrosion-resistant wrought copper or cast bronze.

Refrigerant piping may be *ASTM B280*, Type ACR drawn tempered seamless copper tube or *ASTM B280* Type ACR annealed tempered. Seamless copper tubing shall be soft-annealed tempered where bending is required and hard-drawn tempered where no bending is required. Soft-annealed tempered copper tubing shall not be used in sizes larger than 5/8 inch.

1. Fittings: *ASTM B16.18* cast copper alloy, solder-joint pressure fittings, *ASTM B16.22*, wrought copper solder pressure joint fittings, or *ASTM B16.26* cast copper alloy flare fittings.

2. Joints: Brazed, except that joints on lines 5/8 inch and smaller may be flared.

    a. Brazing filler metal: *ANSI A5.8 BCuP*, copper phosphorus alloy or BAg, silver alloy classification.

2.09 CONCRETE CYLINDER PIPE

Concrete cylinder pipe shall be *Class 100* and conform to *AWWA Specification C303*.

2.10 CONCRETE CULVERT PIPE

A. Plain concrete culvert pipe shall be round and shall conform to the requirements of *ASTM C14*.

B. Reinforced concrete culvert pipe shall be round and conform to the requirements of *ASTM C76*.

2.11 CORRUGATED STEEL DRAINPIPE

Corrugated steel pipe shall be galvanized and of the gauge and diameter shown on the Drawings and meet requirements of *AASHTO M36*. In general, sheet thickness for 6 inch diameter pipe will be 0.052 inch and 0.064 inch for pipes 8 inches and larger in diameter. Coupling bands shall match the pipe and have gasket rings.

2.12 CORRUGATED ALUMINUM DRAINPIPE

Corrugated aluminum pipe shall be of the diameters and gauges shown on the Drawings and meet the requirements of *AASHTO M196*. In general, the sheet thickness for 6 inch diameter pipe will be 0.052 inch and 0.064 inch for pipes 8 inches and larger in diameter. Coupling bands shall match the pipe and have gasket rings.

2.13 CORRUGATED ALUMINIZED STEEL DRAINPIPE (CADP)

Corrugated aluminized pipe, *Type 2*, shall be of the diameters and gauges shown on the Drawings and meet the requirements of *AASHTO M274* and *AASHTO M36*. In general, the sheet thickness for 6 inch diameter pipe will be 0.052 inch and 0.079 inch for pipes 8 inches and larger in diameter. Coupling bands shall match the pipe and have gasket rings. Manufacturer: *Contech Construction Products, Inc*. or Engineer-approved equal.

2.14 UNDER-DRAINPIPE

Under-drainpipe shall be perforated concrete, plastic, or corrugated steel or aluminum as indicated on the Drawings.

2.15 DRAIN, WASTE, VENT PIPE, AND FITTINGS

Drain, waste, and vent (DWV) pipes shall be *ASTM D2661, ABS-Type 1* or *ASTM D2665, PVC-Type 1, Grade 1*. Joints shall be plain end, solvent-welded, flanged, or threaded as shown on the Drawings.

2.16 FLANGED JOINTS

Flanged joints shall comply with the applicable requirements of *AWWA Standard C207*. Steel pipe larger than 3 inches shall have slip-on-weld type, Class B or D flanges to match mating surface, where required. All flanged pipe shall be accurately dimensioned. No "drawing-up" will be allowed. Flanged joints shall be made up true and square so there is no strain on the pipe or valve. Bolts shall be tightened uniformly around the joint. Washers shall be included on both ends of flange bolts. Gaskets shall be 1/8 inch, SBR (red), 8-Duro, 1200 pounds-per-square-inch neoprene rubber.

2.17 COUPLINGS

A. Couplings shall be installed as recommended by the coupling manufacturer. All couplings shall receive manufacturer's prime coat and corrosion-resistant finish coat.

B. Flexible-type couplings, where indicated on the Drawings, shall be *Dresser Style 38*. The middle ring shall be extra-long for couplings used on installation of *HDPE* pipe.

1. Middle ring length for *HDPE* pipe less than 18 inches nominal diameter shall be 14 inches.

2. Middle ring length for pipe 18 inches to 36 inches nominal diameter shall be 16 inches.

3. Middle ring length for pipe 42 inches in diameter or greater shall be 18 inches.

C. Flange-to-pipe coupling adapters may be *Rockwell Type 913*. The coupling-rated working pressure shall be not less than the service rating of the pipeline. The middle ring shall have a minimum thickness of 3/8 inch, and the follower ring shall have a minimum thickness of 1/4 inch. Coupling gaskets shall be supplied by the coupling manufacturer.

D. Victaulic couplings will be standard coupling *Style 77*, malleable iron housing, with factory standard, orange enamel housing coating. Gaskets shall be *Grade T Buna N* with temperature range from minus 20F to plus 180F. Bolts and nuts shall be heat-treated carbon steel conforming to *ASTM A183*. Grooves on pipes fitted with Victaulic couplings shall have factory recommended groove cuts suitable for *Style 77* couplings.

E. Flexible Pipe-to-Manhole Connector: Use *KOR-N-SEAL* connectors with stainless steel fastening hardware, manufacturer: *NPC Inc*. or Engineer approved equal.

2.18 MISCELLANEOUS EQUIPMENT

A. Pressure Gauges:

1. Glycerin filled type, 2½ inch reading dial with aluminum face and black numerals, markings in English units, 304 stainless steel case and acrylic lens. Provide each gauge with snubber and needle valve. Provide sockets with extension necks where installed on insulted piping.

2. Pressure Gauge Ranges:

Measuring	Range PSIG	Numeral Intervals PSIG	Inter-Graduations
Compressed Air	0 – 160	20	2

3. Approved Manufacturers:

a. Ashcrost

b. Marsh

c. Weiss

d. Tel-Tru

e. Winters

f. Taylor

B. Unions: Cooper Unions: Conform to *ASME B16.22* and *MSS SP-104*.

C. Flexible Connectors:

Stainless Steel Hose: Corrugated stainless steel tube with stainless steel wire braid covering and ends welded to inner tubing. 200 psig working pressure. Threaded steel connection.

PART 3 - EXECUTION

3.01 INSTALLATION OF PIPING

A. All pipe fittings and couplings shall be installed as recommended by the manufacturer, the Drawings, these Specifications, and in accordance with the best commercial trade practices. Any special tools required for laying, jointing, cutting, etc., shall be supplied and properly used. All pipes shall be thoroughly cleaned before laying and be kept clean until accepted in the completed work.

At all times during the pipe-laying operations, trenches shall be kept free of water. **Pipe shall be installed in accordance with the bedding details shown on the Drawings.** Extra protection shall be taken to prevent rocks or other large objects from lodging against the pipe during backfill. Each pipe shall be inspected for defects before being lowered into the trench. Bell and spigot pipe shall be laid with the bells upgrade.

All types of piping shall be laid and fitted together so, when complete, the pipe will have a smooth invert. Each length of pipe laid shall be thoroughly swabbed to remove all foreign materials before the next length is laid. Trench length open at any given time shall not exceed 50 feet unless otherwise approved by the Engineer.

B. All piping buried below structures, foundations, or slabs shall be installed with extreme care. When all joints have been made, the Contractor shall inspect the piping to ensure the piping is watertight and clear of any obstructions before proceeding with any work above the piping. Flexible couplings shall be installed wherever a pipe passes from concrete to earth. Contractor shall make certain there is full support of the pipe in the earth between and beyond the joints.

C. All pipes shall be carefully placed and supported at the proper lines and grades and, where possible, sloped to permit complete drainage. Piping runs shown on the Drawings shall be followed as closely as possible except for minor adjustments to avoid architectural and structural features. Major relocations of the piping shall have prior approval from the Engineer.

D. Types and sizes of pipes are shown on the Drawings. Where sizes of small pipe are omitted from the Drawings and not mentioned in the Specifications, the sizes used shall correspond to plumbing code requirements. In any event, undesignated pipe sizes shall be those proper for the function performed or as accepted by the Engineer. Unions shall be installed in all threaded piping to facilitate the removal of sections or valves for maintenance and repairs.

E. The Contractor shall keep the pipelines clear during construction. Any blockage or restriction in the pipeline due to earth, debris, cement slurry, etc., shall be removed before the work will be accepted.

F. The Contractor shall design the pipe hangers and supports layout and furnish them according to their design. See *PARAGRAPH 3.03 in SECTION 15100 VALVES AND ACCESSORIES*.

3.02 AIR-PRESSURE TESTING

The compressed air system shall be tested under 200 psi air pressure held for 2 hours without reduction of pressure (a pressure fluctuation of +/- 1 psi is acceptable). If any leaks occur or piping or valves are found to be defective, same shall be removed and new material installed, and the test made on the section again until all material is found to be satisfactory. Such test shall be made in the presence of the Owner's Representative.

END OF SECTION 15060

SECTION 15100
VALVES AND ACCESSORIES

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

This Section describes valves and accessories as shown on the Drawings described in the Specifications and as required to completely interconnect all piping and equipment for a complete and operable systems.

1.02 SUBMITTALS

A. Shop Drawings: Catalogue cuts and shop drawings to demonstrate that the valves and appurtenances conform to the Specification requirements.

B. Manuals: The Contractor shall furnish manufacturer's installation and operation manuals, bulletins, and spare parts lists for the valves.

1.03 GUARANTEE

In addition to the regular guarantee requirements of *DIVISION 0 - GENERAL CONDITIONS*, the Contractor shall guarantee the valves for a period of 2 years beginning on the date of final acceptance.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Valves:

1. Ball Valves: Shall be 316 stainless steel body, trim with PTFE seats. Valves shall feature a blowout proof skin and full port design. Rated for 200 psig.

2. Gate Valves: Smaller than 3 inches shall be 316 stainless steel body and trim with PTFE seats, non-rising stem, wedge disc, and 200 pound service rated.

3. Air-Relief Valve: Shall be cast iron body, stainless steel float, and built to provide vacuum relief and air relief.

B. Butterfly Valves:

1. Butterfly valves shall be tight closing, rubber-seated type with cast-iron or ductile-iron bodies and structurally designed to provide closure against the system operating pressure. Valves and their components shall be designed for a minimum working pressure of 125 psig unless otherwise indicated. Valves 24 inches and smaller may be wafer or flanged style except where lug wafer or flanged valves are indicated for the end service.

All nonmetallic components and elastomers shall be suitable for 180F. Valve shafts shall be *Type 304* or *316* stainless steel. Valve discs shall be cast design with no external ribs transverse to the direction of flow.

2. Disc material shall be either cast-iron or alloy cast-iron conforming to *ASTM A436, Type 2.* Rubber seats shall be applied to the body. The mating surface shall be 18-8 stainless steel, nickel, or alloy cast-iron conforming to *ASTM A436, Type 2.* Shaft bearings or bushings shall be provided for both the upper and lower ends of the shaft. Valve flanges shall be the same class as required for the lines installed in. Exposed valves shall have either traveling-nut or gear operator and hand-wheel sized to handle seating torque requirements and shall be supplied by the manufacturer.

3. Buried valves shall be furnished and installed with traveling-nut type, buried-service rated operators, valve box, valve operator extension for surface operation, and *Pratt Diviner* position indicator with 2 inch nut installed in 5 inch cast-soil pipe bell and riser. Contractor shall furnish a minimum of 1 valve operator wrench with 36 inch long shaft and 24 inch “T” handle for this project. Buried valves shall have a factory-applied, corrosion-resistant finish. **The Contractor shall verify that the butterfly valve is compatible with the finished pipe ends and that the valves open fully with no contact with the pipe ends or walls.**

4. Manufacturer: *Pratt, Groundhog,* or Engineer-approved equal.

C. Check Valves:

1. Smaller than 3 inches shall be swing-check type with bronze body, trim, and threaded ends. Industry standard is *Crane*.

2. Check valves larger than 3 inches shall be of ductile iron or cast steel with swing-type steel plate and external spring. Industry standard is *Keystone*.

D. Angle Valves shall be bronze with 100 pound service rating. Standard hose thread adapters shall be supplied on each angle valve smaller than 1 inch, and standard pipe short nipples shall be installed on all other angle valves. Industry standard is *Kennedy Valve*.

E. Air-relief Valves shall be cast-iron body, stainless steel float, and built to provide vacuum relief and air relief. Industry standard is *APCO* combination air valve, *Model AVC-140C.*

F. Floor Drain Valves shall be an irrigation-style valve with cast-iron body and cover. The cover shall be concave with *National Standard Thread* bronze screw. The frame shall be a solid arch and sized to fit outside diameter steel pipe. Industry standard is *Waterman Industries' "Red Top" Alfalfa Valve, Type 3 frame.*

G. Canal Gates: shall be rated for 10 feet unseating head. The frame, cover yoke, hand-wheel, and collar shall be cast-iron. The side rails shall be galvanized iron with a bronze lift nut. Frame style shall be flat-back which will be bolted on to cast-in-place anchors in the concrete wall. Valve installation shall follow the manufacturer's recommendations. Industry standard is *Waterman Industries C-20f Canal Gate*.

H. Pressure Relief Valves: (for groundwater relief) shall have nominal 5 inch diameter cast-iron body with bronze cover and neoprene rubber gasket. Body length will be specified on the Drawings. Industry standard is *Waterman Industries Pressure-Relief Valve, Model PRF-14*.

I. Adjustable Weir:

1. Crest gates shall consist of *ASTM A572* Grade 50 steel panel (0.5 inch min thickness) gate sections attached to supporting slab by means of elastomeric hinge and restraining strap clamps, reinforced rubber air bladder, reinforced EPDM rubber wiper type panel seals between adjacent panels and abutments, rubber nappe breaker, Type 304 stainless steel air pipping, and stainless steel hardware.

2. Compressed air shall be supplied by high-efficiency air compressor to a 30 gallon receiver tank rated for 200 psi. Air supplied to air bladder shall be clean and dry. Maximum working pressure for the air bladder shall not exceed 35 psi.

3. Gate control system shall be provided by gate manufacture. Control system shall utilize a color touchscreen as an operator interface to a PLC controlling inflate and deflate functions, automatic upstream water level control (via KPSI water level transmitter), and other equipment required for age operation.

PART 3 - EXECUTION

3.01 VALVE INSTALLATION

A. Valves in this contract shall not be buried.

B. Before installation, the Contractor shall clean and touch up all surfaces previously primed, make visual check of operating parts for proper and satisfactory operation, and clean and remove all foreign matter from the valve.

C. All valves shall be installed according to the manufacturer's instructions and as shown on the Drawings. Buried valves shall have all operators and valve boxes installed so that tee wrenches or operators perform freely, without binding or other interference. Buried valves shall be bedded and backfilled according to the requirements of the pipe they are attached to. Direct-buried valves shall receive manufacturer's prime coat and corrosion-resistant finish coat.

D. Valves shall be installed with manual operators in the most accessible position unless otherwise shown. Unions shall be installed adjacent to all valves with threaded or socket ends. Each valve shall be labeled by means of a phenolic plate describing the service. All bolts, nuts, and washers for flanged connections shall be hot-dip galvanized. Safety and relief valves shall be installed at all points required by codes, and where required for protection of equipment and piping. Set pressure shall be as indicated or directed. Discharge shall be piped to nearest floor drain where pressure cannot exceed 30 psig.

3.02 THRUST BLOCKS

A. Buried piping shall have concrete thrust blocks as shown on Drawings and described in this Section.

TABLE 15100 - 3.02A

THRUST BLOCK BEARING AREA
Square Feet

Pipe Size	Dead End	90° Bend *Note 1	45° Bend *Note 2	22 1/2° Bend *Note 3
4	0.3	0.4	0.2	0.1
6	0.6	0.9	0.5	0.2
8	1.1	1.5	0.8	0.4
10	1.8	2.5	1.4	0.7
12	2.6	3.6	2.0	1.0
14	3.3	5.0	2.7	1.3
16	4.7	6.7	3.6	1.8
18	6.0	8.5	4.6	2.3
24	10.5	15.0	8.0	4.0
30	16.5	23.5	12.5	6.3
36	24.5	35.0	18.5	9.3

*Note 1: Includes Bull Head Tee and Bull Head Cross.
*Note 2: Includes Elbow, Tee, and Cross.
*Note 3: Includes Elbow, Lateral, Vert. Bend, Offset.

