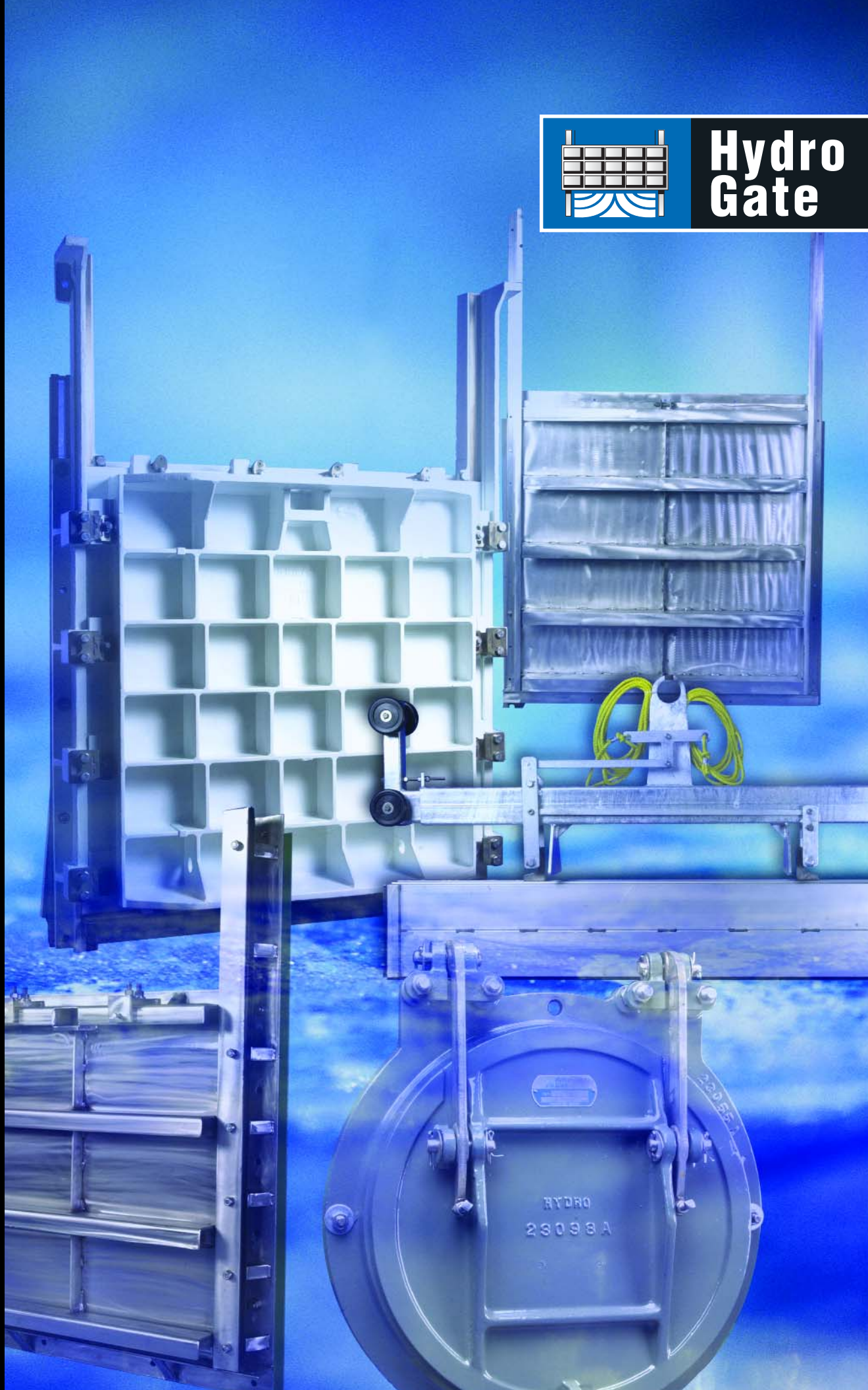
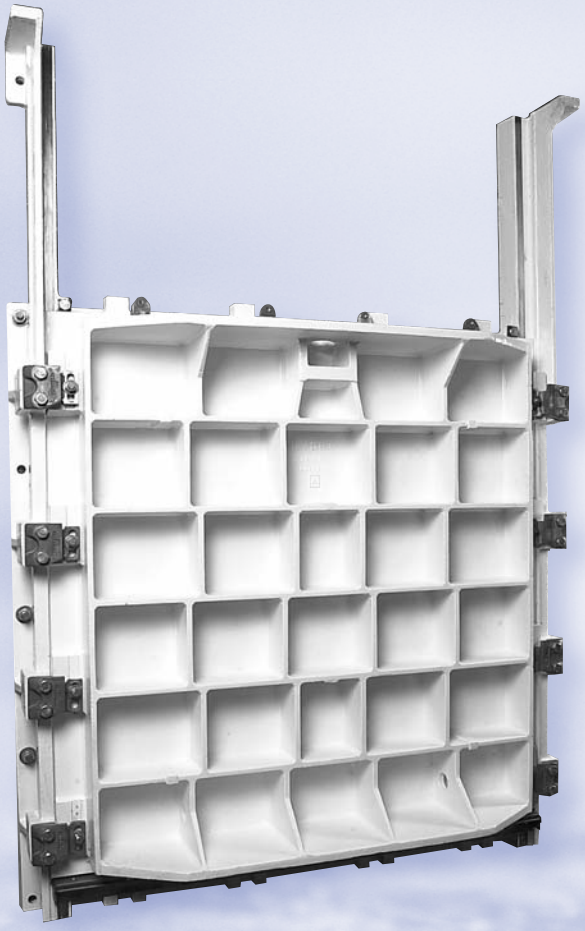
Roller Gates



