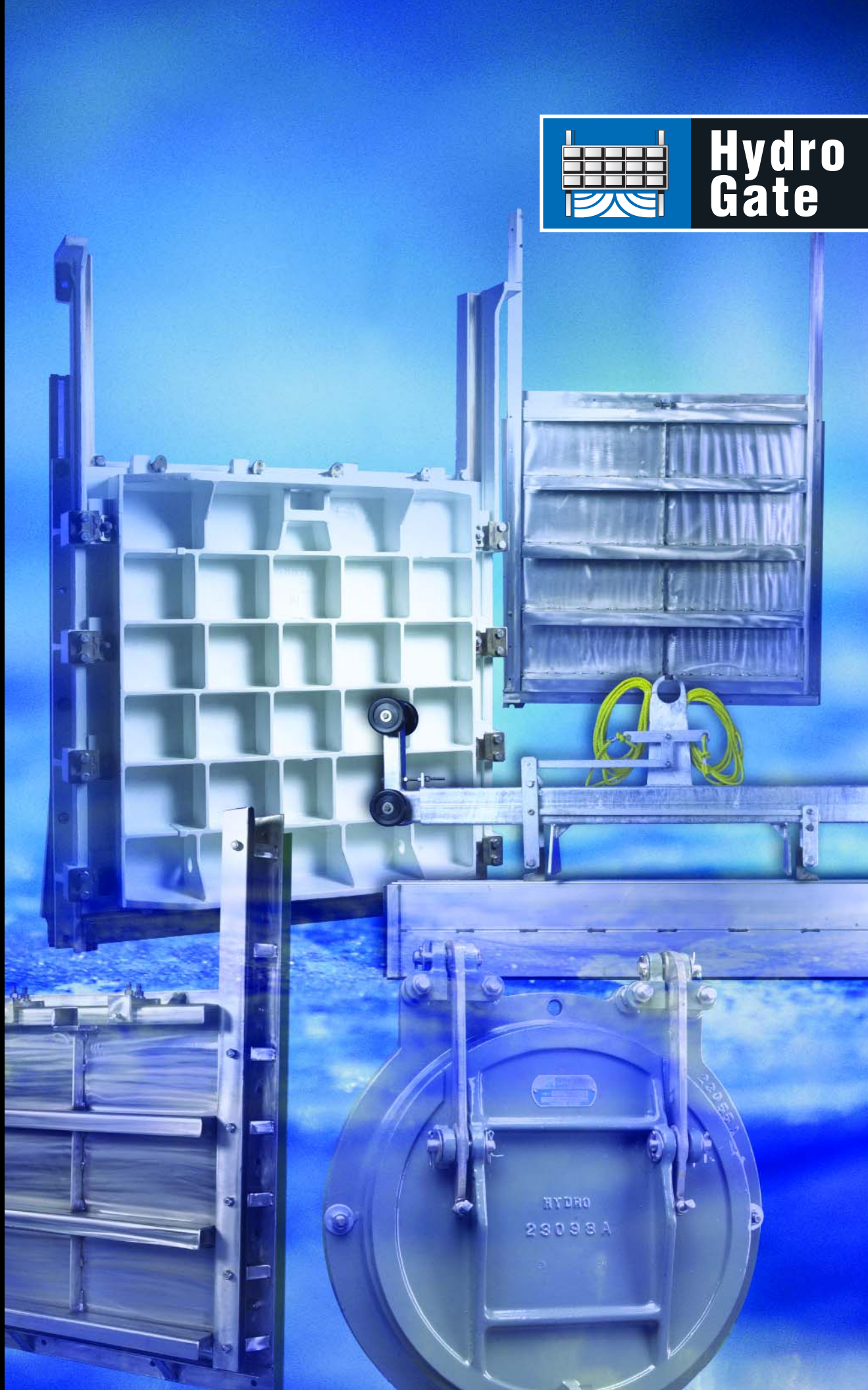
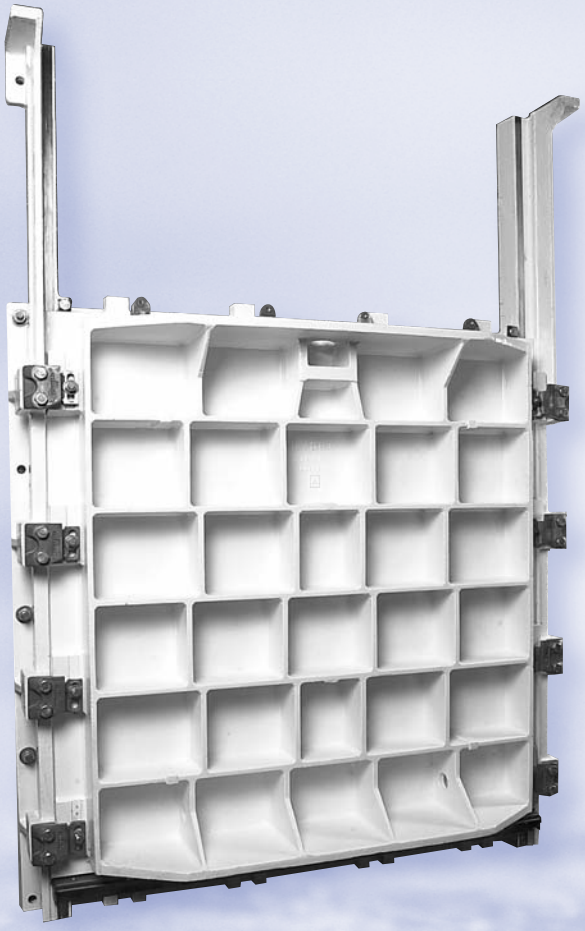
Lifts and Lift Accessories



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.

Hydro Gate Lifts

Hydro Gate

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Hydro Gate Lifts

Crank Lift

Description

Lifting devices for gates vary from the simple handwheel lift to electrically operated units with torque and limit switches or hydraulically actuated cylinders. The type of lifting device selected depends upon the gate size, the unbalanced head under which the gate will operate, speed of gate travel and frequency of operation.

Selection of the lifting device will depend on:

1. The unbalanced head under which the gate is to operate,
2. The frequency of operation, and
3. The distance the slide is to be moved.

Hydro Gate lifts transmit and multiply the input torque to the lift nut. The lift nut has internal threading matching the modified stub Acme stem threads, forming a power screw. Hydro Gate lifts are either handwheel lifts or enclosed gear lifts and are usually pedestal mounted. Bench-mounted small lifts may be placed in floor boxes. Since handwheel lifts have no gear reduction, they are used on smaller gates with low thrust requirements on stems up to 2 in. in diameter. Handwheel lifts produce the most gate travel per revolution. With Hydro Gate double lead stem threading, which is 1/2 for stems 2-1/2 in. in diameter and less, one handwheel turn will move the gate 1/2 in.

Hydro Gate enclosed gear lifts are used where operating loads exceed the capacity of handwheel lifts and on stems 1-1/2 in. in diameter and larger. Single-speed (ratio) and two-speed enclosed gear lifts are available upon request. The enclosed gear lift is a commercially manufactured gear lift meeting Hydro Gate design requirements. The most common type of enclosed gear lift uses bevel gearing, which puts the handcrank pinion at 90° to the stem. The operator stands to the side of the stem to operate the lift. For applications requiring the lift input to extend upward parallel to the stem, special lifts are available: e.g., a spur parallel drive unit or a double bevel unit.

As with handwheel lifts, the output travel rate of geared lifts on Hydro Gate stems is double that of single lead units and the input effort is nearly the same.

All Hydro Gate crank lifts are suitable for operation by portable electric, gasoline or hydraulic power units.

If the gate is to be opened or closed infrequently and only a few inches at a time, a manual lifting device is appropriate. On the other hand, if the gate is to be completely opened or closed daily or weekly, an electrically operated lift or a hydraulically activated cylinder operator should be considered.

As the size of the gate and operating head increase, a higher capacity lift is required. As the ratio of the lift goes up, so does the number of turns required to move the gate a given distance. Consideration should be given to motorizing larger geared lifts by some type of portable power unit. All geared lifts are designed with a safety factor that allows them to take temporary thrust much greater than their listed capacities.

An arrow indicates the direction of rotation of crank and handwheel to open a gate and the word “open” cast as an integral part of the handwheel or gear housing.

For standard valve and gate operation, Hydro Gate arranges the direction of threading and gearing so that clockwise rotation of the crank, handwheel or T-wrench will close the gate. The most common upward opening gate, the single-stem and single-speed gate lift, will have a left-hand stem. If the gate is downward opening, the stem will be right-hand to maintain clockwise closure of the gate.

Lifts in Tandem

Most gates are operated with a single stem and lift located on the vertical centerline of the gate. Fabricated gates with a width more than twice the gate height may require double lifting devices to prevent racking.

Tandem lifts are built by connecting two crank-type lifts together with an interconnected input shaft, sometimes called the tandem shaft. One of the lifts is modified to have a dual input pinion, which is the master gear head. One input end will have the crank and the other is connected to the second gear head (slave unit). Single-speed gear lifts have one stem threaded left-hand and the other right-hand.

When tandem lifts are used, each lift is capable of raising a load equal to the values shown on the lift table (see chart on page 5). However, if the crank pull is to be maintained at 25 lb. or 40 lb. then each lift should be selected on the basis of half of its total capacity for that particular pull.

