PART 1 – GENERAL

1.01 DESCRIPTION

A. The WORK specified in this Section includes the requirements for furnishing and installing structural steel, as designated in the Contract, including:

1. Safety Climb Device
2. Materials

1.02 DEFINITIONS

A. References

1. American Institute of Steel Construction (AISC)

a. Specification for Structural Steel Buildings - Allowable Stress Design and Plastic Design

2. American Society for Testing and Materials (ASTM)

a. A36/A 36M - Standard Specification for Structural Carbon Steel

b. A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

c. A108 – Standard Specification for Steel Bars, Carbon, Cold-Finished

d. A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

e. A167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip

f. A193 - Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service

g. A276 - Standard Specification for Stainless Steel Bars and Shapes

h. A307 - Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength

i. A312 – Standard Specification for Seamless, Welded, and Heavily Cold-Worked Austenitic Stainless Steel Pipe

j. A325 - Standard Specification for Structural Bolts, Steel, Heat Treated 120/105 ksi, Minimum Tensile Strength

k. A489 - Standard Specification for Carbon Steel Lifting Eyes

l. A490 - Standard Specification for Structural Bolts, Alloy Steel, Heat Treated 150 ksi Minimum Tensile Strength

m. A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes

n. A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing

o. A992 - Standard Specification for Structural Steel Shapes

p. F568M - Standard Specification for Carbon and Alloy Steel Externally Threaded Metric Fasteners.

q. F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.

r. F594 - Standard Specification for Stainless Steel Nuts.

s. F738M - Standard Specification for Stainless Steel Metric Bolts, Screws, and Studs.

t. F836M - Standard Specification for Style 1 Stainless Steel Metric Nuts.

3. American Welding Society (AWS)

a. A2.4 - Standard Symbols for Welding, Brazing and Nondestructive Examination

b. A3.0 - Standard Welding Terms and Definitions

c. D1.2 - Structural Welding Code - Aluminum

d. D1.6 - Structural Welding Code - Stainless Steel

e. QC1 - Standard for AWS Certification of Welding Inspectors

4. American National Standards Institute (ANSI)

a. A10.14 – Requirements for Safety Belts, Harnesses, Lanyards, and Lifelines

b. A14.3 – Ladder – Fixed – Safety Requirements

1.03 SUBMITTALS

A. Comply with the requirements of Sections 01300, SUBMITTAL PROCEDURES and 05500, MISCELLANEOUS METALS.

B. Quality Control Submittals

1. Design Data: Submit design of members to be fabricated before starting their fabrication.

C. Test Reports

1. Certified copies of mill tests and analyses made in accordance with applicable ASTM standards, or reports from a recognized commercial laboratory, including chemical and tensile properties of each shipment of structural steel or part thereof having common properties.

1.04 QUALITY ASSURANCE

A. Qualifications

1. Perform welding of structural metals with welders who have current AWS certificate for the type of welding to be performed.

2. Notify OWNER'S REPRESENTATIVE 24-hours minimum before starting shop or field welding.

3. OWNER'S REPRESENTATIVE may check materials, equipment, and qualifications of welders.

4. Remove welders performing unsatisfactory WORK, or require to requalify.

5. OWNER'S REPRESENTATIVE may use gamma ray, magnetic particle, dye penetrant, trepanning, ultrasonic, or other aids to visual inspection to examine any part of welds or all welds.

6. Provide for retests on defective welds.

B. Quality Requirements: Comply with the requirements of Section 05500, MISCELLANEOUS METALS .

1.05 DELIVERY, STORAGE AND HANDLING

A. Packing and Shipping: Deliver structural steel free from mill scale, rust, and pitting.

B. Storage and Protection: Until erection and painting, use a shop coat of paint to protect items not galvanized from weather.

PART 2 – PRODUCTS

2.01 EQUIPMENT (NOT USED)

2.02 MATERIALS

A. Unless otherwise specified or indicated on the Drawings, materials shall conform to the following:

Item	**ASTM Standard Item**	**Class, Grade, Type or Alloy Number**
Steel		
Plate, bars, rolled shapes, and miscellaneous items	A 36 A992	--
Tubing, cold-formed	A 500	--
Tubing, hot-formed	A 501	--
Steel pipe	A 53	Grade B
Stainless Steel		
Plate, sheet, and strip	A 167	Type 304* or 316**
Bars and shapes	A 276	Type 304* or 316**
Bolts	A593 or F738M	Type 304* or 316**
Nuts	A594 or F836M	Type 314* or 316**
* Use Type 304L if material is welded. ** Use Type 316L if material is welded.		

1. Stainless steels are designated by type or series defined by ASTM.

2. Where stainless steel is welded, use low-carbon electrodes and filler metals or heat control methods to prevent "carbide precipitation". Polish all stainless steel welds to prevent crevice corrosion.

3. Where anchors, connections or other details of structural steel are not specifically indicated on the Drawings or specified, their material, size, and form is equivalent in quality and workmanship to items specified.

B. Fasteners

1. General: Furnish threaded fasteners, except high strength bolts, with flat washers, and self-locking nuts, or lock washers and nuts.

   a. Bolt Heads and Nuts: Hex-type.

   b. Bolts, Nuts, and Washers: Of domestic manufacture.

   c. Apply anti-seize to all Type 304 or Type 316 stainless steel fasteners during assembly to prevent thread galling.

2. All Thread Rods

   a. Type 316 stainless steel for use in wet and moist locations, including:

1) Water-Containing Structures

a) Below and at water level.
b) Above water level.

(1) Below top of walls of water-containing structures.

(2) Under the roof, slab, beam, or walkway of enclosed water-containing structures.

c) Dry side of walls of water-containing structures.

b. Type 304 or Type 316 stainless steel for aluminum assemblies.

c. ASTM A 36 meeting the mechanical requirements of ASTM A 307. Hot-dip galvanize for galvanized assemblies and for applications other than those specified.

3. Anchor Bolts

a. Anchor Bolts, Nuts, and Washers: As specified in Section 05501.

4. Assembly Bolts

a. Bolts, nuts, and washers for field-assembled construction: Type 316 stainless steel.

5. Eyebolts

a. Welded or forged, when manufactured of materials other than carbon steel.

b. Having geometric and strength characteristics of eyebolts specified in ASTM A489, Type 1. The strength characteristics include proof load requirements, breaking strength requirements, tensile strength requirements, bend test, and impact strength.

6. High Strength All Thread Rods: In accordance with ASTM A 193, Grade B7.

7. High Strength Bolts: High strength bolts, nuts, and hardened flat washers are in accordance with ASTM A 325 or ASTM A 490, as indicated on the Drawings.