Pioneers in Gate Design

Hydro Gate

3888 E. 45th Ave.
#120
Denver, CO 80216



Your Source for Water Control Gates

No matter what type of gates your project demands, chances are excellent Hydro Gate has the right gates for your specific application. Our product offering is vast and can suit applications for a wide variety of industries. Choose from cast iron slide or flap gates, fabricated slide or flap gates, rectangular butterfly gates, stop logs, wall thimbles, lifts and accessories.

Industries We Serve

Whether you need gates for flood control, wastewater treatment, environmental water treatment, irrigation, dam projects or hydroelectric plants, we can help. From standard configurations to custom designs, Hydro Gate offers a wide variety of water control gates as well as a full complement of actuators to meet your specific application.

Service Well Beyond Shipment

Our services extend beyond manufacturing. Hydro Gate's experienced field service technicians can help you with repair and refurbishment projects. If you have existing, yet serviceable gates, we can perform a retrofit that will extend their life and durability.

Focus on Quality

Hydro Gates expansive 90,000 square foot manufacturing facility utilizes precision equipment that allows us to merge time-tested gate design with cutting edge technology. We offer large scale manufacturing capabilities with the ability to produce cast iron gates up to 14' x 16' in size, and fabricated gates up to and over 20' in width or height.

With more than 100 years of experience in gate design, Hydro Gate has built a long-standing reputation of providing superior quality water control gates for a variety of industries. Our manufacturing expertise revolves around making big, heavy-duty gates that are 100% custom-built to match specific applications.

Commitment to You… Our Customer

At Hydro Gate, customer satisfaction is our top priority. Bring your special requirements to our engineers who have years of experience in gate design. Our dedicated customer service staff is accustomed to custom requests, because that is what we do best. From your first contact through final delivery, our team of engineers and service experts are here to make sure you have the right gates to suit your needs.

Roller Gates

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Roller Gates

Tandem electrically actuated roller gates.

Applications

- Power Plant Cooling Water Systems
- Municipal Waterworks
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- Irrigation Systems
- On Top of Dams to Increase Reservoir Capacity

Description

Hydro Gate roller gates are designed to control flow through large waterway openings where economy and ease of operation are important. They may be designed as either upward or downward (skimmer) opening.

A roller or fixed wheel gate consists of a fabricated steel slide with cast iron rollers and rubber seals. The gate leaf is a box-like design of welded construction. It varies in width and height as required by the size of the opening in the concrete and varies in thickness depending on the depth of water. Recesses at the sides of the gate opening are provided with rails and with contact faces for side seals.

The thrust developed from water pressure against the gate is transmitted through the rollers to the rails and into the structure. The lift capacity required to open the gate under maximum operating conditions is minimized as the thrust caused by the water pressure is transferred to rolling friction (in lieu of sliding friction as with other types of gates).

