SP- 231046
(New)

SPECIAL PROVISIONS
FOR
FIBERGLASS REINFORCED SLUICE GATES

Polk County
HDP-1945(411)--71-77

Effective Date
January 22, 2025

THE STANDARD SPECIFICATIONS, SERIES 2023, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SPECIAL PROVISIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

PART 1 – GENERAL

1.01 Summary.

This specification includes all fiberglass reinforced plastic sluice gates (sluice gates) required for the project.

1.02 References.

A. The provisions of the following codes, specifications, and standards, latest editions, shall apply:

1. ASTM A 193 - Stainless Steel Anchor Bolts
2. ASTM A 276 - Stainless Steel Bars
3. ASTM B 584 - Alloy 865 Manganese Bronze
4. ASTM D 256 - Izod Impact Strength
5. ASTM D 570 - Water Absorption Rate
6. ASTM D 638 - Tensile Strength
7. ASTM D 695 - Compressive Properties of Rigid Plastic
8. ASTM D 696 - Coefficient of Linear Expansion
9. ASTM D 790 - Flexural Properties
10. ASTM D 792 - Density and Specific Gravity at 230 C
11. ASTM D 1056 - Polymer Grade
12. ASTM D 2563-0 - Visual Defects
13. ASTM D 2583 - Indentation Hardness
14. ASTM D 2584 - Resin, Glass & Filler Content
15. AWWA C563 - Fabricated Composite Slide Gates
16. AWWA C540 - Power Actuating Devices - Sluice Gates

1.03 Submittals.

Submit Shop Drawings showing all critical dimensions and Principal parts and materials.

1.04 Delivery, Storage and Handling.

Ship all gates with suitable packaging to protect products from damage. Protect threads, flanges, stems and operators from damage.

1.05 Measurement And Payment.

A. Measurement: No measurement will be made for sluice gates.

B. Payment: Shall be considered incidental to other project work.

PART 2 – PRODUCTS

2.01 Materials.

A. Gate Body.
- **1.** Engineered composite fiberglass reinforced plastic (FRP) completely encapsulating an internal steel reinforcing structure.
- **2.** Infusion molded to create a seamless corrosion barrier impervious to moisture.
- **3.** FRP resin shall be vinylester.
- **4.** Internal Steel Reinforcing: Carbon steel as needed for deflection requirements.
- **5.** Internal Core Foam: 2 pound polyisocyanurate closed cell rigid foam.

B. Guide Frame.
- **1.** Guide Frame Rails: T-304L stainless steel.
- **2.** Operator Support Yoke: T-304L stainless steel.

C. Stems and Gate Hardware.
- **1.** Stem: T-304L stainless steel
- **2.** Gate Hardware: T-304L stainless steel
- **3.** Seals
- **4.** Side, Top and Flush Bottom Seals: Hollow Bulb J Seal molded of extruded virgin EPDM.

D. J-Seal Clamping Bar and Fasteners.
- **1.** Clamping Bar: T-304L stainless steel
- **2.** Fasteners: T-304L stainless steel

E. Lift Nuts and Thrust Nuts: Manganese Bronze, ASTM B-584, Alloy 865.

F. Hand Wheel: Cast Iron, ASTM A-126, Class B.

G. Anchor Bolts: T-304L stainless steel

H. Stem Cover: Butyrate

I. Stem Guides (When applicable): UHMW

2.02 Sluice Gates.

A. Pre-Approved Manufacturers: Plasti-Fab, a division of Ershings, Inc.

B. Gates shall meet AWWA C-563 Requirements:
- **1.** Leakage: Gates shall have a maximum leakage rate of 0.05 GPM per foot of wetted perimeter under seating and unseating head pressures under full design head.
- **2.** Sluice gate shall be wedging and have adjusting bolts.