8. Powder Actuated Fasteners

a. For Installation in Concrete or Steel: Zinc coated, heat-treated, alloy steel.

b. Fasteners Not Sufficiently Protected Against Corrosion from Exposure to Corrosive Conditions: Coat as necessary to make suitable for such conditions.

c. Pins: Furnish with head or threaded stud capable of transmitting loads to shanks.

d. Pins Connected to Steel: Furnish with longitudinal serrations around circumference of shank.

9. Studs

a. ASTM A 108 with 50,000-psi minimum yield strength, and 60,000-psi minimum tensile strength.

b. Headed Studs: Manufacturers: One of the following or equal:

1) Nelson Stud Welding Company, S3L Shear Connectors or H4L Concrete Anchors

2) Stud Welding Products, Headed Concrete Anchors and Shear Connectors or Concrete Anchors

2.03 SUPPLEMENTARY PARTS

A. Furnish as required for complete structural steel erection, whether or not such parts and WORK are specified or indicated on the Drawings.

2.04 FABRICATION

A. Shop Assembly

1. Fabricate structural steel in conformance with AISC "Specification for the Structural Steel Buildings - Allowable Stress Design and Plastic Design," unless otherwise specified or modified by applicable regulatory requirements.

2. Where anchors, connections or other details of structural steel are not specifically indicated on the Drawings or specified, their material, size and form is equivalent in quality and workmanship to items specified.

3. For Structural members such as W Shapes, S Shapes, Channels, Angles, and similar members not available in quantity, size, and type of stainless steel specified or indicated on the Drawings.

a. Fabricate by welding together pieces of low carbon stainless steel plate, such as 316L joined with matching low carbon stainless steel filler metal.

b. Make complete joint penetration welds between pieces of plate to attain same or higher section modulus and moment of inertia as members indicated on the Drawings.

4. Where galvanizing is required, hot-dip galvanize structural steel after fabrication in accordance with ASTM A 123.

a. Do not electro-galvanize unless specified or accepted by OWNER'S REPRESENTATIVE.

b. Re-straighten galvanized items that bend or twist during galvanizing.

5. Round off sharp and hazardous projections and grind smooth.

6. Take measurements necessary to properly fit WORK in the field.

7. Ensure that all metal work is a correct fit.

B. Welding: Comply with the requirements of Section 05500, MISCELLANEOUS METALS .

PART 3 – EXECUTION

3.01 CONSTRUCTION

A. Examination

1. Verification of Conditions: Examine WORK in place to verify that it is satisfactory to receive the WORK of this Section. If unsatisfactory conditions exist, do not begin this WORK until such conditions have been corrected.

B. Erection

1. General

a. Fabricate structural and foundry items to true dimensions without warp or twist.

b. Form welded closures neatly, and grind off smooth where weld material interferes with fit or is unsightly.

c. Install structural items accurately and securely, true to level, plumb, in correct alignment and grade, with all parts bearing or fitting structure or equipment for which intended.

d. Do not cock out of alignment, redrill, reshape, or force fit fabricated items.

e. Place anchor bolts or other anchoring devices accurately and make surfaces, which bear against structural items smooth and level.

f. Rigidly support and brace structural items needing special alignment to preserve straight, level, even, and smooth lines. Keep structural items braced until concrete, grout, or dry pack mortar has hardened for 48 hours minimum.

g. Erect structural steel in conformance with AISC "Specification for Structural Steel Buildings - Allowable Stress Design and Plastic Design," unless otherwise specified or modified by applicable regulatory requirements.

h. Where anchors, connections, and other details of structural steel erection are not specifically indicated on the Drawings or specified, form, locate, and attach with equivalent quality and workmanship to the items specified.

i. Round off sharp or hazardous projections and grind smooth.

j. Paint or coat steel items as specified in Section 09900.

2. Welding: General

a. Make welds complete joint penetration type, unless otherwise indicated on the Drawings.

b. Remove backing bars and weld tabs after completion of weld. Repair defective welds observed after removal of backing bars and weld tabs.

3. Welding Stainless Steel

a. General: Comply with AWS D1.6.

4. Welding Carbon Steel

a. General: Comply with AWS D1.1.

1) Field repair cut or otherwise damaged galvanized surfaces to equivalent original condition using the following:

a) Manufacturers: One of the following or equal:

(1) Galvinox
(2) Galvo-Weld

5. Comply with the requirements of Section 05500, MISCELLANEOUS METALS.

6. Interface With Other Products

a. Where steel fasteners come in contact with aluminum or other dissimilar metals, bolt with stainless steel bolts and separate or isolate from dissimilar metals with sleeves and washers.

1) Sleeves: Mylar, 1/32 inch thick, of proper size to fit bolts. One sleeve required for each bolt.

a) Manufacturers: The following or equal:

(1) Central Plastics Company, Shawnee, Oklahoma

2) Washers: 63 glass phenolic, 1/8 inch thick, of proper size to fit bolts. Two washers are required for each bolt.

b. Prior to installing nuts, coat threads of stainless steel fasteners with following to prevent galling of threads.

1) Manufacturers: One of the following or equal:

a) Never Seez Compound Corporation, Never-Seez
b) Oil Research, Inc., WLR No. 111

7. Threaded Fasteners

a. General

1) Install bolts, including anchor bolts and concrete anchors, to project 2 threads minimum, but 1/2-inch maximum beyond nut.

2) Unless otherwise specified, tighten bolts, including anchor bolts and concrete anchors, to the "snug-tight" condition, defined as tightness attained by a few impacts of an impact wrench or the full effort of a man using an ordinary spud wrench.

b. Anchor Bolts

1) Install anchor bolts as specified in Section 05501, ANCHORAGE TO CONCRETE.

c. High Strength Bolts

1) Consider connections with high strength bolts to be slip critical structural connections, unless otherwise indicated on the Drawings.

2) Connections with high strength bolts conform to AISC Specification for Structural Joints Using ASTM A 325 or A 490 Bolts.

3) Furnish Hardened Flat Washer

a) Under element, nut or bolt head, turned in tightening.
b) On outer plies for short slotted holes.

4) Notify OWNER'S REPRESENTATIVE in advance of method selected for tightening and verification pursuant to the referenced AISC Specification.

d. Powder Actuated Fasteners: Use powder actuated fasteners only for applications indicated on the Drawings or specified.

e. Studs

1) Butt joint weld with automatic stud welding gun as recommended by the manufacturer.

2) Ensure butt joint weld develops full strength of the stud.

3.02 SAFETY CLIMB DEVICE

A. Install mandrel in accordance with manufacturer's instructions to enable the worker to be attached to device at all times during climb without having to remove hands from ladder to operate system effectively and able to easily pivot onto and off of rest platforms or landings while safety attached to device.

B. When installed to any height, fall prevention system shall be extremely rigid and combine to become an integral part of structure.