Types of Roller Gates

Hydro Gate offers two types of roller gates: the overflow type for use where the water depth is the same as the height of the gate slide; and the breastwall type where water is considerably deeper than the height of the gate and/or where complete closure of the opening is required.

Overflow Type

The overflow type normally is designed for 1-ft water depth over the top of the gate. Typical installations are on the top of a dam to increase water storage, in the spillway of a dam to add water storage, and in diversion ditches or streams through levees on flood control projects. In recent years this type of gate has found wide application for control of power plant cooling water systems and for pump and turbine isolation gates.

Breastwall Type

The breastwall type is designed for the maximum heads that will be encountered on the horizontal centerline of the gate. These heads range up to 40 ft or more.

The breastwall-type gate functions in connection with a wall over the top of the opening and usually is used for flood control on a storm sewer or any other conduit that flows under a levee. This gate is similar in construction to the overflow type, but the higher head of water requires the gate to be strengthened with additional or heavier cross-support members and with larger rollers. Also, a top seal makes contact with an angle embedded in the concrete across the top of the opening. This angle must project from the face of the concrete, thus permitting the top seal to move upward without the bulb of the seal being dragged against the concrete and above the opening.

Size Range

Since roller gates are fabricated of steel and with rubber seals contacting angles embedded in concrete, they are the most versatile as far as size range is concerned. This is due to the ability to fabricate the gate to virtually any size and configuration. The maximum width of a roller gate depends to a certain extent on the height of that particular gate, the maximum operating head, and the availability of very long structural steel.

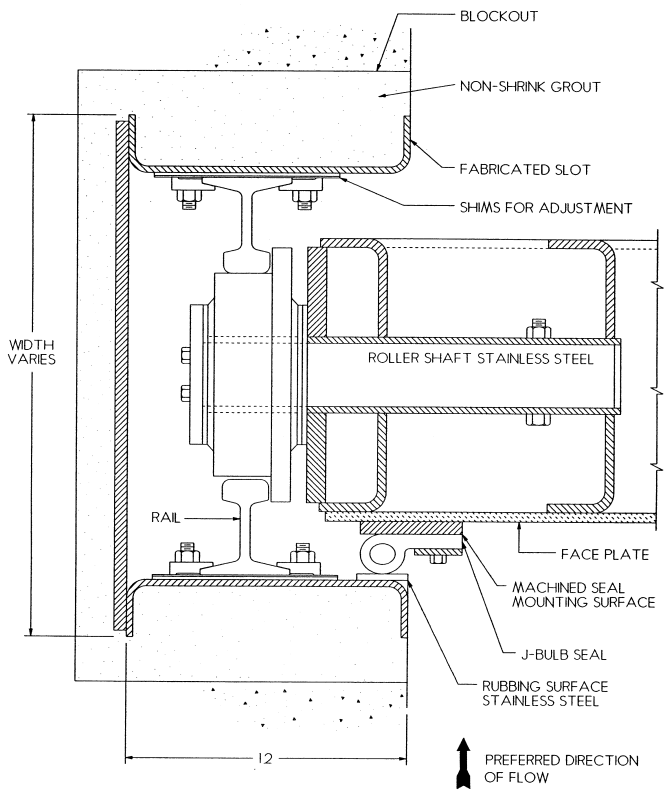

Figure 8-1
Fabricated Roller Slot with Double Rails

Gates that are higher than 10 ft are made in two or more sections to facilitate fabrication, shipping and installation. Each section is provided with a minimum of two rollers per side. Sections are match drilled for ease of field assembly. A flat rubber gasket is supplied to seal the joint between sections. Very small gates are economically impractical.

Gates for Face and/or Back Pressure

Roller gates are quite versatile and can be designed to handle either face or back pressure. They should be arranged so that the higher pressure is on the face (smooth) side. Where both high face and back pressures exist, the leaf can be "double skinned" to increase strength; however, doing so may lead to corrosion/infiltration problems in the interior of the leaf. Filling the dead air space with an inert material such as concrete adds significantly to the lift load requirement and shipping costs.

Seals are designed and mounted to be most effective for the given head pressure conditions. The most effective and reliable seal for head in either direction is the hollow J-bulb seal in direct bulb compression between the gate leaf and seal contact surface. Cantilevered bulb seals (pressure energized) are not completely effective at low heads since the stem of the seal is very stiff.

