



SPECIFICATION: COMPOSITE SLIDE GATES

PART 1 GENERAL

1.01 DESCRIPTION

A. Scope:

1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install composite gates and appurtenances complete and operational.
2. Included are composite gates, anchorage systems and all appurtenances.
3. Extent of the equipment is shown on the Composite Gate Schedule located at the end of this section.

B. Coordination:

1. Review installation procedures under this and other Sections and coordinate the installation of items that must be installed with, or before the composite gates work.

C. Related Sections:

1. Section _____, Cast-In-Place Concrete.
2. Section _____, Grouting.
3. Section _____, Anchor Systems.
4. Section _____, Painting.

1.02 REFERENCES

A. Standards referenced in this Section are listed below:

1. American Society for Testing and Materials, (ASTM).
 - a. ASTM A 276, Specification for Stainless Steel Bars and Shapes.
 - b. ASTM B 584, Specification for Copper Alloy Sand Castings for General Applications
2. National Electrical Code, (NEC).
3. National Electrical Manufacturers' Association, (NEMA).
4. AWWA C563-14

1.03 QUALITY ASSURANCE

A. Manufacturer's Qualifications: All stop gates shall be supplied by the same manufacturer, who shall be fully experienced, reputable and qualified in the manufacturing of the equipment furnished and who

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has been building composite gates for a minimum period of five (5) years.

B. Component Compatibility: All components shall be specifically designed for the specified service and shall be integrated into the overall assembly by the composite gate equipment manufacturer.

C. Performance Requirements: Composite Slide gates shall be designed for the seating and unseating heads as listed in the gate schedule. Composite Slide shall conform to the AWWA C563-14. Conformance to AWWA C563 applies to discs and frames with a safety factor of five (5) with regard to tensile, compressive and shear strength and with the requirement that all gates will yield no more leakage than shown in the standard for Field Leakage Test. Calculations shall be submitted to show conformance. Materials of construction shall be suitable for the environment in which the composite slide gates shall be installed and operated.

1.04 SUBMITTALS

A. Submit the following:

1. Shop Drawings:
 - a. Fabrication, assembly and installation diagrams.
 - b. Setting drawings, templates, and directions for the installation of anchor bolts and other anchorages.
 - c. Wiring diagrams for electric motor operators.
2. Product Data:
 - a. Manufacturer's literature, illustrations, specifications and engineering data.
 - b. Deviations from the Contract Documents if any.
 - c. Furnish a lubricant specification for the type and grade necessary to meet the requirements of the equipment.

B. Informational Submittals: Submit the following:

1. Support Design Information:
 - a. Submit for record purposes only the weight of each slide gate and expected opening and closing thrust loads on the supporting structure.
2. Shop Test Results:
 - a. Submit results of required shop tests.
3. Field Test Results:
 - a. Submit a written report giving the results of the field tests required.

C. Closeout Submittals:

1. Operation and Maintenance Manuals:
 - a. Submit complete Installation, Operation and Maintenance Manuals including, test reports, maintenance data and schedules, description of operation and spare parts information.
 - b. Furnish Operation and Maintenance Manual in conformance with the requirements of



Section _ _ _ _ _ , Operations and Maintenance Data.

1.05 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling and Unloading:

1. Gate supplier to deliver anchor bolts and anchorage devices to be embedded in cast-in place concrete.
2. Handle all Composite gates and appurtenances properly, in accordance with manufacturer's recommendations. Composite gates, which are distorted or otherwise damaged, will not be acceptable.
3. Protect all bolt threads and ends from damage.

B. Storage and Protection:

1. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.
2. Store all mechanical equipment in covered storage off the ground and prevent condensation.

C. Acceptance at Site:

1. All boxes, crates and packages shall be inspected by CONTRACTOR upon delivery to the site. CONTRACTOR shall notify ENGINEER, in writing, if any loss or damage exists to equipment or components. Replace loss and repair damage to new condition in accordance with manufacturer's instructions.

1.06 WARRANTY AND GUARANTEE:

A. The Manufacturer shall guarantee the Composite slide gates, when installed and operated as recommended by the Manufacturer with a documented maintenance program, trouble-free operation for a period of ten (10) years. If the Owner or Engineer is not completely satisfied with the performance of the product, the Manufacturer shall remedy the problem at no cost or refund the materials and installation cost upon the return of the equipment. The Manufacturer shall guarantee the following.