Physical Stops on Stem

A threaded bronze stop nut is furnished on all geared and ball bearing lifts. With the gate in the fully closed position, the stop nut is lowered to make contact with the top of the lift and is locked in place with a set screw. Each time the gate is fully closed, contact is made between the stop nut and the lift nut to prevent further turning of the input shaft of the lift, thus protecting the stem and gate from damage.

Similarly, many installations require a physical stop to limit the travel in the opening direction. A stop collar is furnished by Hydro Gate and shall be installed on gates up to 18 in. where it is likely that over-opening the gate high and pulling it out of the guides will occur. A stop collar is normally located below the threads on the stem and can be a one-piece unit or two-piece unit. A two-piece stop collar allows for installation after the stem is installed. It should make contact with the underneath side of the lift platform or other suitable contact surface.

Lift Lubrication

Experience has proven that Hydro Gate's standardization on grease lubrication is superior to oil bath lubrication. Grease fittings are provided on all lifts at all bearing points and over gears. Grease does not run out through reamed bushings and water is not admitted through a greased bearing due to tight tolerance machining techniques. There are no mechanical oil seals to wear out, dry out, or become physically damaged by rough treatment and corrosive environments encountered by lift components.

Stem Lubrication

Full cleaning and lubrication of the threaded stem at the time of installation is required to ensure efficient and easy operation and to extend the life of the threads in the lift nut. To lubricate the threads in the nut and the entire length of stem, Hydro Gate can provide a lubricator flange for applying the grease to the threads just below the threaded lift nut. Grease should be applied through the lubricator flange each 6 in. of gate travel during initial operation and the threads should be greased frequently thereafter depending upon job site conditions.

Crank Lift

Mounting of Lifts

Lifts are mounted on steel or concrete platforms, on wall brackets, on concrete corbels, or on the self-contained frame of the gate. The lift support must be designed to take the thrust developed during opening and closing of the gate with minimum deflection.

Lifts on Self-Contained Gates

In some installations it is desirable to carry the thrust of operation on the yoke of a self-contained gate. In these instances, the lift can be mounted directly on the yoke and operated by a handwheel, handcrank or a T-wrench.

Selection of Lifting Devices

In order to operate any gate, the lifting device must overcome several forces. These include the weight of the gate slide, weight of the stem, frictional resistance caused by water pressure against the slide, the frictional resistance caused by the wedges and hydraulic downpull.

Required Lifting Force

To determine the lifting force required to open a gate, the following formula is used:

$$F = 62.4APf+W+w+dp$$

Where:

F = lifting force required in pounds
A = area of gate opening in square feet
P = effective head of water in feet
f = coefficient of friction
W = weight of gate slide in pounds
w = weight of stem in pounds
dp = downpull in pounds

After the gate has been unwedged, the coefficient of friction is a conservative value of approximately 0.35. As indicated, frictional factors are approximate and will vary depending upon how long the gate has been in the closed position; if the slide is partially covered by silt or sand; if the faces are lubricated or dry; and the condition of the threaded portion of the stem.

The area of the square or rectangular gate opening is used to determine the frictional load created by the water pressure on either the face or the backside of the gate. The area of the square is also used to determine frictional load for round sluice gates since they are made with square slides with the seating faces mounted on a square around the circular opening. Therefore, the water pressure is always active against the square area.

For roller gate operation, the same formula is used to determine the lifting force required, except the frictional factor is 0.2. This smaller factor is adequate because this type of gate rolls on rails and has no wedging device. Fabricated slide gates have a frictional factor range of 0.15 to 0.35 depending on type of seal and guide liner used.

The force to unwedge, unseat or crack open a gate is an instantaneous force. Experience indicates that this instantaneous friction factor is normally no more than double the running friction or 0.70.

Hydraulic downpull is a factor based on head, flow conditions, geometry of the gate slide, structure entrance, exit shapes and gate position. Consult Hydro Gate's Engineering Department for further details.

Design of Lift Platform

To start or lift a sluice or slide gate from the fully closed position, the platform or other mounting for the lift support device must be designed to take the thrust with the minimum amount of deflection.

Selection of Proper Lifts

Capacities for lifting devices are shown for 50 ft. lb. Input torque (40 lb. Pull) on the crank or handwheel (see table on pages 8, 10 and 11. Lifting devices selected on the basis of a 25-lb pull will be easier to operate, but the larger the lift, the more turns of the crank per inch of gate travel will be required. Regardless of whether the lifting device is selected on the basis of a 25- or 40-lb pull, the coefficient of friction 0.35 is used for lift selection. The crank or handwheel pull is approximately double that to "crack" the slide from its wedges. The higher pull is only required for a few turns of the crank. It then drops back to the 25-or 40-lb average.

There are two basic steps in selecting the lift and stem. The first step is to determine the total lift load and the minimum permissible stem diameter that can be used with any given gate size. The tables on pages 5 and 6 give theoretical combined weight plus downpull values for a wide range of gate sizes operating under unbalanced heads of 5 to 60 ft. After the gate size has been selected and the maximum unbalanced operating head has been calculated, use these tables to determine the lift load.

The next step is to determine the actual stem diameter required for the stem material selected. The "Allowable Loads" tables (page 18) show the maximum permissible loads for each size of stem for various unsupported stem lengths. In selecting the actual stem size, use a diameter that has a strength at least equal to the lift load obtained from the table, and a diameter equal to or greater than the minimum needed for column action in closing the gate.

Dimensional Data

Theoretical Weight Plus Hydraulic Downpull Values For Cast Iron Slide Gates (6" x 6" & larger)

Gate Size (In.)	Effective Head of Water in Feet								
	5	10	15	20	25	30	40	50	60
	(W + w + dp) Factor for Given Head Above (In Pounds)								
6 x 6	—	—	—	—	—	—	98.8	130.8	170.1
8 x 8	—	—	—	—	—	—	128.2	171.0	223.2
10 x 10	68.2	80.4	101.1	130.1	167.5	213.4	330.2	480.6	664.7
12 x 12	98.3	12.9	137.5	172.3	217.1	272.0	412.1	592.4	813.1
14 x 14	138.2	155.1	183.8	224.3	276.5	340.5	503.6	713.8	971.1
15 x 15	157.0	175.1	205.8	249.1	305.0	373.5	548.2	773.3	1048.8
16 x 16	206.7	225.9	258.6	304.7	364.3	437.3	623.6	949.1	1280.7
18 x 18	210.0	234.3	275.7	334.1	409.6	502.2	738.5	1043.1	1415.9
20 x 20	210.1	240.0	291.1	363.3	456.6	571.0	863.2	1239.9	1701.2
21 x 21	231.2	262.5	316.0	391.7	489.6	609.7	916.3	1311.7	1795.8
24 x 24	307.3	341.9	401.2	485.2	593.8	727.2	1068.1	1507.7	2046.2
30 x 30	499.4	549.6	636.5	759.9	919.8	1116.4	1619.1	2268.1	3464.3
36 x 36	667.7	682.2	707.4	1104.1	1362.8	1681.0	2495.8	3548.5	4839.1
39 x 39	883.2	969.4	1120.0	1335.0	1614.5	1958.4	2839.5	3978.3	5374.9
42 x 42	1074.9	1153.3	1290.8	1487.5	1743.3	2058.3	3596.6	5062.2	6860.0
48 x 48	1482.5	1605.8	1824.1	2137.3	2545.3	3048.3	4338.9	6009.2	8059.0
54 x 54	2183.4	2356.8	2666.2	3111.7	3693.1	4410.6	6253.6	8640.6	11571.7
60 x 60	2844.7	3037.7	3385.0	3886.7	4542.8	5353.3	7437.4	10138.9	13458.0
63 x 63	4509.1	4637.9	4870.8	5207.7	5648.8	6193.9	7596.4	9415.2	11650.4
66 x 66	4105.0	4334.9	4752.5	5357.8	6150.8	7131.4	9655.8	12931.0	16956.9
72 x 72	4297.1	4552.2	5019.8	5699.9	6592.6	7697.9	10561.1	14244.1	19860.0
78 x 78	4819.7	5110.1	5647.7	6432.4	7464.3	8743.4	12043.0	16331.3	21608.2
84 x 84	6442.3	6779.8	7410.7	8335.2	9553.1	11064.5	14967.7	20044.8	26295.9
90 x 90	7895.5	8304.1	9075.9	10210.9	11709.0	13570.4	18382.6	24647.6	32365.3
96 x 96	12291.9	12689.4	13448.4	14568.7	16050.5	17893.6	22664.1	28880.2	36541.8
108 x 108	16037.9	16455.6	17271.1	18484.3	20095.4	22104.3	27315.5	34117.9	42511.5
120 x 120	20711.9	21153.9	22037.9	23363.9	25131.9	27431.9	33087.9	40601.9	49883.9
144 x 144	35084.9	35453.5	36231.5	37419.1	39016.1	41022.7	46264.3	53143.9	61661.5

To find lifting force *(F)*:
***F* = 62.4 *APf* + *(W + w + dp* [factor from table above])**

Example:
30 x 30 Gate, 20 Ft Head
***F* = 62.4 (2.5) (2.5) (20.0) (0.35) + 759.9 = 3489.9 lbs.**

Dimensional Data *continued*

Theoretical Weight Plus Hydraulic Downpull Values For Cast Iron Slide Gates (18" X 24" & larger)