END OF SECTION

PART 1 – GENERAL

1.01 DESCRIPTION

A. The WORK specified in this section includes the requirements for furnishing labor, materials, and equipment for the fabrication and erection of metal fabrications shown on the Drawings and as specified which are not part of structural steel or other metal systems specified in this document and as designated in the Contract.

B. This section includes embedded and non-embedded materials.

1.02 DEFINITIONS

A. Acronyms:

1. CJP: Complete Joint Penetration
2. CWI: Certified Welding Inspector
3. MT: Magnetic Particle Testing
4. NDE: Nondestructive Examination
5. NDT: Nondestructive Testing
6. PJP: Partial Joint Penetration
7. PQR: Procedure Qualification Record
8. PT: Liquid Penetrant Testing
9. RT: Radiographic Testing
10. UT: Ultrasonic Testing
11. VT: Visual Testing
12. WPQ: Welder/Welding Operator Performance Qualification
13. WPS: Welding Procedure Specification

B. Safety: Comply with OAR 437, Division 3, Subdivision J, Welding and Cutting.

C. References

1. American Society for Non-Destructive Testing (ASNT)
    a. SNT-TC-1A – Non Destructive Testing

2. American Society for Testing and Materials (ASTM)

   a. A36 – Standard Specification for Carbon Structural Steel

   b. A53 – Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

   c. A123 – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

   d. A153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

   e. A167 – Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip

   f. A193 – Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service

   g. A307 – Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength

   h. A500 – Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes

   i. A516 – SSF Pressure Vessel Plates, Carbon Steel for Moderate and Lower Temperature Service

   j. A615 – Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement

   k. A653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated Galvanealed by the Hot-Dip Process

   l. A724 – Standard Specification for Pressure Vessel Plates, Carbon Manganese-Silcon Steel, Quenched and Tempered, For Welded Layered Pressure Vessels

   m. A792 – Standard Specification for Steel Sheet, 55 Percent Aluminum-Zinc Alloy-Coated by the Hot-Dip Process

   n. A992 - Standard Specification for Structural Steel Shapes

   o. A1008 – Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High Strength, Low Alloy With Improved Formability

   p. B209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate

q. B308 – Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles

r. B429 – Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube

s. C478 – Standard Specification for Precast Reinforced Concrete Manhole Sections

t. F593 – Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs

u. F594 - Standard Specifications for Stainless Steel Nuts

3. American Water Works Association (AWWA)

a. C200 - Steel Water Pipe – six inch (150mm) and Larger

b. C210 – Liquid-Epoxy Coating Systems for the Interior and Exterior of Steel water Pipelines

c. C219 – Bolted, Sleeve-Type Couplings for Plain-End Pipe

4. American Welding Society (AWS)

a. A2.4 – Standard Symbols for Welding, Brazing, and Nondestructive Examination

b. A3.0 – Standard Welding Terms and Definitions

c. D1.1 - Structural Welding Code, Steel

d. D1.2 - Structural Welding Code - Aluminum

e. D1.6 - Structural Welding Code - Stainless Steel

f. QC1 – Standard for AWS Certification of Welding Inspectors

5. Federal Specifications

a. FF-B-561 – Bolts, (Screw), Lag

b. FF-B-588 – Bolts, Toggle, Zinc-Coated (Galvanized)

c. Oregon Administrative Rules (OAR) 437-D2 – General Occupational Safety and Health Rules

d. Oregon Administrative Rules (OAR 437-D3 - Construction

6. Military Specifications

   a. MIL-P-21035 – Paint High Zinc dust Content, Galvanizing Repair (Metric)

7. American National Standards Institute (ANSI)

   a. A14.3 – Safety Requirements for Fixed Ladders

1.03 SUBMITTALS

A. Comply with the requirements of Section 01300, SUBMITTAL PROCEDURES.

B. Product Data: Submit manufacturer's descriptive literature and installation instructions for the following:

1. Fasteners
2. Grouts
3. Galvanizing repair paint.
4. Paint primers.
5. Manufacturers storage, handling and installation instructions for access hatches.

C. Shop Drawings: Submit shop drawings of metal fabrications.

1. Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners and accessories.

2. Include erection drawings, elevations and details where applicable.

3. Include anchorage layout drawings for items.

D. Welding:

1. Shop and field WPSs and PQRs.

2. NDT procedure specifications prepared in accordance with ASME BPVC SEC V.

3. Welding data (shop and field welding):

   a. Show location, type, size, and extent of welds with reference called out for WPS and NDT procedure specification numbers.

   b. Distinguish between shop and field welds.

   c. Indicate, by welding symbols or sketches, details of welded joints and preparation of base metal.

      1) Show welding and NDE symbols in accordance with AWS A2.4.

2) Use welding terms and definitions in accordance with AWS A3.0.

E. Informational:

1. WPQs
2. CWI credentials
3. Testing agency personnel credentials
4. CWI reports
5. Welding documentation on appropriate forms in referenced welding codes

1.04 QUALITY REQUIREMENTS

A. Do not deliver any steel items, other than those to be encased in concrete, which have not received either a galvanized or painted surface treatment.

B. Store jobsite metals on blocks above snow or mud and soil. After erection, remove any weld spatter, oil, and grease.

C. Clean abraded, bolted, and welded areas, and touch up with primer or galvanizing repair paint to prevent rusting.

D. Quality Assurance Qualifications:

1. WPSs: In accordance with AWS D1.1 (Annex E) or as indicated by referenced code.

2. WPQs: In accordance with AWS D1.1 (Annex E) or as indicated by referenced code.

3. CWI: Certified in accordance with AWS QC1, and having prior experience with the welding codes specified.

4. Testing Agency: Personnel performing tests, certified as NDT Level II in accordance with ASNT SNT-TC-1A.

PART 2 – PRODUCTS

2.01 EQUIPMENT (NOT USED)

2.02 MATERIALS

A. Steel and Iron

1. Carbon steel wide flange shapes & ASTM A992

2. Carbon steel other shapes, plates and bars: ASTM A36.

3. Steel Pipe - Round: ASTM A53, Grade B, Type E or S, Schedule 40 unless indicated otherwise.

4. Steel Tubing – Square or Rectangular: ASTM A500 Grade B, welded and seamless.

5. Steel Sheet: ASTM A1008 if not galvanized, ASTM A653 if galvanized.

6. Welded Steel Pipe (Temporary Bypass Pipe):

    a. Manufactured per AWWA C200.

    b. Coils per ASTM A1018 made to killed fine-grain practice

        1) Minimum yield strength: 38,000 psi

        2) Maximum yield strength: 55,000 psi

        3) Minimum tensile strength: 70,000 psi

        4) Ductility: 25 percent

        5) Weld-ability: Carbon equivalent not greater than 0.45 as measured using IIW (International Institute of Welding) formula; $CE = C + (Mn/6) + (Cr + Mo + V)/5 + (Ni + Cu)/15$.

    c. Plate per ASTM A516, Grade 70.

    d. Coatings and Linings: AWWA C210.