2.03 Design Criteria.

A. Composition of the sluice gate laminate shall be in accordance with the recommendations shown in the Quality Assurance Report for Reinforced Thermostat Plastic (RTP) Corrosion Resistant Equipment prepared under the sponsorship the Society of the Plastics Industry, Inc. (SPI) and the Material Technology Institute of the Chemical Process Industries, Inc. (MTI) for “Hand Lay-up Laminates” and shall meet the specifications for Type 1, Grade 10 laminates shown in Appendix M-1 of said report.
- **1.** Visual inspection for defects shall be made without the aid of magnification. Defects shall be classified as shown in Table 1 Level II of ANSI/ASTM D2563-0, approved 1977, (or any subsequent revision).

B. Deflection: Deflection across the gate width shall be limited to: L/360 or 1/4 Inch whichever is less, at the maximum operating head.

C. Head Pressure: Gate shall be designed for a maximum head pressure as shown in sluice gate schedule located in the plans.

D. Gate size as shown in the plans and/or sluice gate schedule.

E. Surface Conditions.
- **1.** All sluice gates shall be flat and level.
- **2.** Warpage throughout the entire gate shall not produce a crown of more than 1/16 Inch in any direction.
- **3.** Gates having reinforcing members bolted or bonded to flat sheet stock will not be acceptable.

F. Sealed Area: Sluice gate shall seal on all four sides.

2.04 Construction.

A. Gate Body.
- **1.** Sluice gate body shall be manufactured of fiberglass reinforced polyester totally encapsulating an internal reinforcing structure.
- **2.** Each gate shall be infusion molded individually to the exact dimensions specified. Seams and joints in and on the body are not acceptable.
- **3.** Sluice gates shall be manufactured of reinforced thermoset plastic.
- **4.** Gate body shall have UV stabilizing pigment in the resin to provide long- term protection from UV.
- **5.** The surface shall be resin rich to a depth of 0.010 inches to 0.020 inches and reinforced with C-glass and/or polymeric fiber surfacing material.
- **6.** The surface shall be free of exposed reinforcing fibers.
- **7.** The composition of these layers shall be approximately 95% (by weight) resin. The remaining laminate shall be made up of copolymer composite and

reinforcing fibers in a form, orientation and position to meet the mechanical requirements.

8. Structural reinforcing shall be utilized to attain the necessary stiffness to meet deflection requirements and shall be well encapsulated with a laminate not less than 1/4 inch thick on each side to ensure against any permeation by water to the core areas.

9. T-304L stainless steel stem mounting bracket shall fasten to the gate with through bolts. The through holes shall not pass through or be in contact with the internal mild steel reinforcing.

10. Core material must be 100% resistant to decay and attack by fungus and bacteria and be resistant to hydrocarbons.

11. Gate body shall be manufactured using advanced technology vacuum infusion resin transfer processes. The closed mold vacuum process must completely evacuate all air from the mold prior to infusing the mold with premium quality resin as specified. The vacuum infusion process must eliminate the potential of air entrapment and/or voids in the matrix of the gate body thus producing a finished product that is one-piece, seamless and uniformly impenetrable by fluids eliminating interior corrosion. Manufacturing techniques that employ adhesives or mechanical fasteners to attach individual panels to a pre-fabricated framework results in seams along vertical and horizontal axes of the gate body which create stress-potential areas, portals for fluid infiltration, subsequent de- lamination and product failure due to corrosion.

B. Seals.

1. The gate shall be equipped with elastomeric seals to reduce leakage.

2. Elastomeric J-seals shall be made of molded or extruded EPDM having a hardness range of 55 to 65 shore A durometer and conforming to ASTM spec. D-2000 having a maximum compression set of 25%, and low temperature brittleness to meet suffix F-17 (-400).

3. Seals, including bottom seals, shall be mounted on gate covers with T- 304L stainless steel cap screws and T-304L stainless steel clamping bars thus providing a means of repair, and replacement without dewatering the gatewell.