Gate Size (In.)	Effective Head of Water in Feet								
	5	10	15	20	25	30	40	50	60
	(W + w + dp) Factor for Given Head Above (In Pounds)								
18 x 24	277.1	283.3	328.9	393.5	477.2	579.9	842.2	1180.7	1595.1
18 x 36	317.5	343.2	387.9	451.6	534.3	636.0	896.4	1233.0	1645.5
24 x 30	413.0	453.2	522.7	621.4	749.4	906.6	1308.8	1828.0	2464.2
24 x 36	505.9	545.4	614.1	712.1	839.3	995.8	1396.6	1914.3	2549.0
39 x 96	3407.9	3486.2	3635.6	3856.3	4148.1	4511.1	5450.6	6674.8	8183.7
42 x 30	1103.7	1252.3	1307.1	1506.8	1765.6	2083.5	2896.8	3946.7	5233.2
42 x 48	1146.1	1223.0	1359.1	1554.3	1808.6	2122.1	2926.5	3967.6	5245.2
42 x 60	1704.9	1808.7	1995.5	2265.4	2618.3	3054.2	4175.2	5628.4	7413.7
48 x 36	1189.2	1352.4	1636.5	2041.5	2567.4	3214.3	4870.6	7010.5	9634.0
48 x 60	2033.9	2133.1	2311.5	2569.2	2906.2	3322.6	4393.1	5780.9	7485.8
48 x 96	3938.7	4071.6	4325.5	4700.3	5196.0	5812.6	7408.5	9488.0	12051.0
54 x 48	2397.2	2604.4	2971.1	3497.2	4182.6	5027.5	7195.5	10001.2	13044.5
54 x 60	2400.1	2570.1	2876.1	3318.2	3896.2	4610.3	6446.5	8826.7	11751.0
60 x 24	546.7	649.1	824.6	1073.2	1394.9	1789.8	2798.9	4100.6	5694.7
60 x 36	694.3	828.1	1061.0	1393.1	1824.3	2354.6	3712.6	5467.1	7618.1
60 x 72	4064.4	4249.6	4589.2	5083.2	5731.6	6534.4	8603.0	11289.1	14592.7
60 x 84	4009.4	4205.6	4572.4	5109.9	5818.0	6696.7	8966.0	11917.8	15552.1
60 x 96	5090.5	5285.3	5657.3	6206.4	6932.6	7835.9	10174.0	13220.5	16975.6
66 x 42	2417.2	2694.3	3180.6	3876.0	4780.5	5894.2	8748.9	12440.2	16968.0
74 x 48	3025.3	3261.0	3678.1	4276.6	5056.4	6017.6	8483.9	11675.7	15592.8
72 x 60	3556.4	3788.0	4204.8	4806.9	5594.2	6566.7	9067.6	12309.5	16292.4
72 x 96	5699.3	5924.6	6354.5	6989.3	7828.7	8873.0	11575.7	15097.4	19438.1
84 x 96	5943.3	6105.0	6847.5	7943.1	8846.3	10436.0	12706.9	16904.3	26437.7
96 x 48	4952.5	5388.5	6159.9	7266.8	8709.0	10486.6	15048.0	20951.1	28195.7
96 x 60	3647.0	4001.2	4638.9	5559.3	6764.4	8252.2	12078.1	17037.6	23130.7
96 x 72	7862.9	8228.0	8897.2	9870.6	11148.3	12730.1	16806.4	22099.5	28609.4
108 x 120	19494.2	19871.5	20626.2	21758.2	23267.5	25154.1	30059.3	36473.8	44397.7
120 x 96	16452.5	16938.7	17866.9	19237.1	21049.3	23303.5	29137.9	36740.3	46110.7

To find lifting force *(F)*:
F = 62.4 APf + (W + w + dp **[factor from table above])**

Example:
54 x 60 Gate, 50 Ft Head
F **= 62.4 (4.5) (5) (50) (0.35) + 8826.7 = 33,397 lbs.**

Hydrogate Geared Lifts

Gear lift

Description:

Hydro Gate geared lifts are ideal for rising stem applications. Visual position indication via clear plastic stem cover or slotted metal covers is simple and reliable. Application of geared lifts to non-rising stems (NRS) is available. Position indication of many geared lifts may be achieved by clock dial type mechanisms attached to the lift gearing. Contact Hydro Gate Engineering Department for specific information and applications.

Higher ratio geared lifts use compound gearing, which may consist of bevel x spur gear units or bevel x bevel units.

Gear units are motorizable for side mounting of electric motor actuators.

In-line or parallel drive gear lifts are either single or compound spur units depending on the ratio or compound bevel units with input pinion parallel to output (stem centerline). Parallel drive units are single speed only.

Tandem lifts can be furnished in many configurations. They can successfully drive 4 stems without serious backlash and synchronization problems.

For special applications of geared lifts, contact Hydro Gate Engineering Department.

Features:

- Totally enclosed cast iron housings
- Mechanical seals
- Precision machined high strength bronze lift nuts
- Precision cut gears
- Stainless steel input shafts
- Anti-friction ball or roller bearings throughout
- Pedestal or bench mounting; special non-std heights available
- Pedestals may be wall bracket mounted
- Provided with 2" square AWWA nut for removable crank, wheel or portable power operation
- Adaptable for portable power operation; electric, hydraulic or gasoline operators
- Wide range of ratios and stem size capacities
- Right angle bevel gear units: single or compound reduction
- Parallel drive units: spur gear units or compound bevel gear units
- Offset pedestals available (limited thrust capacity)
- Precision mounted stem covers: clear plastic, galvanized steel or aluminum without slots or with slots for visual indication
- Threaded stop nuts for rising stems
- Sized for 40 lb crank or rim pull (50 ft-lb torque)
- Withstand 100 lbs (2.5 times) pull without damage
- Tandem arrangement for all sizes
- Lubrication fittings

Some Optional Features:

- Two speed lifts for 12:1 and higher ratios: shiftable gear or dual input pinions
- Locking devices and vandal protection equipment
- Dropped enclosed chain drives
- Chain wheels
- Stem lubricator flanges
- Stem cover mounted position limit switches

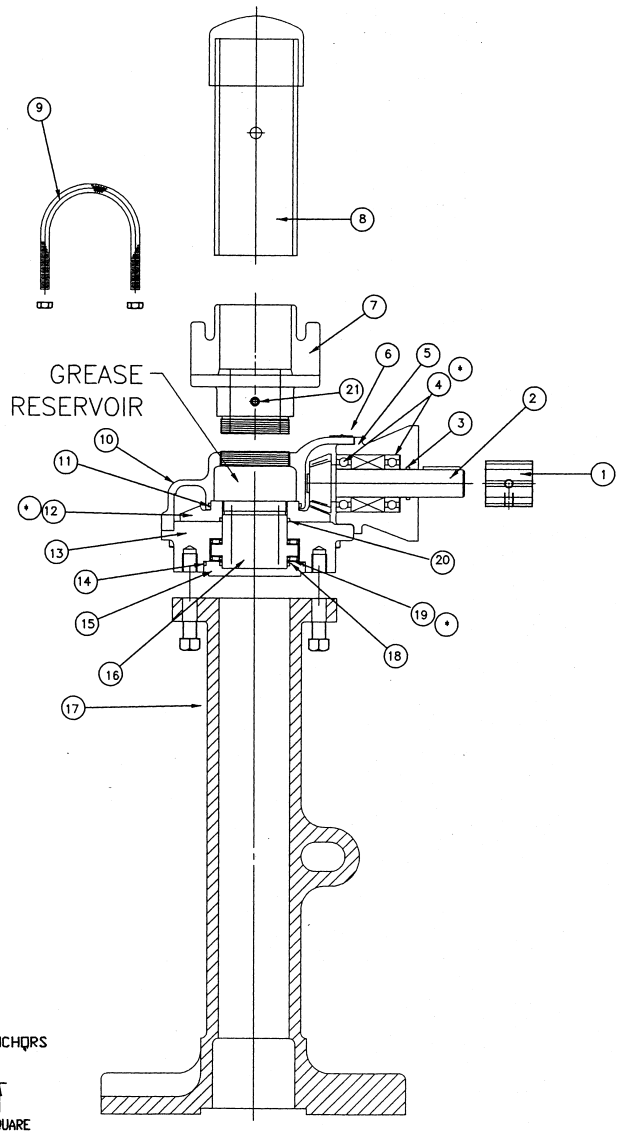
Bevel Gear Unit Capacities

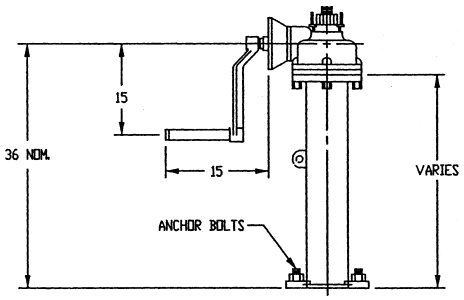
Model	Ratio	Stem dia Range	Stem thread lead	Input turns to move 1 ft.	Output @ 40 lb. crank pull (50 ft-lbs) / stem diameter								
					1-1/4	1-1/2	2	2-1/2	3	3-1/2	4	4-1/2	5
CPS2	2:1	1-1/4 – 1-1/2	1/2	48	5985	5380							
CPS4	4:1	1-1/2 – 2-1/2	1/2	96		10760	8950	7660					
CPS6	6:1	1-1/2 – 3	1/2	144		16140	13420	11490					
			2/3	108					9270				
CPS8	8:1	2 – 3	1/2	192			17895	15315					
			2/3	144					12365				
CPS12	(12:1)	2 – 3	1/2	288			23685	20270					
			2/3	216					16365				
			2/3	72					5455	4885			
CPS16	(16:1)	2-1/2 – 3	1/2	384				27030					
			2/3	288					21820	19545			
			2/3	81					6140	5500			
CPS20	(20:1)	2-1/2 – 3-1/2	1/2	480				33785					
			2/3	360					27270	24430			
			2/3	81					6140	5500	4980		
CPS36	(36:1)	3 – 4-1/2	2/3	648					49090	43975	39825	36390	
CPS48	(48:1)	3 – 4-1/2	2/3	864					65455	58630	53100	48520	
CPS96	(96:1)	3 – 5	2/3	1728					130910	117265	106195	97035	89330

Higher ratio and capacity gear units available, contact Hydro Gate Engineering department.

