C.H.S. PENSTOCK CATALOGUE

Dedicated to your solutions.

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1.0 C.H.S. PENSTOCK TYPE

Wall Mounted Penstock (WM)

Channel Mounted Penstock (CM)

Weir Gate|Downward Opening Penstock (WG)

1.1 Wall Mounted Penstock (WM)

C.H.S. wall mounted penstock (WM) is the most popular and common of penstock used in wide variety of water and waste water work application as water / sewage treatment project and flood control project.

C.H.S. Penstock has provides penstock which fabricating with stainless steel under BS 7775 or AWWA C561 specification. This type of penstock can be used in on seating and off seating water pressure direction with rising or non-rising stem option.

C.H.S. offer from sizes 150 mm x 150 mm to 1200 mm x 1200 mm, the WM model has a unique self-adjusting seal design that can achieve minimal equal seating and unseating (bidirectional) leakage rates. Sizes 1300 mm x 1300 mm up to 4000 mm x 4000 mm are also available in bidirectional configurations. The maximum leakage rate is lower than the maximum allowable recommended by BS7775 standard under normal conditions.

1.2 Channel Mounted Penstock (CM)

The C.H.S. Channel mounted gate (CM) is designed for open channel installation with a highly versatile flow control in waste water treatment plants, irrigation, hydraulic works and hydro-electric power plants. It is used for channel water flow direction or water distribution control purpose and allows to overflow on top of the gate. Technically the water head design for channel penstock shall follow the height of the gate. However, higher water head can be designed upon request.

The sealing system is incorporated on both laterals and bottom area of the slide, resulting in a perfect seal without the need of wedges on the gate. From sizes 150 mm x 150 mm to 2000 mm x 2000 mm, the CM Penstock has a unique seal design for applications requiring accurate flow regulation and optimum performance. The maximum leakage rate is lower the maximum allowable recommended by BS7775 standard under normal conditions. CM Penstock can use in on and off seating with rising and non-rising stem optional. All the sealing surface and the assembly hardware is used corrosion resistant material.

Besides, C.H.S Channel Mounted Penstock is available in 4 sides seating face and the allowable leakage rate fulfill to the BS7775 standard.

Weir Gate|Downward Opening Penstock (WG) 1.3

The C.H.S. Weir Gate (WG) is designed for downward opening applications where a more accurate flow control is required. It also can be used in water distribution, drainage and other places for flow and level controlling. The water flows over the top of the slide permitting a constant upstream water elevation. The C.H.S. Weir Gate (WG) is available from sizes 150mm x 150mm up to 2000mm x 2000mm.

The sealing system is incorporated on 3 sides (both laterals and bottom), resulting in a substantially watertight seal without the need of wedges on the gate. This unique design achieves bidirectional performance (seating and unseating pressure conditions). Additionally, a 4 sides sealing system to BS7775 standard is available upon request.

2.0 C.H.S. Penstock Design Feature

Modular Design

Frame Configuration Options

Mounting Configuration Options

Flush Bottom Design

Modular Configuration For Actuation

HMWPE Guide

Sealing Design

Spindle & Stem Nut

Leakage Allowance

Seating

2.1 Modular Design

- Allows for both Open Yoke Frame and Self-Contained /Closed Yoke Frame configurations.
- Allows Rising or Non-Rising stem configurations

▲Self-contained / Closed Yoke Frame

▲Open Yoke Frame

Non-Rising Stem Configuration 2.1.1

As standard, non-rising stem gate configurations are used with self-contained frame designs. Therefore, the stem extension does not support the axial load (only torque) and less wall brackets are required. As a general rule, a stem guide should be installed every 3 meters of unsupported stem extension.

Rising Stem Configuration 2.1.2

As standard, rising stem gate configurations are used with open-frame designs. Therefore, the stem extension has to support the axial load when the gate is operated to avoid any buckling failure. As a general rule, a stem guide should be installed every 2 meters of unsupported stem extension.

