



SPECIFICATION: ALUMINUM SLIDE GATES

PART 1 GENERAL

- 1.1 The Slide gates shall be manufactured from Aluminum material as specified and shall be Flange back type suitable for wall thimble mounting and generally manufactured in line with provisions of AWWA C-562-12 with improvements as desired and specified hereunder. For Wall mounted gates: Remove references to thimble.
- 1.2 The Slide gates shall be capable of performing the isolation duties in water treatment plant & pumping stations and shall use NSF 61 certified materials for use in drinking water application.
- 1.3 The slide gate shall be so constructed and designed that there is no undue wear or deterioration during its operative life and that the maintenance is kept to a minimum. To ensure this the slide gate manufacturer shall incorporate sealing arrangement which has been tested and certified for accelerated wear over 25,000 cycles of operation using water and sand and the resultant increase in leakage due to seal wear after 25,000 cycles should be well within the permissible leakage requirement. This certification shall be submitted with the offer.
- 1.4 The Slide gates shall be designed for water tightness for both seating as well as off-seating differential pressure of 6 meter water column or as per the actual site requirement.
- 1.5 The Slide gates shall have an on-seating and off-seating leakage rate of not more than 50% of the leakage rate tolerated under AWWA-C562-12 or its latest revision.
- 1.6 All the Slide gates shall be shop tested to verify the leakage performance at operating head, torque tested at operating head to verify the suitability of actuating mechanism and PMI tested to verify the correctness of the material used. This testing will be done in presence of client / client representative or approved third party inspection agency.
- 1.7 The Slide gates shall be rising spindle type and the operation shall be by means of manual / electric operating mechanism as mentioned elsewhere in the specification.
- 1.8 The Slide gate shall be supplied along with all accessories such as wall thimble, gates assembly, gasket between wall thimble and gate assembly, studs and nuts for mounting on thimble, stem connecting block, spindle, spindle couplings, spindle guides, pedestal, operating mechanism as required, gate opening indicating arrangement and required anchor bolts and fasteners for stem guides and pedestal.
- 1.9 The Slide gate manufacturer shall be ISO-9001:2008 certified and have an existing track record of supplying Thimble mounted gates for more than 5 years and should have at least 50 installations in various projects.
- 1.10 The Slide gate manufacturer shall have a suitable representative in the area, having expertise in installation / installation supervision of such gates and the ability to undertake maintenance of such gates.

Rodney Hunt

46 Mill Street
Orange, MA 01364
Phone: 978-633-4362
www.RodneyHunt.com



- 1.11 The Slide gate manufacturer shall conduct welding using the welding process described in AWS D 1.6 and ASME Welding code - Section IX using qualified welding process and welders. Process qualification and welders' qualification will be submitted before commencement of manufacturing.
- 1.12 The Slide gate manufacturer shall ensure that all the submerged weld joints shall be continuous welded and not stitch welded so as to avoid start of intergranular & crevice corrosion under submergence.
- 1.13 The Slide gate manufacturer shall ensure that all the weld joints are fully Dye penetrative tested using qualified inspectors.
- 1.14 The corrosion resistant property of aluminum gets reduced when exposed to heat while cutting by plasma. To avoid this, all the cutting of aluminum material shall be done using heat less water jet cutting procedure.
- 1.15 All the aluminum material used on the assembled product shall be checked for correct chemical composition using Positive Material Identification equipment. This shall be re-verified at the time of inspection in presence of client / client representative / third party inspection agency.
- 1.16 The manufacturing and assembly of aluminum products shall be carried out in a clean area / plant where only aluminum manufacturing is carried out. This clean area is to be maintained in line with good manufacturing practices to be observed while working with aluminum so as to avoid ferrous contamination which results into corrosion impregnation.
- 1.17 After manufacturing the gates will be cleaned to remove any surface contamination and thereafter the gates shall be wrapped in plastic foils to prevent possibility of ferrous contamination while handling at site.

PART 2 EQUIPMENT

2.01 GENERAL

Each Slide gate will be manufactured as detailed hereunder and shall be supplied duly tested as per requirement. The main gate assembly comprising of frame, guides and shutter will be supplied as a factory assembled unit and shipped to site as a ready to install unit on the wall thimble to be supplied earlier or together with gate. This gate assembly will be uncrated at site and installed as complete assembled unit without stripping down into components. This is to ensure that the performance integrity of the sluice gates remains as factory tested and supplied condition, thus minimizing the influence of the installation process to achieve optimum performance at site after installation.