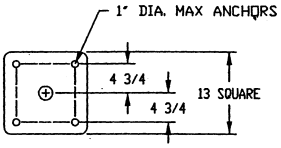
Hydro Gate CPS Series Lift – Bevel Gear Base Unit

1	AWWA 2" SQ. CRANK ADAPTER
2	INPUT SHAFT/PINION GEAR
3	INPUT SHAFT O RING
4	INPUT SHAFT BEARINGS
5	INPUT HOUSING
6	IDENTIFICATION TAG
7	STEM COVER ADAPTER
8	STEM COVER
9	STEM COVER MOUNTING U BOLT
10	PRIMARY GEAR HOUSING
11	BEVEL GEAR O RING SEAL
12	BEVEL GEAR
13	BASE PLATE
14	SPIGOT RING O RING SEAL
15	SPIGOT RING
16	LIFT NUT
17	PEDESTAL
18	THRUST WASHERS
19	THRUST BEARINGS
20	DRIVE NUT O RING SEAL
21	GREASE ZERK FITTINGS
*	LUBRICATION PRESENT



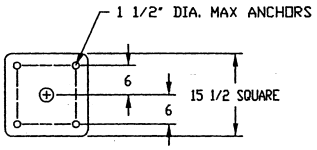


BEVEL GEAR LIFT
ON PEDESTAL FOR
36" STD CRANK HEIGHT

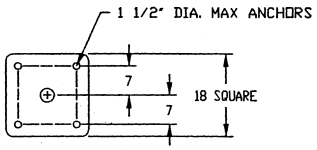


MOUNTING BOLT LAYOUT
SMALL SQUARE BASE
3" MAX STEM DIA.

CPS Type Geared Lift Mounting Dimensions

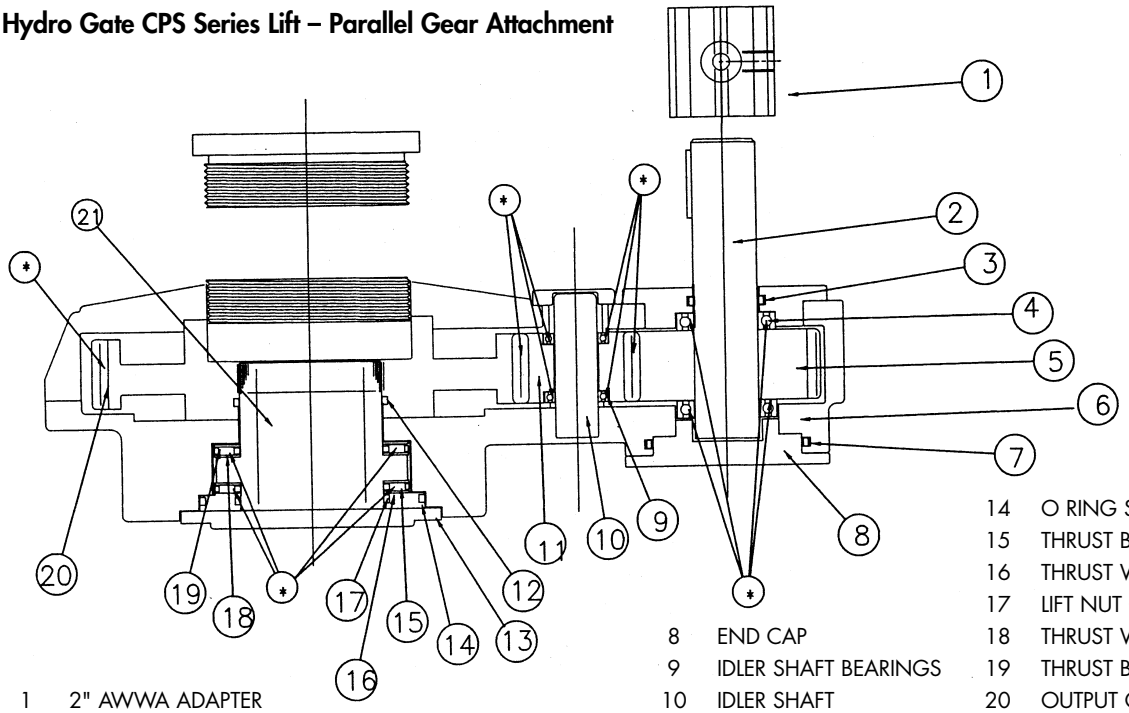


MOUNTING BOLT LAYOUT
MEDIUM SQUARE BASE
4" MAX STEM DIA.



MOUNTING BOLT LAYOUT
LARGE SQUARE BASE
4 1/2" MAX STEM DIA.

Hydro Gate CPS Series Lift – Parallel Gear Attachment



1	2" AWWA ADAPTER	5	INPUT GEAR	8	END CAP	14	O RING SEAL
2	INPUT SHAFT	6	GEARCASE	9	IDLER SHAFT BEARINGS	15	THRUST BEARINGS
3	O RING SEAL	7	O RING SEAL	10	IDLER SHAFT	16	THRUST WASHERS
4	BEARINGS			11	IDLER GEAR	17	LIFT NUT O RING SEAL
				12	O RING SEAL	18	THRUST WASHERS
				13	SPIGOT RING	19	THRUST BEARINGS
						20	OUTPUT GEAR
						21	DRIVE SLEEVE
						22	PLUG
						*	LUBRICATION PRESENT

Parallel Gear Unit Capacities

Model	Ratio	Stem Diameter Range	Stem thread lead	Input turns to move 1 ft.	Output @ 40 lb. crank pull (50 ft-lbs) / stem diameter								
					1-1/4	1-1/2	2	2-1/2	3	3-1/2	4	4-1/2	5
SPG1.25	1.25:1	1-1/4 – 1-1/2	1/2	30	3960	3560							
SPG2	2:1	1-1/4 – 2	1/2	48	6445	5790	4815						
SPG3	3:1	1-1/4 – 2-1/2	1/2	72	9510	8545	7105	6080					
SPG6	6:1	1-1/2 – 2-1/2	1/2	144		17090	14210	12160					
SPG8	8:1	2 – 3	1/2	192			18950	16215					
			2/3	144					13090				
SPG12	12:1	2 – 3	1/2	288			23685	20270					
			2/3	216					16365				
SPG16	16:1	2-1/2 – 3-1/2	1/2	384				27030					
			2/3	288					21820	19545			
SPG24	24:1	2-1/2 – 3-1/2	1/2	576				40540					
			2/3	432					32730	29315			
SPG36	36:1	3 – 4-1/2	2/3	648					49090	43975	39825	36390	
SPG48	48:1	3 – 5	2/3	864					65455	58630	53100	48520	44665

Higher ratio and capacity gear units available, contact Hydrogate Engineering department.

Handwheel Lifts Models H1B and H2B

The Model H1B and H2B lifts are similar in physical size to the Model H1 and H2 lifts but have greater lifting capacity due to the use of ball thrust bearings and fully machined nuts and top housings. The lift nut is high-strength bronze and the housings and handwheels are cast iron. The bearings are grease lubricated through a zerk fitting. This unit can be bench (yoke) mounted or pedestal mounted. The lifts can be furnished with or without stem covers. If the stem cover version is desired, it must be initially specified. These models are not recommended for non-rising stem (NRS) gates due to the lack of position indications. This unit can be T-wrench operated; it can also be floor box mounted, however, a long hollow T-wrench may be required to accommodate the stem. A bronze stop nut is furnished with the lift.