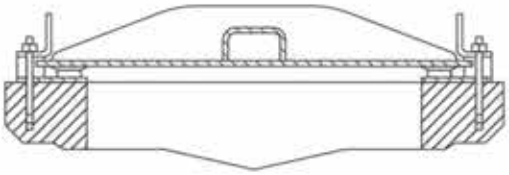
2.2 Frame Configuration Options

- Square (standard)
- Round & Rectangular opening
- Round base

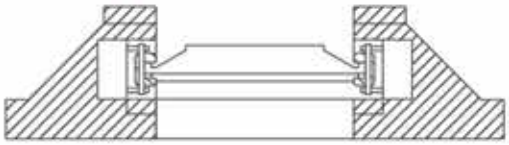
▲Square (Standard)

▲Rectangular

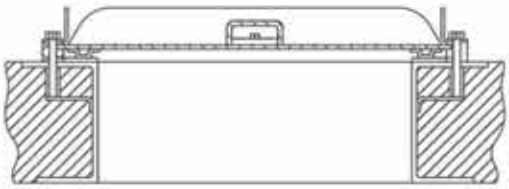
Mounting Configuration Options 2.3



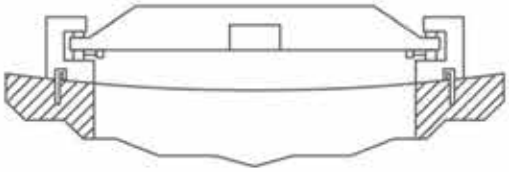
- Wall Mount (standard for sizes ≤ 1200)



- Embedded in concrete (standard for bidirectional and sizes >1200



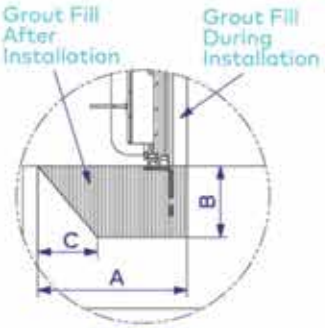
- Thimble Mount



- Curved Wall Mount

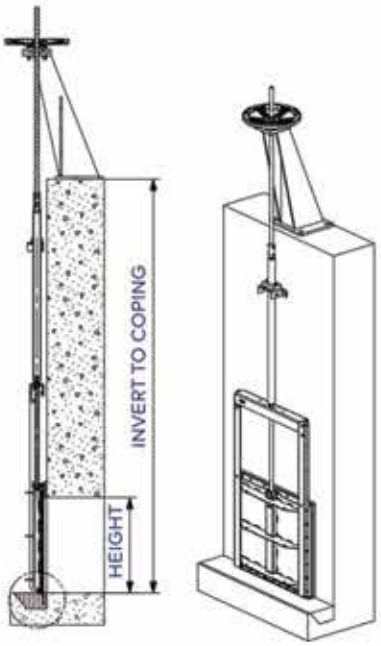
2.4 Flush Bottom Design

To prevent the rubbish stay or block at the slot between the bottom of the penstock and the mounted wall. This is used for preventing the gate operation stuck and water leakage cause by the stuck at the bottom gapping.