B. Anchor gate valves 12 inches and larger as shown on the Drawings or as indicated on the thrust block location sheet.

C. In general, no forms or reinforcing will be required. The concrete will bear directly against the undisturbed trench wall. However, the Contractor shall shape and compact the trench backfill to minimize the amount of concrete used. Thrust blocks shall be poured and cured before the pipe is subjected to any hydrostatic pressure. *Thrust Bond Breaker* (90-pound asphalt paper) shall be placed wherever concrete thrust blocks contact the pipe.

3.03 HANGERS AND SUPPORTS

A. The Contractor shall design and provide all necessary supports, tie rods, bracing, brackets, or other types of supports necessary for proper suspension, bracing, or support of the pipe. The Contractor shall provide special supports under the pipe where fixtures, such as valves, are to be supported by the pipe. No attempt is made to show all of these supports or hangers on the Drawings. The Contractor shall be required to include such supports and bracing and install them in a manner that would be considered as good practice in the trade.

END OF SECTION 15100

SECTION 15145
PIPE, DUCTWORK, AND EQUIPMENT INSULATION

PART 1 - GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall provide pipe and equipment insulation, complete and in place, as indicated in accordance with the Contract Documents.

B. In addition to the insulation indicated, the Contractor shall insulate cold or hot piping and exhausts that could be hazardous to personnel upon contact or that may cause condensation and moisture damage.

1.02 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Federal Specifications

1. HH-I-558B Insulation Blocks, Boards, Blankets, Felts, Sleeving (Pipe and Tube Covering), and Pipe Fitting Covering, Thermal (Mineral Fiber, Industrial Type)

1.03 CONTRACTOR SUBMITTALS

A. Submit complete Shop Drawings of thermal insulation, with manufacturer's data on materials, thermal properties, covering, jackets, and finish, in accordance with the requirements of this Section and *SECTION 15050 BASIC HVAC REQUIREMENTS*.

B. Furnish the following certifications:

1. Certification from the heating system manufacturer that the insulation has been installed in accordance with the manufacturer's recommendations.

PART 2 - PRODUCTS

2.01 GENERAL

A. Components of the insulation, including covering, mastics, and adhesives, shall have a flame-spread rating of not greater than 25 and a smoke development rating of not greater than 50.

B. Ratings shall be as established by tests in accordance with *ASTM E 84,* and the above federal and commercial specification standards.

C. Insulation shall be applied in strict accordance with the manufacturer's instructions.

2.02 BASIC MATERIALS

Unless otherwise indicated, the insulation thickness shall be as follows:

Pipe		Minimum Thickness of Insulation (inches)
Hot and cold potable water	6 inch and smaller	1
	8 inch and larger	1½
Compressed air piping and liquid refrigerant piping exposed to the	all sizes	2
Boilers, heaters, and manufactured equipment		as recommended by manufacturer

2.03 PIPING INSULATION

A. Except as indicated otherwise, piping shall be insulated with heavy density, closed cell foam pipe insulation, or preformed fiberglass pipe insulation.

B. Insulation shall have factory-applied ASJ/SSL type jacket with vapor barrier for cold piping (below ambient).

C. Pipe insulation shall have an average density of 4 pounds per cubic foot or greater, and its conductivity (k) shall not exceed 0.23 BTU-inch per (hour) (square foot) (degree F) at a mean temperature of 75 degrees F.

2.04 PIPE SUPPORTS

The Contractor shall design the pipe hangers and supports layout and furnish them according to their design. See *PARAGRAPH 3.03 in SECTION 15100 VALVES AND ACCESSORIES*.

PART 3 - EXECUTION

3.01 GENERAL

Insulation and liners shall be installed by a qualified insulation contractor in strict accordance with the manufacturer's recommendations.

3.02 PIPING INSULATION

A. Piping, fittings, and valves shall be clean and dry prior to installation of insulation.

B. Piping shall be completely insulated inside structures, except where indicated otherwise.

END OF SECTION 15145

SECTION 15250
FLOW METERS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

This Section describes the flow meters (M-1, M-2, and M-3) installed on the water supply pipelines for Springs 1, 2, and 3, respectively, as shown on the Drawings..

1.02 SUBMITTALS

Submit the following information in accordance with *SECTION 15000*:

1. Flow meter technical information demonstrating conformance of the proposed product to these specifications;

2. Installation instructions;

3. Operation instructions.

PART 2 - PRODUCTS

2.01 FLOW METER

A. Flow Meter: The flow meter shall be of the general classification Ultrasonic Flowmeter. It shall consist of transducers and a transmitter. The flow meter shall be **Sierra Instruments'** transit time flowmeter **Innova-Sonic Model 205**, or Engineer approved equal. The primary element shall employ a single pair of electroacoustic transducers mounted diagonally on the surface of the water pipe. The transducers shall be mounted on the water pipe by use of straps or saddle mountings provided by the manufacturer.

B. Transmitter (readout meter) shall provide backlit LED display, and provide instantaneous flow and totalized flow for daily, monthly and yearly terms. Data shall be stored for up to a year, and transferrable to standard desktop computer. Software shall be provided by the manufacturer for reading and manipulation of data. The readout meter for the flow rates of the three 12 inch water supply pipelines for Springs 1, 2, and 3 shall be mounted on the side of the water distribution box.

C. Transmitter Electronics: The transmitter electronics shall be mounted in a *NEMA 4X* enclosure, RS232 / RS485 standard.

D Power: 24 VDC

E. Measurement Capabilities:

1. Range: 0.0 to 20 ft/sec

2. Accuracy: +/- 0.5% of flow reading

3. Repeatability: 0.5%

F. Operating Specs – Transducers and cable:

1. Permanently submersible;

2. Liquid Temperatures: Standard sensors -10° to 120° F;

3. Liquid Pressure: CPVC: 250 psig @ 27°C;

4. Sensors: NEMA 7 connection heads on standard sensors;

5. Cable Length (Max): 200 feet.

G. Humidity: 0-100%, non-condensing

H. Computer Mode: All functions for setup and measurement available through RS232 interface.

PART 3 - EXECUTION

3.01 MOUNTING TRANSDUCER

The electroacoustic transducers shall be mounted with strap or saddle type mounting brackets supplied by the manufacturer. Transducers shall be carefully installed in accordance with the manufacturer's instructions and shall be installed suitably for a permanently submerged condition.

3.02 CABLING

Except for the transducers and their cables, all electrical connections and junction boxes inside the meter vault shall be mounted within 2 feet of the top of the vault to reduce the susceptibility to groundwater damage in the future. Cabling shall be sufficiently slack to allow personnel to work in the vault without interference.

END OF SECTION 15250

SECTION 15300
PUMPS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

This Section describes the electrical, mechanical, environmental, agency and reliability requirements for the truck-fill pump as specified herein and as shown on the contract Drawings.

1.02 GENERAL REQUIREMENTS

A. Provide pumps and pumping appurtenances, complete and operable, as indicated in accordance with the Specifications.

B. The provisions of this Section shall apply to pumps and pumping equipment throughout the Specifications, except where otherwise indicated.

C. Unit Responsibility:

1. The pump manufacturer shall be made responsible for furnishing the work and for the coordination of design, assembly, testing, and installation of the work of each specific pump Section.

2. The Contractor shall be responsible to the Owner for compliance with the requirements of each specific pump Section.

D. Single Manufacturer:

1. All pump systems including pumps and all appurtenances shall be provided by the same manufacturer.

2. Where 2 or more pump systems of the same type or size are required, provide pumps produced by the same manufacturer.

1.03 REFERENCES

A. All equipment shall be fabricated, assembled and tested in accordance with the most current applicable standards as defined by the following institutions:

1. Institute of Electrical and Electronic Engineers (IEEE)

2. National Electrical Manufacturers' Association (NEMA)

3. Anti-Friction Bearing Manufacturers' Association (AFBMA)

4. American National Standards Institute (ANSI)

5. National Electrical Code (NEC)

6. Underwriters' Laboratory (UL)

1.04 SUBMITTALS

A. Furnish submittals in accordance with the requirements of *SECTION 15000*.

B. Shop Drawings:

1. Submit pump name, identification number, and specification Section number.

2. Indicate dimensions, weights, and placement of openings and holes. Provide shop drawings for pump systems including controls and valves.

3. Performance Information:

a. Submit performance data curves showing head, capacity, horsepower demand, NPSH required, and pump efficiency over the entire operating range of the pump.

b. Require the equipment manufacturer to indicate separately the head, capacity, horsepower demand, overall efficiency, and minimum submergence required at the design flow conditions and the maximum and minimum flow conditions.

c. Submit performance curves at intervals of 100 RPM from minimum speed to maximum speed for each centrifugal pump equipped with a variable speed drive.

4. Operating Range:

a. Require the manufacturer to indicate the limits on the performance curves recommended for stable operation without surge, cavitation, or excessive vibration. Additionally, pump manufacturer shall indicate the allowable operating range (AOR) and preferred operating range (POR) on the curve.

b. Provide a stable operating range as wide as possible, based on actual hydraulic and mechanical tests.

5. Submit assembly and installation drawings, including shaft size, seal, coupling, bearings, anchor bolt plan, part nomenclature, material list, outline dimensions, and shipping weights.

6. Submit data for the electric motor proposed for each pump.

7. Submit a wiring diagram of field connections, with identification of terminations between local control panels (if applicable), junction terminal boxes, and equipment items.

8. Submit a complete electrical schematic diagram.

C. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes. Provide pump curves for all pumps.

D. Equipment and Product Data Submittal Sheets: Submit all equipment and product data submittal sheets to the Engineer for review and material approval prior to purchase.

E. Manufacturer's Installation Instructions: Indicate assembly and support requirements.

F. Technical Manual: Submit a Technical Manual containing the required information indicated in *SECTION 01300* - Contractor Submittals and each specific pump Section.

G. Spare Parts List: Submit a spare parts list containing the required information indicated in *SECTION 01300* - Contractor Submittals and each specific pump Section.

H. Factory Test Data:

1. Submit signed, dated, and certified factory test data for each pump system which requires factory testing.

2. Submit these data before shipment of equipment.

I. Certifications:

1. Submit the manufacturer's certification of proper installation.

2. Submit the Contractor's certification of satisfactory field testing.

PART 2 - PRODUCTS

2.01 GENERAL

A. Performance Curves:

1. Provide centrifugal pumps with a continuously rising curve or with the system operating range not crossing the pump curve at 2 different capacities or "dip region."

2. Unless otherwise indicated, the required shaft horsepower for the entire pump assembly at any point on the performance curve shall not exceed the rated horsepower of the motor or engine or encroach on the service factor.

B. Compatibility:

1. Provide entirely compatible components of each pump system provided under the specific pump Sections.

2. In each unit of pumping equipment, incorporate basic mechanisms, couplings, electric motors or engine drives, variable frequency drives, necessary mountings, and appurtenances.

2.02 MATERIALS

A. Provide materials suitable for the intended application.

B. For materials not indicated, provide high-grade, standard commercial quality, free from defects and imperfections that might affect the serviceability of the product for the purpose for which it is intended, and conforming to the following requirements:

1. Provide cast iron pump casings and bowls constructed of close-grained gray cast iron, conforming to *ASTM A48* - Gray Iron Castings, Class 30, or equal.

2. Provide bronze pump impellers conforming to *ASTM B62* - Composition Bronze or Ounce Metal Castings, or B 584 - Copper Alloy Sand Castings for General Applications, where dezincification does not occur.

3. Provide pump shafts constructed of Type 416 or 316 stainless steel.

4. Miscellaneous stainless steel parts shall be of Type 316.

5. Provide anchor bolts, washers, and nuts in standard service (non-corrosive application) of galvanized steel in accordance with the requirements of *SECTION 05500- Miscellaneous Metalwork*.

6. Provide anchor bolts, washers, and nuts in corrosive service as defined in *SECTION 05500* - Miscellaneous Metalwork, of stainless steel in accordance with *SECTION 05500 - Miscellaneous Metalwork*.

2.03 PUMP COMPONENTS – GENERAL

A. Flanges and Bolts

1. Provide suction and discharge flanges conforming to *ASME B16.1* - Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800 or *ASME 816.5* Pipe Flanges and Flanged Fittings dimensions.

2. Provide bolts shall be in accordance with the requirements of *SECTION 05500 - Miscellaneous Metalwork*.

B. Lubrication:

Vertical pump shafts of clean water pumps shall be product water lubricated, unless otherwise indicated.

C. Hand holes:

Provide hand holes on pump casings shaped to follow the contours of the casing in order to avoid any obstructions in the water passage.

D. Drains:

Pipe gland seals, air valves, cooling water drains, and drains from variable frequency drive equipment to the nearest floor sink or drain, using galvanized steel pipe. Or copper tube that is properly supported with brackets.

E. Grease Lubrication:

For vertical propeller, mixed-flow, and turbine pumps, other than deep well pumps, of bowl sizes 10 inch and larger, provide a stainless steel tube attached to the column for grease lubrication of the bottom bearing.

F. Stuffing Boxes:

1. Where stuffing boxes are indicated for the pump seal, provide stuffing boxes of the best quality, using the manufacturer's suggested materials best suited for the specific application.

2. For sewage, sludge, drainage, and liquids containing sediments, provide freshwater-flushed seals, using lantern rings.

3. If fresh water is not available, the seal shall be flushed with product water cleaned by a solids separator as manufactured by John Crane Co., Lakos (Claude Laval Corp.), or equal.

4. Conventional Packing Gland Type Seal:

   a. Unless otherwise indicated, provide packing material of Teflon braiding, containing 50 percent ultrafine graphite impregnation in order to satisfy the requirements listed in the table below.

   b. Acceptable ring materials are asbestos-free die-molded packing rings of braided graphite material free of PTFE, Chesterton 1400R or equal, for nonpotable water service, and braided PTFE material, Chesterton 1725 or equal, that is listed under NSF Standard 61 for potable water service.

   c. Seal Requirements:

Shaft Speeds	Per Manufacturer
Temperature	Per Manufacturer
pH Range	Per Manufacturer

5. Mechanical Seals (Conventional Non-Split-Type):

   a. Provide mechanical seals of the fresh water-flushed-type, unless otherwise indicated in which case use product water cleaned by a solids separator as indicated above.

6. Where indicated, circulate a buffer fluid at a minimum 20 psi above discharge pressure, or as required by the manufacturer, in order to maintain reliable seal performance.

7. Equip mechanical seals with nonclogging, flexible-mounted seats with elastomer secondary seals.

8. Provide wetted metal parts constructed of Type 316 stainless steel, Alloy 20, or Hastelloy B or C, whichever has the best corrosion resistance to the pumped fluid.

9. Provide double-balanced dual cartridge seals in order to allow for seal integrity in case of flush water pressure reversal.

10. Provide springs in single and double seals, in the non-wetted end of the seal.

11. Deliver fresh water to the seals through appropriate size piping with plug valves, strainers, pressure regulators, electrically operated solenoid valves, and rotameters.

12. Wiring shall comply with the requirements of *DIVISION 16* – Electrical.

2.04 PUMP APPURTENANCES

A. Nameplates:

Equip each pump with a stainless steel nameplate indicating serial number(s), rated head and flow, impeller size, pump speed, and manufacturer's name and model number.

B. Solenoid Valves:

1. Require the pump manufacturer to provide solenoid valves on the water or oil lubrication lines and on cooling water lines.

2. Provide solenoid valve electrical ratings compatible with the motor control voltage.

C. Gauges:

1. Except for sample pumps, sump pumps, and hot water circulating pumps, equip pumps with pressure gauges installed at the pump discharge lines.

2. Provide pump suction lines with compound gauges.

3. Located gauges in a representative location, where not subject to shock or vibrations, in order to achieve true and accurate readings.

4. Where subject to shock or vibrations, wall-mount the gauges or attach the gauges to galvanized channel floor stands and connect by means of flexible connectors.

2.05 FACTORY TESTING

A. Conduct the following tests on each indicated pump system:

1. Motors:

a. Test electric motors.

b. Furnish test results to the pump manufacturer prior to the pump test.

2. Constant Speed Drives:

   a. Test constant speed drives.

   b. Furnish test results to the pump manufacturer prior to the pump test.