4. HDTS gates shall be designed and manufactured with the seals mechanically affixed to the gate body not the guide frames. When replacement of seals eventually becomes necessary (variables such as frequency of open-close cycles, chemical composition and abrasiveness of the fluid will ultimately determine the effective life of the seals) the HDTS gate shall be removable from the guide frame without dewatering the gatewell and, in a suitable work area, easily and economically refitted with new seals. Gates designed with seals integral to the guide frames, which require gatewell dewatering, scaffolding/lifts/ladders and time- consuming “non-workshop” conditions shall not be permitted.

C. Frames and Guides.

1. Guides shall be styled for wall mounting as shown in the plans and/or gate schedule.

2. Guides shall be fabricated from T-304L stainless steel and shall have a slot suitable for mating with the gate body.

3. The head rail shall be affixed so as to allow the gate to be removed from the guide without disassembly.

4. The head rail shall have a maximum deflection of 1/4 Inch when subjected to a horizontal force of four times the 40 pound maximum hand wheel pull.

5. Where a wall mounted guide frame extends above a concrete wall the top anchor bolt shall be not more than 6 inches below the top of the wall.

6. Gate inverts shall be flush with the gatewell bottom.

7. If the gate width is greater than 4 foot wide and two times the gate height, a tandem stem shall be used.
8. Guides to be bolted to the gatewell shall be equipped with heavy duty mounting angle for ease of mounting to the gatewell wall by means of T- 304L stainless steel anchor bolts.
9. No wall thimbles shall be required for installation.

D. Adjustable Wedging Device: Gates shall be fitted with an adjustable wedging assembly comprised of a T-304L stainless steel wedging bar and silicon bronze adjusting bolts with locking nuts. The adjusting bolts shall be non-galling for long-term easy adjustment. Gate wedging assembly shall be initially adjusted at the factory; however, they shall be easily adjusted to achieve the specified leakage rate.

E. Lifts & Operators.
1. Operators shall be sized to start the gate moving under a maximum head pressure with a pull of not more than 40 pounds.
2. A crank shall be supplied that is compatible with the lift.

F. Operating Stems.
1. Each gate shall be equipped with a rising or non-rising operating stem. The stem shall be T-304L stainless steel.
2. The stem will have Acme threads and shall be provided with adjustable stop collars to limit upward and downward travel.
3. Stems shall have a maximum L/R of 200.
4. Stem guides with UHMW bushings shall be used to maintain an L/R of 200.

G. Stem Covers.
1. Transparent plastic stem covers shall be provided with vent holes to minimize condensation.
2. The stem covers shall be marked with `Open' and `Closed' position indicators.

H. Pedestals.
1. For non-self-contained guide frames a wall mounted pedestal shall be furnished for mounting the operator.
2. Pedestal material shall be T-304L stainless steel.

2.05 Physical Properties.

A. Structural characteristics for a 1/8 glass mat laminate shall meet the following minimum physical properties:

1.	Tensile Strength:	15,000 psi
2.	Flexural Modulus	1,000,000 psi
3.	Flexural Strength	20,000 psi
4.	Compressive Strength	22,000 psi
5.	Impact Strength	9.0 ft-lbs/in.
6.	Water Absorption	0.13% (in 24 hours)

B. Seals:- Extruded Virgin EPDM Seals shall have the following physical characteristics:

1.	Specific Gravity	1.25
2.	Hardness	55 – 65 Shore A Durometer
3.	Tensile Strength	1500 psi min.
4.	Elongation	300%
5.	Low temperature brittleness	- 40°F

C. Wear Strips UHMW Polyethylene:

1.	Tensile Strength	5600 psi
2.	Flexural Modulus @ 730°F	130,000 to 140,000 psi
3.	Coefficient of Friction	0.15
4.	Water Absorption	0.01% in 24 hours

PART 3 – EXECUTION

3.01 Installation.

A. Thoroughly clean and remove all shipping materials prior to setting.

B. Install gates per manufacturer's recommendations.

C. Operate all gates from fully opened to totally closed.

3.02 Field Testing.

Contractor shall provide Engineer a Certification of Proper Installation from the manufacturer for each gate installed along with the method of testing.