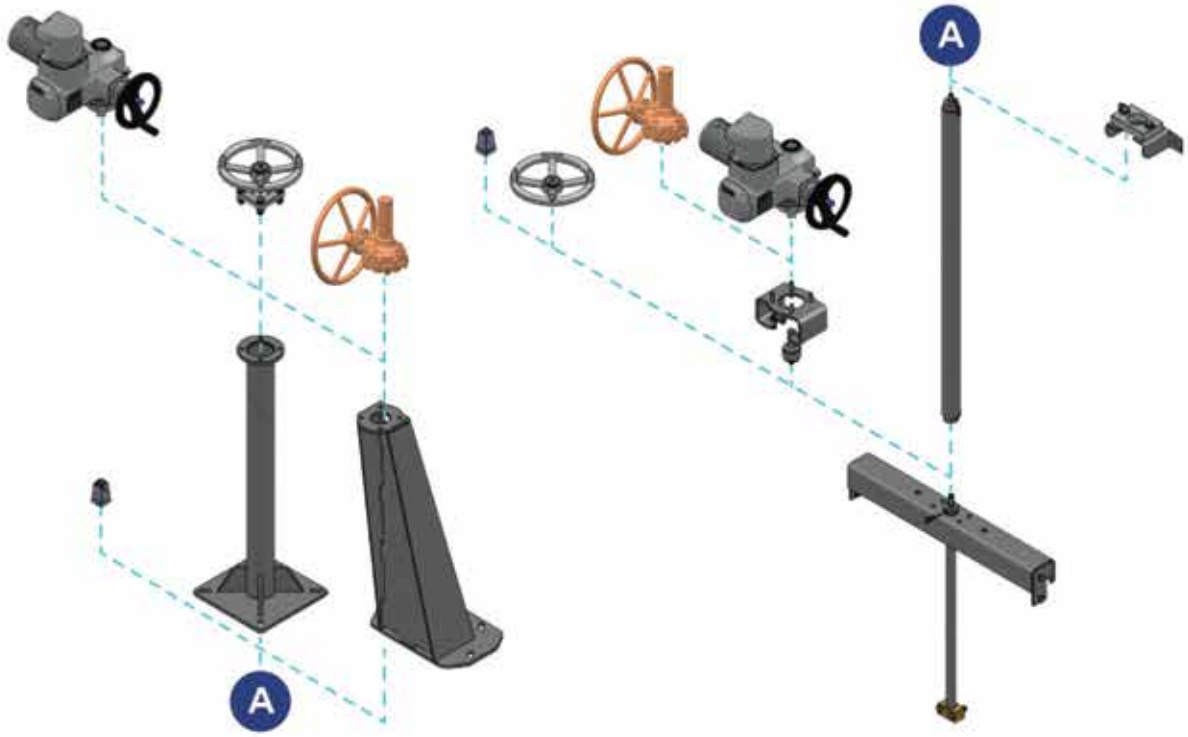
DETAIL B

Stainless Steel Penstock			
PENSTOCK SIZE	A	B	C
200 - 500	200	100	50
600 - 900	250	150	70
1000 - 1400	300	200	90
1500 - 2000	400	230	100



2.5 Modular Configuration for Actuation

Suitable for actuation with manual, electric, pneumatic or hydraulic actuators

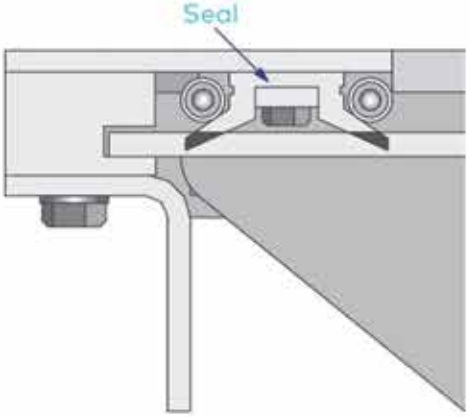


HMWPE Guide 2.6

- Self-cleaning HMWPE guides reduce the friction coefficient during operation, minimizing therefore the actuation thrust and extending the seal life.
- Machined slot for slide on guides to prevent "seesaw" effect when opening and closing the slide.

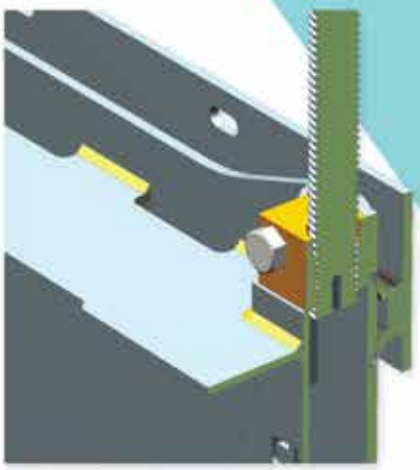
2.7 Sealing Design

- Seal design is self adjusting (wedge-less design), thus reducing torque requirements
- Slide ribs are designed to avoid crevice corrosion.
- Seal and guides bolting is completely separated from the frame anchoring