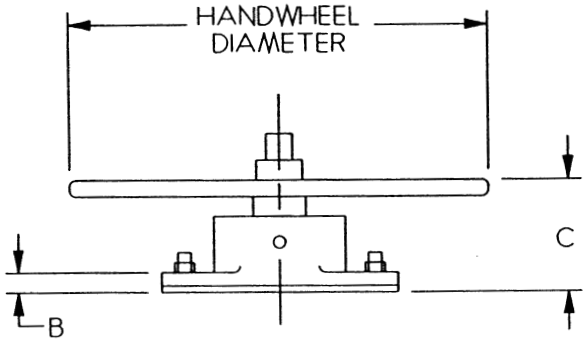
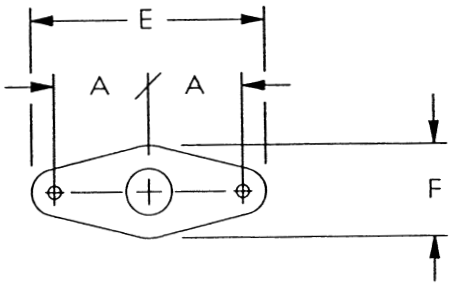


Figure 5-4
Drawing next

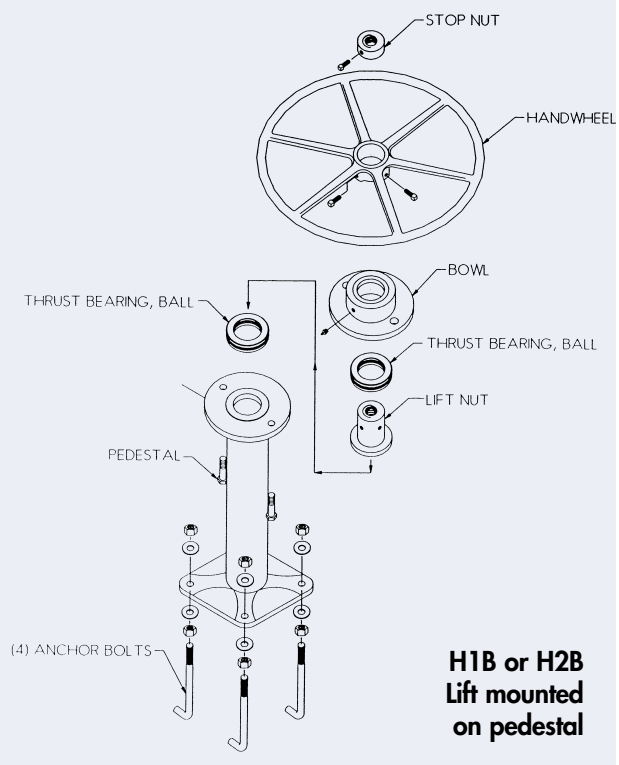


MOUNTING BOLT LAYOUT FOR LIFT

Lift Capacities and Dimensions

Lift Model	Rim Pull (lbs)	Torque ft-lbs)	Stem Diameters		
			1-1/4	1-1/2	2
Handwheel turns per inch travel			2	2	2
H1B-10	25	10.4	730	—	—
	40	16.7	1180	—	—
H1B-14	25	14.6	1030	—	—
	40	23.3	1640	—	—
H2B-18	25	18.75	1320	1190	990
	40	30	2110	1900	1580
H2B-24	25	25	1760	1580	1320
	40	40	2820	2530	2110
H2B-30	25	31.3	—	1980	1650
	40	50	—	3160	2630
H2B-36	25	37.5	—	2370	1980
	40	60	—	3800	3160

Dimensions Model	A	B	C	E	F	Bolt dia
H1B-xx	2-3/4	5/8	3-1/8	7	3-3/4	1/2
H2B-xx	3-1/2	1-1/8	3-7/8	9	4-3/4	5/8



H1B or H2B Lift mounted on pedestal

Power-Operated Lifts

These devices vary from a simple portable wrench for operating a geared lift to an electrically operated unit with torque and limit switches. The type selected depends upon the gate size, the unbalanced head under which the gate will operate, operational speed required, frequency of operation and available power supply.

Introduction

Handwheel lifts are normally used to operate small gates. Motorization of these handwheel lifts is not practical. Since there is no gearing in the lift and the gates are usually small, two or three turns of the handwheel will move the gate 1 in. The gate can be moved a few inches in less time than it takes to remove the handwheel, install the portable wrench, plug it in and operate the required distance.

There are a number of different methods that may be used in motorizing a Hydro Gate lift. The following is a partial list of those methods most frequently encountered:

1. Electric-powered heavy-duty wrench
2. Hydro Gate portable power unit with gasoline engine
3. Portable hydraulic gasoline-powered unit

Hydro Gate Portable Gasoline Engine

This portable power unit is designed primarily for remote locations where electric power is not available. The unit consists of a gasoline engine with an attached reducer that has a double output shaft. An adapter is furnished to connect with the input shaft of the lift. By utilizing the double output shaft of the portable actuator, it is easy to turn the unit 180° with respect to the Hydro Gate gear lift and open or close the gate. The two-cycle gasoline engine power unit drives the output shaft at approximately 125 rpm with a torque of 65 ft-lb. This portable power assembly is easily moved between gate installations because it weighs less than 40 lb. The unit also can be adapted for tripod mounting.

Portable Hydraulic Operator

This unit is used to operate Hydro Gate manual lifts where electricity is not available. The unit consists of a two-wheel "hand truck" that has a gasoline engine-driven pump, 6-gal. Reservoir with temperature gauge and sight glass, directional control valve, pressure relief valve and oil filters. An optional electric start engine is available. The compact unit is easily maneuvered by a single person. It has auxiliary handles allowing two people to carry it in a stretcher fashion. A rotary hydraulic drive rotates the lift input shaft to move the gate. The rotary drive head connects to the power cart with 10 ft of twine hose (longer hose is available within practical limits that won't cause pressure losses). The drive can be either hand-held or a mounting bracket can be provided. Hand-held units are supplied with an overload release clutch for additional personnel safety. The bracket-mounted unit relies on a pressure relief valve for overload protection.

Dry weight of the power cart (without the drive head and hoses) is approximately 175 lb. The weight of the bracket-mounted drive head with standard hoses is approximately 45 lb.

Portable hydraulic operator

Heavy-Duty Electric Wrench

Heavy-duty electric wrenches have proved satisfactory for gate operation. They are supplied with reversible switches for raising or lowering the gate and are designed for 15-minute operation under full load with a similar period of time between operations.

Portable electric wrenches are supplied for 110-volt single phase, 60-cycle current only. They are not available for 220-volt or for three-phase power. Higher-voltage portable electric wrenches are not manufactured, as they cannot be safely handled where the floor or ground is wet. The portable electric wrench is a heavy-duty 1-1/4 in. industrial reversible electric drill adapted with an overload release clutch and a driving socket to fit the gate lift input shaft. The drill can be mounted on an adjustable tripod, which is easily portable. The overload clutch is manually reset for operator safety. The "no load" speed of the unit is 250 rpm. The tripod weighs approximately 30 lb and the electric wrench with overload clutch weighs approximately 32 lb. Projects with several large gates may require more than one portable wrench.

Portable electric wrench with tripod stand

Adapter Brackets for Portable Units

Hydro Gate brackets are available for attaching the portable operator to the lift. This makes the operator more stable and eases the strain of "hanging on to" the unit. The brackets are "swing-away" type or "telescoping" type and are designed so they do not interfere with normal crank operation.

Electric-Powered Lifts

Electrically operated lifts are used on larger gates and/or when the gate is to be opened or closed frequently. The standard operating unit includes the gear train mounted in a cast iron or aluminum housing; fabricated-steel or cast iron pedestal; bronze lift nut (also referred to as a stem nut); and attached electric motor; reversing controller; push-buttons for "raise", "stop", and "lower"; two indicator lights; geared position limit switches; torque switches and a handwheel for emergency operation. Stem covers and dial position indicators are extras that are also often specified.

Other equipment that is available for refined operation of the electrically actuated lifts includes remote position indicator, remote and automatic controls, tandem operation, explosion-proof and submersible motors and modulating controls.

For this type of lifting device, 12 in. of gate travel per minute is considered standard. The gear ratio and motor size are selected on the basis of this approximate speed unless specifications give a different operating speed.

Standard motors are usually designed for 15-minute duty. If motors must be operated for a longer period of time to open or close the gate, or if the gate must run through more than one full cycle, then heavier-duty motors are required and should be specified.

These electric lifting devices are usually used on larger sluice gates where frequent raising or lowering will be required. Three-phase power is recommended for electric lifts. Single-phase power may be used for small units if three-phase is not readily available. Wiring diagrams show the field connections to be made to complete the installation.

Electrically operated lifting devices are available for lift capacities of 1000 to 100,000 lb or more. As in other types of gate lifting devices, stem diameters must be large enough to give the stem sufficient column strength to close the gate and enough strength in tension to open the gate. Stems should be specified to withstand 125% of motor stall conditions.

Hydraulic Cylinders

Hydraulic cylinders can also be used to operate sluice gates. Cylinders up to and including 14-in. diameters are readily available at a reasonable cost. Larger diameters can be manufactured but require extra lead times. Standard cylinders are readily available to operate with oil pressures at 2000 psi.

The principle of hydraulic cylinder operation is simple. Fluid, usually oil, is introduced under pressure into the cylinder through ports at the top and bottom. This pressure acts against a piston that is connected to one end of the cylinder rod and the gate slide that is attached to the other end. The cylinder rod thus becomes the gate stem. In opening the gate, pressure is introduced through a valve at the bottom side of the piston. This pressure is exerted equally to the interior of the cylinder, including the cylinder wall, the bottom end cap and the piston. The area of the piston in square inches, minus the ineffective area taken up by the piston rod, multiplied by the pressure in pounds per square inch, gives the total force available for lifting the gate (Lifting Force = (piston area (in^2) - rod area (in^2) x system pressure)psi).

Design of Hydraulic Systems

The design of the hydraulic system, including the necessary valving, pump, motor, and tubing are the responsibility of the gate manufacturer. The pump and motor must be of adequate size to deliver the operating fluid under the required pressure and in a sufficient amount to lift the gate in the time specified. Tubing must be of adequate size to transmit the required volume of oil to operate the gate at the specified speed. If the tubing is longer, there will be a considerable pressure drop unless the tubing is of adequate size. Long hydraulic lines running between the pump and the cylinder cause a loss of pressure. The oil has to be pumped to the cylinder and an equal amount of force is required to return the oil from the cylinder to the pump.