3. Factory Non-witnessed Test:

   a. Test centrifugal pump systems with drives 10 hp up to and including 125 hp at the pump factory in accordance with the American National Standard for Centrifugal Pump Tests (ANSI/HI 1.6) acceptance Level "1U" or the American National Standard for Vertical Pump Tests (ANSI/HI 2.6) as approved by ANSI and published by the Hydraulic Institute.

   b. For sump pumps and sample pumps, acceptance shall be in accordance with Level "2" of ANSI/HI 1.6, unless otherwise indicated.

   c. Perform tests using the complete pump system to be furnished, including the Project motor and variable speed drive if equipped with variable speed drive.

   d. For pumps with motors smaller than 100 hp, the manufacturer's certified test motor will be accepted.

   e. Testing of prototype models will not be accepted.

   f. Conduct the following minimum tests and submit the test results:

      1) Hydrostatic test

      2) Performance Test:

         a) Conduct performance testing at maximum speed, obtain a minimum of 5 hydraulic test readings between shutoff head and 25 percent beyond the maximum indicated capacity, and record on data sheets as defined by the Hydraulic Institute standards;

         b) For variable speed driven pumps, test each pump between maximum and minimum speed at 100-RPM increments;

         c) Submit pump curves showing head, flow, bhp, and efficiency results;

      3) Mechanical test

      4) NPSH:

         a) Perform a net positive suction head required test (NPSHr3), if required by the specific pump Section.

         b) If not required by the specific pump Section, submit the published manufacturer-calculated NPSHr3 curve.

g. Submit certification signed by a senior official of the pump manufacturer that the pump shaft horsepower demand did not exceed the rated motor horsepower of 1.0 service rating at any point on the curve.

h. Submit test results to the Engineer for review prior to delivery to the Site.

4. Acceptance:

In the event of failure of any pump to meet any of the requirements, make necessary modifications, repairs, or replacements in order to conform to the requirements of the Contract Documents, and re-test the pump until found satisfactory.

2.06 TRUCK FILL PUMP

A. Operating Conditions:

Drive	Constant speed
Ambient Environment	Outdoors
Ambient Temperature, degrees F	0 to 100
Ambient Relative Humidity, %	20 to 100
Fluid Service	Raw spring water
Fluid Temperature, degrees F	32 to 70
Fluid pH Range	6 to 9
Fluid Specific Gravity	1.0
Fluid Viscosity, absolute centipoises at 60 deg F	1.1
Project Site Elevation, ft. msl	62.5
Minimum available NPSH, ft absolute	±29.0

B. Performance Requirements:

Maximum Shutoff Head, ft	Per Manufacturer
Design Flow Capacity, gpm	400
Design flow pump head TDH, ft	70
Design flow minimum pump efficiency, percent	Per Manufacturer
Maximum flow capacity at maximum speed, gpm	680
Maximum flow pump head TDH, ft	40
Maximum flow minimum pump efficiency, percent	75
Maximum flow NPSH available, ft absolute	±31.5
Minimum flow capacity at maximum speed, gpm	Per Manufacturer
Minimum flow pump head TDH at maximum speed, ft	Per Manufacturer

Minimum flow pump efficiency, percent	Per Manufacturer
Maximum pump speed, RPM	1800
Minimum pump speed, RPM	Per Manufacturer
Maximum motor speed, RPM	Per Manufacturer
Maximum motor size, hp	10

C. Pump Dimensions:

Minimum suction diameter, in	4
Minimum discharge diameter, in	4
Connection Type	NPT

D. Materials of Construction:

Casing	Cast Iron
Impeller	Cast Iron
Shaft	416 SS
Wear rings	Ductile Iron
Bearings	Bronze line shaft bearings
Bolting	316 SS

2.07 MANUFACTURER

Truck Fill Pump – **Berkeley B3ZPM**, or equal.

PART 3 - EXECUTION

3.01 MANUFACTURER'S SERVICES

A. Inspection, Startup, and Field Adjustment

1. Where required by the specific pump Section, furnish an authorized service representative of the manufacturer at the Site continuously to supervise the following items and to certify in writing that the equipment and controls have been properly installed, aligned, lubricated, adjusted, and readied for operation:

   a. Installation of the equipment;

   b. Inspection, checking, and adjusting the equipment;

   c. Startup and field testing for proper operation; and

   d. Performance of field adjustments to ensure that the equipment installation and operation comply with the indicated requirements.

B. Instruction of Owner's Personnel

1. Where required by the individual pump Section, furnish an authorized training representative of the manufacturer at the Site for the number of Days indicated in the specific pump Section, to instruct the Owner's personnel in the operation and maintenance of the equipment, including step-by-step troubleshooting with necessary test equipment.

2. Furnish instruction specific to the model of equipment provided.

3. Qualifications:

   a. Furnish a representative with at least 2 years' experience in training.

   b. Submit a resume for the representative.

4. Schedule the training a minimum of 3 weeks in advance of the first session.

5. Lesson Plan Review:

   a. Submit the proposed training material and a detailed outline of each lesson for review.

   b. Incorporate review comments into the material.

6. The trainees will keep the training materials.

7. The Owner may videotape the training for later use with the Owner's personnel.

3.02 PUMP INSTALLATION

A. General:

Install pumping equipment in accordance with the manufacturer's written recommendations.

B. Alignment:

1. Field-test the equipment in order to verify proper alignment and freedom from binding, scraping, shaft runout, or other defects.

2. Measure the pump drive shafts just prior to assembly in order to ensure correct alignment without forcing.

3. Ensure that the equipment is secure in position and neat in appearance.

C. Lubricants:

Provide the necessary oil and grease for initial operation.

3.03 PROTECTIVE COATING

Coat materials and equipment in accordance with the requirements of *SECTION 09900* - Protective Coating.

3.04 FIELD TESTS

A. Field-test each pump system after installation in order to demonstrate:

1. Satisfactory operation without excessive noise and vibration;

2. No material loss caused by cavitation;

3. No overheating of bearings; and,

4. Indicated head, flow, and efficiency at the design point.

B. Conduct the following field testing:

1. Startup, check, and operate the pump system over its entire speed range.

2. If the pump is driven by a variable speed drive, test the pump and motor at 100 RPM increments.

3. If the pump is driven at constant speed, test the pump and motor at the maximum RPM.

4. Unless otherwise indicated, vibration shall be within the amplitude limits recommended by the Hydraulic Institute standards at a minimum of 4 pumping conditions defined by the Engineer.

5. Obtain concurrent readings of motor voltage, amperage, pump suction head, and pump discharge head for at least 4 pumping conditions at each pump rotational speed, at 100-RPM increments if equipped with a variable speed drive or at maximum RPM if equipped with a constant speed drive.

6. Check each power lead to the motor for proper current balance.

7. Bearing Temperatures:

a. Determine bearing temperatures by a contact-type thermometer.

b. Precede this test with a run time sufficient to stabilize bearing temperatures, unless an insufficient liquid volume is available to furnish such a run time.

8. Ensure that electrical and instrumentation tests conform to the requirements of the Section under which that equipment is specified.

C. Witnessing:

1. Field testing will be witnessed by the Engineer.

2. Furnish 3 Days advance notice of field testing.

D. If the pumping system fails to meet the indicated requirements, modify or replace the pump and re-test as indicated above until it satisfies the indicated requirements.

E. Certification:

1. After each pumping system has satisfied the requirements, certify in writing that it has been satisfactorily tested and that final adjustments have been performed.

2. Certification shall include the date of the field tests, a listing of persons present during the tests, and the test data.

F. The Contractor shall be responsible for costs of field tests, including related services of the manufacturer's representative, except for power and water, which the Owner will bear.

G. If available, the Owner’s operating personnel will provide assistance in field testing.

END OF SECTION 15300

SECTION 15430
PLUMBING, PIPING, AND SPECIALTIES

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. This Section describes the plumbing, piping and accessories as shown on the Drawings, described in the Specifications, and as required to install and design the plumbing and piping in the interior of the Buildings and to provide a complete and operable system. The term, “Drawings” may reference either the owner supplied Drawings or Contractor design submittal drawings. Work does not include process piping in the Building or process, civil, and yard piping on the site.

1.02 RELATED WORK

A. *See SECTION 15000 - General Mechanical Requirements*

B. *See SECTION 15060 - Pipe, Fittings, & Accessories*

C. *See SECTION 15100 - Valves and Accessories*

D. *See SECTION 15145 – Pipe, Ductwork, and Equipment Insulation*

1.03 QUALITY ASSURANCE

All materials and equipment furnished under this Section shall:

A. Be of a manufacturer who has been regularly engaged in the design and manufacture of the materials and equipment; and

B. Be demonstrated to the satisfaction of the Owner that the quality is equal to the materials and equipment made by those manufacturers specifically named herein, if an alternate product manufacturer is proposed.

1.04 SUBMITTALS

A. Product Review Shop Drawings: In addition to the requirements in *SECTION 15000 GENERAL MECHANICAL REQUIREMENTS*, complete shop drawings shall be submitted for approval before manufacture of equipment. These drawings shall show layouts, dimensions, construction details, and connection diagrams and include catalog cuts, bulletins, brochures, or copies thereof as supplements to the shop drawings. Failure to obtain prior approval of the drawings may result in rejection of equipment supplied.

B. Product Information Shop Drawings: In addition to the detailed installation drawings of all piping and connected equipment, the drawings shall include all:

1. Pipes, fittings, supports, and accessories;

2. Flexible couplings and flanged adapters; and

3. Plumbing fixtures

4. Locations, types, and appurtenances.

1.05 WORKMANSHIP AND MATERIALS

A. Work shall be in strict accordance with the Uniform Plumbing Code and codes of the State of Washington, and any other authorities having jurisdiction. The Contractor shall have required certifications and be thoroughly *familiar* with the local codes. The Contractor shall obtain and pay for necessary permits.

B. Care shall be taken to protect floors and walls during the make-up and installation of piping and equipment. The Contractor shall remove stains and repair damage before final acceptance of the work.

C. If the Engineer finds materials that have identifying marks removed or lack such marks completely, such items will be rejected until the Contractor has furnished proof that said items conform to the Specifications. The Engineer will determine adequacy and extent *of* such proof.

PART 2 - PRODUCTS

2.01 GENERAL

A. All material delivered to the job site shall be new, free from defects, and marked to identity the material, class, and other appropriate data, such as thickness for piping.

B. Plumbing piping, fixtures, specialties, and equipment shall be of the latest design, new, first-quality products, manufactured for the intended usage, and shall be compatible with elements of related or connected Work.

C. Plumbing fixtures shall be without flaws and with white finish unless otherwise indicated. Exposed brass, lancets, valves, wastes, traps, piping, and escutcheons shall be chrome-plated. Each fixture shall be provided with individual stops and shall be anchored firmly to the building wall or floor. Softeners, water heaters, and lab equipment shall have drains and isolating valves on each side.

D. Water closets, valves, fixtures, and hardware shall be approved by local governing authorities as low flow items.

E. Floor mounted and tank type water closets indicated (by "WC") for handicapped persons or located within a toilet stall indicated for handicapped persons shall conform to ADA requirements.

F. Insulation at lavatories requiring handicapped persons protection shall conform to the wheelchair accessibility requirements of ADA and other governing authorities. The insulation shall be easily removable, bacteria resistant, molded to piping and fixture configurations, closed cell vinyl assembles. Fasteners shall be corrosion resistant and reusable. Handicapped persons protection shall be Lav. Guard as manufactured by Truebro, Inc., Pro-Warp as manufactured by McGuire, Inc., or equal.

G. The Contractor shall design the pipe hangers and supports layout and furnish them according to their design. See *PARAGRAPH 3.03 in SECTION 15100 VALVES AND ACCESSORIES*.

2.02 COPPER PIPE AND FITTINGS

See *PARAGRAPH 2.08 in SECTION 15060 PIPE, FITTINGS, AND ACCESSORIES*.

2.03 PVC PIPE AND FITTINGS

See *PARAGRAPH 2.05 in SECTION 15060 PIPE, FITTINGS, AND ACCESSORIES*.

2.04 POLYETHYLENE PIPE AND FITTINGS

See *PARAGRAPH 2.06 in SECTION 15060 PIPE, FITTINGS, AND ACCESSORIES*.

2.05 DRAIN, WASTE, VENT PIPE, AND FITTINGS

See *PARAGRAPH 2.15 in SECTION 15060 PIPE, FITTINGS, AND ACCESSORIES.*

2.06 ISOLATION VALVES

A. Ball Valves

1. For all plumbing supply piping 3 inches and smaller provide ball valves for shutoff applications.

2. Ball valves for copper domestic hot and cold-water service pipe:

a. Lead free bronze material construction conforming to MSS SP-110, NSF/ANSI 61, and NSF/ANSI372.

b. Standard port

c. CWP Rating: 600 psig

d. SWP Rating: 150 psig

e. Maximum temperature of 350°F

f. Solder joints

g. Ball: Lead Free Brass; Chromium Plated or stainless steel

h. Seat: RPTFE

i. Body: Lead Free Bronze (Not containing more than 15% zinc)

j. Lever: Zinc Plated Steel

k. Nibco S-585HP-66-LF, Apollo 70LF-100, or approved equal

2.07 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers

1. Y-Strainers for copper domestic hot and cold-water service pipe:

a. Lead Free bronze material construction conforming to *NSF/ANSI 372* and *ASTM B584*

b. Body: Lead Free Cast Bronze (Alloy shall not contain more than 15% Zinc)

c. Cap: Lead Free Brass

d. Screen: Stainless Steel with round perforations

e. O-Ring: PTFE

f. Gasket: PTFE

g. CWP Rating: 400 psig

h. SWP Rating: 125 psig

i. Manufacturer: Keckley Style E7, Apollo 59-300LF, or equal

2.08 WATER HAMMER ARRESTERS

A. Conform to standards ASSE 1010 or PDI-WH201

B. Manufacturer: PPP Inc, or equal

2.09 FLOOR DRAINS IN CONCRETE FLOORS

A. General: Floor drains in concrete floors shall be of cast iron, in the sizes indicated, with sediment buckets. Each floor drain located on an upper floor shall have a clamping collar, with 4 lb sheet lead flashing, 12 inches minimum all around. Where lead flashing does not comply with Code, use epoxy water proofing material and submit a Shop Drawing for review.

B. Manufacturers, or Equal:

1. Josam Mfg. Co., Series 31120

2. Jay R. Smith Mfg. Co., Fig. 2350

3. Zurn Industries, Inc., Series Z-520-Y

2.10 TRAP SEAL

A. Manufacturer: Rectorseal SureSeal model SS2009V Waterless Inline 2 inch Drain Trap Seal

B. HDPE housing with heavy duty proprietary silicone diaphragm and soft EPDM rubber sealing gasket.

2.11 CLEANOUTS

A General: Cleanouts shall be heavy plugs with tapered shoulders against caulked lead or heavy brass plugs. Where underground or concealed, cleanouts shall be brought to floor level and to accessible locations with access covers and frames.

B. Manufacturers, or Equal

	Josam Series	J.R. Smith No.	Zurn No.
Exposed Locations	58500-20	4405	Z-1440-A
Underground (finished floors)	56010/30	4143	ZN-1400-2
Walls, Concealed	58790-20	4535	ZN-1445-1-A
Traffic Areas	56070	4240	Z-1420-27

C. Clean outs shall have a minimum diameter of 3 inches.

D. Stack cleanouts shall be installed at the base of each stack. Cleanouts shall be galvanized cast iron with ABS plastic cleanout plugs.

2.12 HOSE BIBBS AND HYDRANTS

A. General: Hose bibbs and hydrants in exposed locations subject to freezing shall be the non-freeze type. Hose bibbs connected to a non-potable water supply shall be provided with plastic or stainless-steel warning signs reading "DO NOT DRINK" in clearly legible letters, permanently attached at the hose bibb. Where indicated, hose bibbs shall be provided with vacuum breakers as furnished by Crane Co., American Standard, or equal.

B. Manufacturers, or Equal

Drawing Callout	Fixture Type	Description
HB-1	Non-freeze Post-type	Exposed bronze hydrant, post-type, depth of bury to suit local conditions; minimum 4-feet. Woodford Manufacturing Co., Model Iowa Y1

2.13 PLUMBING FIXTURES

Plumbing Fixtures: See Drawings for Fixture Schedule for the Office Building. All plumbing fixtures shall be as scheduled or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION OF PIPING

A. All pipe fittings and couplings shall be installed as recommended by the manufacturer, the Drawings, these Specifications, contractor design submittal drawings, and in accordance with the best commercial trade practices.