1. Leakage shall be no more than that allowed by the AWWA C563-14 standard, during the guarantee period.
2. Door (disc) shall be free of sticking or binding as judged by the Engineer (move freely via operator provided) with no exercising required. Gate operators are to be warranted by the operator manufacturer.



PART 2 EQUIPMENT

2.01 SERVICE CONDITIONS

A. GENERAL:

1. Design Composite gates to safely withstand conditions listed in Composite gate schedule, located at the end of the Section.
2. Composite gates shall be substantially watertight with leakage less than allowable by AWWA C563-14 standard, (Under the design head, seating or unseating, as specified, the allowable leakage shall not exceed 0.10 gpm/ft. of seating perimeter).
3. Manual operators shall turn right to close, unless otherwise specified. Operators shall indicate the direction of operation.
4. Bolts, studs, cap screws, and adjusting screws shall be of ample section to withstand the force created by operation of the gate under a full head of water.

2.02 MANUFACTURERS

Provide equipment of one of the following:

- A. Rodney Hunt Company
- B. Or approved equal.

2.03 FABRICATION

A. Materials of Construction:

1. Stainless Steel: For frame, rails and yoke, ASTM A 276, Type 304L or 316L stainless steel, as specified in schedule. All metal for Composite gate parts shall have a minimum thickness of 1/4-inch.
2. Bronze Casting: For operating nut, thrust nut and lift nut, ASTM B 584 Alloy 865.
3. All bolts, studs, cap screws and adjusting screws shall be of Type 304 or 316 Stainless Steel.
4. Bolts and nuts shall have hexagon heads.
5. Installation shall conform to manufacturer's recommendations based upon the use of a suitable non shrink grout; mounting of gates to a concrete wall using a flexible gasket will not be acceptable.
6. ALL fixing angles shall be full and continuous; NO tab fixing is acceptable.



B. Reinforced Composite slide gate (frame) – General: Type 304L or 316L stainless steel shall have a minimum thickness of 1/4-inch. Reinforced Composite slide- (disc) as specified herein; FRP, GRP, plastic coated steel or externally reinforced slide (disc) shall not be acceptable. Frames are wall mounted against a 1” nominal grout base; no thimbles or flanges are needed or included.

C. Slide (Disc): Shall be constructed from a reinforced rigid composite plastic material, having a minimum thickness of 1/8-inch. Slide (disc) shall have an internal matrix of horizontal carbon steel tubes of suitable strength for the specified service. No internal foam filled spaces are acceptable, as travelling debris could damage these unreinforced areas. The slide (disc) outer surface skin shall be a homogeneous plastic material having high tensile and impact strength, be nontoxic and shall be stabilized against ultraviolet light. The plastic material shall be an Aramid fiber from the KEVLAR family of fibers, and shall have the following minimum properties and be designed to limit the deflection to a max of 1/1000 of the span under design head condition based upon horizontal support members only. Manufacturer shall submit drawings and comprehensive design criteria to substantiate that the required deflection figure for each door has been achieved; safety factors shall be calculated for the disc under maximum head, and shear at the disc/seal interface. No substitute of fiber type will be acceptable.

Physical Properties	Typical Values	Unit	Test Method
Ultimate tensile strength	43,000	psi	ASTM D 638
Shear strength, perpendicular	21,500	psi	ASTM D 732
Ultimate flexural strength	66,000	psi	ASTM D 790
Ultimate flexural modulus	3,400,000	psi	ASTM D 790
Ultimate compressive strength	44,000	psi	ASTM D 695
Izod Impact strength	7.9	ft-lb/in	ASTM D 256
Water absorption (14 days)	0.10%	%	
Specific gravity	1.85	(g/cc)	
Heat distortion point	130	C	

D. Seals: The sealing arrangement for the reinforced Composite slide gates shall comprise of sealing faces and side guides constructed of ultra-high molecular weight polyolefin having an extremely low coefficient of friction, sealing faces shall have a backing constructed of highly resilient expanded neoprene. Side guides and seating of the gate shall be easily adjustable (min. 5/8-inch). All moving contact surfaces shall be compatible to each other thereby minimizing sticking / jamming and making the operation easy.

E. Fasteners: Shall be: 304 or 316 stainless steel. All anchor bolts, assembly bolts, screws, nuts, etc. shall be of ample section to safely withstand the forces created by operation of the gate under full head conditions.