Roller Slots

The roller slot assembly interfaces the gate leaf with the structure. It forms the "frame" of the gate. The slot consists of two structural channels and a plate welded together to form a "U". Inside the U, two T-head rails are attached to carry and transmit the wheel (roller) loads into the structure. The U also contains the corrosion-resistant seal rubbing surface. The slot assemblies extend to the top of the structure. They may be one piece per side or multiple sections, depending on the length (see Figure 8-1).

The slots may be embedded in the original pour concrete or they may be mounted and grouted in a blocked-out recess. The owner/engineer or contractor should decide which method is best for the project. Alignment of the slots – plumb, parallel and correct spacing – is extremely critical for successful gate performance. Slots can also be surface mounted with special design. A slot design without the steel U-shaped slot is possible. This requires the rails and seal contact surface to be mounted and grouted in a slot cast in concrete. This is very work intensive and does not result in the quality roller gate system that the complete fabricated slot system provides.

Gates for Upward or Downward Opening

The most common direction of opening for a roller gate is up. It can, however, be designed for downward (weir type) operation. For downward operation, the structure must be configured to accommodate the leaf and slot assemblies for full downward travel. The lower end of the slot must be open for self-cleaning. It is not advisable to have a dead slot or sump for the gate to travel into due to silt and debris buildup. Downward-opening gates will have the bottom (horizontal) seal mounted on the structure invert so that the seal is in continuous contact with the leaf. Abrasive debris in the water could affect the life of such a seal and the life of coatings on painted steel leafs.

Materials for Corrosive Environments

While roller gates are commonly coated carbon steel (epoxy paints), portions of the gate or the entire gate can be fabricated from stainless steel to withstand corrosive conditions. This would include leaf, wheel, shafts, slot assembly rails and fasteners.

Adjustable Bottom Sill

A corrosion-resistant sill plate is designed to mount on anchors set in a blocked-out recess in the invert. This allows the sill to be adjusted and leveled to make uniform contact with the rubber seal on the bottom of the leaf. The sill is grouted in place after other alignments are verified. (see figure 8-3 on page 5.)

Leaf Design and Construction

The leaf consists of a steel face plate of 1/4-in. minimum thickness reinforced with horizontal channels or I-beams. Vertical beams at the edges and at interior locations may be needed for stability of the horizontal members. Horizontal members and rollers are hydraulically spaced for optimum strength and equal load distribution.

Roller shaft housings (tubes) are accurately aligned and welded onto the vertical members. Stem connection to the gate leaf is by cast or fabricated stem block pocket attached to the upper horizontal beam with bolts.

The front (smooth) side of the leaf has a steel “flat” completely welded around the perimeter of the leaf. This surface is machined flat to a true plane parallel to the shaft housings to form a seal mounting surface. This machining is critical to the successful performance of the gate and should be specified as a requirement.

Rollers and Shafts

Rollers are cast ductile iron with permanently lubricated bronze bushings pressed in place. Rollers are single flanged and are fitted with spacers to adjust the horizontal distance and centering of the leaf between the rails. The flanges keep the leaf positioned accurately between the rails.

Roller shafts are stainless steel for corrosion resistance and ensure trouble-free operation. Shafts are held in the housing tubes in the leaf with a bolt in a cross-drilled hole through the shaft and housing. Alignment and seal compression is accomplished by the use of shims on the rails in the slot assembly toward or away from the seal rubbing surface, as required.

Adjustable Roller Assemblies

An optional roller assembly is available. It should be considered where there are a large number of rollers on the gate. This helps ensure that each wheel carries an equal load. It may also make seal compression adjustment and alignment easier than adjusting rails with shims.

The adjustable roller assembly consists of a special design shaft and adjuster nut and bracket. The roller journal is machined eccentric to the main body of the shaft. By turning the shaft with the nut adjuster bracket with a large wrench, the gate leaf can be moved forward or backward between the rails to compress the seals. The rollers can also be fine tuned forward or backward for uniform rail contact and load sharing. The nut adjuster bracket is locked down to the leaf with bolts to hold the angular position of the shaft. The adjustment range is approximately 1/4 in. (1/2 in. total movement).

Rails

The double-rail system (rail both upstream and downstream of the wheel) is required for gates having pressure in either direction, and the system also is recommended for gates having pressure in one direction only. Double rails keep the gate aligned for smooth operation.