Any special tools required for laying, jointing, cutting, etc., shall be supplied and properly used. All pipe shall be thoroughly cleaned before laying and be kept clean until accepted in the completed work.

At all times during the pipe-laying operations, trenches shall be kept free of water. Pipe shall be installed in accordance with the bedding details shown on the Drawings. Extra protection shall be taken to prevent rocks or other large objects from lodging against the pipe during backfill. Each pipe shall be inspected for defects before being lowered into the trench. Bell and spigot pipe shall be laid with the bells upgrade. All types of piping shall be laid and fitted together so, when complete, the pipe will have a smooth invert. Each length of pipe laid shall be thoroughly swabbed to remove all foreign materials before the next length is laid.

B. All piping buried below structures, foundations, or slabs shall be installed with extreme care. When all joints have been made, the Contractor shall inspect the piping to ensure the piping is watertight and clear of any obstructions before proceeding with any work above the piping. Flexible couplings shall be installed wherever a pipe passes from concrete to earth. Contractor shall make certain there is full support of the pipe in the earth between and beyond the joints.

C. All pipe shall be carefully placed and supported at the proper lines and grades and, where possible, sloped to permit complete drainage. Piping runs shown on the Drawings shall be followed as closely as possible except for minor adjustments to avoid architectural and structural features. Major relocations of the piping shall have prior approval from the Engineer.

D. Types and sizes of pipes are shown on the Drawings. Where sizes of small pipe are omitted from the Drawings and not mentioned in the Specifications, the sizes used shall correspond to plumbing code requirements. In any event, undesignated pipe sizes shall be those proper for the function performed or as accepted by the Engineer. Unions shall be installed in all threaded piping to facilitate the removal of sections or valves for maintenance and repairs.

E. The Contractor shall keep the pipelines clear during construction. Any blockage or restriction in the pipeline due to earth, debris, cement slurry, etc. shall be removed before the work will be accepted.

3.02 PIPE TESTING

A. Contractor to provide all testing equipment, tools, appliances, devices, and labor

B. Test Conditions:

Service	Test Pressure	Test Medium
Domestic Water Supply	150 psi	water
Sanitary Waste	Fill System to Highest Vent Stack	water

C. Procedure:

1. Disconnect all fixture devices and other accessories which may be damaged by the specified test pressure.

2. Plug or cap ends as required

3. Test domestic water supply piping for 1 hour with no loss in pressure

4. Determine leakage by loss of pressure, soap solution, or other positive method.

5. All joints shall be tight:

   a. Repair leaking joints

   b. Repeat tests on repaired lines

6. Test drainage and venting systems by filling with water to level of highest vent stack:

   a. Plug openings as necessary

   b. Test for drop in water level after 30 minutes

3.03 INSTALLATION OF PLUMBING FIXTURES

A. Each fixture shall be installed with trap, easily removable for servicing and cleaning, and be vented in accordance with the applicable plumbing code.

B. The Contractor shall provide chrome-plated rigid or flexible supplies to fixtures with angle stops, reducers, and escutcheons.

C. Components shall be installed level and plumb. Supplies and wastes shall be centered on or between the wall tiles.

D. Fixtures shall be installed and secured in place with wall supports wall carriers floor carriers and bolts.

E. Fixtures shall be sealed to wall and floor surfaces with sealant as indicated in *SECTION 07100 - MOISTURE PROTECTION*. Color shall match fixture.

F. Fixtures shall be mounted with heights above finished floor as indicated on the Drawings.

3.04 ADJUSTING AND CLEANING

A. Stops or valves shall be adjusted for intended water flow rate to fixtures without splashing, noise, or overflow.

B. At completion, the Contractor shall clean plumbing fixtures and equipment.

C. Water closets shall be solidly attached to floor or wall carrier with lag screws. Lead flashing shall not be used to hold fixture in place.

END OF SECTION 15430

SECTION 15500
HEATING AND VENTILATION EQUIPMENT

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. This section covers the design and installation of fans, louvers, air handlers, and heaters, along with accessories required for a complete installation.

B. The contractor is responsible for the design and installation of the HVAC system per this specification and all related sections in *DIVISION 15*.

1.02 DESIGN CONDITIONS

A. Design Conditions Table:

Outdoor Design Conditions		Indoor Design Conditions	
Summer Dry Bulb Temp °F	83.3	Temperature setpoint for indoor occupied office areas (Cooling) °F	74-78
Summer Wet Bulb Temp °F	64.7	Winter temperature setpoint for occupied offices °F	69-75
Winter Dry Bulb Temp °F	24.3	Office Areas Relative Humidity %	50-60
		Cooling setpoint for process areas °F	90
		Heating setpoint for process areas °F	50

1.03 SUBMITTALS

A. General: Submittals in this section are in addition to the requirements in *SECTION 15050 BASIC HVAC REQUIREMENTS.*

B. Equipment Numbers: Equipment is identified by number code for reference and location purposes in the Drawings and other Contract Documents. The appropriate equipment numbers shall be included on the Shop Drawings and on other submittals.

1.04 WARRANTY

A. Heaters, fans, and louvers shall carry the manufacturer's standard warranty, and all such warranties shall be furnished to the Engineer before final acceptance. See *Paragraph 1.04 of SECTION 15050 BASIC HVAC REQUIREMENTS*.

PART 2 - PRODUCTS

2.01 GENERAL

A. Manufacturer: The manufacturers and model numbers of the fans, louvers and heaters shall be as shown in the Fixture Schedules on the Drawings or approved equal. See SHEET A8 for the Office/ Storage Building and SHEET A13 for the Hatchery Building.

B. Quality: All mechanisms and parts shall be amply proportioned for the stresses which may occur during operation and during fabrication and installation. Individual parts which are alike in all *units* shall be alike in materials workmanship, and design and shall be of the manufacturer's top of the line, industrial-commercial grade.

C. Supports: Equipment and appurtenances shall be firmly anchored or connected to supporting members. Supports required for the proper installation of the equipment, but not forming an integral part of the building structure, shall be provided by the heating and ventilating subcontractor, unless otherwise indicated. Equipment shall be supported on restrained spring-type vibration isolators.

D. Noise/Vibration Control: The system shall be free of any objectionable vibrations and noise. Flexible connections shall be provided in all ducts and piping connections to tans, compressors, and any other vibrating equipment.

2.02 CONTROLS

A. General: Heating and ventilating equipment shall be provided with manual or automatic control systems as indicated. Electric unit heaters shall have unit- mounted contactors unless otherwise indicated and shall be controlled from wall- mounted line voltage heating thermostats.

B. Thermostats: Room thermostats shall be single pole type, provided by the heating equipment manufacturer.

2.03 EXHAUST FANS

A. General: Location, type, capacity, and motor horsepower shall be as indicated. Fans shall be complete with motors, adjustable motor bases, adjustable drives, safety cages, belt guards, flexible connections to supply and/or suction ducts, vibration isolators, and necessary accessories. Fans shall be suitable for continuous operation.

B. Performance: Fans shall be guaranteed to deliver the quantities of standard air against the respective static pressure without deviating by more than 5 percent. Every fan wheel, regardless of size, shall be statically and dynamically balanced and shall be free from objectionable vibration or noises.

C. Bearings: All fan bearings shall be permanently sealed and self-lubricating. Fan bearings shall be rated for a minimum L10 life in excess of 100,000 hours at maximum catalogued operating speed.

D. Fan shafts shall have a critical speed that is at least 25% over the maximum operating speed.

E. Corrosion-Resistant Fans: Fans in corrosive atmospheres shall be of corrosion-resistant construction or shall be coated with a suitable protective coating in accordance with the manufacturer's printed recommendations.

F. Propeller Fans:

1. General: Propeller fans shall be belt or direct drive type with wire basket rear guard. Blades shall be statically and dynamically balanced. Resilient mounted motor. Furnish with combination louver/shutter.

2. Manufacturer: Provide fan by Greenheck, Cook, Penn Barry, or approved equal

3. Wheel: Shall be propeller type with cast aluminum hubs and aluminum airfoil blades

4. Motor: Provide motor with ODP enclosure. Motor shall be accessible for maintenance. Provide ECM motor for direct drive fans.

5. Disconnect Switch: Non-fusible type, with thermal overload protection, factory-wired through an internal conduit. For single phase motors include a control relay with dry contact to indicate running status. Use NEMA 4X enclosure in corrosive or wet environments.

6. Motorized Damper: Provide fans with low leakage motorized damper in compliance with the 2015 WSEC.

7. Speed Control: Use manufacturer's recommended speed control, which varies speed from 50 to 100% of full speed. All fan motors 1/12th HP or greater and less than 1 HP shall be electronically commutated motors (ECM) or shall have a minimum efficiency of 70% when rated in accordance with DOE 10 C.F.R. 431. These motor speeds shall be adjustable.

G. Roof Ventilators:

1. General: Roof ventilators shall be belt or direct drive centrifugal upblast type fans. Fans shall consist of housing, wheel, fan shaft, bearings, motor, drive assembly, curb, flashing, bird screen, and dampers as needed.

2. Manufacturer: Provide fan by Greenheck, Cook, Penn Barry, or approved equal

3. All fasteners and attachments shall be stainless steel.

4. Wheel:

   a. Non-overloading backward inclined centrifugal wheel

   b. Statically and dynamically balanced in accordance to AMCA Standard 204-05

5. Motor: Provide motor with ODP enclosure. Motor shall be mounted on vibration isolators and out of the airstream. Provide ECM motor for direct drive fans.

6. Disconnect Switch: Non-fusible type, with thermal overload protection, factory-wired through an internal conduit. For single phase motors include a control relay with dry contact to indicate running status. Use NEMA 4X enclosure in corrosive or wet environments.

7. Vibration Isolation:

   a. Double studded or pedestal style true isolators

   b. No metal to metal contact

   c. Sized to match the weight of each fan

8. Accessories: Provide aluminum bird screen

9. Roof Curbs: Provide galvanized roof curb with 1 inch thick insulation

H. Ceiling Mounted Exhaust Fans (Bathroom and Locker room Exhaust Fans)

1. General: Ceiling exhaust fans shall be direct-drive centrifugal type consisting of housing, wheel, fan shaft, bearings, motor, drive assemble, and accessories.

2. Manufacturers: Air King, Acme, Barry Blower, or equal

3. Housing: The housing shall be heavy-gauge, removable, spun-aluminum, dome top with outlet baffle; base shall be square one-piece, hinged, aluminum with venturi design fan inlet cone.

4. Wheel: The fan wheel shall be aluminum hub and wheel with backward-inclined blades.

5. Provide fan with NEMA 1 non-fusible disconnect switch with thermal overload protection.

2.04 LOUVERS AND GRAVITY VENTILATORS

A. Manufacturers: Greenheck or equal

B. Structural Performance: Louvers and gravity ventilators shall withstand the effects of gravity loads and the wind loads and stresses within limits without permanent deformation of louver components, noise or metal fatigue caused by louver blade rattle or flutter, or permanent damage to fasteners and anchors.

C. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

D. Join frame members to each other and to fixed louver blades with fillet welds concealed from view welds, threaded fasteners, or both, as standard with louver manufacturer unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

E. Louver Screening: Same kind of metal as indicated for louver.

1. Insect screening: aluminum, 16 x 18 square mesh, 0.011-inch wire, unless noted otherwise.

F. Gravity Ventilator Hood: The hood shall be constructed of aluminum with an interior structure constructed of galvanized steel.

G. Bird-screens: Shall be constructed of 1/2 inch Galvanized mesh.

H. Gravity Ventilator Curb Assembly: Curb assembly shall consist of aluminum curb cap with inlet venturi and pre-punched mounting holes, rubber seal between ventilator and roof curb, and the curb itself which shall be mounted onto the roof with the fan and constructed of galvanized steel. Curb shall have 1-inch insulation.

I. Provide Louvers and gravity ventilators with gravity backdraft dampers

2.05 ELECTRIC HEATERS

A. Finishes: High-Performance Organic Finish: 2-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pre-treat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

B. General: Electric unit heaters and room heaters shall be provided where indicated. Heaters shall be controlled from wall-mounted thermostats, unless otherwise indicated. Brackets shall be provided for ceiling or wall mounting as required. Heaters shall have built-in magnetic contactors and safety devices to meet UL listing, National Electrical Code, and local regulations. Heaters shall be as manufactured by **QMark** or approved equal.

C. Room Heaters:

1. Unit Heaters: Unless otherwise indicated, unit heaters shall be of the fan-forced electric, horizontal type, with enameled steel cabinet, mounting bracket, adjustable horizontal louvers, spiral finned, enclosed heating element, automatic reset overheat protection, thermal protected, permanently lubricated fan and motor, fuses, and contactors. Where unit heaters are supplied with wall-mounted low voltage thermostats, the heaters shall be equipped with control transformers. Electrical characteristics shall be in accordance with electric diagrams on Drawings.

   a. Unit heater fan shall be precision balanced and assembled to be vibration free

   b. Heaters shall have built-in fan delay

   c. Heaters shall have baked-on enamel finish

2. Baseboard Heaters: Baseboard heaters of capacities indicated shall be of the wall mounted type; exposed, semi-recessed, or fully recessed, with mounting boxes, baked enamel or chrome plated cabinets, heating elements with built-in thermostat, fan, safety switches, grilles or louvers. Heaters shall be securely anchored to the structure.

   a. Heaters shall have baked-on enamel finish

2.02 PLENUM-MOUNTED SPLIT SYSTEM AIR HANDLING UNITS

A. Manufacturers:

1. AAON, Inc.
2. Carrier corporation
3. Trane Inc.
4. Or equal

B. Unit shall be a factory-assembled and tested including leak testing of the coils and run testing of the supply fans and factory wired electrical system. Unit consists of a fan and coil section with factory-installed direct expansion coil, filter section, combination filter/mixing box, and access section as indicated on the equipment schedules.

C. Unit Cabinet:

1. All cabinet walls and access doors shall be fabricated of double wall, impact resistant, rigid polyurethane foam panels.
2. Unit insulation shall have a minimum thermal resistance R-value of 6.25. Foam insulation shall have a density of 2 pounds/cubic foot and shall be tested in accordance with *ASTM D-1929* for a minimum flash ignition temperature of 610°F.
3. Unit construction shall be double wall with G90 galvanized steel on both sides and a thermal break.
4. Access to filters, cooling coil, heating coil, supply fans and electrical and controls components shall be through hinged access doors. Stainless steel hinges shall be included on the doors.
5. Access doors shall be flush mounted to cabinetry, with stainless steel removable hinges and quarter-turn, zinc cast lockable handles.
6. Units shall include a 304 stainless steel sloped drain pan. Drain pan connection shall be on the either side of the unit.
7. Cooling coils shall be mechanically supported above the drain pan by multiple supports that allow drain pan cleaning and coil removal.

D. Fan Section:

1. Unit shall include (direct drive,) unhoused, backward curved, plenum supply fans.
2. Blower and motor assembly shall be dynamically balanced and mounted on rubber isolators.
3. Motor shall be a high efficiency electrically commutated motor.
4. ECM driven supply fan cfm setpoint shall be set with factory installed potentiometer within the control compartment.
5. ECM driven supply fan speed shall be controlled with field provided 0-10 VDC control signal.
6. Motor shall be premium efficiency ODP with ball bearings rated for 200,000 hours service with external lubrication points.

E. Cooling Coil:

1. Evaporator Coil shall be designed for use with R-410A refrigerant and constructed of copper tubes with aluminum fins mechanically bonded to the tubes and galvanized steel end casings. Fin design shall be sine wave rippled.
    a. Coil with dual circuits shall have interlaced circuitry.
    b. Coil shall be helium leak tested.
    c. Coil shall be furnished with a factory installed thermostatic expansion valves. The sensing bulbs shall be field installed on the suction line immediately outside the cabinet.
    d. Liquid and suction connections shall be sweat connection. Coil connections shall be labeled, extend beyond the unit casing and be factory sealed with grommets that cover both the interior and exterior of the unit casing, to minimize air leakage and condensation inside the panel assembly.

