

SECTION 05120

MISCELLANEOUS STEEL

PART 1 - GENERAL

1.1 Summary

A. This Section includes fabrication and erection of the structural steel and other steel or metal items as defined in AISC Manual, Code of Standard Practice.

B. Structural Steel Repair and Improvement Requirements

1. Interior Structural Steel Repair Work

a. Replace a total of one column and top cap plate. The replacement column and cap plate shall be equal or greater in size and material properties to those being replaced. The existing column base plates shall remain in place. Grind the top of the existing column base plate surfaces smooth for column to fully bear against the top of the plate. Install the columns plumb. At the Contractor's option the columns may be repaired by welding new cover plates of sufficient cross sectional area to restore the load carrying capacity of the existing members to their original condition. Prior to the start of work, the Contractor shall submit a detailed report with recommendations and drawings for the replacement or repair of the structural steel columns to the Engineer for approval. The Contractor shall submit the report and drawings sealed by a registered professional Engineer licensed in the state of Arizona.

b. Replace roof purlins at locations directed by the Engineer. Inspect all structural steel surfaces following abrasive blasting operations. Notify the Engineer in writing where the loss of material exceeds fifteen (15) percent of the original material thickness. At the Contractor's option the roof beams may be repaired by welding new cover plates of sufficient cross sectional area to restore the load carrying

capacity of the existing members to their original condition. Prior to the start of work, the Contractor shall submit a detailed report with recommendations and drawings for the replacement of repair of the structural steel roof beams to the Engineer for approval. The Contractor shall submit the report and drawings sealed by a registered professional Engineer licensed in the state of Arizona.

- c. Perform Ultra Sonic Floor Thickness Survey and vacuum test on all floor seams prior to application of the new protective coating system. Locate any leaks in the floor plate or welded joint using vacuum testing in accordance with AWWA D100, Section 11.12. Leaks observed in welds shall be repaired by gouging-out the defective area and rewelding. Leaks observed at surfaces of plates shall be repaired by seal welding a ¼ inch thick plate (minimum) to the existing floor plate. Prior to the start of the repair work, the Contractor shall submit a detailed report with recommendations and drawings for the repair of the floor, to the Engineer for approval. The Contractor shall submit the report and drawings and sealed by a registered professional engineer licensed in the State of Arizona.

2. Exterior Structural Steel Modifications:

- a. Install new safety handrail and chain as indicated in Sketches SK-1 and SK-3.
- b. Install new gauge board numbers, float and target per Sketch SK-7.
- c. Remove and replace the existing roof vent located at the center of the roof per Sketch SK-4. Install new side vents through the shell wall of reservoir per Sketch SK-5 and SK-6. Eight side vents shall be equally spaced around the perimeter of the shell wall of each 1.0 mg tank above maximum overflow inlet pipe elevation and shall avoid interference with existing ladders, piping, level indicators, etc.

- d. Furnish and install 30" access door on shell at location determined by the Engineer. Access door to be installed per AWWA D100- *Welded Steel Tanks for Water Storage* and shall be constructed with a side hinge assemble. Shop drawings to be submitted with a structural engineer stamp prior to installation.

C. Related Work Specified Elsewhere

Protective CoatingsSection 09900

1.2 References

A. Applicable Standards

1. American Institute of Steel Construction (AISC)

Manual of Steel Construction – Allowable Stress Design.
Quality Criteria and Inspection Standards.

2. American Welding Society (AWS)

A5.4 – Stainless Steel Electrodes for Shielded Metal Arc Welding.
D1.1 – Structural Welding Code – Steel.
QC1 – Standard for AWS Certification of Welding Inspectors.
QC3 – Standard for AWS Certified Welders.

3. American Society for Testing and Materials (ASTM)

A6 – General Requirements for Rolled Steel Plates, Shapes Sheet Piling, and Bars for Structural Use.
A36 – Structural Steel.
A53 – Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
A106 – Seamless Carbon Steel Pipe for High-Temperature

Service.