F. Stem:

1. Operating stems shall be of Type 304 or 316 Stainless Steel and designed as specified below.
2. Design stem to transmit in compression at least 2-1/2 times the rated output of the operating mechanism with an 80-pound effort on the crank or hand wheel. Determine the critical buckling load using the Euler column formula, using $C = 2$. Where hydraulic cylinder lifts are used, the stem design force shall not be less than 1.25 times the output thrust of the hydraulic cylinder with a pressure equal to the maximum working pressure of the hydraulic fluid supply. When electric actuators are used, the stem design force shall not be less than 1.25 times the output thrust of the unit in the stalled motor condition.
3. Stems shall have a slenderness ratio (L/R) less than 200.
4. Threaded portion of the stem shall have machined cut threads of the Acme type. Join stems of more than one section by stainless steel couplings threaded and keyed or threaded and bolted. All threaded and keyed couplings of the same size shall be interchangeable. Couplings shall be designed to be of greater strength than the stems.
5. Connect the stem to the disc by means of a bolted connection.
6. Provide rising stems with an adjustable stop collar on the stem above the floor stand lift nut.
7. The Slide gate manufacturer shall conduct a welding process as described in AWS D 1.6 and ASME Welding code - Section IX using qualified welding process and welders. All submerged weld joints shall be continuous welded. Stitch Welds will not be accepted so as to prevent inter-granular corrosion under submergence. Slide Gate manufacturer shall ensure all weld joints are dye penetrative tested using certified qualified inspectors.

2.04 APPURTENANCES

A. Stem Guides:

1. Stem guides shall be fabricated from Type 304L or 316L Stainless Steel and shall be equipped with UHMW polyethylene or UHMW polymer bushing.
2. Guides shall be adjustable in two directions and shall be spaced accordingly to comply with the AWWA C563-14 Standard.
3. Anchor bolts for stem guides shall be Type 304 or 316 Stainless Steel.

B. Anchor Bolts:

Provide Type 304 or 316 Stainless Steel anchor bolts as required for stem guides, floor stands, and all equipment or appurtenances, which must be secured to concrete walls or floors. Anchor bolts shall be of ample size and strength for the purpose intended, and shall be furnished by the manufacturer. Anchor bolts shall be hooked, and provided for direct embedment during placement of concrete. Mounting templates must be provided. Alternate: heavy duty epoxy anchoring system.



C. Stem Cover:

1. Furnish all stems with a clear polycarbonate or butyrate plastic pipe stem cover. Covers shall be furnished with a cast aluminum adaptor for mounting covers to floor stands. Stem covers shall be designed and furnished with a gasket and breathers to eliminate water intrusion into operators and condensation within the covers.
2. Engrave the covers with legible markings showing as a minimum the gate position at 1/4 open, 1/2 open, 3/4 open and full open.
3. The stem cover shall be equipped with a clear Mylar position indicating tape. The tape shall be field applied on the stem cover after the gate has been installed and positioned. As a minimum, the tape shall indicate the gate position at 1/4 open, 1/2 open, 3/4 open and fully open.

D. Manual Operators:

1. Manual operation shall be by hand wheel or crank operated floor stand or bench stand as shown and specified.
2. Hand wheel-operated type shall be without gear reduction and crank-operated type will have either a single or double gear reduction, as required. Each type shall be provided with a threaded cast manganese bronze lift nut to engage the operating stem.
3. Provide anti-friction bearings to properly support both opening and closing thrusts.
4. Stands shall operate the gates under the specified operating head with not greater than a 40-pound pull on the crank or hand wheel.
5. All components shall be totally enclosed in a cast-iron weather-proof housing. Provide positive mechanical seals to exclude moisture and dirt and prevent leakage of lubricant out of the unit.
6. Provide lubricating fittings for all gears and bearings.
7. Stands shall include a cast-iron pedestal designed to position the input shaft approximately 36-inches above the operating floor. An arrow with the word "OPEN" shall be permanently attached or cast on the floor stand indicating the direction of rotation to open the composite weir gate.
8. Removable cranks shall be cast-iron with a revolving brass grip. Removable hand wheel shall be fabricated steel designed for rough treatment and minimum weight.
9. For self-contained type composite gates, the distance between hand wheel or crank operator and the operating floor shall be 36-inches minimum and 48-inches maximum.
10. Crank-operated gates shall be provided with nut-operator drives as noted on Gate schedule.
11. Provide mechanical stops adjustable \pm five degrees at each end of travel.