2. AHU and matching condensing unit shall be capable of operation as an R-410A split system heat pump. Each refrigeration circuit shall be equipped with thermostatic expansion valve type refrigerant flow control. Unit shall be configured as heat pump. Refrigeration circuit shall be equipped with thermal expansion and check valve on the indoor coil. Filter dryer shall be factory provided for field installation.

3. Control valves shall be field supplied, and field installed.

F. Filters:

1. Unit shall include 2 inch thick, pleated panel filters with an ASHRAE efficiency of 30% and MERV rating of 8, upstream of the cooling coil.

G. Mixing Box:

1. Shall contain return air opening and outside air opening.

2. Return air opening shall contain an adjustable, motor operated damper assembly constructed of extruded aluminum, hollow core, airfoil blades with rubber edge seals and aluminum end seals. Damper blades shall be gear driven. Dampers shall be controlled by a fully modulating actuator and shall provide full economizer operation.

3. Outside air opening shall contain an adjustable, motor operated outside air damper assembly constructed of extruded aluminum, hollow core, airfoil blades with rubber edge seals and aluminum end seals. Damper blades shall be gear driven. Dampers shall be controlled by a fully modulating actuator and shall provide full economizer operation.

H. Accessories:

1. AHU shall be provided with a factory installed return air smoke detector.

I. Controls:

1. Unit shall be provided with an external control panel with separate low voltage control wiring with conduit and high voltage power wiring with conduit between the control panel and the unit.

2. Unit controller shall be capable of controlling all features and options of the unit. Controller shall be factory installed in the unit controls compartment and factory tested.

2.03 OUTDOOR PAD-MOUNTED CONDENSING UNIT

A. Manufacturers:

1. AAON, Inc.

2. Carrier corporation

3. Trane Inc.

4. Or acceptable substitution

B. Unit Description: Provide and install as shown on the plans, outdoor pad-mounted, factory assembled, air-cooled scroll compressor condensing units in the quantity specified. Each unit shall consist of an air-cooled condenser section and isolated control compartment containing hermetic scroll compressors, control system, suction and liquid connection valves, and all components necessary for safe and controlled unit operation when connected to the specified low side equipment. Condensing units shall be provided by the same manufacturer as the indoor air handling units described above.

C. Construction:

1. Unit shall be completely factory assembled, piped, and wired and shipped in one section.
2. Unit shall be specifically designed for outdoor application.
3. Paint finish shall be capable of withstanding at least 1000 hours, with no visible corrosive effects, when tested in a salt spray and fog atmosphere in accordance with *ASTM B 117-95* test procedure.
4. The condenser coil shall be mechanically protected from physical damage by painted galvanized steel louvers covering the full area of the coil.

D. Compressor:

1. The compressors shall be sealed hermetic scroll type, with inherent thermal overload protection and shall be mounted on rubber vibration isolators.
2. Each compressor shall be furnished with a crankcase heater.

E. Condenser:

1. The condenser coils shall consist of seamless copper tubes mechanically bonded into plate type aluminum fins. The fins shall have full drawn collars to completely cover the tubes. A subcooling section shall be an integral part of the main condenser coil.
2. The condenser fan(s) shall be propeller type arranged for vertical air discharge and driven by a direct drive fan motor. The fan discharge area shall be equipped with a heavy-gauge fan guard.
3. Fan motor(s) shall be weather protected, single-phase, direct drive, 1100 rpm, open drip-proof type.

F. Refrigerant Circuit:

1. The condensing unit shall operate with R-410A refrigerant. The condensing unit shall be furnished with liquid line filter driers and service valves for liquid and suction connections. The finished field installed refrigerant circuit furnished by the contractor shall include the low side cooling components, refrigerant, thermal expansion valve, liquid line and insulated suction line.

G. Control System:

1. A centrally located weatherproof control panel shall be isolated from condenser coil airflow, and shall contain the field power connection points, control terminal block and control system.
2. Control circuit transformer and wiring shall provide 24V control voltage from the line voltage provided to the unit.

3. Power and starting components shall include fan motor contactors, 5 minute off time delay relay(s) for the compressor(s), inherent fan motor overload protection and unit power terminal blocks for connection to remote disconnect switch. Safety and operating controls shall include a manually reset high pressure switch and an automatic reset low pressure switch. Barrier panels shall be furnished to protect against accidental contact with line voltage when accessing the control system.

H. Wiring Diagrams:

1. Color-coded and marked wiring diagrams shall be provided in both “point-to-point” and “ladder” to match the color and markings of the unit wiring.

2. Diagrams shall be laminated in plastic and permanently fixed to the control compartment door.

3. Installation, Operation, and Maintenance manual shall be supplied with unit within the control compartment.

I. Power Options:

1. Unit shall be provided with phase and brown-out protection to shut down all motors in the unit if the phases are more than 10% out of balance on voltage, or the voltage is more than 10% under design voltage or on phase reversal.

2. Unit shall be provided with a factory installed and wired 115 volt; 12 amp ground fault service receptacle powered by a 1.5 kVA transformer.

PART 3 - EXECUTION

3.01 GENERAL

A. Roughing- In: The Contractor shall ascertain that all inserts, chassis, shafts, and openings are correctly located; if not, cut new openings as part of the work.

B. Installation: Install heating and ventilation equipment in accordance with the manufacturer's written instructions.

1. Louvers: Locate and place louvers and vents level, plumb, and at indicated alignment with adjacent work.

C. Checking: The Contractor shall test and tighten all Work, furnish all equipment necessary to carry out the tests, and thoroughly clean the system before startup.

D. Protection: Repair damaged finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory and refinish entire unit or provide new units.

END OF SECTION 15500

SECTION 15891
STEEL DUCTWORK

PART 1 - GENERAL

1.01 GENERAL

Includes, but not limited to, design, furnishing and installing above-ground ductwork and related items specified below and shown on Drawings.

The Contractor is responsible for the design and installation of the ductwork system per this specification and all related sections of *DIVISION 15*.

1.02 RELATED SECTIONS

A. *SECTION 15000 GENERAL MECHANICAL REQUIREMENTS*.

B. *SECTION 15050 BASIC HVAC REQUIREMENTS*.

1.03 SUBMITTAL REQUIREMENTS OF THIS SECTION

A. Motorized Dampers

B. Duct Sealers

1.04 OPERATION AND MAINTENANCE MANUALS

A. Motorized Dampers

1.05 DEFINITIONS

A. Duct Sizes: All duct dimensions shown are inside clear dimensions. Where inside duct lining is specified or indicated, duct dimensions are to the inside face of lining.

B. Low Pressure System: Velocities less than 2,000 fpm and static pressure in duct 2 inches w.g. or less.

C. Gauges: Steel sheet and wire are U.S. Standard Gauge; aluminum sheet is Brown and Sharpe Gauge.

PART 2 - PRODUCTS

2.01 DUCTS

Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards - Metal, except as indicated. Fabricate of zinc-coated lock-forming quality steel sheets meeting requirements of *ASTM A527-85*, "Specification for Sheet Steel Zinc Coated (Galvanized) by the Hot-Dip Process, Lock Forming Quality", with G 60 coating.

2.02 DUCT JOINTS

General: Duct with sides or diameter up to and including 36 inches shall be as scheduled below.

Max. Side Inches	Required Minimum Metal Gauges Steel, U.S. Standard Gauge	Type of Transverse Joint Connections	Bracing Required
25" to 30"	24	S-drive, 1" pocket or 1" bar slips on 7'-10" centers	1"x1"x1/8" angles 4' from joints

2.03 MOTORIZED DAMPERS

A. General:

1. Coordinate actuator type with Controls Contractor.

2. Damper actuators and actuator linkages shall be mounted in the airstream for all rooftop fans and mounted external of the airflow at all other locations, unless specifically indicated otherwise on plans.

3. Multi section damper assemblies shall be provided with a factory installed common jackshaft.

4. Shall be Class IA.

B. Damper Blades:

1. 18 gauge or equivalent galvanized steel or aluminum with replaceable rubber blade edges, 9 inches wide maximum.

2. 18 gauge, 304 stainless steel when installed in ductwork serving a dishwasher hood.

3. End seals shall be flexible metal compression type.

4. Opposed blade airfoil type.

C. Performance:

Maximum leakage rate shall be 3 cfm/sq. ft. of damper area per 1.0 inch w.g. in accordance with AMCA Standard 500D.

D. Approved Manufacturers:

1. Honeywell

2. Johnson

3. Ruskin

4. Louvers & Dampers

5. Arrow OBDAF

6. American Warming

7. Greenheck

2.04 DUCT SEALANT AND ADHESIVES

A. Duct Sealant technical makeup shall be water based, solvent-free and of the synthetic latex family. Sealants shall be UL 181 Listed, meet all SMACNA pressure and seal classes and be rated to ± 15 inches water gauge. Sealants shall have flame spread of 0 and smoke development of 0 when tested in accordance to *ASTM E-84*. They shall be formulated to withstand working temperatures of -25°F to +200°F. All sealants shall exceed 500 hours under *ASTM C-732* (Artificial Weathering) and pass *ASTM C-734* (Low Temperature Flexibility after Artificial Weathering). All sealants shall be of an elastomeric nature, have a minimum weight of 12 pounds and a minimum solids content by weight of 66% ± 2%. Sealants shall be resistant to cracking, peeling, mold and mildew. Sealants shall also have excellent water and UV resistance. Sealants shall meet FDA, USDA and EPA standards as well as meet NFPA 90A and 90B requirements. Sealant shall be Design Polymerics DP 1010 or DP 1020 duct sealant or equal.

B. Solvent based duct sealant VOC shall be less than or equal to 50 g/l and be UL 723 Classified with a flame spread of 0 and a smoke development of 0. Sealant shall have passed 1000 hours of QUV accelerated outdoor aging testing. Sealant shall be Design Polymerics DP 1090 duct sealant or equal.

1. All traverse joints, longitudinal seams and penetrations in duct systems shall be sealed with duct sealant of the type specified. Spiral lock seams are not longitudinal seams and do not require duct sealant. All sealant shall be applied per the manufactures' recommendations. Joints that are not fully welded shall be sealed. For spiral and flat oval duct slip connections; coat both the female and male ends. The slip connections should then be brushed over with an additional coat 2 to 3 inches wide 20 to 40 mils thick.

2. Seal sealants and joint sealants shall not be used as a substitute for good workmanship. No ductwork will be covered or installed until inspected and pressure tested if necessary.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Ducts:

1. Straight and smooth on inside with joints neatly finished unless otherwise directed.

2. Brace and install ducts so they shall be free of vibration under all conditions of operation.

3. Ducts shall not bear on top of structural members.

B. Motorized Dampers:

Motorized dampers shall be installed in all outside air intakes, exhaust outlets, and relief outlets per Washington State Energy Code and as shown on Drawings.

END OF SECTION 15891

SECTION 16000
GENERAL ELECTRICAL PROVISIONS

PART 1 - GENERAL

1.01 SUMMARY

A. Provisions of the *GENERAL CONDITIONS, SUPPLEMENTAL CONDITIONS,* and *DIVISION 1* of these Specifications are by this reference a part of this division and shall govern work under this division where applicable.

B. This section describes the electrical components such as power services, metering, controllers, timers, relays, disconnects, wire, and conduits. Contractor shall furnish all labor, materials, services, product accessories, equipment, conduits, conductors, devices, tools, and other incidentals necessary, whether specifically shown and/or mentioned, for the completed, fully operational electrical systems shown on the Drawings.

C. Related Work:

1. *SECTION 02220 – EXCAVATION, BACKFILL, & COMPACTION*

2. *SECTION 15050 – BASIC HVAC REQUIREMENTS*

3. *SECTION 15300 – PUMPS*

D. Contractor shall pay for all permits, inspections, and other costs associated with the electrical installations, except that any utility charges shall be paid direct to the utility company by the State.

1.02 REFERENCES AND CODES

A. The completed installation shall comply with all applicable requirements of the latest edition of the *National Electrical Code*, *State of Washington Electrical Code*, and the requirements of any local codes or requirements of the serving utility effective at the construction site. Where conflicts arise between Drawings, Specifications, and code requirements, the code shall prevail UNLESS the Drawings or Specifications are more stringent.

B. Specified references governing the work of this division include the *National Electrical Code (NEC), Underwriters Laboratories Inc. (UL), American National Standards Institute (ANSI), National Fire Protection Association (NFPA), American National Standards Institute (ANSI), and National Electrical Manufacturers Association (NEMA).*

1.03 DEFINITIONS

A. The term “provide” shall mean furnish, install, and connect equipment and materials complete in operating condition.

B. The term “approved” as used herein shall mean the written approval of the Engineer.

C. The term “Drawings” as used herein shall mean all Contract Drawings for all divisions of work.

D. The term “code” as used herein shall mean all applicable national, state, and local codes.

E. The term “listed” as used herein shall refer to the definition in the latest edition of the *National Electric Code* and Washington Administrative Rules.

1.04 DESIGN REQUIREMENTS

A. Contractor shall inspect the jobsite before submitting a bid and become familiar with existing conditions that will affect the work. The electrical layouts indicated are generally diagrammatic. The locations of outlets, fixtures, and other equipment and devices are approximate unless dimensioned. The actual location and routing of conduits, fixtures, conductors, etc. may be governed by structural conditions, physical interferences, or location of electrical terminations on equipment. Minor relocations ordered by the Owner or Engineer or required for actual installations shall be made without added costs. Major relocations shall have prior written approval from the Owner or Engineer before the changes are made in the field. All items not specifically shown on the Drawings, but obviously required to obtain a safe, workable installation shall be included without direct reference.

B. Drawings and Specifications are complementary: What is called for in either is binding as if called for in both. In case of conflict within the Drawings and Specifications, the Contractor in bidding shall select the most expensive method. The Owner or Engineer will select the method to be taken.

C. Conduits, conductors, equipment, and devices shown on the Drawings are the minimum required. The Electrical Contractor shall interface with the Mechanical Contractor to ensure and provide for the adequate connection and operation of the equipment specified.

D. Where alterations, power interruptions, or repair of existing service is involved, the existing service or circuit shall be kept in operation while the new one is installed, or repair is complete. Only after the new or repaired service is in operation shall the temporary service be removed.

E Where alterations or replacement of an existing standby system is involved, a temporary system, sized to carry the minimum load needed, must be in place during the work until the completed system is operational and tested to be reliable.

F. Power interruptions must be coordinated with and approved by the WDFW facility manager. No equipment is to be removed or de-energized without the manager’s consent.

1.05 SUBMITTALS

A. General submittals for this division shall be in accordance with the *GENERAL CONDITIONS* and include all switch gear, transfer switches, generators, equipment, controllers, switches, disconnects, receptacles, plugs, panels, controllers, fixtures, conduit, conductors, support devices, and other items as designated by the Owner or Engineer.

B. Provide “Shop Drawings” for special systems, Contractor designed solutions, complex assemblies, or where the execution significantly deviates from the Contract Documents. The Owner may request Shop Drawings for any installation that is determined to need such clarification.

1.06 QUALITY ASSURANCE

A. All materials supplied by Contractor shall be new, free from defects, and of the quality specified or shown, and be approved and listed by *Underwriter's Laboratories* for the purpose for which it is to be used. Similar types of materials shall be of the same manufacturer and quality throughout the work.

B. Before final acceptance, Contractor shall instruct the facility staff on the proper operation and maintenance of all mechanical systems, equipment, and controls under this Contract. A qualified technician for each component of this installation shall be made available by the Contractor for this instruction.

1.07 DELIVERY, STORAGE, AND HANDLING

All materials shall be shipped, stored, and handled in a suitable manner to prevent damage. Defective equipment, or equipment damaged in the course of installation or testing shall be replaced or repaired by the Contractor. Failure of the Contractor to protect or properly repair the installation and equipment may be grounds for rejection of the installation or equipment.

1.08 PROJECT AND SITE REQUIREMENTS

Not Used.

