

# SECTION 11400 RADIAL GATES



## GENERAL

### SUMMARY

- A. The Contractor shall provide all labor, materials, equipment, and incidentals required to furnish and install radial gates, complete and operational with all necessary accessories as shown on the Contract Drawings, as specified herein, or as required for complete operation.
- B. Radial gates shall be provided at the following locations: (Insert Structure Number or Building Number)
- C. The Contractor shall obtain all equipment specified in this Section from one manufacturer to ensure proper coordination and functionality. The manufacturer shall have responsibility for performance and compatibility of the entire system. This does in no way relieve the Contractor for ultimate responsibility under this Contract for equipment, coordination, installation, operation and guarantee.
- D. The Contract Drawings are for purpose of guidance and to show functional features and required external connections. They do not necessarily show all components necessary to accomplish the desired results nor do they necessarily show all components required to interface with the equipment. The Contractor shall provide all parts, equipment, and devices necessary to meet the functional requirements of the system.

### REFERENCES

Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified:

- 1. American National Standards Institute (ANSI)
- 2. American Society for Testing and Materials (ASTM)
- 3. American Welding Society (AWS):
  - i. D1.1 Structural Welding Code Steel
  - ii. D1.6 Stainless steel

### SYSTEM DESCRIPTION

Design Requirements:

- 1. Liberal safety factors will be used in the design of all equipment. Working stresses will not exceed the lower value of, one half of the yield strength, or one fifth of the ultimate strength of the material per ASD design approach. The Radial gates and appurtenances shall be designed for installation in the structures as shown on the plans.
- 2. When the radial gate is in the fully opened position, it shall be raised completely out of the water for full flow.

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- 3. Radial gates shall be provided in accordance with the Schedule to be provided as outlined below:

Location	Tag	Gate Width	Gate Height	Gate Invert Elevation	Design Head (In feet)	Overflow Type or Breastwall Type

**SUBMITTALS**

- A. Submit the following for approval:
  - 1. Manufacturer’s information, specifications, and data showing dimensions, materials of construction, and weight of all major items of equipment.
  - 2. Installation diagrams showing location, arrangement, and size of all fasteners required for the equipment.
  - 3. Setting drawings, templates, and instructions for installation of guides, etc.
  - 4. Calculations justifying that all components were designed based upon the maximum heads described herein.
  
- B. Upon completion of installation, submit a digital copy of the Operation and Maintenance Manual for this equipment. A final copy of this manual shall be approved by the Engineer prior to distribution and as a minimum shall contain the following:
  - 1. Operational and maintenance manuals shall include all approved shop drawings associated with this Section, complete instructions for installation, and parts list for all components.
  - 2. Include a list and frequency of specific maintenance activities.

**PRODUCTS**

**MANUFACTURERS**

- A. Provide radial gates as manufactured by the following:
  - 1. Henry Pratt Company (Hydro Gate brand).
  - 2. Prior-approved equal.
  
- B. Radial Gate manufacturer shall have a minimum of 10 years’ experience in the design and manufacture of this type of equipment.

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## EQUIPMENT MATERIALS

- A. All radial gates shown on the plans and listed in the gate schedule shall conform in all respects to the project specifications and manufacturer's design standards. Materials used in construction of radial gates and appurtenances will be best suited for the application and will conform to the following specifications:
1. Hot-Rolled Steel (Flats, Structural Shapes, Plates): ASTM A36, A283, Grade C or D; or ASTM A306, Grade 60.
  2. Stainless Steel (Structural, Plates, Flats): ASTM A167, ASTM A240 or ASTM A276, all Type 304L or 316L.
  3. Fasteners: Stainless Steel, ASTM F593/F594, Alloy Group 1 or 2 (304 or 316).
  4. Side Seals: EPDM or Neoprene ASTM D2000, 60 Durometer with a stainless steel ASTM A276, Type 304 or 316 retainer bar.
  5. Pins and Pin Bearings, Hoist shaft: Cold-Rolled Steel, ASTM A108, Grade 1045.
- B. Leaf: The leaf, steel or stainless steel, shall consist of a curved, minimum ¼-inch steel plate reinforced with horizontal and vertical stiffeners and shall be sufficient to withstand and operate under the full range of loading conditions. Overflow-type gates shall be designed to withstand a water depth of 1 foot greater than the vertical height of the gate. The breastwall-type gate shall be designed to withstand a water depth as shown in the gate schedule. Maximum deflection of the face plate shall be limited to L/360 for overflow-type and to a maximum of 3/16-inch for breastwall-type gates at the upper reinforcing members. The leaf shall be fabricated in one piece unless shipping limitations require multiple sections. When multiple sections required, joints shall include a rubber gasket to minimize leakage.
- C. Radial Arms: The radial arm assemblies, steel or stainless steel, shall transmit the load from the radial arms to the pivot pin, and shall be designed to resist pin friction. The arms shall be fabricated from structural steel angles. The unsupported or unbraced length of the radial arms shall not exceed an L/R ratio of 120.
- D. Trunnions: The trunnion sleeve shall be fabricated steel and welded to the trunnion arms. The trunnion sleeve shall be equipped with self-lubricating bronze sleeve bearings. The trunnion pin shall be properly supported, either by a channel wall mounted bracket or embedded in the concrete. The trunnion pin shall be type 304 stainless steel and designed to support the maximum transferred load.
- E. Side Seal Rubbing Plates: Provide type 304 stainless steel rubbing plates for a smooth and true contact surface for the seals throughout the full range of gate movement. Side seal rubbing plates shall be designed to attach to the structure channel walls. The plates shall be adjustable on the anchor bolts to provide proper alignment.