7. Bolted Sleeve-Type Coupling:

    a. Manufactured per AWWA C219.
    b. Coatings and Linings: AWWA C210.
    c. Middle Ring: 10 inches minimum.

8. Slide Bearings:

    a. Manufactured with upper and lower plates of virgin unfilled polytetraflouroethylene (PTFE), with a static coefficient of friction not to exceed 0.06 at 800 psi compressive loading. The plates are to be 3/32 inch thick; bearing dimensions as indicated on the Drawings.

    b. Manufacturers and Products:

        1) Fluorocarbon Company, Pinebrook, NJ; Flourogold, Model FC-1010-CS.

        2) Fabreeka Products Company, Boston, MA.

3) Watson Bowman Acme, Amherst, NY.

4) D. S. Brown, North Baltimore, OH.

B. Aluminum

1. Pipe Railings, Sleeves, and Balusters: ASTM B429, Schedule 40 and 80 pipe, alloy 6061-T6, finish AAM32 (directional texture).

2. Pipe Railing Sleeve Flange: ASTM B209 alloy 6061-T6 finish AAM32.

3. Extruded Structural Shapes and Tread Supports: ASTM B308 alloy 6061-T6, mill finish.

4. Fabrication: Weld balusters to railings.

C. Stainless Steel: ASTM A167 Type 304L and Type 316L.

D. Corrugated Metal

1. Siding: Centira, "IW-60A" concealed fastener system.

a. Base Metal: ASTM A792, Grade 40, minimum yield 43,500 psi, thickness 18 gauge.

b. Protective Coating: Galvalume conforming to ASTM A724 with Kinar 500 coating.

2. Steel Sheets: BHP Steel Building Products, "Nu-Wave Corrugated", or equal.

a. Base Metal: ASTM A792, Grade 40, minimum yield 43,500 psi, thickness 24 gauge.

b. Protective Coating: Zincalume AZ50 conforming to ASTM A792

E. Galvanizing: Where items are to be galvanized, use the hot-dip process in conformance with ASTM A123, A153, and A653. Two ounces/square foot minimum.

F. Fasteners

1. Metal to Metal

a. Steel to Steel: ASTM A307, Grade A, hex head, galvanized unless neither steel item is galvanized.

b. Aluminum to Aluminum: ASTM F593, Type 304 stainless steel.

c. Other: Stainless steel; ASTM F593, Type 304.

2. Metal to Concrete: See Section 05501, ANCHORAGE TO CONCRETE.

3. Metal to Wood

   a. Bolts: ASTM A307, Grade A, hex head, hot-dip galvanized, except stainless steel where noted on Drawings.

   b. Lag Screws: Square head type, Federal Specification FF-B-561, zinc coated for steel, stainless steel for all other.

4. Metal to Hollow Construction: Toggle bolts, Federal Specification FF-B-588, zinc-coated (galvanized).

5. Powder-Actuated Fasteners: May be used for all types of fastenings where pullout and shear values not exceed 40 percent of manufacturers specified values; galvanized for steel; stainless steel for all other.

6. Washers: Provide washers of the same material and finish as the bolt or lag bolt in the following locations:

   a. Under all nuts.

   b. Under bolt heads where bolt material has a yield stress more than 110 percent of the yield stress of the material being fastened.

7. Lock Washers: Provide spring steel helical lock washers of the same finish as the bolt under nuts and bolt heads of connections subject to vibration.

8. Nuts: Nuts conform to the recommendation of the applicable bolt specification and are of the same material as the bolt.

G. Welding

1. Perform welding in accordance with AWS D1.1 or applicable code with qualified welders and procedures.

   a. Welding is done by operators who are State-licensed. The quality of welding conforms to AWS D1.1 as indicated herein, 3.01 Construction or applicable code.

2. The CWI is to be present whenever shop welding is performed. Inspection is performed prior to assembly, during assembly, during welding, and after welding. CWI duties include:

   a. Verifying conformance of specified job material and proper storage.

   b. Monitoring conformance with approved WPS.

c. Monitoring conformance of WPQ.

d. Inspecting weld joint fit-up and in-process inspection.

e. Providing 100 percent visual inspection of all welds.

f. Supervising nondestructive testing personnel and evaluating test results.

g. Maintaining records and preparing reports that confirm the results of inspection and testing comply with the WORK.

3. Welds Behind Finished Surfaces: Use methods to minimize distortion and discoloration of finished surface.

4. Remove flux and slag from both sides of welds.

5. Grind accessible welds smooth.

6. Buff or polish welded surfaces which are exposed to view in the finished WORK to match and blend with adjacent parent material.

7. Complete welding before galvanizing, anodizing or painting.

8. Comply with OAR 437, Division 3, 1926.350-1926.356, and applicable provisions of the General Construction Safety Provisions.

H. Galvanizing Repair Paint: High zinc dust content paint, meeting the requirements of Military Specification MIL-P-21035.

I. Shop-Primed Surfaces and Assemblies

1. Steel Surfaces

a. Shop prime steel with primer for paint system in accordance with Section 0594 Preparing and Coating of Steel Structures, City of Portland Standard Construction Specifications 2007. Should the entire coating system fail down to bare metal as a result of the shop primer, remove existing coatings, reprime and repaint.

J. Surface Treatment: Field Applied

1. Galvanized Surfaces: Coat items that must be drilled or cut in the field as approved with galvanizing repair paint before installation.

2. Painted Surfaces: Touch-up damaged shop-primed surfaces. Provide and apply field priming and finish painting as specified in applicable section of City of Portland Standard Construction Specifications 2007.

3. Perform field preparation and painting as required by applicable section of the City of Portland Standard Construction Specifications 2007.

K. Pipe Hanger Rods: Cut and thread rods to fit and galvanize after fabrication. The use of "all thread-rod" is not accepted unless it is stainless steel in accordance with ASTM A193 and used throughout the whole project.

L. Aluminum Ladder

1. Steps have tread-like protrusions on the top face of the front crossbar.

2. Steps are designed for a minimum load of 1000 pounds.

3. Steps are a minimum of 16 inches wide.

5. Comply with all requirements of ANSI A14.3.

M. Individual Ladder Rungs

1. Use plastic ladder rungs with reinforcing steel meeting the requirements of ASTM C478 and A615.

   a. Plastic coating is nonsusceptible to corrosion.
   b. Reinforcing steel has a minimum diameter of ½-inch.
   c. Steps have treat-like protrusions on the top face of the front crossbar.
   d. Steps are designed for a minimum live load of 300 pounds.
   e. Steps are a minimum of 12 inches wide.