1.09 AS-BUILT RECORD DRAWINGS

A. Continuously maintain a field set of as-built drawings to indicate all significant deviations from the original design and the actual placement of equipment and underground conduits. Location of conduit stubouts shall be dimensioned from accepted reference lines. Changes shall be shown in red colored pencil while work is in progress. This “As-Built” set shall be clearly marked *“AS-BUILT RECORD DRAWINGS – DO NOT REMOVE FROM OFFICE.”*

B. As-built prints shall be updated regularly and checked each week by the Project’s Inspector.

C. “As-Built Record Drawings” and “Corrected to As-Built” prints shall be delivered to the Owner.

1.10 ELECTRICAL EQUIPMENT OPERATION AND MAINTENANCE (O&M) MANUALS

A. Prepare 3 copies of O&M manuals that contain operating and maintenance information, replacement parts list, shop drawings, wiring diagrams, and equipment test data for all equipment and systems installed under this Contract. Manuals shall be organized as follows:

1. All information contained in the manuals shall be grouped by Specification section categories. The manual shall be provided with a typewritten index identifying divider tab to facilitate future references.

B. Provide digital PDF files of all O&M manuals and documents listed above, organized in separate folders for each piece of equipment, assembly, or area of construction.

1.11 ELECTRICAL IDENTIFICATION

A. Nameplates shall be made of 1/16 inch thick, machine-engraved, laminated plastic having white letters not less than 3/16 inch high on black background. Equipment titles shall be completely spelled out on nameplates as shown on the Drawings. The nameplate schedule with line distribution shall be submitted for review and acceptance before engraving. Nameplates shall be secured to the panels with stainless-steel drive screws. Individual devices on control panel faces shall be suitably identified with a nameplate having 1/8 inch high characters, or with standard right nameplates for pushbuttons.

B. Each motor controller, control station, panelboard, or its field panel shall have a nameplate designating the function of the equipment controlled. Each motor shall have a corresponding nameplate matching its controller.

C. Relays and other control devices within panels shall be suitably identified by a legible, permanent means, such as painting or self-adhesive markers.

D. All wiring terminations shall be color-coded and/or labeled using self-adhesive markers.

E. All wires and spare conduits in handholes shall have permanent nameplates attached with tie wires around each set of individual feeders to identify them.

F. Switches for use with hatchery water alarm controls shall have nameplates engraved “Water Alarm” and have on and off identification.

1.12 GENERAL INSTALLATION AND WORKMANSHIP

A. Contractor shall cooperate with other contractors engaged in the project and shall execute work in a manner so as not to interfere with other contractors or Owner’s operation. Work shall be coordinated with other contractors regarding location and size of pipes, raceways, ducts, openings, switches, outlets, disconnects, controls, etc., so there is no interference between installation or progress of other contractors.

B. Contractor shall install all equipment with ample space allowed for removal, repair, or changes to equipment. Provide ready access to removable parts of equipment and to all wiring without moving equipment installed or already in place; and provide access panels for all devices installed above nonaccessible ceilings, or within walls or partitions. Contractor is also responsible for installing an outlet and area lighting where equipment is to be serviced.

C. Contractor shall provide sleeves for all electrical conduits passing through walls, partitions, ceilings, and floors. The sleeves shall be of enough length to extend through full thickness of wall construction with ends flush. Extend floor sleeves 1 inch above finish floor.

D. In mechanical and electrical equipment spaces, Contractor shall locate ceiling outlets and conduit with due consideration to ventilating ducts and mechanical piping. Where numerous ducts occur, install conduits and outlets after ventilating ducts. Puncturing of ductwork or hanging equipment such as light fixtures, ceiling hangers or conduits from ductwork is prohibited, unless specifically noted otherwise.

E. Where cutting is required to facilitate construction, Contractor shall patch, and repair cut items to original state. Do not cut structural work without prior written approval of the Owner or Engineer. Cut holes through concrete and masonry in new and existing structures with a diamond core drill or concrete saw. Pneumatic hammer, impact electric, hand, or manual hammer type drills are not allowed, except where specifically permitted by the Owner or Engineer. Lay out holes in advance. Notify the Engineer prior to drilling through structural sections for determination of proper layout.

F. Where conduits, wire ways, busducts, and other electrical raceways pass through fire partitions, firewalls, or walls and floors, contractor shall install a fire seal that provides an effective barrier against spread of fire, smoke, and gases to maintain integrity of rating of partition wall or floor. Pack fire seal material tightly, and completely fill clearances between raceways and openings.

G. Contractor shall make floor, exterior wall, and roof seals watertight. Contractor shall sleeve walls and floors that are cored for installation of conduit with steel tubing, grouted and spaced between the conduit and sleeve filled as specified herein.

PART 2 - PRODUCTS

2.01 MATERIALS

Acceptable Manufacturers: All manufacturers that meet Washington State administrative laws and rules having *UL* rated equipment are acceptable.

2.02 METHODS

All work shall be completed by competent craftsmen, skilled in the specific work to be done. Equipment and material shall be installed in a neat and workman-like manner, following the best practice of the trade.

PART 3 - EXECUTION

3.01 COOPERATION

Contractor shall cooperate with other contractors engaged in the project and shall execute work in a manner so as not to interfere with other contractors' or Owner's operation. Work shall be coordinated with other contractors regarding location and size of pipes, raceways, ducts, openings, switches, outlets, disconnects, controls, etc., so there is no interference between installation or progress of other contractors.

3.02 ADJUSTING AND STARTUP

A. Before final acceptance, Contractor shall instruct the facility staff on the proper operation and maintenance of all mechanical systems, equipment, and controls under this Contract. A qualified technician for each component of this installation shall be made available by the Contractor for this instruction.

B. Contractor shall submit bound sets of equipment manuals and operating instructions to the Owner. The manuals will consist of complete descriptive data pertinent to all fixtures, equipment, control valves, and automatic controls as well as diagrams, including a complete list of repair and replacement parts essential to maintenance and general servicing of all equipment. The operating instructions in conjunction with the maintenance manuals shall include written step-by-step detail of startup and shutdown procedures.

3.03 CLEANING AND PROTECTION

A. Contractor shall, at project completion, clean all equipment to the original finish, including removing all shipping labels.

B. Contractor shall paint conduit and other electrical equipment where specified and touch-up painting of all equipment marred in any way during shipment or installation.

END OF SECTION 16000

SECTION 16050
BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1.01 SUMMARY

This section includes all raceways, fittings, hangers, wire, cable and terminations, and wiring devices, plates, and other appurtenances required for a complete and operational installation.

PART 2 - PRODUCTS

2.01 CONDUITS AND RACEWAYS

A. All underground and in-slab raceways shall be *Schedule 40* or *Schedule 80* PVC electrical conduit unless the code requirement, Owner or Engineer specify otherwise, or if it is subject to severe physical damage. Raceway emergence from the ground or through the cement slab shall be Galvanized Rigid Steel (GRS) up to the equipment it supplies, unless vibration dictates the use of liquid-tight flexible metal conduit. Outside above ground raceways shall be GRS unless otherwise noted on the Drawings. Electrical metallic tubing may be used in interior work to the extent permitted by code, and as described in the Drawings & Specifications.

B. Surface metal raceways and wireways shall be rigid metal with hinged or screwed cover, painted steel, UL listed for their purpose, and rated for the environment where installed. Wireways shall have field drilled conduit openings (NKO).

C. Flexible metal conduit, flexible non-metallic conduit, liquid-tight flexible conduit and cable will be allowed only when specifically shown or approved by the Owner or Engineer.

D. CONDUIT BODIES (Condulets: LB, LR, LL, T, C) shall be malleable iron with cover and gasket designed for the fitting. “Die-cast” or “pot-metal” condulets are not permitted. The condulet shall be properly sized for the conductors it contains.

2.02 FITTINGS

A. Galvanized Rigid Steel (GRS) fittings, couplings, and connectors shall be galvanized malleable iron or non-corrosive alloy compatible with galvanized conduit and have threaded connections. Erickson couplings, watertight split couplings (OZ type or equivalent) are permitted. Running-thread or setscrew type fittings are not permitted. Install insulating plastic bushings on all threaded conduit ends

B. EMT fittings, couplings, and connectors used in damp or wet locations shall be rain-tight, steel or malleable iron type utilizing a split corrugated compression ring and tightening nut or stainless steel locking disk. Steel setscrew fittings are permitted in dry locations (not in wet locations or in concrete). Zinc, pot metal, die cast fittings, and indenter fittings are not acceptable.

C. PVC fittings, couplings, and connectors shall be full weight cementable type.

D. Conduit fittings and supports are not shown on the Drawings. Contractor shall provide all fittings and supports required to suit the conditions.

2.03 CONDUCTORS

A. All conductors shall be copper (no aluminum), unless otherwise approved by the Owner or Engineer. *Size No. 8 AWG* and larger conductors shall be insulated, soft-drawn, *Class B* stranded copper. Minimum conductor size shall be *No. 12 AWG* unless otherwise noted. Insulation shall be *Type THHN*, *THWN-2, USE-2, or THW-2, XHHW*, 600V, minimum rated 90°C, and be color coded in a consistent manner. Direct-burial underground power cables shall be No. 12 and larger, 600-volt, *NEC Type UF* or *USE.* Conductors shall not be direct buried unless approved by the Owner or Engineer. *Romex* (nonmetallic sheathed cable) of the grounding type may be used for residential wiring when used in compliance with *NEC and WAC* code requirements. Flexible Cords shall be *UL* listed for outdoor use and allowed only when approved by the Owner or Engineer.

B. Conductors shall have colored insulation, except wires larger than No. 6 may be black with colored tape identification at all terminations and splices. Additional colors may be used where such colors will help in identifying wires and different systems. Where conductors of different systems are installed in same raceway, box, or other type enclosure, comply with *NEC 300.3 (C) (1)*. Color-coding of phase conductors shall be accomplished with colored tape approved by Engineer for sizes larger than *No. 6 AWG*. Identify control wires at each end and in all junction boxes, handholes, panels, switchboards, and other enclosures with designated wire number corresponding to control schematics.

2.04 SPLICES AND JOINTS

A. Splices above grade shall be in junction or outlet boxes only, using factory manufactured, insulated-wire connectors as stated below.

1. Wire No. 10 or Smaller: Pre-insulated twist-on-type spring connector (Wire Nuts). (*3M*, *Ideal,* or equal).

2. Wire No. 8 or Larger: Pre-insulated Mechanical Connectors. ILSCO PBTS (or equal). Other methods require Owner or Engineer approval.

3. Terminator Lugs of No. 10 Wire and Smaller: Insulated, spade-type, tool applied eye connectors.

B. Underground feeder and branch circuits shall be pulled continuous without splices unless otherwise shown or approved. No direct burial splices shall be made without prior approval. Necessary and approved splices shall be made in handholes by one of the following methods:

1. *Ilsco, NSI or equal Mechanical Watertight Underground Splice Kits. Ilsco USPA-SS, or SS SSK. NSI "Polaris Blue" or ISPB, ISPC Series.*

2. Solderless connectors (Ilsco “SPA” or equal) overlaid with rubber splicing tape to 2½ times the original insulation thickness, and then covered with 2 half-lap layers of *Scotch No. 33* or equal electrical tape. The completed splice shall then be sealed with Heat-Shrink type insulating cover (Ideal TS-46 or equal) approved for direct bury. In multi-conductor cables, each conductor shall be spliced, with splices staggered, and then all splices double half-lap wrapped with both rubber and electrical tape and sealed.

3. Direct bury or Handhole connector for wire size 10 *AWG* and smaller: Insulated steel spring twist-on presser connector with plastic cap with prefilled sealant gel listed for the purpose. (Ideal Weatherproof Wire-nut or equal) Approved Mechanical splice kits may be used for multi-wire cables. Treat connections with oxide inhibitor and seal with Heat-Shrink sleeve.

2.05 SEALING

A. Fire Seal: All seals must meet with the approval of the local Fire Marshall. Seal penetrations of fire-rated walls, floors or ceilings by raceways for compliance with *NEC*. Fill void around raceway. Sleeves shall be heavy wall steel pipe, anchored to building Construction, and finished plumb with wall, ceiling, or floor lines. Acceptable products: *Dow Corning Corp. – Fire Stop*, *Three M Co. – Fire Barrier*, or another approved sealant. Smoke and fire-stop fittings may be used instead of the above sealant.

B. Thermal Seal: Seal penetrations of thermally insulated equipment or rooms to prevent heat transfer. Seal exterior of raceway with fiberglass or other material compatible to equipment or room and approved by the Engineer. Seal interior or raceway with duct sealing compound at entry to equipment or room.

C. Water Seal: Seal penetrations of perimeter walls or floors below grade to prevent entry of water. Use materials compatible with wall or floor construction and approved by the Engineer. Penetrations of roof shall be sealed with flashings compatible with roof design and approved by the roofing system manufacturer and the Engineer.

2.06 BOXES AND ENCLOSURES

A. Boxes include outlet, pull, and junction boxes. Size as required by *NEC, or as shown. Whichever is larger*. In dry locations, boxes shall be galvanized sheet metal. In outdoor and wet locations, boxes shall be weatherproof with weatherproof covers and threaded hubs.

B. Handholes for buried conduit shall be precast concrete with steel top covers, unless otherwise noted on the Drawings. The covers shall be fabricated from galvanized steel diamond plate and have provisions for grounding the cover and ring. The entire assembly shall be designed with *AASHTO HS-20* design loads. Handholes shall be *Old Castle or Fog-Tite* manufacturer, or equal, and correctly sized for the quantity and size of the conduit and wire installed. . Vaults or Handholes for primary voltage cables must meet local utility standards.

C. Alarm, cable, and telephone handholes shall be *Fog-Tite #J-11A*, *Type 1 C*, *D*, *G*, or rated equal.

D. All handholes shall be permanently marked on the cover by welded symbology with the intended use: *ELECTRICAL (ELECT)*, *TELEPHONE (T)*, *ALARM (A)*, or *CABLE (CTV)*.

2.07 SWITCHES

Switches shall be commercial grade 20-amp/125-volt toggle-type, *Hubbell*, *Leviton,* or other approved type unless called out as special.

2.08 RECEPTACLES

A. General purpose receptacles shall be commercial grade straight blade, 3-wire, safety-grounded, duplex type, 20-amp/125-volt, *Hubbell*, *Leviton,* or other approved type, except where called out as special. GFI-type receptacles shall have an automatic trip device and a sensing and testing circuit. Individual GFCI receptacles shall be 15-amp with 20-amp feed-through rating, unless called out as special.

B. Outdoor receptacles shall be W/R rated. Tamper-proof receptacles are NOT permitted, except where required by applicable codes.

2.09 CIRCUIT AND MOTOR DISCONNECTS

All circuit or motor disconnects shall be of the circuit breaker type (no fuses). Enclosures shall be of the proper type for the intended location, or as indicated on the Drawings.

2.10 SUPPORTING DEVICES

A. Suspended Conduits Less Than 1½ Inch: For exposed construction, provide strap-type hangers supported from beam clamps or threaded rods. For conduits suspended above ceilings, anchor to building structural steel. When span exceeds *NEC* limits, provide channel steel between framing members. Tie wiring of conduit to air ducts or other piping is not permitted. Plumber's perforated strap is not permitted.

B. Suspended Conduit 2 Inch or Larger: Provide threaded rod with "U"-type hangers for single conduit. Anchor threaded rod to inserts in concrete or beam clamp on steel structure. Provide trapeze hanger assemblies and threaded rod for 2 or more conduits. Adhere to all applicable seismic support requirements.

C. Surface Mounted Conduit: Provide 1-hole galvanized steel straps for conduits 1 inch or less. Provide clampbacks on exterior walls below grade or in wet areas. For conduit larger than 1 inch, use malleable iron pipe straps. For multiple conduits, provide channel anchored to wall with conduit attached to channel with split pipe (strut) clamps.

PART 3 - EXECUTION

3.01 INSTALLATION OF CONDUIT, RACEWAYS, AND FITTINGS

A. Install conduits and raceways concealed in construction of finished spaces unless noted otherwise on the Drawings or specifically approved in writing by the Owner or Engineer. Exposed conduits and raceways shall be run parallel to, and at right angles to building lines and mounted in the least obvious locations, unless otherwise approved.

B. Conduits and raceways shall be continuous from outlet to outlet, and from outlets to cabinets, pull or junction boxes, and shall be secured to all boxes with locknuts, and bushings installed in such a manner that each system shall be electrically continuous throughout. Stubbed conduit ends shall have a manufactured end cap to prevent entrance of foreign materials during construction.

C. Joints shall be cut square, reamed smooth, and drawn tight. Bends or offsets shall be made with standard conduit ells; field bends made with a bender or hickey, or hub-type conduit fittings. Number of bends per run shall conform to *NEC* limitations. Bends shall conform to *NEC* radius requirements and shall not have kinks or flat spots.