E. Identification: Identify each composite weir gate with a stainless steel nameplate stamped with the approved designation as shown in the Composite Gate Schedule, located at the end of this Section. Nameplate shall be permanently fastened to the gate at the factory.

2.05 SURFACE PREPARATION AND PAINTING

A. Clean, prime coat, and finish coat ferrous metal surfaces of equipment in the shop in accordance with the requirements of Section _____, Painting.

B. Coat machined, polished and non-ferrous surfaces bearing surfaces and similar unpainted surfaces with corrosion prevention compound, which shall be maintained during storage, and until equipment begins operation.

C. CONTRACTOR shall certify, that the shop primer and coating system conforms to the requirements of Section _____, Painting.

2.06 SOURCE QUALITY CONTROL

A. Shop Tests:

1. Test each Composite gate fully assembled in the vertical position for proper seating.
2. Fully open and close gate disc in its guide system to ensure that it operates freely.
3. Operate and test floor stands, bench stands and motor operators to ensure proper assembly and operation.
4. Details for the leakage test and torque test are as follows:
 - a. Shop Leakage Test: Shop leakage test by applying unseating hydraulic pressure will be conducted. A hydrostatic pressure equal to maximum seating/unseating head shall be applied to gate at center line of gate opening from the back, i.e. unseated face of the gate in closed position, through positive displacement screw pump. A suitable scaled calibrated pressure gauge put on the unseating face of the gate shall indicate reading equal to unseating pressure head. Water leakage through the gate under above condition shall be collected in a collection pan and measured. The leakage so measured should not exceed 50% of the limit as stated in AWWA C563. After the first leakage test, the gate will be opened by at least 150 mm (6") to fully un-wedge door and frame wedges and then closed. Leakage test will be once again conducted. Leakage measured should not exceed 50% of the limit as stated in AWWA C563. No alternate testing arrangement and procedure will be permitted in place of the above.
 - b. Torque Test at Operating Head: In case of an electrical operating mechanism, the torque and amperage measured should not exceed 80% of the rated torque and amperage of the actuator. This test is required to verify the suitability of offered operating arrangement at actual operating head.



In the event that the manufacturer is unable to demonstrate to ENGINEER that their equipment meets the requirements of the tests, the deficient equipment will be rejected and CONTRACTOR shall adjust and/or modify and retest the equipment as often as necessary to meet the specified requirements. No separate payments shall be made for adjustments and/or modifications.

2.07 SLIDE GATE SCHEDULE

A. The Composite Gate Schedule is located at the end of this Section. Conform to type, size, operation and other data specified, unless otherwise approved by ENGINEER.

B. Provide all Composite Gates as shown and listed in the schedule.

C. Schedule Abbreviation:

1. Type:

- a. EF - Embedded Frame.
- b. SM - Surface Mounted Frame.
- c. WG - Downward Opening Weir Gate.

2. Operator Type:

- a. CO - Crank Operated.
- b. HW – Hand wheel.
- c. MO - Motor Operated.

D. The seating and unseating design head as stated in the Composite Gate Schedule is based on the head measured to the centerline of the gate in its closed position.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install the Composite gate equipment in accordance with manufacturer's instructions and recommendations.

B. Brace guides and frames during placement of concrete.

C. Set anchor bolts in accordance with approved Shop Drawings and manufacturer's recommendations.



D. Provide minimum of 1-inch of non-shrink grout below all floor-stands, and behind any wall mounted slide gates, wall brackets, and guide brackets.

E. Adjust all parts and components as required to provide correct operation.

3.02 MANUFACTURER'S SERVICES

A. A factory trained representative shall be provided for installation supervision, start-up and test services and operation and maintenance personnel training services. The representative shall make a minimum of 2 visits, minimum 8 hours on-site for each visit, to site. The first visit shall be for assistance in the installation of equipment. Subsequent visits shall be for checking the completed installation, start-up and training of the system. Manufacturer's representative shall test operate the system in the presence of the ENGINEER and verify that the equipment conforms to the requirements. Representative shall revisit the site as often as necessary until all defects are corrected and the installation is entirely satisfactory.

B. All costs, including travel, lodging, meals and incidentals, for additional visits shall be at no additional cost to the OWNER.