2.02 DESIGN & CONSTRUCTIONAL DETAILS

The slide gates shall be manufactured generally as per AWWA C-562-12. The constructional features and details of components of the required gates are to be as under:

2.2.1 WALL THIMBLE

A. Wall thimbles shall be provided for embedment in the wall so that the slide gate can be mounted on to it. The front mounting flange shall be accurately formed to provide a suitable mounting surface for gate frame and shall be drilled and tapped to match with the flange of the gate frame.

B. The cross section of the wall thimble shall be of a shape to inhibit pullout and water seepage. A ring or a flange around the outside of the wall box shall be provided to form a water stop and anchor ring in the concrete.

C. The depth of wall thimble running parallel to the direction of flow shall be equal to the depth of the wall or 300 mm whichever is minimum. Gates subjected to very high heads will have minimum depth of 450 mm or depth equal to the depth of the wall.

D. To permit entrapped air to escape as the thimble is being encased in concrete, holes shall be provided in each entrapment zone, formed by the reinforcing ribs, flanges and water stops. The holes shall be at least of 40 mm size.

2.2.2 GATE FRAME

A. The gate frame will be made of Aluminum and shall be sufficiently rigid to withstand the designated water head.

B. Back flange of the gate aperture frame to be reasonably flat within 3mm and drilled to engage with the corresponding studs of the wall thimble to be mounted on the wall. A rubber gasket will be provided between the wall thimble and the gate for sealing the leakage between the flanges of wall thimble and frame.

C. The gate frames will be provided with low friction UHMWPE guides to ensure that galling between aluminum frame and aluminum shutter does not take place during gate operation.

D. In case of self contained gates, the frames shall have full length extension guides and shall be provided with a yoke at their top. The length of extension guides in such cases shall be sufficient to engage the overall vertical height of door when the gate is full open position.

(In some extreme cases the frame yoke may be made from stainless steel or coated carbon steel),



both materials would be isolated from the aluminum).

In case of non self contained gates, the frames shall have short length extension guides and shall be without yoke at their top. The length of extension guides in such cases shall be sufficient to engage at least half the overall vertical height of door when the gate is full open and shall be in accordance with the relevant provisions of AWWA C-562.

2.2.3 GATE SLIDE / SHUTTER / DOOR:

A. The gate slide / shutter / door will be made from aluminum and shall be sufficiently ribbed to withstand the designated water head. The slide / shutter shall be designed for the minimum safety factor of 4 with regards to ultimate tensile, compressive and shear strength and a minimum safety factor of 2 with regards to the tensile, compressive and shear yield strength. Slide deflection shall not exceed 1/720 of gate width or 1.6 mm whichever be lower at maximum design head.

B. The gate slide / shutter will be provided with either bolted type or integral pocket to house the thrust nut used to connect the stem with the slide.

2.2.4 SEATING / SEALING FACES:

A. Sealing arrangement shall comprise of low friction self lubricating UHMWPE seals mounted on frame and remaining in forced contact with slide / door through use of resilient back up seal. This sealing arrangement has to be integrated with auto pressurized flushing arrangement to ensure that hard grit particles trapped at the bottom of the guide does not affect full closure of the gate.

B. Alternate sealing arrangement comprising of low friction self-lubricating UHMWPE seat mounted on shutter and remaining in forced contact with resilient rubber seal mounted on frame shall also be acceptable.

C. The sealing arrangement should be so finished that the clearance or gap, if any, between the mating sealing faces, in gate closed position, does not exceed 0.1 mm.

D. Provision of any sealing arrangement wherein resilient seals are in direct contact with aluminum or metal faces will not be accepted as this result into high friction, higher wear and tear and comparatively lower seal life.

E. Any resilient seal used should be of NSF certified EPDM material.



2.2.5 WEDGING DEVICES

A. Depending upon requirement, Slide gates subjected to unseating head can be provided with adjustable wedging devices to ensure forced contact between frame and shutter sealing faces, when the gate is in closed position.