Standard practice for gates with very long slots is to provide rails long enough to accommodate normal gate travel only. If the gate must travel more than its own opening height or if it is frequently removed, as in a bulkhead situation, rails all the way to the top should be specified.

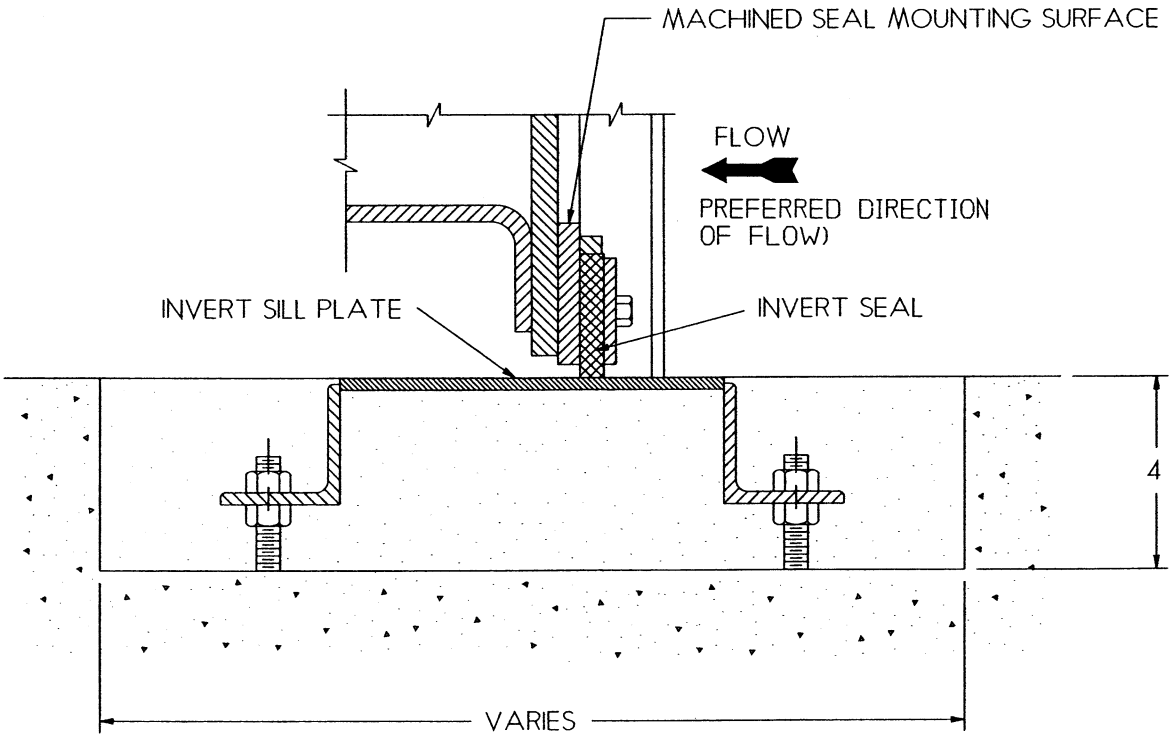

Figure 8-3
Sill Plate Detail

Seals and Seal Contact Surfaces

Seals at the top and sides are hollow J-bulb type. The bottom (sill) seal is a heavy flat (rectangular section) which contacts the sill on its edge. The bottom seal strip is heavily backed up with a bar and cover retainer to withstand the closing weight of the slide. Each corner of the seal is vulcanized.

The stainless steel contact surface in the slot assembly is polished and extends just above the opening. This allows the seals to relax and unload when the gate is fully open.

The breastwall seal contact surface is a specially formed curb angle attached to the structure and grouted into alignment. The concrete breastwall should be recessed or relieved a couple of inches so that the top seal does not drag on it.

Gate Operation

Roller gates are usually operated with threaded stems and manual or electric lifts. Single stems are used when the gate width does not exceed twice the height. Gates that are very wide compared to their height should have tandem stems. Very tall gates (even though square) may be equipped with tandem stems and traveling stem guides in order to keep the stem size, yoke and lift in an optimum cost range.

Roller gates may also be cylinder (oil hydraulic) operated; however, very tall or very wide gates requiring tandem cylinders are not recommended due to synchronization/alignment problems.

