**Reviewers: Delete section 2.1 if drainage system does not include scuppers and grates, and renumber paragraphs accordingly.**

 DRAINAGE SYSTEM 7/1/21

**1.0 Description.**

**1.1** This work shall consist of furnishing, fabricating and installing the drainage items necessary to complete the entire drainage system as shown on the contract plans.

**1.2**  Detailed shop drawings of the drainage system shall be prepared and submitted to the engineer. Shop drawings shall be in accordance with Sec 1080. Catalog data may be furnished for components that are standard manufactured items in lieu of detailed drawings, provided that governing dimensions are given.

**2.0 Materials.**

**2.1** Scupper outlets and grates shall be equivalent to Neenah R-4014-E. Castings shall be cast gray iron in accordance with Sec 614. A fabricated outlet and grate of similar size and in accordance with the requirements for ASTM A 709 Grade 36 steel may be submitted for approval. Castings shall be coated with a prime coat of the coating system as specified on the bridge plans to provide a minimum dry film thickness of 5 mils or may be galvanized in accordance with ASTM A 385. Steel outlets and grates shall be coated as described above or galvanized in accordance with ASTM A 123.

**2.2** Reinforced fiberglass pipe, collection basins and fittings shall be a Reinforced Thermosetting Resin Pipe (RTRP) system in accordance with the requirements of ASTM D 2996. The RTRP system shall have a minimum short time rupture strength hoop tensile stress of 30,000 psi. The RTRP system shall be pigmented resin throughout the wall. The color of the RTRP system shall be concrete gray or as specified on the bridge plans. The RTRP system shall not be coated with paint, gel-coat or any other exterior coating.

**2.3** The contractor shall furnish a manufacturer's certification to the engineer for each lot furnished, certifying that the materials supplied are in accordance with all requirements specified. The certification shall include results of all required tests. Acceptance of the material will be based on the manufacturer's certification and upon results of such tests as may be performed by the engineer. The certification shall show the quantity and lot number that is represented.

**3.0 Construction Requirements.**

**3.1** All connections shown on the plans to facilitate future removal for maintenance cleanout or flushing shall be made with a threaded gasket coupler system, bolted gasket flange system or a female to male threaded PVC plug. Adhesive bonded joints will be permitted for runs of pipe between such connections.

**3.2**  Runs of pipe shall be supported at a spacing of not greater than the lesser of those as recommended by the manufacturer of the pipe or as shown on the bridge plans. Supports that have point contact or narrow supporting areas shall be avoided. Standard sling, clamp, clevis hangers and shoe supports designed for use with steel pipe may be used. Minimum hanger thickness shall be 3/16 inch with the minimum strap width for the pipe sizes shown in the table below. Straps shall have 120 degree minimum contact with the pipe. Pipe supported on a surface with less than 120 degrees of contact shall have a split fiberglass pipe protective sleeve bonded in place with adhesive. All new steel, hangers and miscellaneous hardware for drainage system shall be ASTM A 709 Grade 36 steel except as noted on the bridge plans. All new steel, hangers and miscellaneous hardware for drainage system shall be galvanized in accordance with ASTM A 153 except as noted on the bridge plans.

| **Pipe Size****inches (mm)** | **Minimum Strap Width****inches (mm)** |
| --- | --- |
| 3 (76.2) | 1.25 (32) |
| 4 (101.6) | 1.25 (32) |
| 6 (152.4) | 1.50 (38) |
| 8 (203.2) | 1.75 (45) |
| 10 (254.0) | 1.75 (45) |
| 12 (304.8) | 2.00 (51) |
| 14 (355.6) | 2.00 (51) |

**3.3** The RTRP system shall be handled and installed in accordance with guidelines and procedures as recommended by the manufacturer.

**3.4** When the drainage system continues between superstructure units and/or between the superstructure and substructure units, the drainage system shall have allowance for the expected differential expansion and contraction movements as recommended by the manufacturer. Runs of pipe shall not exceed 200 feet in length.

**4.0 Method of Measurement.** No measurement will be made.

**5.0 Basis of Payment.** Payment for the above described work, including all material, equipment, labor and any other incidental work necessary to complete this item will be considered completely covered by the contract lump sum price for Drainage System (On Structure).