N. Guardrail and Handrail and Railing:

1. Fabricate pipe railings to dimensions and details shown, with smooth bends and welded joints ground smooth and flush. Use maximum post spacing of 6 feet. Design rails to withstand 200 pound load applied horizontally or vertically at any point along the rail.

   a. Hot-dip galvanize after fabrication.

2. Provide handrails with toe plates over tanks, walkways, drivable areas, or where otherwise required by code, except where a concrete wall serves as a toe plate adjacent to the handrail.

3. Adjust railings prior to anchoring to ensure matching alignment at butting joints.

4. Comply with OAR 437 Division 2-1910.23.

O. Platform Gratings:

1. Use fiberglass reinforced plastic gratings when designated on the Drawings as FRP.

2. When designated on the Drawings, provide aluminum grating that is pressure locked, with 1 1/2 by 3/16-inch bearing bars at 1 3/16 inches on center. Space cross bars at four inches on center.

   a. Field measure aluminum grating for proper cut-outs and proper fit. End band the cut-outs. Provide continuously banded ends on bearing bars. Provide banding with 1/4 inch less depth than bearing bands over support and with the same depth as the bearing bar cut-outs.

      1) Weld banking over support to bearing bars. Tack weld every fifth bearing band, top and bottom, to all other bearing bars. Weld banding at cut-outs to all bearing bars. Tack weld all cross bars to the bearing bars at the edge of each grating panel and to the bearing bar at the end of the cut-outs.

   b. Fasten aluminum grating to its supporting surfaces with approved hold-down devices.

   c. Limit weight of individual grating pieces to 80 pounds.

3. Stainless Steel Grating: As indicated on the Drawings and as specified in Section 05530, STAINLESS STEEL GRATING.

P. Corrosion Protection: Hot-dip galvanize ferrous metals that are not entirely embedded in concrete after fabrication. Hot-dip galvanize other miscellaneous steel items not specifically described elsewhere.

Q. Fabrication, General

1. Verify dimensions on site prior to shop fabrication.

2. Fabricate items with joints neatly fitted and properly secured.

3. Fit and shop assemble in largest practical sections, for delivery to site.

4. Exposed Mechanical Fastenings: Flush countersunk screws or bolts unobtrusively located consistent with design of structure, except where specifically noted otherwise.

5. Make exposed joints flush butt type hairline joints where mechanically fastened.

6. Supply components required for proper anchorage of metal fabrications. Fabricate anchorage and related components of same material and finish as metal fabrication.

7. Clean surfaces of rust, scale, grease and foreign matter prior to prime painting, galvanizing, anodizing, or buffing.

8. Galvanize or prime paint steel items as scheduled. Do not shop prime surfaces to be embedded in concrete. Conform with ASTM A123 and A153 as applicable. Provide minimum 2.00 ounce/square foot galvanized coating except as otherwise specified therein.

9. Shop primers that do not contain rust-inhibitive agents are not acceptable.

PART 3 – EXECUTION

3.01 CONSTRUCTION

A. General

1. Welding and Fabrication by Welding: Confirm to governing welding codes.

B. Nondestructive Weld Testing Requirements

1. Weld Inspection Criteria:

a. Selection of Welds to be Tested: As agreed upon with the OWNER'S REPRESENTATIVE.

b. Unless otherwise specified, perform NDT of welds at a spot testing frequency as shown below. Perform UT on CJP groove welds that cannot be readily radiographed. In case there is a conflict, the higher frequency level of NDT applies.

1) CJP Butt Joint Welds: 10 percent random RT.

2) CJP Groove Welds: 10 percent random UT.

3) Fillet Welds and PJP Groove Welds: 10 percent random PT or MT.

4) All Welds: 100 percent VT.

c. Weld Acceptance:

1) VT:

a) Structural Pipe and Tubing: AWS D1.1, paragraph 6.9, Visual Inspection, Tubular Connections.

b) All Other Structural Steel: AWS D1.1, paragraph 6.9, Visual Inspection, Statically Loaded Non-tubular Connections.

c) Stud Connections: AWS D1.1, paragraph 7.8.1.

2) UT: Perform UT of CJP groove welds in accordance with AWS D1.1, paragraph 6.13.3, Class R Indications.

3) RT: Perform RT of CJP butt joint welds in accordance with AWS D1.1, paragraph 6.12.1.

4) PT or MT:

a) Perform on fillet and PJP groove welds in accordance with AWS D1.1, paragraph 6.10.

b) Acceptance in accordance with VT standards specified above.

C. Field Quality Control

1. The CWI is to be present whenever field welding is performed. Inspection is performed prior to assembly, during assembly, during welding, and after welding. CWI duties include:

a. Verifying conformance of specified job material and proper storage.

b. Monitoring conformance with approved WPS.

c. Monitoring conformance of WPQ.

d. Inspecting weld joint fit-up and in-process inspection.

e. Providing 100 percent visual inspection of all welds.

f. Supervising nondestructive testing personnel and evaluating test results.

g. Maintaining records and preparing reports that confirm the results of inspection and testing comply with the WORK.

D. Weld Defect Repair: Repair and retest rejectable weld defects until sound weld metal has been deposited in accordance with appropriate welding codes.

3.02 INSTALLATION

A. Examine the areas and conditions under which miscellaneous metal items are to be installed and notify in writing of conditions detrimental to the timely and proper completion of the WORK. Do not proceed with the WORK until unsatisfactory conditions have been corrected.

B. Preparation: Furnish setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, such as concrete inserts, anchor bolts, and miscellaneous items having integral anchors which are to be embedded in concrete or masonry. Coordinate delivery of such items to project site.

C. Erection

1. Obtain OWNER'S REPRESENTATIVES' written permission prior to site cutting, welding, or making adjustments, which are not part of scheduled WORK.

2. Install items square and level, accurately fitted and free from distortion or defects.

3. Make provision for erection stresses by temporary bracing. Keep WORK in alignment.

4. Replace items damaged in course of installation.

5. Grouting (see Section 03600, STRUCTURE GROUT and 05501 ANCHORAGE TO CONCRETE)

   a. Grout anchor bolts and other items subject to pullout with epoxy grout.
   b. Use non-shrink grout for other grouting.

6. After installation, touch up scratched and damaged prime painted and galvanized surfaces.

   a. Use same primer as used for shop priming of painted surfaces.
   b. Use galvanizing repair paint for galvanized surfaces.

D. Protection of Aluminum

1. Aluminum in contact with masonry materials:

   a. Paint aluminum surfaces in contact with lime mortar, concrete, or other masonry material with paint system C-3A.

2. Aluminum in contact with dissimilar metals:

    a. Where aluminum surfaces are in contact with metals other than stainless steel, zinc, or small areas of white bronze, keep aluminum surfaces from direct contact with incompatible metals by any of the following methods:

        1) Paint the dissimilar metal with an approved paint system.