Another way of operating gates is with a rope hoist (winch). Close attention must be paid to closing friction loads since the gate may require a ballast to close against the operating head. A roller gate may also serve as a removable bulkhead using an overhead crane. Lifts may be mounted on the concrete structure and are available with pedestals or wall brackets. More commonly, there is no concrete structure above the gate opening. In this case, the lift or tandem lifts are mounted on a head frame (yoke) which can be either attached to the structure or be attached to the extended slot assemblies (self-contained).

Specifications for Roller Gates

General

Gates, lifts, stems and accessories shall be of the size, material, and construction as shown on the drawings and specified herein. They shall be Hydro Gate roller gates or approved equal. Similar installations shall have operated successfully for five years or more. All component parts shall be of the type material shown and shall conform to the ASTM specifications designated in the "Materials" section of this specification. The gates shall be of the overflow type or breastwall type as designated in the "Gate Schedule".

Leaf

Horizontal and vertical structural reinforcing members and a smooth faceplate shall be assembled and securely welded to provide a flat, box-shaped gate slide. The structural members shall be of the proper size, dimension, and placement to safely withstand the maximum unbalanced head designated in the "Gate Schedule". The faceplate shall be of sufficient thickness to safely withstand the maximum unbalanced head and shall be attached to structural members by welding. The leaf shall be designed to limit defection to L/360 for overflow-type gates and to a maximum 3/16 in. for breastwall-type gates at upper reinforcing members.

The gate slide shall be fabricated in one or two sections and shall be furnished with a minimum of two rollers per side, per section. A flat bar shall be welded to the outer periphery of the front face of the slide to provide a mounting surface for side and bottom seals. After all other welding on the gate slide has been completed, the raised seating surface shall be machined to a plane parallel to the roller axis and drilled for mounting the rubber seals.

Cast rollers shall be spaced along the sides of the gate slide to carry equal portions of the hydraulic forces. Each roller shall be provided with a heavy, one-piece, self-lubricating bushing. Roller shafts shall be bolted to collars to provide for field assembly of rollers, bushings and shafting.

Adjustable Roller Assemblies (Option)

Rollers shall be furnished with eccentric shafts to provide for field adjustment of approximately 1/4 in.

Rubber Seals

Side seals shall be of rubber of the hollow J-seal type. The bottom seal shall be a flat rubber section. Seals and steel retainer flats shall be provided with holes to match those on the slide. Corners shall be vulcanized.

Fabricated Roller Slot

Shop-fabricated roller slots shall be provided for attaching to the front of concrete or for embedding as shown on the manufacturer's drawing. The slot shall consist of structural steel shapes of the proper assembled dimension to provide a rubbing surface for the seals, design compression of the seals, and the housing area for the roller assemblies. The seal rubbing surface shall be a stainless steel flat attached to the inside of the roller slot. It shall be finished and polished after all other welding has been completed. The roller slot shall be of sufficient vertical height to provide for full opening of the gate, plus 1 ft, when the slide is fully opened or as otherwise indicated. The assembled slot shall be provided with a means for anchorage in the concrete and attachment to the concrete forms.

Adjustable Sill Plate

The bottom sill plate shall provide a smooth, level, and corrosion-resistant 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.

Welding

Manual welding operators performing welding operations on these gates, or accessories, shall currently be qualified either under Section 9, Part A, of the ASME Boiler and Pressure Vessel Code, or under the Standard Qualification Procedure of the American Welding Society.

The surface to be welded shall be properly prepared. Each deposited layer of weld metal shall be thoroughly cleaned before additional weld material is applied. All welds shall have complete fusion with the base metal, shall be of uniform thickness and shall be free from cracks, oxides, slag inclusions and gas pockets.

All sharp edges shall be removed by grinding.

Fasteners

All anchor bolts and assembly bolts shall be of the material shown in the "Materials" section of these specifications and of ample size to safely withstand the forces created by operation of the gate under specified heads. Anchor bolts shall be provided with two nuts each to facilitate installation.

Stems

Stems shall be manufactured from round, corrosion-resistant steel bar stock. Stems shall be minimum diameter to safely withstand forces created during gate operation under the unbalanced heads shown in the "Gate Schedule". Stems shall be furnished with left-hand rolled threads, 29° Modified Acme threads of proper length to provide for complete opening of the gate. All contact surfaces of threads shall be rolled to a 32 micro-inch finish or better. The bottom end of the stem shall be threaded to connect to the cast stem block.