D. Install galvanized rigid steel (GRS) for all conduits upon emergence from ground (from minimum 6" below finished grade or floor to related equipment enclosure), up through concrete slab, and where subject to physical damage, and as noted on the Drawings. Metallic conduits in direct contact with earth, or concrete shall be wrapped in 10mil "pipe-wrap" with 1/2 minimum overlap. Exposed conduits installed below 8 foot AFF in Hatchery Incubation areas, attached to exterior structures, and in damp or wet locations shall be GRS, except as approved in writing by the Owner or Engineer. Connections shall be watertight in damp or wet locations. EMT may be installed for wiring in masonry block, in framed construction, furred ceilings, above suspended ceilings, and exposed unfinished dry location spaces not subject to physical damage. EMT shall not be installed underground, in direct contact with earth, or under/encased in concrete slabs.

E. Where possible, practical, or shown; service entrance, feeder, branch, and limited energy conduits shall be installed underground or under slab, per best practices. If the opportunity is available for under slab or underground installations, and the Contractor elects not to use that method, notify the Owner or Engineer in writing of that intent BEFORE surfaces are closed. The design intent may be for under-surface installation, even if not specifically called out in the documents.

3.02 FLEXIBLE CONDUIT

A. Provide metallic liquid-tight-flexible (LTF) conduit connections to motors, transformers, and equipment subject to vibration with adequate slack to allow for isolation and flexibility. Use LTF for all pumps, motors, and equipment that require a flexible connection in wet or damp locations. Provide bonding jumper as required by *NEC*.

B. Type MC cable may be used from junction boxes to fixtures in concealed ceiling areas in lengths not to exceed 8 feet or as specifically called out in the Drawings. Any other use of armored cable must be approved by the Owner or Engineer.

C. Steel or aluminum flexible metallic conduit shall only be used in dry, exposed locations with written approval of the Owner or Engineer.

3.03 UNDERGROUND INSTALLATIONS

A. All trenching and backfilling shall be Contractor supplied. Trenching for underground services shall be as required by the serving utility. All other distribution line trenching shall be as required by code and as shown on the Drawings. General trenching, backfilling, and compaction shall be as described in *DIVISION 2 – SITEWORK*. Appropriate bedding and backfill material approved by the Owner or Engineer shall be used.

The Contractor shall coordinate backfilling of incoming service lines with utility company personnel. Yellow or red warning tape shall be installed over all underground runs 12 inches above the electrical installation. Surface of warning tape shall be labeled with the words "*CAUTION – BURIED ELECTRICAL CABLE*" printed on it.

B. Ground shall be excavated in open trenches to the width, depth, and direction necessary for the proper installation of the underground work. Burial depth of underground raceways shall not be less than *NEC* minimums and shall be deeper where so noted herein or required to avoid conflicts. Maintain all trenches and excavations free of standing water. Conduit shall be bedded firmly and continuously on sand or pea gravel and provide a minimum of 6 inches of covering of sand or pea gravel on all sides of conduit prior to final backfilling.

C. Handholes shall be installed with top of handhole set flush with top of finished grade. All entrances to handholes shall be suitably sealed to prevent the entrance of foreign material. Handholes & Vaults shall be installed square with adjacent structures, fences, roads, etc.

D. Galvanized rigid steel and PVC are acceptable for underground use where permitted by code. Metallic conduits in direct contact with earth, or concrete shall be wrapped in 10mil "pipe-wrap" with 1/2 minimum overlap. Provide code-sized ground wire in all underground conduits. Conduit emergence into handhole may be PVC unless the run is over 300 feet; then all 90° bends shall be rigid steel.

E. Arrange and slope conduits entering buildings to drain away from the point of entry, or if impractical, provide for the drainage of water entering the building through the conduit system.

F. Conduits passing through the exterior walls below grade and/or bridging areas of naturally unstable soil conditions or previously filled areas shall be placed in a manner to avoid crushing from ground settlement. Backfill under conduit shall be thoroughly compacted. Use approved deflection/expansion fitting on conduits such as *OZ type DX*.

G. Conduits in the foundation area shall be installed so as not to undermine the footings. Install all inserts and sleeves necessary for *DIVISION 16* installation prior to pouring of concrete slabs and walls. Check structural Drawings for any specific instructions. Backfill over conduits, under footings, and concrete slabs shall conform to the requirements of the Structural Engineer. Use lean concrete unless otherwise noted.

H. Minimum spacing between conduits in trenches shall be 1 inch.

I. Locate all underground utilities before any excavation is attempted, including but not limited to power utility, telephone, gas, water, cable, alarm, and secondary service laterals.

3.04 CONDUCTOR INSTALLATION

A. Do not pull any cable or wire in a raceway until conduit system is complete and internal raceway has been cleaned. Strain on cables shall not exceed manufacturer's recommendations during pulling. Pulling shall be done from the conductor and not by the insulation. Use pulling lubricant compatible with insulation and covering that will not cause deterioration of insulation or jacket covers of cables or conductors.

Do not make splices except in outlet or junction boxes. Make all feeder cables continuous from origin to panel or equipment terminations without running splices in intermediate pull or boxes, unless specifically indicated on the Drawings or approved in writing by the Owner or Engineer.

B. All wire shall be stranded copper, #12 AWG minimum, unless otherwise shown on the Drawings. Do not exceed conduit fill established by *NEC*.

C. Provide each cable or conductor in panels, pull boxes, or troughs with a permanent pressure-sensitive label with suitable color, numbers, or letters for easy identification. Identify control wires at each end and in junction boxes with designated wire numbers corresponding to control schematic drawings.

D. Provide wires and cables entering equipment, junction boxes, or panels with enough slack to eliminate stretched, strained, or angular connections. Neatly arrange wiring bundle and fan out to termination points using cable ties, if practical. Make minimum bending radius for conductors in accordance with *NEC*. Leave at least 6 inches of conductor at each outlet for installation of devices or fixtures. Conductors NOT connected to a device or fixture shall be neatly tucked into box with wires identified, junctioned circuits connected, and/or ends capped.

E. Upon completion of cable and wire installation, but before termination to equipment, test each wire for grounds and short circuits. Replace or correct defective wiring.

3.05 SEALING RACEWAY INSTALLATIONS

A. For concrete exterior wall surface above grade, cast raceway or sleeve in wall or core drill wall and hard pack with Non-Shrink Grout. Seal around all penetrations with caulking approved for exterior use. Seal interior of all conduits that enter the building through floor, roof, or outside walls that may carry water into the building. Seal on the end inside the building using duct-sealing mastic, nonhardening compound type, specifically designed for such service. Pack around wires in the conduit.

B. For exterior surface below grade, cast raceway into wall/floor or use manufactured seal assembly cast in place. *OZ Type FSK* or equal. Change from PVC to steel conduit (couplings or bushings) where necessary to obtain a watertight seal in poured concrete wall or floors. For exterior wall penetrations below grade, install *OZ Type CSB* sealing bushing at interior end of penetrating conduit. Only threaded fittings are permitted in entering conduits ahead of the sealing bushing. Provide for water drainage so no electrical problems will result if seals leak.

3.06 INSTALLATION OF BOXES AND ENCLOSURES

A. The location of all boxes and enclosures shall be coordinated prior to rough-in.

B. Inside of structures with finished surfaces, boxes and enclosures shall be recessed, unless otherwise noted on the Drawings. Face of box (or extension ring) shall be flush with wall finish, plumb, have all unused openings closed with knockout closures, and be accessible.

C. Outside boxes and enclosures shall be mounted on galvanized racks, secured to structures or embedded in concrete and be rated for their location. Enclosures mounted on structures shall be mounted with reversible anchors (“wedge anchors” or inserts with bolts). Lead “drive-pins” are not permitted.

3.07 SWITCHES, RECEPTACLES, AND OTHER DEVICES

A. Rigidly fasten each switch, receptacle, or device to the box. Set plumb & level with the structure lines and at proper position with the wall or surface to bring receptacle flush with plate or switch handle the proper distance through the plate. Covers, plates, or enclosures shall be of the correct type for the location, box type, and device, installed as required, or as called for on the Drawings, and fit tight without gaps or strain.

B. Set switches vertical, with handle operating vertically, with the up position being “ON.” Switches and receptacles shall be wired with the wire looped clockwise and fully seated under the head of the terminal; no stab-type connections allowed. Provide bonding wire between receptacle grounding terminal and box (all devices). Devices rated as “grounding” will not be an acceptable substitute for a wired ground connection.

C. Set switches 48 inches above finished floor, and receptacles 18 inches above finished floor to the top of the box, unless otherwise noted on the Drawings or required by ADA.. Height may vary slightly to accommodate construction. All devices of the same type in any one room shall be installed at the same height, unless otherwise noted on the Drawings. Devices for special equipment shall be mounted as to be readily accessible.

D. Receptacle devices shall be pigtailed to circuit wiring, allowing continuous feed-through operation. (Do not feed through the device).

3.08 DISCONNECTS

A. All circuit or motor disconnects shall be of the circuit-breaker type (no fuses). Enclosures shall be of the proper type for the intended location or as indicated on the Drawings.

B. Make all final connections to motors and equipment with liquid-tight-flexible (LTF) conduit. Provide ground wire to motor frame. Adequately support conduit at each motor or piece of equipment.

C. Manual overload resets shall be coordinated to reset the device without opening the door.

3.09 SUPPORTING DEVICES

A. Provide channels, angles, and trapeze and metal supports where indicated, or as required for the proper support of equipment. Unless otherwise indicated on the Drawings, supports shall be galvanized or stainless steel. Use galvanized fittings, bolts, and nuts. Where welding is necessary, the welds shall be cleaned, given a prime coat of zinc chromate, and finished to match the existing paint in type and color.

B. Support conduits by pipe straps, wall brackets, hangers, or ceiling trapeze and within 2 feet of box, couplings, and each side of offsets or bends. Horizontal and vertical conduit runs shall be supported by 1-hole, heavy-duty, malleable iron straps, clamp backs, or other devices with suitable bolts, expansion shields (where needed), or beam-clamps for mounting to building structure or special brackets. Support flexible conduit within 12 inches of every outlet box or fitting.

C. The use of perforated straps or wire for supporting conduits is prohibited. Beam clamps shall be bolted to structure or secured by integral bolt-clamps. “Drive-on” clip-style supports shall only be used within finished walls. They are not permitted for exposed work.

D. In existing concrete slabs and walls, utilize drilled-in threaded inserts (wedge anchors), installed as recommended by the manufacturer where additional supports are required. Neatly core drill openings where additional sleeves are required.

END OF SECTION 16050

SECTION 16060
GROUNDING & BONDING

PART 1 - GENERAL

1.01 SUMMARY

A. Provide a code compliant Grounding and Bonding system throughout the project. The Contractor is responsible for complying with all applicable local, state, and national codes and laws, whether or not all elements are specified or shown in the Drawings or Specifications.

B. This Section includes grounding of electrical systems and equipment and basic requirements for grounding and bonding for protection of life, equipment, circuits, and systems. Grounding requirements specified in this Section may be supplemented in other Sections of these Specifications.

1.02 RELATED WORK

SECTION 16050 BASIC MATERIALS AND METHODS

PART 2 - PRODUCTS

2.01 MATERIALS

A. Governing Requirements: Where types, sizes, ratings, and quantities indicated in the Specifications are in excess of NEC requirements, the more stringent requirements and the greater size, rating, and quantities shall govern.

B. All Grounding and Bonding equipment and products shall be NEC and UL 467 compliant.

C. Equipment Grounding Conductors (EGC) in conduit shall be stranded copper THHN with continuous green colored insulation. Install a code sized EGC in all conduits.

D. Grounding Electrode Conductors (GEC) #4 or larger shall be stranded bare copper. #6 or smaller shall be solid bare copper.

E. Ground Rods shall be minimum 5/8 inch x 8 foot Galvanized steel or copper.

PART 3 - EXECUTION

3.01 CONDUCTOR SIZING

A. Equipment Grounding Conductors (EGC) and Grounding Electrode Conductors (GEC) shall be sized according to the applicable tables in NEC Article 250, unless the size shown in the Drawings or Specifications is larger. The larger size shall, then, be used.

B. Contractor shall review the Drawings prior to purchase and installation of materials. Any discrepancies between code requirements and design shall be brought to the Owner's attention before purchase and installation, for resolution.

3.02 APPLICATION, INSTALLATION

A. ALL concrete structures on the premises shall be provided with a means to attach a compliant GEC to the structural reinforcing bar (rebar). The Contractor shall coordinate with the appropriate trade to assure that connection means are provided prior to encasement. If the rebar connection is concealed, it shall be the Contractor's responsibility to have the connections inspected by the authority having jurisdiction (AHJ).

B. Provide an appropriate EGC or GEC connection to building structural steel, metallic siding, and/or metal piping, as required or shown. All connection points shall be readily accessible. Where connecting to dissimilar metals, use appropriate connection materials and methods to prevent corrosive electrolysis. Bare or score painted metal at points of contact.

C. Provide appropriate means to connect an EGC to handrails, ladders, metallic walkways, rails and embeds in areas that have line voltage power equipment or devices and have a likelihood of becoming energized as defined by the NEC.

D. Underground or underslab conduits specifically for EGC or GEC are not shown. Contractor is responsible for coordination and installation of these raceways if needed.

E. Parallel Feeders shall have an EGC in each conduit sized for the current rating of the entire circuit, as required in NEC 250.122 (F)

F. Provide a listed EGC grounding pigtail in every metallic box, whether required by code, or not. This includes limited energy and communication boxes. Connect to EGC conductors entering the box. Connect to all devices provided with, or requiring an EGC connection point

3.03 CONDUCTOR SUPPORT

A. Exposed EGC or GEC conductors shall be adequately supported along their entire length to, at least, code minimums. Where additional support is needed for a neat installation, or for physical protection, Contractor shall do so at no additional cost to Owner.

B. Conductors shall be supported by listed and approved means. Screws or fasteners shall be galvanized or stainless steel. "Zip-Ties" shall be heavy-duty UV rated. Straps shall be listed for the purpose and environment in which they are installed. Conduit used for support shall be non-metallic electrical PVC, schedule 40 minimum. Schedule 80 where physical protection is required. Conduits shall be supported at code minimums or better.

3.04 NETWORK / TELECOM

A. Provide a "Telecommunications Main Grounding Busbar" (TMGB) for each Telecom, data, or network backboard that is shown on the contract Drawings. Install on or adjacent to backboard. Coordinate location with Owner, Engineer and/or Telecom installer. Provide and install a #4 Bare Copper Conductor to the TMGB from the nearest appropriate grounding junction point.

B. #6 Bare Copper conductor connected to the GEC shall be provided within 3 foot of any Communication Utility interface planned for a WDFW residence or structure in the project. If the ground rod GEC is not in this space, install an additional wire connected to the GEC and supported by approved means to the required area. Coordinate, as needed, with the Utility.

END OF SECTION 16060

SECTION 16400
SERVICE AND DISTRIBUTION

PART 1 - GENERAL

1.01 SUMMARY

A. The system shall consist of all electrical service, feeder, branch circuit, distribution equipment, secondary grounding of all equipment, and panelboards complete with all accessories, options, and miscellaneous materials to form a complete functional electrical system of proper voltage, capacity, and location to serve the project as shown on the Drawings.

B. Related Work:

1. *SECTION 16050 – BASIC MATERIALS AND METHODS*

2. *SECTION 16060 – GROUNDING & BONDING*

PART 2 - PRODUCTS

2.01 ENCLOSED BREAKERS

Where a disconnecting means *and* overcurrent protection (OCP) is required, an Enclosed Breaker shall be used, unless otherwise specified. No fuses are allowed. Enclosed Breakers shall be *Eaton / Cutler-Hammer* General Purpose. For damp or wet locations (or as shown) NEMA 3R Rainproof enclosures with exterior, lockable operating handles shall be used. NEMA 1 enclosures shall be front operable with pad-lockable handle. Size enclosure and breaker as shown or called out. Provide adjustable trip mechanism when specified breaker frame size exceeds maximum allowable overcurrent rating of the feeder it serves.