2.2.6 CONVENTIONAL OR FLUSH BOTTOM CLOSING

The slide gates shall be provided with Conventional bottom closure or flush bottom closure arrangement as may be required as per site conditions.

Flush Bottom Closing shall involve a flexible rubber seal mounted on the bottom of gate frame, ensuring that the sealing face remains flush with the floor or opening.

In those cases where the invert of gate and invert of opening on either side of the gate is required to be flush the bottom portion of frame is required to be embedded in the channel / chamber floor and for this a cut out / recess of ample dimensions is required to be provided beneath the waterway opening along the gate invert, while constructing the floor. The dimensions of this cut out shall be provided depending upon the feasibility to do so as per actual site conditions. The depth of this cut out below the invert of opening shall not be more than 200 mm.

This cut out/recess should be later on filled up with removable asphalt or loose concrete mixed with sand dust or vermiculate after putting the gate in position so that it is possible to break open this second stage grout for removal of the gate in future.

The rubber seal employed shall be made of EPDM and NSF certified and the rubber seal retainer bar as well as the fasteners for fitting the rubber seal and the retainer bar shall be of stainless steel.

2.2.7 MANUAL GATE OPERATING HEADSTOCK / LIFT MECHANISM

A. The operating headstocks shall be designed in such a manner as to permit the gate operation by a single person under the specified maximum operating head with an effort of less than 18 kgs on the crank / handwheel.

B. The headstock may be ungeared or geared type and the geared headstock may be either of single speed or of double speed, as might be necessary to make it convenient for one person to open or close the gate as fast as practicable. Two speed headstocks shall be supplied with gates requiring higher hoisting capacities. In this type of headstock the low speed is meant for crack opening the gate when the effort required to open the gate is maximum and the high speed is meant for further faster opening after the gate is crack opened.



C. Geared headstock shall be supplied with easily removable crank handle or handwheel with a radius not exceeding 375 mm.

D. All the gears of geared headstock shall be kept completely encased in cast iron housing to protect them from damage, dirt, dust, water etc. and other atmospheric effects and thus ensure their smooth operation. Grease nipples shall be provided at proper places for lubricating with grease.

E. Headstock meant for mounting on operating platform shall be supplied with a pedestal / floor stand to provide a convenient operating height of approximately 900 mm. The pedestal of the headstock shall be provided with a covered window opening to enable cleaning and greasing of stem threads.

2.2.8 LIFTING SPINDLE / STEM

The sluice gates shall be supplied with rising type lifting spindles / stems. The stem shall be provided with acme / square threading, length of threaded portion being about 400 mm more than the height of waterway opening. This much extra length is required to allow for a minor variation of approximately 100 mm on either side of the specified height of operating platform.

The design of stem will be done as per the provision in AWWA standard.

2.2.9 STEM BLOCK / CONNECTING BLOCK / THRUST NUT

The rising type stem shall be connected to the door through a stem block / thrust nut housed in a ribbed pocket cast integral with the door. The bottom end of stem shall thread into the stem block and is locked in place by a set screw to prevent the stem from unscrewing. The Stem block shall be cast bronze or Gunmetal.

2.2.10 SAFETY STOP NUT

The stem shall be provided with a safety stop nut to prevent the chances of over closing of gate which may otherwise damage either the stem or the lifting platform. The stop nut shall be furnished with a set screw for setting it in a fixed position after the gate is installed.

Upon installation the safety stop nut should be set in such a way that its bottom remains about 1 to 2 mm away from the top of headstock, in gate closed position.

In case of stainless steel stem, the stop nut shall also be of stainless steel material of the same grade.



2.2.11 STEM / SPINDLE COUPLINGS

For ease in transportation and handling, maximum length of one piece stem shall be restricted within 5 meter length. Where the stem are required to be furnished in more than one piece, threaded stem couplings shall be furnished to interconnect different sections of the stem. The couplings shall have provision for pinning after inserting in the threaded end of the stem.

In case of Stainless steel stem, the couplings shall also be of Stainless steel material of the same grade.