Lifts

Lifting devices may be of the manually or electrically actuated type depending on gate size and frequency of operation.. For gates where the width is more than twice the height, tandem geared lifts are required.

Enclosed Gear Mechanical Lift

The manual lift mechanism shall be the crank-operated type with either a single or double gear ratio, depending on the lift load. It shall have a cast-bronze lift nut threaded to fit the operating stem. Roller bearings shall be provided above and below the flange on the lift nut to take the maximum thrust developed in opening and closing the gate.

The design of the lift mechanism shall be such that the slide can be operated with no more than a 40-lb effort on the crank. The maximum crank radius shall be 15 in. The direction of rotation to open the gate shall be indicated on the lift mechanism.

Tandem Lift

Each geared lift shall be as described above. Individual lifts shall be positioned to lift the gate from a point near each top corner of the gate and shall be connected to operate in tandem. The tandem lifts shall be connected with 1-3/8 in. diameter stainless steel or fabricated carbon steel shafting. Each end of the tandem shaft shall be fitted with flexible couplings to transmit the torque from one lift to the other and to compensate for slight misalignment. An intermediate support shall be provided for the tandem shaft when stems for tandem lifts are more than 12 ft apart.

Clean and Paint

All carbon steel surfaces shall be grit-blast cleaned to "near white" (SSPC SP-10) base metal before painting. All carbon steel parts of the gate shall be painted as specified. All machined-steel surfaces shall be suitably protected with a light prime coat or grease.

Drawings for Approval

Drawings showing dimensions and essential details required to locate and install the gate, stem, lift and accessories shall be submitted for the engineer's approval prior to fabrication.

Installation

Installation of all parts shall be done by the contractor in a workmanlike manner. It shall be the contractor's responsibility to handle, store and install the fabricated roller slots, gate, lift support assemblies, operating mechanism, stem guides and accessories in strict accordance with the manufacturer's drawings and recommendations.

Materials

Materials shall conform to the requirements of the following ASTM specifications.

Hot-Rolled Steel (Flats, Structural Shapes, Plates)
ASTM A36, A283, Grade C or D; or ASTM A306, Grade 60

Cold-Rolled Steel (Shafting for Tandem Lifts)
ASTM A108, Grade 1045

Galvanized Steel (Fasteners)
ASTM A307 (Steel Bolts); ASTM A164 (Galvanized Coating)

Stainless Steel (Structurals, Plates, Flats)
ASTM A167, ASTM A240 or ASTM A276, all Type 304 or 304L

Stainless Steel (Fasteners)
ASTM F593 Alloy Group 1 (Bolts)
ASTM F594 Alloy Group 1 (Nuts)

Stainless Steel (Stems and Shafting)
ASTM A582, Type 303 or ASTM A276, Type 304

Rubber (Seals)
ASTM D2000, 1AA625

Bushings
Bronze, Self-Lubricating

Ductile Iron Castings (Rollers)
ASTM A536, Grade 60-40-18 or 65-45-12

Bronze (Stem Block)
ASTM B584 C86500

Gate Schedule

Quantity Required	Size of Opening (In.) (W x H)	Gate Type: Self-Contained or Not Self-Contained	Maximum Operating Head (Ft)		Operator Manual/ Electric	Remarks
			Seating Design/Operating	Unseating Design/Operating		

Hydro Gate Representative Territories Listed by State

ALABAMA
Eco Tech, Inc.
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Beaver Equipment
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Phone: 623-972-9238

ARKANSAS
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Phone: 714-832-1090

Southwest Valve LLC (Northern)
Phone: 559-322-4715

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Van Devanter Engineering Co. (Southern)
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INDIANA
Colley & Associates
Phone: 317-254-1001

INTERNATIONAL
Stealth Valve & Controls, Ltd (Canada)
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Construction Products Int'l (Middle East & Caribbean)
Phone: 281-362-0155

URBACA (Mexico - Northern & Western)
Phone: 011-52-664-686-0699

Vanderbeken Americas (Mexico - Eastern & Southern)
Phone: 011-52-818-400-7849

IOWA
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KANSAS
Mid-America Valve
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Van Devanter Engineering Co., Inc. (Western)
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Phone: 248-476-3204

Peterson & Matz (Upper Peninsula)
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