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- F. Sill Plate: The bottom sill plate shall be stainless steel and shall provide a smooth, level, and contact surface for the bottom seat for the full width of the invert of the gate. The sill plate shall be adjustable on anchor to permit leveling and alignment with the gate bottom. After the gate has been installed and the sill plate adjusted, it shall be grouted in place.
- G. Seals: J-seals shall be provided as specified. Seals shall be securely fastened to the leaf with formed stainless steel retainers and shall be replaceable and adjustable. The corners of the J-seals shall be vulcanized. The bottom seal shall also be a j-seal type. Seals and retainer flats shall be provided with holes to match those on the slide.
- H. Wire Rope Hoist: The hoisting system shall consist of hoist base frame, cable drums, drum shaft, wire rope cables, bearing bracket and anchor bolts. The hoist shall be operated by either a manual or electric operator. The hoist shall be suitable for modulation service and for fully raising and lowering the gate. The root diameter of the drum shall be a minimum of 12 times the cable diameter.
1. Wire Rope Cable: Wire rope cable and attachment hardware shall be stainless steel. Cable and attachment hardware shall be designed to withstand all loads to the gate. Wire rope shall be standard IWRC type.
  2. Bearings: Hoist shall include a shaft support pillow block and bearing combination to prevent friction.
  3. Shaft: The shaft and tube material shall be cold rolled steel as shown in the materials.
  4. Manual Operator (Enclosed Gear): The manual hoist operator shall consist of a self-locking worm gear, with reduction spur gears as required, enclosed in a ductile iron housing. A handwheel, located approximately 36 inches above the operating surface, shall be provided to produce the necessary output torque to raise and lower the gate when a maximum 40 lb pull is exerted on the handwheel rim.
  5. Electric Operator: The electric actuator shall be of sufficient rating to raise or lower the gate under all head conditions. The power supplied to the actuator shall be 480 Volt, 3-Phase, 60 Hz. The motor duty rating shall be sufficient for one complete and continuous open or close cycle

**FINISHES**

- A. Carbon or structural steel: The gate manufacturer shall be responsible for shop prime and finish painting of all gates and appurtenances supplied under this contract. All coatings shall conform to VOC Emission Regulations in effect at the manufacturing location and at the project site to allow touch up or recoating to be performed with the same products. All surfaces shall receive a primer and finished coat with a high solids epoxy coat or approved equal for potable water use. Primer and finished coats shall be applied in the manufacturer's shop. Where required by application, the coating shall be approved for contact with drinking water by the NSF, EPA, or other appropriate governing agencies. Number of coats, mil thickness, and surface preparation shall be in accordance with the

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paint manufacturer's recommendations for that application. Coating shall be Ameron Amerlock 400, medium gray color.

- B. Submerged surfaces shall be cleaned to SSPC SP10, dry, and grease-free prior to painting in conformance with the paint manufacturer's instructions. Non-submerged surfaces shall be cleaned to SSPC SP6.
- C. All surfaces shall receive a primer and finished coat with a high solids epoxy coat or approved equal for potable water use. Primer and finished coats shall be applied in the manufacturer's shop.
- D. Where required by application, the coating shall be approved for contact with drinking water by the NSF, EPA, or other appropriate governing agencies. Number of coats, mil thickness, and surface preparation shall be in accordance with the paint manufacturer's recommendations for that application.
- E. Coating shall be Ameron Amerlock 400, medium gray color.
- F. Stainless Steel: Stainless steel components shall not be coated.

### **SHOP TESTING**

The complete gate assembly will be shop inspected for proper tolerances as shown on the manufacturer's drawings.

### **EXECUTION**

#### **SHIPPING & INSTALLATION**

- A. Manufacturer shall provide temporary bracing to maintain tolerances during shipping and installation.
- B. The radial gate equipment and appurtenances shall be installed by the contractor in a workmanlike manner in accordance with the Installation Manual furnished by the gate manufacturer. Extreme care should be used in handling, storage, and installation of this equipment to prevent damage or distortion of the equipment and to insure proper performance.

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## FIELD QUALITY CONTROL

Field testing shall be performed after installation of the equipment. Testing shall demonstrate the following:

- A. The equipment has been properly installed in accordance with manufacturer's instructions and recommendations.
- B. The equipment has been installed in the specified location and orientation or as shown on the Contract Drawings.
- C. The equipment has been aligned.
- D. There are no mechanical defects in any of the parts.



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