2.2.12 STEM GUIDE BRACKETS:

Longer stems shall be provided with sufficient number of stem guides to prevent buckling of stem. The stem guide bracket to be provided shall be Adjustable Centre Type - wherein a separate stem guide is bolted on to the wall bracket. The stem guide shall be adjustable in the slots on wall bracket in a direction perpendicular to the face of wall. Wall bracket should also offer minor adjustment in the direction parallel to the wall.

The stem guides shall have machine bored split journals to facilitate erection. The journal shall be lined with UHMWPE bush.

2.2.13 PIPE HOOD FOR STEM

A Pipe hood shall be provided on the top of headstock in case of rising spindle / stem gates to cover the spindle threads for protection against damage, dirt, dust, water etc. It shall be made of transparent fracture resistant polycarbonate material or galvanized steel tube. Transparent pipe hood shall have vent holes to prevent condensation.

2.2.14 GATE OPENING INDICATING ARRANGEMENT

Gate opening indicating arrangement shall be provided to indicate the position of the shutter. This shall comprise of scale mounted on the pipe hood and an indicator nut mounted on the rising spindle to show the extent of the opening and closing. The minimum scale graduation shall be 25 mm.

2.2.15 FOOT PLATE WALL BRACKET

Foot plate wall bracket shall be provided for gates in those locations where a platform floor or headstock support beam is not available as a part of the structure. In such cases the Headstock is to be mounted on such bracket. The thrust is transmitted from the headstock through the anchor bolts of the bracket to the wall.

Rodney Hunt

46 Mill Street

Orange, MA 01364

Phone: 978-633-4362

www.RodneyHunt.com



The foot plate wall bracket shall either be made from cast iron or steel. Steel brackets shall be galvanized as well as epoxy painted.

2.2.16 MATERIALS OF CONSTRUCTION

The materials of construction for various components of the sluice gates offered shall be as under:

- | | |
|---|---|
| a) Gate frame, Door / Shutter / Slide: | Aluminum Grade 6061-T6 * |
| b) Seat facings and shutter guides: | Low friction UHMWPE ASTM D4020 |
| c) Thrust Nut / Stem block: | Stainless Steel Grade 304 or 316 * |
| d) Lifting Nut: | Phosphor Bronze BS 1400 grade PB4C or BS 2874 PB102 |
| e) Wedges: | Aluminum 6061-T6 or Stainless Steel 316L * or
Low friction UHMWPE ASTM D4020 |
| f) Spindle / Lifting rod / Stem: | Stainless Steel Grade 304 or 316 * |
| g) Assembly bolts and nuts for gate frame
and wall guide bracket: | Stainless Steel Grade 304 or 316 *
Plastic isolation washers & tubes shall be used |
| h) Anchor fasteners for gate frame, extension
guides and wall guide bracket: | Stainless Steel Grade 304 or 316 *
Plastic isolation washers & tubes shall be used |
| i) Assembly bolts and nuts and anchor bolts
for headstock: | Stainless Steel Grade 304 or 316 * |
| j) Coupling and Stop nut: | Stainless Steel Grade 304 or 316 * |
| k) Pipe hood: | Polycarbonate |
| l) Rubber seals / Gasket **:: | EPDM Rubber ASTM D2000 NSF certified |
| m) Headstock body and gearbox: | Plain Cast Iron to ASTM A126 / Stainless steel grade 304 |
| n) Stem guide bracket and wall bracket: | Stainless Steel Grade 304L or 316L * |
| o) Foot Plate wall bracket: | Carbon Steel, galvanized & epoxy painted /
Stainless steel grade 304L or 316L * |

* Positive Material Identification (PMI) tests to be carried out for these components at manufacturer works during the inspection.

** All resilient seals used shall be NSF certified. Certificate to this effect will be submitted at the time of inspection.

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2.2.17 FINISHING / PAINTING

Aluminum gate assembly coating per AWWA C562-12: Portions of guides and frames in contact or embedded in concrete shall be coated with bitumastic paint, epoxy, or polyamide.

The final coating thickness inclusive of priming on cast iron headstock shall be maintained 150 microns. The epoxy paint to be used to be NSF certified.

2.2.18 SHOP TESTING:

Following shop tests at manufacturers place shall be conducted.

a) Shop leakage test - Shop leakage test by applying unseating hydraulic pressure will be conducted at manufacturer's shop. 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. Unseating 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 C-562-12.