A108 – Steel Bars, Carbon, Cold-Finished, Standard Quality.

A307 – Carbon Steel Bolts and Studs, 60,000 psi Tensile.

A563 – Carbon and Alloy Steel Nuts.

A569 – Steel, Carbon (0.15 Maximum, Percent) Hot-Rolled Sheet and Strip Commercial Quality.

F436 – Hardened Steel Washers.

4. American Water Works Association (AWWA)

D100 – Welded Steel Tanks for Water Storage

1.3 Submittals

- A.** Submit as specified in DIVISION 1.
- B.** Includes, but not limited to, the following:
 - 1.** Fabrication and erection drawings for all Work. The Contractor may use a reproduction of the Engineer prepared Contract Drawings for erection drawings such as to indicate information on erection or to identify detail drawing references. Where the drawings are revised to show this additional Contractor information, the Engineer's title block is to be replaced with a Contractor's title block and the Engineer's professional seal will be removed from the drawing. The Contractor shall revise these erection drawings for subsequent Engineer revisions to the Contract Drawings.
 - 2.** All necessary information for the fabrication, including filler metal for welds, of the component part of the structure, presented on drawings to conform to recognized standard practice, AISC Manual Part 5, and AWS Code.
 - 3.** Drawings showing each piece marked for identification to correspond to erection drawings.

4. Manufacturer's literature on products including, but not limited to hardware and protective coatings.

1.4 Quality Assurance

A. Welder Qualifications

1. Welders shall be previously qualified by passing the tests prescribed in the AWS Standard Qualification Procedure.
2. Welders shall have been tested within the past 12 months and their qualification shall be considered as remaining in effect unless the welder is not engaged in a given process of welding for a period exceeding 6 months.

- B. Inspection:** Material or workmanship may be subject to inspection in the shop and field.

1.5 Delivery, Storage and Handling

- A.** Handle and store all steel and appurtenances as specified in DIVISION 1.
- B.** Store all steel and appurtenances blocked-up off the ground and in orderly stacks.
- C.** Protect all items with shop applied protective coatings from corrosion. Store in an environment and manner consistent with type of coating.

PART 2 – MATERIALS

2.1 Basic Materials

- A. Steel:** Conform to ASTM A36, as designated in the AISC Manual, Part 1, unless otherwise indicated or specified.
- B. Connection Bolts, Nuts, and Washers**
1. Conform to ASTM A307.
 2. Be galvanized when connecting galvanized steel.

- C. **Handrail:** Conform to ASTM A53, Type E or S, Grade B or ASTM A106, Grade B.
- D. **Pipe for Structural Uses:** Conform to ASTM A53, Type E or S, Grade B, or ASTM A106, Grade B.
- E. **Welding**
 - 1. For ASTM A36 steel, use E70 electrodes for shielded metal arc welding, F7 series electrodes for submerged arc, E70T series electrodes for flux-cored arc welding, and ER70S series electrodes for gas metal arc welding.
 - 2. Select "matching" filler metal in accordance with Table 4.1, AWS D1.1.
 - 3. Select "matching" electrodes in accordance with AWS A5.4 for welding of stainless steel.

2.2 Steel Fabrication

- A. Fabricate all steel to conform to AISC specifications, codes, and standards.
- B. Permissible variations for sweep, camber, length, and cross section of all steel members shall conform to ASTM A6, AISC "Manual of Steel Construction, Part 1", AISI "Code of Standard Practice", and AISC "Quality Criteria and Inspection Standards" unless indicated otherwise.
- C. **Welding**
 - 1. All welding shall be shielded metal arc, submerged arc, or flux cored arc, or gas metal arc. For gas metal arc welding, the short-circuiting mode of filler metal transfer is not permitted.
 - 2. Conform to AWS Code, AISC Manual, Part 4, and the AISC Quality Criteria and Inspection Standards.
 - 3. The Contractor shall perform fabrication welding inspection in accordance with AWS D1.1. This welding inspection shall

be performed by AWS Certified Welding Inspector(s) (CWI).
Defective welds shall be corrected.