        2) Apply a good quality caulking material between the aluminum and the dissimilar metal, only when accepted by the OWNER'S REPRESENTATIVE.

        3) Use a non-absorptive tape or gasket only when accepted by the OWNER'S REPRESENTATIVE.

    b. Coat dissimilar metals when used in locations where drainage from them passes over aluminum.

E. Aluminum Ladders

1. Install ladder rungs in accordance with the manufacturer's instructions.
2. Locate ladder rungs at 12 inches on center.

F. Individual Ladder Rungs

1. Install ladder rungs in accordance with the manufacturer's instructions.
2. Locate ladder rungs at 12 inches on center.

G. Finishes: Prime paint with a primer that is compatible with field finish, as required.

END OF SECTION

PART 1 – GENERAL

1.01 DESCRIPTION

A. This section covers the WORK necessary to furnish and install all anchorage to concrete, complete with washers and nuts.

1.02 DEFINITIONS

A. General

1. Use like items of materials provided that are the end products of one manufacturer in order to achieve standardization for appearance, maintenance, and replacement.

B. Anchor Bolts and Concrete Anchors

1. Use the diameter required by the equipment or machinery manufacturer. Verify the capacities and configurations conforming to the Drawings.

C. References

1. American Society of Mechanical Engineers (ASME)

   a. B1.1 Unified Inch Screw Threads, UN & UNR Thread Form

2. American Society for Testing and Materials

   a. A36 – Standard Specification for Structural Steel

   b. A108 – Standard Specification for Steel Bar, Carbon and Alloy, Cold finished

   c. A153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

   d. A193 – Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service

   e. A194 – Standard Specification for Carbon and Alloy-Steel Nuts for Bolts for High-Pressure or High-Temperature Service, or Both

   f. A307 – Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength

   g. A563 – Specification for Carbon and Low-Alloy Steel Nuts

   h. C881 – Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete

i. D648 – Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Dense Position

j. D695 – Standard Test Method for Compressive Properties of Rigid Plastics

k. D746 – Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact

l. D1505 – Standard Test Method for Density of Plastics by the Density-Gradient Technique

m. D1525 – Standard Test Method for Vicat Softening Temperature or Plastics

n. F844 – Standard Specification for Washers, Steel, Plain (Flat), Unhardened for General Use

1.03 SUBMITTALS

A. Comply with the requirements of Section 01300, SUBMITTAL PROCEDURES. In addition, provide the following specific information:

1. ICBO (International Conference of Building Officials) reports verifying the products meet or exceed the capacities shown on the Drawings. Manufacturers' information showing the recommended installation equipment and procedures for the following:

a. Drilled in concrete anchors.
b. Epoxy anchor adhesive.

2. Design calculations, stamped by a State of Oregon licensed Structural Engineer, for all anchor bolts and concrete anchors exceeding the capacities, or not conforming to the configurations, specifically shown on the Drawings.

1.04 QUALITY REQUIREMENTS (NOT USED)

1.05 PROJECT CONDITIONS

A. Exposure conditions are defined as follows:

1. Dry: Indoor areas not subject to moisture, washdown, or chemicals.

2. Wet: Indoor areas subject to moisture, washdown, or chemicals, or outdoor areas.

3. Submerged: At or below a point one foot six inches above maximum fluid surface.

B. All non-submerged surfaces are considered to be wet, unless noted otherwise.

PART 2 – PRODUCTS

2.01 EQUIPMENT (NOT USED)

2.02 MATERIALS

A. General

1. The use of a manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration desired only.

2. Unless otherwise indicated, provide materials that conform to the latest issue of the following ASTM Specifications:

a. Anchor Bolts and Nuts:

1) Carbon Steel: ASTM A307, Grade A 36.
2) Stainless: ASTM A193, Type 316.

b. Galvanized Steel Bolts and Nuts: ASTM A153, zinc coating for ASTM A307 or A36.

c. Flat Washers (Unhardened): ASTM F844, use ASTM A153 for zinc coating.

d. Threaded Bars: ASTM A36.

e. Drilled-In Concrete Anchors:

1) Carbon Steel Anchors: ASTM A108.
2) Stainless Steel: ASTM A193, Type 316.

f. Epoxy Anchors:

1) Stainless-Steel Anchors: ASTM A193, Type 316.
2) Epoxy Adhesive: ASTM C881, Type 1, Grade 3, Class A, B, or C.

g. Grouted Concrete Anchors:

1) Stainless-Steel Anchors: ASTM A193, Type 316.
2) Grout: Type II A or B, as specified in Section 03600, STRUCTURE GROUT.

h. Nuts:

1) Carbon Steel: ASTM A563.
2) Stainless Steel: ASTM A194, Type 316.

i. Galvanizing – Carbon Steel: ASTM A153, Zinc Coating for ASTM A307.

3. Include the concrete anchorage system indicated on the Drawings, or required to secure the various parts together and provide a complete installation. The tabulation of items herein is not intended to be all-inclusive; provide all metalwork and castings shown, specified, or which can reasonably be inferred as necessary to complete the project.

B. Anchor Bolts

1. Unless shown otherwise on the Drawings, use 3/4 inch minimum diameter by 12 inch long and other geometry shown on the Drawings. Furnish a minimum of two nuts and a washer of the same material for each bolt. Provide sleeves as shown on the Drawings for location adjustment.

2. Provide anchor bolt material for the exposure conditions as noted below:

a. Equipment and Machinery:

1) Dry exposure, use stainless steel.
2) Wet exposure, use stainless steel.
3) Submerged exposure, use coated stainless steel.

b. Fabricated Metalwork or Structural Building or Frame Components:

1) Dry Exposure:

a) Steel anchoring, use galvanized steel.
b) Other metal anchoring, use stainless steel.

2) Wet exposure, use stainless steel.

3) Submerged exposure, use coated stainless steel.

3. Anchor Bolt Sleeve: High-density polyethylene plastic.

a. Single unit construction with deformed sidewalls such that the concrete and grout lock in place.

b. The top of the sleeve is self-threading to provide adjustment of the threaded anchor bolt projection.

c. Material requirements conform to the following:

1) Plastic High-density polyethylene.
2) Density: ASTM D1505.
3) Vicat Softening Point: ASTM D1525.
4) Brittleness Temperature: ASTM D746.

d. Manufacturer: Sinco West, 655 East Cochran Street, Simi Valley, CA 93085, telephone 805/522-3901.

C. Concrete Anchors

1. Drilled-in concrete anchors: Red Head Wedge anchors or Red Head Sleeve anchors, manufactured by ITT Phillips, Michigan City, IN; Kwik-Bolt stud type or HDI Drop-In anchors, manufactured by Hilti, Inc., Stamford, CT; Wej-It, manufactured by Wej-It Corporation, Broomfield, CO; or Parabolt PB anchors, manufactured by Molly Division of Erithart Corp., Temple, PA. Anchors will provide allowable working loads not less than those tabulated in the Structural General Notes. Provide diameter shown or required except minimum diameter of 3/8 inch.