After the first Leakage test the gate will be opened by at least 150 mm to fully un-wedge shutter and frame wedges and then closed. Leakage test will be once again conducted and the leakage so measured should not exceed 50% of the limit as stated in AWWA C-562-12.

No alternate testing arrangement and procedure will be permitted in place of above.

b) Torque test at operating head for manual / electric operating arrangement - After conducting hydrostatic body test a Torque test at operating head would be conducted at manufacturer's shop for gates up to 2000 x 2000 mm size. The torque required to open the gate with manual operating arrangement should not be in excess of 7 Kg-m. In case of electrical operating mechanism, the torque and amperage measured should not exceed 80% of rated torque and amperage of the actuator. This test is required to verify the suitability of offered operating arrangement at actual operating head.

c) Movement Test - Movement test should be conducted in horizontal / vertical assembled condition using stems & headstock. The gate should be operated once from full close to full open and back to full close condition with a max. Force of 135 Newton-meter on the crank or hand wheel.

d) Seat clearance check - With the gate in closed condition 0.1 mm thick feeler gauge should not pass through between sealing faces.



- e) Dimensional Check - Important Dimensions shall be checked with reference to approved drawing.
- f) Material Test Certificates - Material tests certificates for all important components of gates such as Thimble, Frame, Shutter, Spindle, & Rubber seals etc. to be furnished at the time of inspection.
- g) Positive Material Identification Test - Positive Material Identification (PMI) test to be conducted for Thimble, Frame, Shutter, Rubber Seal Retainer Bar, fasteners & Stem / Spindle during the inspection to verify that the correct material as specified has been actually used on gate assembly.

PART 3 SUBMISSION OF BROCHURES, DRAWINGS AND DATA SHEET

The contractor shall submit color brochures of the offered slide gates and following data sheet duly filled, signed and stamped by gate manufacturer along with technical bid.

Sr. No.	Parameters	Offered
1.	ISO 9001 – 2008 certified company (yes / no)	
	NSF 61 certified materials (yes / no)	
	25,000 cycle seat wear test certified (yes / no)	
	Manufactured in separate Fab product plant (yes / no)	
	Continuous welded (yes / no)	
	Cleaned per AWWA C562-12 (yes / no)	
2.	Reference standard AWWA C-562-12 (yes / no)	
3.	Gates size (W x H) in mm	
4.	Operating Head: (Seating {+}/ Unseating {-}/ Both {+/-}) in meters	
5.	Design Head: (Seating {+}/ Unseating {-}/ Both {+/-}) in meters	
6.	Leakage Rate in liters / minute (50% of AWWA)	
7.	CL-PL distance in meters	
8.	Type of Bottom Closure Offered: (Conventional -CBC / Flush Bottom – FBC)	
9.	Cross Section & Depth of Wall Thimble	
10.	Sealing arrangement: UHMWPE to Metal / UHMWPE to Resilient seal	
11.	Operation: Manual / Electrically actuated	
In case of Manual operation:		
	Nos. of Revolution to open / close the gate	



	Effort required to open / close the gate by a single person (required < 18 kgs)	
	Type of operation (Geared – Single Speed or Double Speed / Ung geared)	
In case of Electrically actuated:		
	Make	
	Type (With Integral Starter / Without Integral Starter) Time to open / close the gate	
12.	Material of Construction:	
	Gate Frame, Shutter / Door, Thimble	
	Stem & Coupling	
	Stem Guides, Stem Guide Brackets	
	Rubber Seal Retainer Bar	
	Assembly bolts, Nuts & Fasteners	
	Yoke (applicable for self contained gates)	
	Headstock Pillar	
	Sealing / Seating Faces	
	Door guide	
	Rubber Seal (NSF certified)	
	Thrust Nut & Lift Nut	
	Pipe Hood	
13.	Shop Testing Confirmation:	
	Shop Leakage Test at operating head (yes / no)	
	Torque Test at operating head for actuating mechanism (yes / no)	
	Movement check for complete assembly (yes / no)	
	Dimensional check (yes / no)	
	Seat Clearance Check (yes / no)	
	Material Test Certificates (yes / no)	
	PMI testing for correctness of materials (yes / no)	