Urethane lip-type "No-Leak" seals should always be specified for piston seals to minimize leakage past the piston. Even with this type of seal, special precautions must be taken to avoid "drift" of the gate slide if it is to be in the open position for any length of time. An accumulator may be installed in the system to compensate for loss of pressure on the underneath side of the cylinder or external locking devices may be engineered for special applications.

For more information concerning the design of hydraulic systems, please consult Hydro Gate's Hydraulic Engineering Department.

Lift Accessories

Stem Covers

A Hydro Gate stem cover protects the greased threaded portion of the stem from the weather when the gate is normally in the open position. Stem covers give the lift a finished appearance. Many lifts used in water and sewage treatment plants are installed indoors. On such installations, the stem cover is also recommended as it covers the greasy stem to improve its appearance and protect the clothing of visitors and operating personnel.

Stem covers are commonly made from standard-weight galvanized steel pipe, aluminum pipe and clear plastic. Each type of cover has advantages and disadvantages listed below.

Galvanized Steel Stem Covers

Galvanized steel stem covers are used to reduce maintenance. The galvanized interior of the pipe prevents rusting. These covers are somewhat more vandal-proof than other types of stem covers as they are heavy enough to deflect small debris. The biggest disadvantage of the steel cover is its weight, especially on larger gates. Longer lengths and larger diameters make it difficult to remove the cover without the aid of a hoist.

Aluminum Covers

Aluminum covers are lighter weight and are adequate for protection against corrosion on most installations. They may be subject to vandalism or damage from small flying objects.

Galvanized steel and aluminum covers are furnished with pipe threads on both top and bottom. The top is closed by a standard pipe cap. The bottom end of the cover is screwed into a threaded housing mounted on the top of the lift or handwheel, with the exception of the H1B and H2B lifts. They are attached to the saddle on the handwheel with a U-bolt clamp. Steel and aluminum stem covers for handwheel lifts are screwed into a threaded adapter cast as an integral part of the handwheel.

Clear Plastic Covers

Clear plastic covers are fitted into an adapter that is attached to the top of the lift housing. A dial indicator is not required with this type of cover as the rising stem is visible through the cover. This cover is very lightweight and can be easily removed by hand. Plastic stem covers have the following disadvantages:

1. They are subject to breakage from rough handling during installation.
2. They are subject to vandalism.

Slotted Metal Stem Covers

Steel or aluminum stem covers, with open slots or plastic-covered slots, combine the durability of metallic covers and the stem visibility of clear plastic. Clear plastic windows are attached and sealed for a totally enclosed, slotted stem cover. Reference marks can be painted or stamped on the body of the cover and the stop nut to provide a "pointer" on the stem. In the fully closed position, the stop nut may be on view in the bottom end of the slot.

Custom Design Indicators

Various methods of utilizing pointers or markers on tail rods for indication of the gate position have been utilized with varying success. Your Hydro Gate Sales Representative can obtain details of custom-engineered indicating devices for special applications since project requirements may need to coordinate these devices with limit switches, float controls or remote indication.

Hydro Gate Offset Pedestals

For those installations where clearance for complete opening of the gate slide is a problem, cast iron pedestals of the offset type can be used in place of wall brackets. Because the base of the offset pedestal is mounted on top of the concrete, the slide can be raised to a higher elevation.

Offset pedestals are available for H2B, CPS-2 and CPS-4 lifts. Offset pedestals for larger lifts are not recommended because the greater capacities make the design and anchoring of the offset pedestals to the floor undesirable. Pedestal walls supporting the offset pedestal must be a minimum of 12 in. thick to support the base.

Hydro Gate Floor Boxes

There are three basic arrangements for floor box operation of gates. Each arrangement has a unique variation:

Self-Contained Gate

The lift is mounted on a yoke to withstand stem thrust and the operating shaft is extended to a floor box. The shaft is terminated in the floor box with a square or hex nut for T-wrench attachment. The floor box has a gravity cast iron cover. The gate may be rising or non-rising within space limitations. Disadvantages are: a) the lift mechanism may be submerged, which will shorten its life; and b) there is no gate indication except the "feel" of stops (unless the gate is visible).

Wall Bracket Mounting

Mounting the lift on a wall bracket above high water line overcomes the visibility disadvantage as stated above. The gate may be a non-rising or rising stem if there is sufficient headroom.

Continuous position indication of rising and non-rising stem arrangements can be accomplished with various degrees of success using tail rods or rope, pulley and scale board devices. Often the result is not justified because of cost and maintenance problems.

Floor Box Mounting

Mounting the lift in a floor box overcomes the water and indication problems; however, this solution is limited to gates that can be operated with HB handwheel lifts. The floor must withstand the gate thrust loads, which are transmitted to it through a ring cast on the exterior of the floor box. The floor must be a minimum of 9 in. thick or greater. The floor box lid has a latching cover that can be made to be tamper resistant. A special wrench is provided to remove the floor box cover. These types of floor boxes are
T-wrench operated for a non-rising stem gate and can be supplied with a counter indicator for position indication. Maximum stem diameter is 2 in. for any type of floor box.

T-Wrench

For operation of the lift nut mounted in a floor box, a T-wrench is normally used. The crossbar on the T-wrench varies in length up to 30 in. maximum. The bottom end of the T-wrench is furnished with a 2-in. square socket to fit over the lift nut inside the floor box.

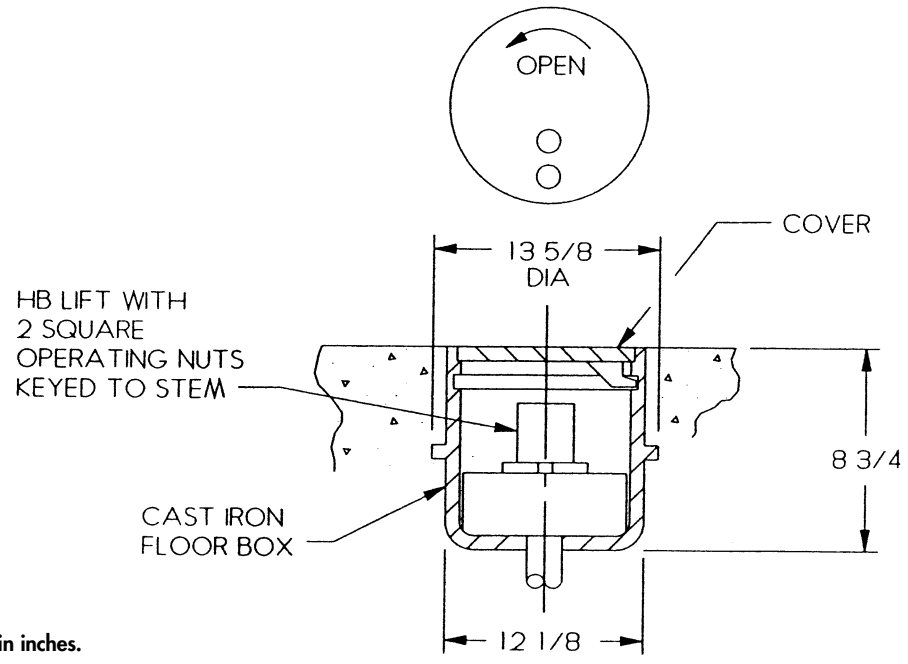
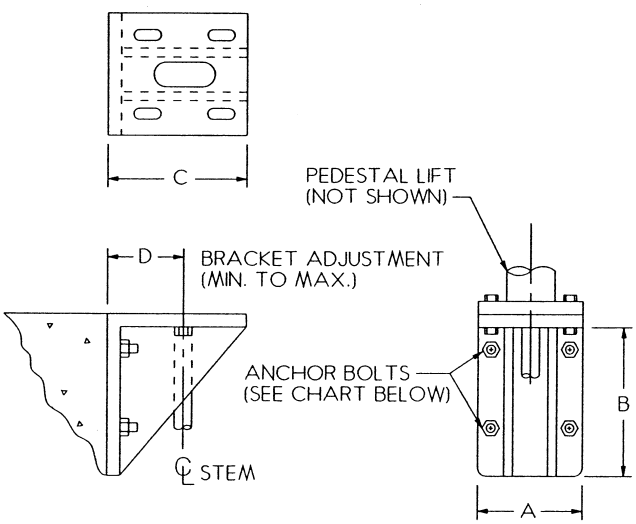


Figure 5-16
Floor Box

Note: All dimensions are in inches.

Hydro Gate Wall Brackets

Hydro Gate wall brackets are used to attach the lift to a vertical concrete wall. In those locations where a floor or lift support beam is not required as part of the structure, it is usually more practical to install a wall bracket with anchor bolts rather than to form and pour a heavy cantilever beam for support of the lift.



Brackets are cast iron with heavy reinforcing ribs. Holes are provided in the back of the bracket for anchoring it to a concrete wall. The top of the bracket is furnished with slotted holes for proper alignment of the lift and centerline of the stem. The holes holding the bracket to the wall by anchors are not slotted. The entire thrust must be transmitted from the lifting device through the anchors to the wall and slotted holes are not desirable at this location. Standard wall brackets are available for all handwheel lifts, crank lifts, electric actuators and hydraulic cylinders.

CAUTION: These maximum capacities of the brackets may be greater than the allowable stress on the concrete wall. Anchorage to the wall frequently becomes a controlling factor.