2. Epoxy Threaded Rod Anchors:

a. Anchor Rod: 316 stainless steel threaded rod free of grease, oil, or other deleterious material with a 45 degree chisel point.

b. Epoxy Adhesive:

1) Meets ASTM C881, Type 1, Grade 3, Class A, B, or C.

2) Two-component, 100 percent solids, nonsag, paste, insensitive to moisture, designed to be used in adverse freeze/thaw environments, and gray in color.

3) Cure Temperature, Pot Life, and Workability: Compatible for intended use and environmental conditions.

c. Mixed Epoxy Adhesive: Nonsag paste consistency with ability to remain in a 1-inch diameter overhead drilled hole without runout, holding the following properties:

1) Slant Shear Strength, ASTM C881/882, no failure in bond line, dry/moist conditions: 5,000 psi.

2) Compressive Strength, ASTM D695: 14,000 psi minimum.

3) Tensile Strength, ASTM D695: 4,500 psi.

4) Heat Deflection Temperature, ASTM D648: 135 degrees F, minimum.

d. Epoxy Adhesive Packaging:

1) Disposable, self-contained cartridge system capable of dispensing both epoxy components in the proper fluxing ratio and fit into a manually or pneumatically operated caulking gun.

2) Dispense components through a mixing nozzle that thoroughly mixes components and places epoxy at base of predrilled hole.

3) Mixing Nozzles: Disposable, manufactured in several sizes to accommodate sizes of anchor rods.

4) Cartridge Markings: Include manufacturer's name, batch number, mix ratio by volume, product expiration date, ANSI hazard classification, and appropriate ANSI handling precautions.

e. Storage of Epoxy Adhesive:

1) Store epoxy cartridges on pallets or shelving in a covered storage area.

2) Control temperature above 60 degrees F and dispose of cartridges if shelf life has expired.

3) If stored at temperatures below 60 degrees F, test adhesive prior to use to determine if adhesive meets specified requirements.

f. Manufacturers: Adhesive Technology Corp., 21850 88th Place South, Kent, WA 98031; or Anchor-It Fastening Systems, HS 200 Epoxy Resin.

g. Anchors will provide allowable working loads not less than those tabulated in the Structural General Notes. Provide minimum diameter of 3/8 inch.

3. Provide concrete anchors for the exposure conditions as noted below:

a. Drilled-In Concrete Anchors:

1) Dry exposure, use galvanized steel.
2) Wet exposure, use stainless steel.
3) Submerged exposure, do not use.

b. Epoxy Anchors:

1) Dry exposure, use stainless steel.
2) Wet exposure, use stainless steel.
3) Submerged exposure, use coated stainless steel.
4) Do not use epoxy anchors in any overhead applications.

c. Grouted Concrete Anchor:

1) Dry exposure, use stainless steel.
2) Wet exposure, use stainless steel.
3) Submerged exposure, use coated stainless steel.

4. Do not use drilled-in concrete anchors for anchoring of any machinery or equipment with moving parts.

D. Stainless-Steel Fasteners Lubricant (Anti-Seizing): Where stainless steel nuts and machined bolts, anchor bolts, concrete anchors, and all other threaded fasteners are used, apply an anti-seizing lubricant to the threads prior to making up the connections. Use a lubricant that contains substantial amounts of molybdenum disulfide, graphite, mica, talc, or copper.

PART 3 – EXECUTION

3.01 CONSTRUCTION (NOT USED)

3.02 INSTALLATION

A. Install per manufacturer's recommendations. Cutting and welding is not permitted. Protect dissimilar metals in conformance with Section 05500, MISCELLANEOUS METALS. Place items to be embedded in concrete accurately and securely positioned during placement. Protect anchors after installation by coating the exposed threads with lubricant (anti-seizing) and installing a nut.

B. Anchor Bolts:

1. Accurately locate all anchor bolts and hold in place with templates at the time the concrete is poured. Set bolts perpendicular to the surface from which they project.

2. Cast-in-place when concrete is placed, wherever feasible.

3. Accurately locate anchor bolts embedded in concrete with bolts perpendicular to surface from which they project.

4. Do not allow anchor bolts to touch reinforcing steel.

5. Where anchor bolts are within 1/4 inch of reinforcing steel, isolate with a minimum of four wraps of ten mil polyvinyl chloride tape in area adjacent to reinforcing steel.

6. In anchoring machinery bases subject to heavy vibration, use two nuts, with one serving as a locknut.

7. Where bolts are indicated on the Drawings for future use, first coat thoroughly with nonoxidizing wax, then turn nuts down full depth of thread and neatly wrap exposed thread with waterproof polyvinyl tape.

8. Furnish anchor bolts with standard hex bolt head and minimum four diameter hook length.

9. Embed anchor bolts ten diameters minimum.

10. Where indicated on the Drawings, set anchor bolts in metal sleeves having inside diameter approximately two inches greater than bolt diameter and minimum ten bolt diameters long. [Fill sleeves with grout when a machine or other equipment is grouted in place.]

C. Concrete Anchors

1. Do not begin installation until the concrete or masonry receiving the anchors has attained its design strength. Install in strict conformance with manufacturer's written instructions. Use manufacturer's recommended drills and equipment.

2. Epoxy Anchors: Do not install when temperature of concrete is below 35 degrees F or above 110 degrees F.

3. Furnish manufacturer's representative, for each type of concrete anchor used, to the jobsite to conduct jobsite training for proper installation, handling, and storage of each anchor system for personnel as required. Notify the OWNER'S REPRESENTATIVE of training session schedule.

4. Do not use flush-mounted concrete anchors unless specifically shown on the Drawings or approved by the OWNER'S REPRESENTATIVE.

D. Galvanizing and Repair

1. The minimum pitch diameter of the threaded portion of all bolts, anchor bars, or studs are to conform to ASME B1.1, having a Class 2A tolerance before galvanizing. After galvanizing, the pitch diameter of the nuts or other internally threaded parts may be tapped over ASME B1.1, Class 2B tolerance by the following maximum amounts:

3/8-inch through 9/ 16-inch	0.016-inch oversize
5/ 8-inch through 1 -inch	0.023-inch oversize
1 - 1 /8-inch and larger	0.033-inch oversize

2. Repair galvanized surfaces that are abraded or damaged at any time after the application of the zinc coating by solvent cleaning the damaged area in accordance with SSPC SP2 or SP3 and removing all loose and cracked coating. After cleaning, apply galvanized paint per Section 05500, MISCELLANEOUS METALS.