D. Shop Connections

1. Weld or bolt as indicated or specified.

E. Provisions for Field Connections

1. Provide with bolted connections as indicated or specified.

2.3 Shop-Protective Coating

A. Prepare surface and apply primer (first coat) as specified in SECTION 9900.

B. Apply primer in shop to all steel including connections, except for the following surfaces:

1. Within 3 inches adjacent to field welds.
2. On faying surfaces of bolted connections when using alkyd primer.

2.6 Handrail

A. 1-1/2-inch nominal (1.9-inch od) round, black standard-weight pipe.

B. Post spacing shall not exceed 5 feet from center-to-center.

C. Form and weld all handrail. Grind all welds smooth and even with the surface of the pipe, including field welds required for erection.

D. Carefully form all handrail where change of direction or elevation occurs.

E. Handrail posts shall be vertical (plumb) unless otherwise indicated.

PART 3 - EXECUTION

3.1 Preparation

- A.** Contractor shall submit the method and sequence of erection for acceptance.

3.2 Steel Erection

- A.** Erect all steel to conform to AISC specifications, codes, and standards; AISC Quality Criteria and Inspection Standard; or any local, state or federal codes which may exceed such requirements.

B. Erection Shoring and Bracing

- 1.** Contractor shall be responsible for structural adequacy, design, engineering, and construction of all erection shoring and bracing.
- 2.** Provide all necessary temporary struts, ties, cables, temporary flooring, planking, and scaffolding in connection with the erection of the structural steel or support of erection machinery.
- 3.** Locate shoring and bracing as required to maintain proper position against loads from erection equipment, construction material, and wind.
- 4.** Leave bracing in place until sufficient steel connections to ensure stability of the structure.

C. Connections

- 1.** Make bolted connections as indicated.
- 2.** Where required for connection fit-up, bolt holes may be adjusted in one of the following manners (flame cutting or flame enlargement of holes is not allowed):
 - a.** Reamed to AISC allowable maximum size for oversized holes.

- b. Holes may be filled with weld metal, ground smooth, and field-drilled.

3. Welded Connections

- a. Make welded connections as indicated and leave all erection bolts in place after completion of welding unless otherwise indicated.
- b. Reinforce connections when members requiring fillet welds are not in contact.
- c. Use backup bars or spacer bars on all butt welds where root opening exceeds 3/16-inch.
- d. Remove all run-out tabs.

D. Welding and Welders

- 1. The requirements for erection welding and welders shall be the same as specified for steel fabrication.
- 2. The Contractor shall perform erection-welding inspection in accordance with AWS D1.1. This welding inspection shall be performed by AWS Certified Welding Inspector(s) (CWI). Defective welds shall be corrected.

- E. Protect pipe sleeves and other anchorage members from deleterious materials at all times.

F. Handrail

- 1. Form and weld all handrail. Grind all welds smooth and even with the surface of the pipe.
- 2. Carefully fit all handrail where change of direction or elevation occurs.
- 3. Install all rails and posts plumb, level, straight and true, and in alignment.

4. Top rail shall clear all fixed objects by at least 3 inches vertically and horizontally.
5. Furnish and install plates, bolts, and additional items as indicated or required for fastening to supporting members.

3.3 Field-Protective Coatings

- A. Surface preparation, priming, and finish coating are specified in Section 9900.

PART 4 – MEASUREMENT AND PAYMENT

- 4.1 **Measurement:** No measurement will be made for this item, Miscellaneous Steel.
- 4.2 **Payment:** Payment will be made at the Contract Lump Sum Price Bid and the "Schedule of Adjustment Unit Prices" and shall be considered full payment for providing all labor, equipment, tools and materials to perform this Work.

****END OF SECTION****