Wall Bracket Dimensions

Bracket Model	Dimensions				Anchor Bolts		Capacity (lb)
	A	B	C	D	No.	Diameter (In.)	
WB9	7	7-1/2	9	1-1/2 – 6-1/2	4	5/8	2000
WB12	9	9-1/8	9-1/8	1-3/4 – 7-1/4	4	3/4	4000
WB3A	11	11-1/4	18-1/8	3 – 6-1/2	5	3/4	12000
WB5	12	12	15-1/2	7 – 9-1/2	4	1-1/8	12000
WB10	14-1/2	16-5/8	16-3/4	7-3/4 – 10	6	1-1/2	45000
WB11	18	20	24	10-1/2 – 15	6	1-/2	60000

Stems

Introduction

The stem (or lift rod) connects the gate slide to the lift so the gate can be opened or closed. A stem is made of a solid bar of metal in a large enough diameter to take the pull required in opening the gate and the thrust developed during closing. Stainless steel is the best stem material for most applications. Carbon steel is a less expensive alternate but has a corrosion problem. Monel can be used for highly corrosive environments. Bronze, which has been used in the past, is not common any longer due to its high cost and significantly lower strength.

Threading

To provide the highest quality and a very smooth thread surface, Hydro Gate uses rolled Acme threads on all gate stems. Carbon steel, stainless steel, Monel and bronze stems can be threaded by an efficient high-pressure, cold rolled process. The critical contact surfaces of the threads have an extremely smooth finish (16 micro-in. rms or less) that greatly prolongs the life of the threads and the lift nut. Of the total gate installation components, the threaded lift nut nearly always is the first part to wear out. The rolling of the threads not only gives a smoother finish, but cold works the metal to add to its strength and wearability. Thus, rolled threads are

superior in all respects to those that are machine cut. Hydro Gate uses left-hand, double lead threads to comply with the standard practice in the valve industry, and to achieve standardization of the direction of rotation to open and close gates and valves. Utilization of the smoother thread and double lead provides almost twice the efficiency of the mechanism. With approximately the same amount of energy input, the gate slide moves twice as far per turn of the crank or handwheel compared to single lead cut threads. Standard stem diameters of the unthreaded section of the stems are 1-1/8, 1-3/8, 1-7/8, 2-3/8, 2-7/8, 3-3/8, 3-7/8, 4-3/8 and 4-7/8 in. The displacement of metal during thread rolling produces nominal diameters of 1-1/4, 1-1/2, 2, 2-1/2, 3, 3-1/2, 4 and 5 in. respectively.

Strength of Stems

The stem acts in tension during opening of the gate and in compression as a column when the gate is being closed. The critical factor is nearly always in column action during closing. To reduce the effective length of the column, stem guides are used. A sufficient number of guides should be provided to reduce the unsupported length of column to the maximum l/r of 200 (slenderness ratio).

Lesser values of l/r allow greater column loads to be applied to various stem sizes per the table on page 11-9. However, stem guide spacing must be long enough to allow for the full gate opening.

Hydro Gate acquired column test results that were conducted several years ago by an independent laboratory. These tests showed that a stem (rising type) acting as a long column in closing of the gate, closely approaches the end conditions equal to that of fixed ends. Based on tests, and many years of field experience, stems designed with the slenderness ratio of 200 are in accordance with good engineering practice.

When higher gate openings are encountered, the distance required for the gate slide to open completely may be the factor determining the stem size. The location of the first stem guide above the top of the opening must be high enough to allow the slide to open fully. This same location also determines the minimum stem diameter that can be used with any given gate size. Ferrous metals have a specific advantage over copper-based metals for gate stems (long columns). They are considerably stronger as a column because of the higher modulus of elasticity (Young's modulus) of steel (both carbon and stainless steel). Euler's column formula: $P_{CRITICAL}=2\ ^2EA/(l/r)^2$ states that the stress is directly proportional to the modulus of elasticity of the material in long, slender columns. The modulus of elasticity of steel is 29,500,000 psi; for bronze, it is 15,500,000 psi. Since the modulus of elasticity and not the strength of the material is the governing factor in the selection of stems, it is evident that the ferrous-metal stem can be of smaller diameter than that of a bronze stem for the same loading conditions.

The other factor in the above formula that affects the load-carrying capacity of the stem as a column is the factor K. It primarily represents the end fixity of the column; however, straightness of the material also affects the value of K. Through actual laboratory tests on file with Hydro Gate, K values for stems were determined. The load-carrying capacities are arrived at by determining the maximum load capacity for each given stem diameter and unsupported length. These values are then reduced by application of necessary safety factors.

This method for stem design results in an allowable working load more than double that needed to close the gate under the given condition. In rare cases where even these maximum conditions may be exceeded, Hydro Gate recommends that the stem should act as the "fuse plug" for the gate installation. Damage to gate and lift components or to the supporting structure is thus avoided.

With electric power actuators, the common practice is to determine the size of a stem and space guides such that the stem can withstand stalled motor (locked rotor) conditions. The idea behind this is that a burned out electric motor is more easily replaced than a bent stem or broken gate.

Stainless Steel Stems

Stainless steel stems with approximately 18% chromium and 8% nickel have performed well in most corrosive environments in which gates are installed. The Series 300 stainless steels are commonly used for stems. Types 303, 304 and 305 all have nearly equal corrosion resistance. Type 303 is a machining grade and Type 304 is better for cold working.

Type 316 has a higher corrosion resistance and in those few installations where corrosive conditions justify spending the additional money, Type 316 stainless steel can be furnished at a higher cost. Standard Hydro Gate rolled threads can be furnished with this type of stainless steel.

Stem Capacity

The following table shows capacities for a given stem diameter and unsupported lengths. Capacities are calculated using the Euler column formula:

Pcritical = $EAC\pi^2(r/l)^2$ where:
P = axial load on stem (lb)
E = modulus of elasticity (psi)
A = area of stem (in.2)
C = defines end restraint conditions (=2)
r = radius of gyration (= diameter/4) (in.)
l = unsupported length of stem (in.)

The l/r is the slenderness ratio and shall not be greater than 200. For a given diameter, the radius of gyration (r) is fixed. The allowable load can increase by decreasing the unsupported length (l). The restraint coefficient (c) is equal to 2 for gate calculation purposes.

The allowable load is shown above the allowable unsupported length for that load for the given l/r ratio. For example, a 1-1/2 in. stem with l/r – 200 can withstand 8630 lb. in. compression (safety factor = 2), and allow 62 in. unsupported length for the threaded portion of the stem. All loads are in pounds and lengths are in inches. Remember, the safety factor for the allowable loads in this chart equals 2. In other words, the stems can physically withstand twice the loads shown before buckling occurs.

Allowable Compressive load (lbs) for Hydro Gate Rolled Thread Stainless Steel Stems

Safety factor = 2 on compressive load

Threaded Section									
Slenderness ration/ Unsupported length				Nominal stem diameter (inch)					
	1-1/4	**1-1/2**	**2**	**2-1/2**	**3**	**3-1/2**	**4**	**4-1/2**	**5**
L/r = 200	5,520	8,630	16,914	27,960	41,767	58,336	77,667	99,759	124,612
Max Unsport L	50	62	87	112	137	162	187	212	200
L/r = 190	6,120	9,562	18,741	30,981	50,583	69,707	86,057	110,536	138,075
Max Unsport L	47	59	83	106	130	154	178	201	225
L/r = 180	6,820	10,654	20,495	34,518	51,565	72,020	98,885	123,159	153,842
Max Unsport L	45	65	78	101	123	146	168	191	213
L/r = 170	7,645	11,944	23,410	38,699	57,810	80,742	107,497	138,075	172,474
Max Unsport L	42	53	74	95	116	138	159	180	201
L/r = 160	8,630	13,484	26,428	43,687	65,262	91,151	121,355	155,873	194,707
Max Unsport L	40	50	70	90	110	130	150	170	190
L/r = 150	9,820	15,341	30,069	49,707	74,253	103,709	138,075	177,349	221,533
Max Unsport L	37	46	65	84	103	121	140	159	178
L/r = 140	11,270	17,611	34,518	57,061	85,240	119,054	158,504	203,180	254,311
Max Unsport L	35	43	61	78	96	113	131	153	166
Unthreaded Section									
	1-1/4	**1-1/2**	**2**	**2-1/2**	**3**	**3-1/2**	**4**	**4-1/2**	**5**
L/r = 200	6,990	10,442	19,417	31,153	45,651	62,910	82,931	105,713	131,257
Max Unsport L	56	68	93	118	143	168	193	218	243
L/r = 190	7,745	11,570	21,514	34,518	50,583	69,707	91,890	117,134	145,437
Max Unsport L	53	65	89	112	136	160	184	207	231
L/r = 180	8,630	12,891	23,971	38,460	56,359	77,667	102,384	130,510	162,046
Max Unsport L	50	61	84	106	129	151	174	196	219
L/r = 170	9,675	14,452	26,874	43,118	63,185	87,073	114,783	146,316	181,671
Max Unsport L	47	58	79	100	122	143	164	185	207
L/r = 160	10,920	16,315	30,338	48,677	71,329	98,297	129,580	165,177	205,089
Max Unsport L	45	55	75	95	115	135	155	175	195
L/r = 150	12,425	18,563	34,518	55,383	81,157	111,840	147,433	187,935	233,346
Max Unsport L	42	51	70	89	107	126	145	164	182
L/r = 140	14,625	21,310	39,626	63,578	93,165	128,388	169,247	215,742	267,872
Max Unsport L	39	48	65	83	100	118	135	153	170
Stem tensile capacity: Safety factor = 2	29,452	55,683	131,835	166,130	243,443	335,482	442,247	563,739	699,957

Stem Accessories

Hydro Gate Stem Splices

Stems must be spliced when their length exceeds standard commercially available stock lengths of rounds and to achieve a practical length for shipment from factory to the job site without damage during handling. Also, lengths of stem must be convenient for installation without bending. Placement of stem guides, lifts, or other structural configurations may necessitate shorter or longer lengths of stem.