2.02 SAFETY SWITCHES

Where a disconnecting means is required but overcurrent protection (OCP) is not, a safety switch shall be used. Safety Switches shall be Eaton Heavy-Duty 100% fully rated Non-Fused. Switch enclosure type shall be selected for the environment in which they are installed. Switches shall be “Lock-out” equipped and sized as shown, or for the load served. Whichever is greater. Where OCP is required, an enclosed breaker shall be used.

2.03 TRANSFORMERS

Dry-type transformers shall be Eaton DOE 2016 Energy-Efficient Ventilated. Install where shown on the Drawings. Size transformers as shown or called out. If specified size or configuration is not readily available, coordinate with DFW Engineering to use the next size up. Transformers shall be securely mounted and suitable for the location. Observe all required clearances when mounting. Transformers installed in damp or wet locations shall be equipped with rain shields.

2.04 PANELBOARDS

A. Panelboards shall be Eaton Pow-R-Line 1a, 2a, 3a, or 3E as shown or called out in the drawings or schedules. Panelboards shall have copper bussing. Panelboard model shall be selected to accommodate branch circuit/feeder breaker sizes required for the application. Use NEMA rating (1 or 3R) suitable for the environment where installed. Exterior mounted panelboards shall have integral thermostatically controlled panel heater. NEMA 1 panelboards shall have “door-in-door” covers.

B. Circuit Breakers installed in panelboards shall be Bolt-on type of the same manufacturer (Eaton) as the cabinet. Order panelboards with sufficient capacity for all circuits, spares, and spaces shown, or known. It is the contractor’s responsibility to order all mounting hardware, covers, and appurtenances for panelboards, whether shown, or not.

2.05 LOADCENTERS

A. Loadcenters shall only be used where shown on the drawings for incidental, light duty loads. Loadcenters shall be *Cutler-Hammer CH* style. No substitutions will be approved, due to agency standardization. Panels shall be of the type and rating suitable to the environment in which they are installed. Covers shall be factory made to fit the panel and application intended (flush, surface, etc).

B. Loadcenters shall be of the Main Breaker (MB) or Main Lug Only (MLO) type as shown on the drawings. If “backfeed” Main Breakers are called for, utilize a manufacturer approved breaker “hold-down” bracket as required. Loadcenter buss shall be copper, and ampere rated as shown, or for the Main Breaker installed at a minimum.

C. Loadcenters shall have enough capacity to accommodate all breakers needed without utilizing “tandem” or other specialty breakers on new installations. If the panel selected has less than 4 spare spaces left after accommodating all existing and new circuits, the contractor shall install the next capacity size up. Branches circuit protection shall be thermal-magnetic circuit breakers of the sizes noted on the Drawings and shall be capable of interrupting a short circuit of 10,000 RMS amperes (symmetrical) for 120/240-volts.

2.06 POWERCENTERS

Powercenters are Loadcenters with integral transformers and primary/secondary overcurrent protection (OCP). Use Powercenters where shown on the drawings. Order transformer KVA and OCP size as shown, called out, or sized to the load served whichever is greater. Powercenters shall be Eaton brand (example: Eaton P48G11S10P). Use only Eaton manufactured breakers designed for the panel used. Powercenters shall have sufficient capacity to accommodate all breakers needed without utilizing “tandem” or other specialty breakers on new installations. If the panel selected has less than 4 spare spaces left after accommodating all existing and new circuits, the contractor shall install the next capacity size up.

2.07 CIRCUIT BREAKERS

A. Provide thermal-magnetic type circuit breakers of the sizes shown on the panel schedule. Provide common trip on all multiple pole breakers. Use breakers designed for the purpose and panel type called for in the drawings.

Circuit breakers intended for switching loads, HID lighting fixture loads, or HVAC loads shall have the appropriate ratings for use. *Eaton / Cutler-Hammer* is the agency standard. No other brands will be approved.

B. Provide "spare" over-current devices, as noted on the Drawings, complete and ready for future circuit connections. Breaker count shall include “known” future loads, such as Heat Pump or Furnace upgrades that are planned.

C. Provide "space" for future over-current devices as noted on the Drawings, including all bussing and device mounting hardware. Provide approved cover plates or over-current devices in all future spaces. Open spaces are not permitted.

PART 3 - EXECUTION

3.01 SERVICE DISCONNECT SWITCH

Install the service-disconnect switch in the location shown on the Drawings. Install plumb and level and securely fasten to the support. Provide all conduit, wire, and grounding as required. Cover of enclosure shall have an engraved label reading *MAIN SERVICE DISCONNECT*, as well as identification specified elsewhere in this contract.

3.02 TRANSFORMERS

Install transformers in the locations shown on the Drawings. Transformers shall be securely fastened in place, and wall-hung units shall include proper mounting brackets as required by the manufacturer. Provide all necessary conduit, wire, and grounding for proper installation. Install vibration isolating pads for Transformers mounted indoors.

3.03 PANELBOARDS & LOADCENTERS

A. Secure panelboards in place with top of cabinet at 6-feet above finished grade, unless otherwise noted. Top of cabinet and trim shall be level. Trim and door shall fit neatly without gaps, openings, or distortion. Top edges of adjacent panels shall be even. Securely anchor panelboards to structural framing or walls with approved fasteners and concealed bracing as required. Panels mounted to block, masonry, or concrete walls shall utilize reversible anchors for mounting. (Not lead drive pins) Provide steel galvanized channel support framing where panelboard is freestanding, as shown on the Drawings. Coordinate final installation method and location with engineer before work begins.

B. Provide a typewritten directory under transparent plastic to identify each circuit load and location served from the panel, and a laminated bakelite nameplate attached to the outside of the panelboard via screws or rivets to indicate panel name or designated usage, voltage, phase and source.

3.04 GROUNDING

The Contractor shall provide a complete grounding system with grounding continuity throughout. Ground rods shall be copper or galvanized iron of not less than 5/8 inch by 8 feet, providing 25 ohms maximum resistance. Ground wire shall be bare and of a size required for the system as defined by the *NEC* and *WAC.*

END OF SECTION 16400

SECTION 16500
LUMINAIRES

PART 1 - GENERAL

1.01 SUMMARY

A. Provide the lighting system identified herein and, on the drawings, to obtain a complete and operational system.

B. Furnish lighting fixtures of the types, sizes, and finish as listed on the lighting schedule and on the Drawings. Fixtures shall be new, complete assemblies constructed to ensure full life of components, and minimize amplification and transmission of component noise.

1.02 RELATED WORK

SECTION 16050 BASIC MATERIALS AND METHODS

PART 2 - PRODUCTS

2.01 MATERIALS

A. Substituted fixtures must be of equal or better quality than the specified fixtures including general appearance, photometric characteristics, operating temperatures, durability of finish and general quality. The Owner or Engineer shall approve all substitutes in writing.

B. All fixtures shall be as specified or substituted in writing and suitable for the conditions of use.

C. Luminaires shall be factory assembled as LED fixtures, unless otherwise specified.

D. Breakers used as switches shall be listed for the purpose.

E. When Square Steel Hinged (SHS) light poles are part of contract, provide 1 operating winch for the project.

PART 3 - EXECUTION

3.01 LIGHTING FIXTURES - GENERAL INSTALLATION

A. Size, orientation, and mounting height from finished grade to the bottom of fixture shall be as indicated on the Drawings. Verify mounting provisions prior to ordering fixtures. Fixtures shall be *UL* listed for the location, environment, and application in which they are installed.

B. Lighting shall be as shown in the lighting schedule and on the Drawings. Minor relocations, to avoid conflicts in construction, shall be permitted with approval from the Owner or Engineer.

C. Fixtures shall be securely mounted to the structure and not depend upon the conduit system for support. Coordinate or provide backing support from structure for fixture mounting prior to finishes. Use of drywall anchors or toggle-bolts for sole support shall be done with Owner or Engineer approval only.

D. For Luminaires mounted on corrugated metal siding, coordinate mounting prior to interior finishes. Provide reinforcement/backing as needed. Wall-Packs shall be mounted with nuts and bolts or wood screws into backing boards. Fixtures shall NOT use sheet metal screws into siding as sole support. Install fixtures so they sit evenly on corrugation and do not flatten or dent the siding. Mounting method shall adequately support the Luminaire without sagging or siding deflection. Seal openings and penetrations in fixture and siding with silicone exterior caulking. Fixture shall be fully openable without sealer, caulking, or obstructions in the way. *FAILURE to adequately support or seal wall-mounted Luminaires will require Contractor to remove and replace them at no cost to the Owner. This may include removal and replacement of some interior finishes at the Contractor's expense.*

E. Mount Luminaires square with structure, walls, or furniture as shown. Align rows of fixtures for visual symmetry. Install wall-mounted fixtures plumb and level.

F. All fixtures shall be properly grounded and suitable for the locations and condition of use and installed per the manufacture's installation instructions.

G. Make all final fixture adjustments and settings under the direction of the Owner/Architect/Engineer prior to the completion of the project. Fixtures shall be aimed or installed to achieve the lighting pattern for which the fixture is designed, and purpose intended.

END OF SECTION 16500

SECTION 16740
DATA / COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. Provide conduit pathways, pull-boxes, junction boxes, backboards, grounding terminals and accessories shown and/or specified to prepare the site for installation of a complete Data/Communication System that may include: Secure Government Network (SGN), Broadband Internet, Multiple Phone and Data copper lines, and/or Fiber Optic cables.

B. Pathway system shall consist of 2 separate conduit systems routed from the Utility connection point to Facility Demarcation point, and to buildings, structures, and locations shown on the Drawings.

C. Provide installation of main service entry conduits as shown on the Drawings, and as per Utility Provider requirements and recommendations. Install pull lines in all conduits. Spare conduits shall be capped.

D. Provide and install all wire, cable, jacks, outlets, racks, terminal strips, patch panels, and other equipment needed to make a complete, functional, code compliant data/communications system as provided by the Utility, from their point of service. Provide separate blocks with labels for Data & Voice.

1.02 RELATED WORK

SECTION 16050 - BASIC MATERIALS AND METHODS

1.03 UTILITY COORDINATION

A. It shall be the responsibility of the Contractor to participate in, or manage coordination with the Communication Utilities during construction, as is necessary for the successful installation of a complete working system. Installations shall comply with Utility standards and requirements. The Department of Fish and Wildlife (WDFW) shall pay all costs directly billed by the Utility for construction of infrastructure. *EXCEPTION:* Contractor shall be responsible for costs of temporary communications services for their use during construction.

B. Splice or pull-boxes, handholes or vaults shown on the Drawings may be required by the Utility to be changed to a pedestal or other Utility provided access point late in the construction phase. These changes shall be coordinated and made by the Contractor at no additional cost to the Owner. Select the more expensive method at bid time.

C. The Owner *shall not* be held responsible for delays caused by Communication or other Utilities during construction. WDFW is a customer of all Utilities. They *are not* our sub-contractor. WDFW will participate and assist with coordination efforts where needed.

D. Contractor shall grant access and cooperate with all Utilities. Bring conflicts to the attention of WDFW in a timely manner, for assistance in resolution.

PART 2 - PRODUCTS

2.01 MATERIALS

A. See *SECTION 16050* for basic conduit and boxes specifications.

B. Terminal Boards shall be 3/4 inch by 4 foot by 8 foot fire-retardant plywood.

C. Data/Comm Cable shall be CAT6 Berk-Tek 6P4P24-BL-P-BER-AP-NS or equal

D. Provide Leviton CAT6 Mod Jacks in all outlets, with Leviton 2-Port Faceplate & frame.

E. Conduit runs shall be as shown on Drawings, or minimum 1 inch C, whichever is larger.

F. Main conduits from Utility service connection point to WDFW demarcation shall be 2 inch minimum trade size.

2.02 GROUNDING

A. Install a “Telecommunications Main Grounding Bussbar” (TMGB) adjacent to the Data / Comm backboard. Connect to building’s Grounding Electrode System with a minimum #4 solid bare copper.

B. When installing racks and equipment, install a bonding conductor, #6 minimum size, to all metallic communications equipment and support racks. Install bonding jumpers to any Data / Comm equipment that hat has a ground terminal provided or is recommended by the manufacturer to be grounded.

PART 3 - EXECUTION

3.01 INSTALLATION OF CONDUIT AND BOXES

A. Furnish and install all conduit (minimum of 1 inch trade size) and boxes or rings shown on the Drawings and install pull lines (minimum 17 pounds test tensile strength). Cap all spare conduits.

B. Provide all conduit terminations with bushings. Where main Utility service conduits terminate at backboard, install a grounding bushing on all stub-ups with a minimum #6 solid bare copper jumper to the TMGB.

C. In buildings with finished walls, single-gang Communication Mounting Brackets may be used for data outlets. Caddy MP1S or equal. Brackets shall be mounted flush with finished walls. Outlets and plates shall fit tightly to surface without gaps or deflection. Conduits shall be supported independently with the end of the connector or bushing no more than 3/4 inch from top edge of ring, vertically, and within 1¼ inch of the finished wall horizontally. End of conduit shall be protected by conduit connector and bushing, or pipe “end” bushing. Conduit shall be supported tightly in place, without slipping in supports. Secure pull string for easy access from opening.

D. For exposed work, boxes shall be minimum 4-11/16 inch x 2-1/8 inch with single-gang mud-ring or Industrial Raised Cover.

E. Data / Comm drops shall run in conduit the entire length from outlet to backboard, unless otherwise approved by Owner or Engineer in writing. Junction boxes and cable consolidation conduits not shown on the drawings must be approved in writing by the Owner or Engineer.

F. Flexible conduit of any kind is *NOT* Permitted in concealed walls for Data or Communication drops. Exposed flexible connections shall not be used unless approved by the Owner or Engineer in writing.

G. Underground and underslab conduits shall be installed according to *SECTION 16050*. Maintain a minimum 12 inch separation between Data/Comm conduits and power runs.

H. Provide (2) 20-amp duplex receptacles on separate 120-volt circuits at each Data/Comm Network closet, backboard, or demarcation point.

I. Where firewalls, or construction elements block access to ceiling space above network closets or other demarcation points, install sleeves for cables through the inaccessible areas *whether or not* they are shown on Drawings. Sleeves shall be continuous metallic conduit 1¼ inch trade size minimum. Flexible conduit is not permitted. Install sufficient quantity of sleeves to accommodate all cables shown, plus 25% spare at no more than 40% conduit fill. All cables penetrating ceilings or walls shall be in adequately supported. Cap metallic sleeves with bushed ends.

J. Data/Comm Backboards shall be of adequate size, and oriented so all disciplines will have room for their terminations. Position network cabinets and racks to accommodate *ALL* equipment required for a complete system. Coordinate space needs of all disciplines

3.02 INSTALLATION OF CABLE AND DEVICES

A. Pull at least (2) CAT6 cables to each outlet location. Label both ends of cable and outlet covers and/or jacks according to WDFW standards. Where approved, free-air cabling shall be supported by the building structure in such a manner that the cable will not be damaged by normal building use. Such cables shall be secured by hardware, including straps, staples, cable ties, hangers, or similar fittings designed and installed so as not to damage the cable. The installation shall also conform to NEC 300.4 and 300.11.

B. Coordinate color of finished outlets and plates to match electrical outlets. Match height of adjacent electrical outlets, unless otherwise shown on Drawings.

C. A voice jack is required adjacent to any Alarm panel. This may include Hatchery or Pump Alarms, Fire Alarms, Security/Intrusion Alarms. Coordinate these locations with WDFW.

D. Communications circuits, pathways, and equipment shall be installed in a neat, workmanlike manner, in accordance with accepted industry practices as described in ANSI/NECA/BICSI 568-2006, *Standard for Installing Commercial Building Telecommunications Cabling*; ANSI/TIA/EIA-568-B.1-2004—Part 1, *General Requirements Commercial Building Telecommunications Cabling Standard*; ANSI/TIA-569-B-2004, *Commercial Building Standard for Telecommunications Pathways and Spaces*; ANSI/TIA-570-B, *Residential Telecommunications Infrastructure*, and other ANSI-approved installation standards.

3.02 TESTING

Prior to acceptance of work by the Owner, the Contractor's representative shall perform a quality inspection of the final installation in the presence of the Engineer, WDFW IT Representative, or WDFW Inspector. All system wiring shall be tested for grounds, opens, and shorts. Test cables with a Fluke Cable Analyzer per the *ANSI/TIA-568-C.2* standards.

END OF SECTION 16740