END OF SECTION

PART 1 – GENERAL

1.01 DESCRIPTION

A. This WORK specified in this section includes the requirements for stainless steel grating as designated in the Contract.

1.02 DEFINITIONS

A. References

1. American Society for Testing and Materials (ASTM)

a. A193 – Standard Specification for Alloy-Steel and Stainless Steel Bolting Material for High-Temperature Service

b. A194 – Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure or High-Temperature Service, or both

c. A276 – Standard Specification for Stainless Steel Bars and Shapes

2. National Association of Architectural Metal Manufacturers (NAAMM)

a. ANSI MBG 531 – Metal Bar Grating
b. ANSI MBG 532 – Heavy-Duty Metal Bar Grating Manual

1.03 SUBMITTALS

A. Submit the following in accordance with Section 01300, SUBMITTAL PROCEDURES:

1. Shop Drawings:

a. Grating: Show dimensions, weight, and size and location of connections to adjacent grating, supports, and other WORK.

b. Grating Anchorage: Show structural calculations and details of anchorage to supports to prevent displacement from traffic impact.

c. Grating Supports: Show dimensions, weight, size, location, and anchorage to supporting structure.

d. Catalog information and catalog cuts.

e. Manufacturer’s specifications, including coatings.

2. Information Submittals:

   a. Special handling and storage requirements.

   b. Installation instructions.

   c. Factory test reports.

   d. Manufacturer's certification of compliance for specified products.

   e. Written test report that swaged crossbars, if used on grating, meet the requirements of the specified test and additional requirements of these Specifications.

1.04 PREPARATION FOR SHIPMENT

A. Insofar as is practical, factory assemble items provided.

B. Package and clearly tag parts and assemblies that are of necessity shipped unassembled and protect the materials from damage, and facilitate identification and final assembly in the field.

1.05 FOOT TRAFFIC GRATING

A. Design

1. Uniform Service Load; 400 psf minimum, unless otherwise shown.

2. Maximum Deflection: 1/4 inch, unless otherwise shown.

3. Space bearing bars at 1-3/16 inch, center to center.

4. Banding: 3/16 inch minimum.

PART 2 – PRODUCTS

2.01 EQUIPMENT (NOT USED)

2.02 MATERIALS

A. Stainless Steel Bar Type Grating

1. Pressure-locked, rectangular design, as manufactured by IKG/Borden, Clark, NJ; IKG/Borden 316L or equal.

B. Anchor Bolts and Nuts

1. Stainless Steel: ASTM A193 and ASTM A194, Type 316.

C. Removable Fastener Clips and Bolts

1. Removable from above grating walkway surface.

2. Hat Bracket: Type 304 stainless steel.

3. Bolt: Type 316 stainless steel.

4. Manufacturer and Product: Struct-Fast, Wellesley Hills, MA; Gratefast, or equal.

D. Partially Removable Anchor

1. Bolt: Threaded stud, Type 316 stainless steel.

   a. Manufacturer: Nelson Stud Welding Co., Lorain , OH.

2. Hat Bracket: Type 304 stainless steel.

   a. Manufacturer: Struct-Fast, Wellesley Hills, MA.

2.03 FABRICATION

A. General

1. Exposed Surfaces; smooth finish and sharp, well-defined lines.

2. Furnish necessary rabbets, lugs, and brackets so WORK can be assembled in a neat, substantial manner.

3. Conceal fastenings where practical.

4. Drill metalwork and countersink holes as required for attaching hardware or other materials.

5. Weld Connections: Not permitted on grating except at banding bars.

B. Design

1. Field measure areas to receive grating, verify dimensions of new fabricated supports, and fabricate to dimension required for specified clearances.

2. Section Length: Sufficient to prevent it's falling down through clear opening when oriented in the span direction when one end is touching either the concrete or the vertical leg of grating support.

C. Minimum Bearing: ANSI/NAAMM MBG 531.

D. Metal Crossbar Spacing: two inches maximum, unless otherwise shown or specified.

E. Crossbars: Flush with top of main bar and extend downward a minimum of 50 percent of the main bar depth.

1. Swaged Crossbars:

a. Within 1/4 inch of top of grating with 1/2 inch minimum vertical dimension after swaging, and minimum before swaging dimension of 5/16 inch square.

b. Crossbar Dimension After Swaging: Minimum 1/8 inch wider than the opening at minimum of two corners at each side of each square opening in main bar.

c. Crossbars may be a special extruded shape so that after swaging the top will be flat, 3/16 inch wide and will be flush with the top surface of the bearing bars for a minimum of 5/8 inch at center between bearing bars.

d. Flush crossbar meeting all of the above except that after swaging shall overlap one corner by a minimum of 1/8 inch. Test a sample of one bearing bar and one cross bar by holding the bearing bar and pulling on the crossbar. The crossbar to bearing bare shall sustain a minimum of 300 pounds without pullout of the bearing bar.

e. Tightly fit main bars and crossbars, allowing no differential movement.

2. Do not use weld type crossbars.

3. Banding: Same material as grating; ANSI/NAAMM MBG 531 and ANSI/NAAMM MBG 532.

4. Furnish stainless steel Type 316 threaded anchor studs, as fasteners for grating attachment to metal supports either not embedded or partially embedded in concrete, as manufactured by Nelson Studs Welding Co., Lorain, OH.

F. Supports

1. Seat angles and beams where shown

a. ASTM A276, Type 316L beams and angles.

2. Coordinate dimensions and fabrication with grating to be supported.

3. Coordinate dimensions with increased depth due to serrations.

4. Welded Frames with Anchors: Continuously welded.

G. Slip-Resistant Surface

1. Rectangular Stainless Steel Bar Grating: As manufactured by IKG/Borden, Clark, NJ; EZ Weldslip-Resistant Coating, or equal.

H. Foot Traffic Grating

1. Any single grating section, individual plank, or plank assemble shall be between 1 foot 6 inches and 3 inches - 0 inches in length and not weigh more than 150 pounds.

PART 3 – EXECUTION

3.01 CONSTRUCTION (NOT USED)

3.02 INSTALLATION

A. Install supports so that grating sections have a solid bearing on both ends, and that rock and wobble grating movement does not occur under designed traffic loading.

B. Install plumb or level as applicable.

C. Install welded frames with anchors to straight plane without offsets.

D. Anchor grating securely to supports using minimum of four fastener clips and bolts per grating section.

E. Use stainless steel anchors and accessories.

F. Completed installation is to be rigid and neat in appearance.

G. Commercially Manufactured Products

1. Install in accordance with manufacturer’s recommendations.

2. Secure grating to support members with fasteners.

3. Welding is not permitted.

4. Fasteners: Field locate and install.

5. Permit each grating section or plank type grating assembly to be easily removed and replaced.

END OF SECTION