For stems that need to be joined, splices or couplings must be used. The material for these splices should be of the same type as that used for the stem. It must be of sufficient strength, of equal or greater corrosion resistance and have the ability to be easily machined. Hydro Gate splices meet these design criteria. Materials are of the same type as that provided for the stems.

Hydro Gate splices are furnished with interior threads to match those on the ends of sections of stems to be joined. This threaded connection ensures precise stem alignment, and the threads take the thrust developed during opening and closing of the gate. Each end of the stem that is to be joined is screwed halfway into the threaded stem splice, is locked in place by use of a key, and is welded or is pinned and welded.

A bolted steel stem splice is available. These are commonly used in the oil-encased stem combinations of threaded and bolted, or bored and bolted may be used for field coupling to odd-size configurations on existing stems. The top end of the splice is slipped into the bottom end of the stem, is carefully aligned, and then welded. The bottom end of the splice and the stem sections to be joined are connected with bolts or pins.

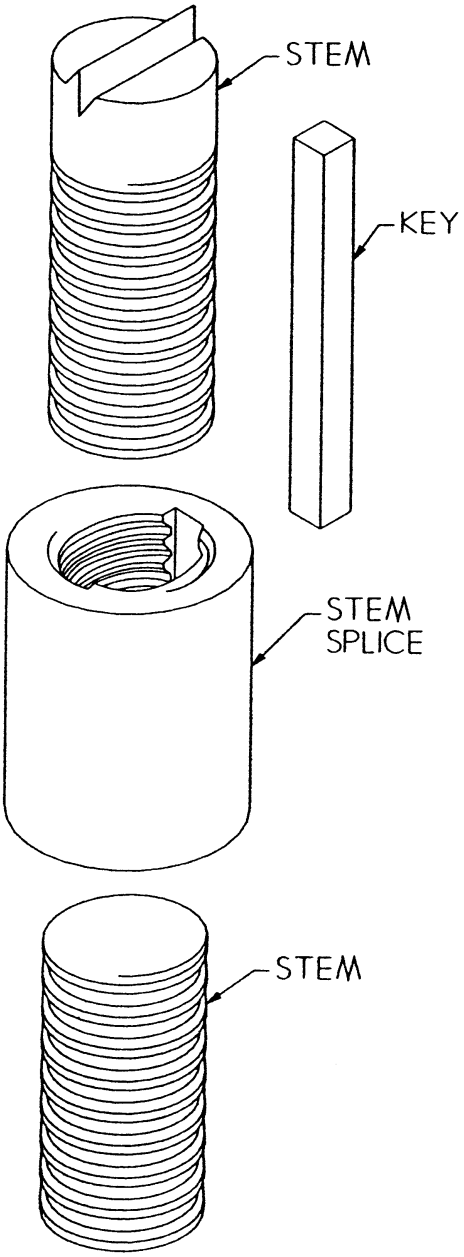
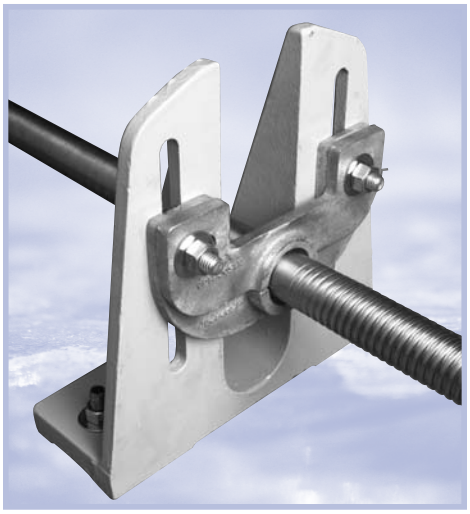


Figure 5-18
Stem Splice

Fully Adjustable Stem Guides

Several different brackets are available for the fully adjustable stem guides. Brackets are selected based on stem diameter and projection required from the wall. Stem guide collars are available to match stem sizes and the brackets needed to achieve the proper projection.



Type B Stem Guide

Stem Guides

Hydro Gate stem guides are used to maintain the alignment of long stems and prevent buckling of the stem when closing the gate.

Stem guides must be placed on a center-to-center distance that will limit the l/r ratio (slenderness ratio) of the stem to 200 or less. Note that the threaded portion requires closer spacing due to the smaller cross section at the root of the thread.

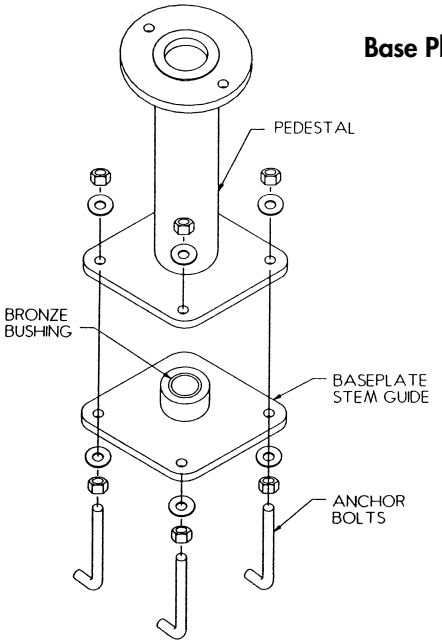
Type C Stem Guide

Base Plate Stem Guides

Many gate installations require support of the threaded portion of the stem. The base plate stem guide with bronze bushing collar is available for mounting underneath the lift. Adjustment is not required with this type of guide.

Base Plate Stem Guide

Figure 5-19
Base Plate Stem Guide



Hydro Gate furnishes one-piece or two-piece stem guide collars. A one-piece collar requires that it be placed on the stem before it is joined to the next stem section or as the lift is installed. Two-piece collars can be installed on the stem after it is in place and facilitate removal of the collar and of the stem if this is necessary at a future date.

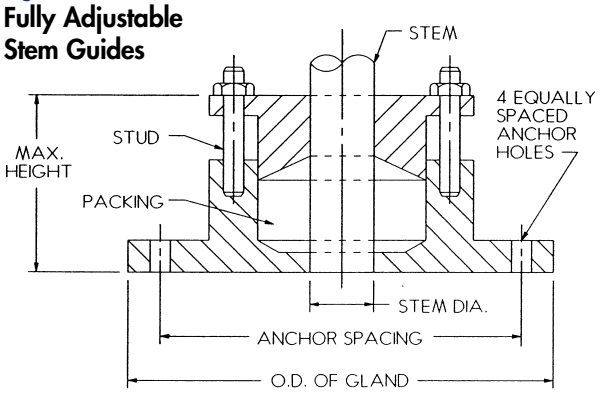
The stem guide collar is "fully adjustable" because it can be adjusted in two directions. Lateral adjustment parallel to the wall is obtained by slotted holes in the back of the bracket. Adjustment from the wall is obtained by long perpendicular slotted holes in the top of the bracket. The stem guide collar attaches through these perpendicular holes and allows for positioning of the collar. The smaller Type B guides are provided with two anchor bolts each for attaching the bracket to the vertical wall. They are usually used in smaller gates.

The larger, fully adjustable Type C guide has a larger bracket. Since the projection from the wall is considerably greater on these guides, four anchor bolts are required for firm attachment. This type of bracket is used with medium and larger size gates requiring stems 2-1/2 in. in diameter and larger.

Bronze Bushing Collars

The one-piece stem guide collar that supports the stem can be either bronze bushed or cast iron. The bronze bushing is recommended for lower friction between stem and collar. The

Figure 5-21
Fully Adjustable Stem Guides



inside diameter of the bushing is bored approximately 3/16 in. larger than the stem it supports. Non-metallic nylon bushings may be furnished on rare occasions when use of the bronze bushing is not acceptable.

When the two-piece stem guide collar is required, it is cast from solid manganese bronze. This avoids the possibility of losing the small two-piece bushing during installation.

Packing Gland

When a gate stem projects through the floor forming a pressure chamber, a packing gland of some type usually is required. The stem coming through the packing gland should be of corrosion-resistant material, such as stainless steel, and the stem going through the gland must be plain (without threads).

When the packing gland is installed on top of the pressure chamber floor, and the lift is to carry the thrust of opening and closing the gate, some means must be provided for mounting the gland underneath the lift and transmitting the load to the structure. When the packing gland is placed inside the pressure chamber under water, the chamber must be de-watered in order to adjust the gland when leakage occurs.

With rising stem gates, threading required on the stem makes it necessary to mount the gland underneath the floor on a double-flanged pipe. One flange is attached to the underneath side of the pressure chamber. The pipe extends downward to a point beyond the bottom threads when the gate is in the closed position. The packing gland is then attached to the bottom flange to complete the seal around the stem below the threaded section.

Stem Diameter (In.)	Outside Diameter of Gland (In.)	Maximum Height of Assembly (In.)	Bolt Circle (in.)
1-1/4 – 1-1/2	8-1/2	4-1/2	7
2 – 2-1/2 – 3	10	4-3/4	8-1/2
3-1/2 – 4	11	5	9-1/2

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