2.8 Spindle & Stem Nut

- Spindles are machined from stainless steel 304/ 316 according to DIN103 in trapezium thread as the optimum thread form for ease of operation, long life, and prevention of ragging. Both rising and non-rising options are available.
- Gunmetal is used as the spindle nut for better thrust movement



EXAMPLE:

500mm (W) x 500mm (H) Penstock,

:- Under 6 meters water head, 0.5l x 1min x (0.5m + 0.5m + 0.5m + 0.5m)
= 1liter/min

:- Under 10 meters water head, (0.1+0.067x10mWH) x (0.5m + 0.5m + 0.5m + 0.5m)
= 1.54liter/min

Leakage Rate 2.9

The leakage rate on WM model is lower than the maximum allowable defined by different standards under normal conditions:

- DIN 19569-4 (Class 5): 1,20 l/min per meter
- AWWA C-561: 1.24 l/min per meter
- **BS 7775:**
  - water heads <= 6 meters the leakage rate shall not exceed 0.5liter/ (min.m) of seal perimeter.
  - Water heads > 6 meters, the maximum leakage rate, R in liter/ (min.m) of seal perimeter, shall conform to

    $R = 0.1 + 0.067\ H$

    where H is the On / Off seating head in meter.

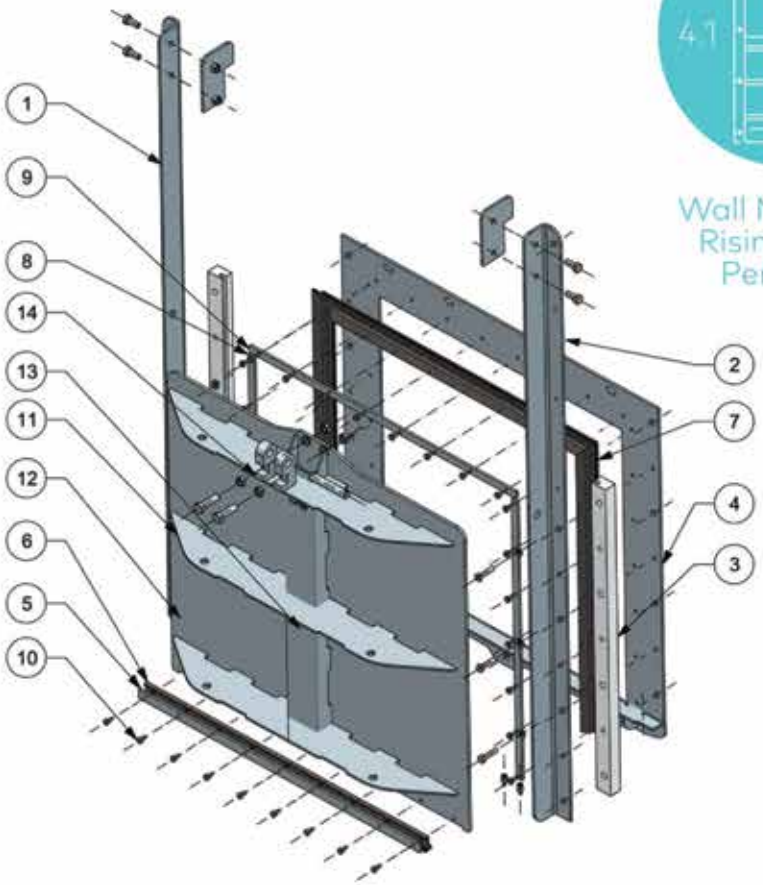
2.10 Seating

Seating / Unseating Design Head:			
	Uni / Bidirectional	Water Head	
Standard Range 150x150 - 1200x1200	BI-DIRECTIONAL	On Seating head pressure	Off-seating head pressure
		150-1100: 10 mWC	150-1000: 10 mWC
		1100-1200: 6 mWC	1100-1200: 6 mWC
1300 X 1300 - 4000 X 4000	BI-DIRECTIONAL	Designed according to the project specification. Typically 6m WC ofseating and unseating water head	

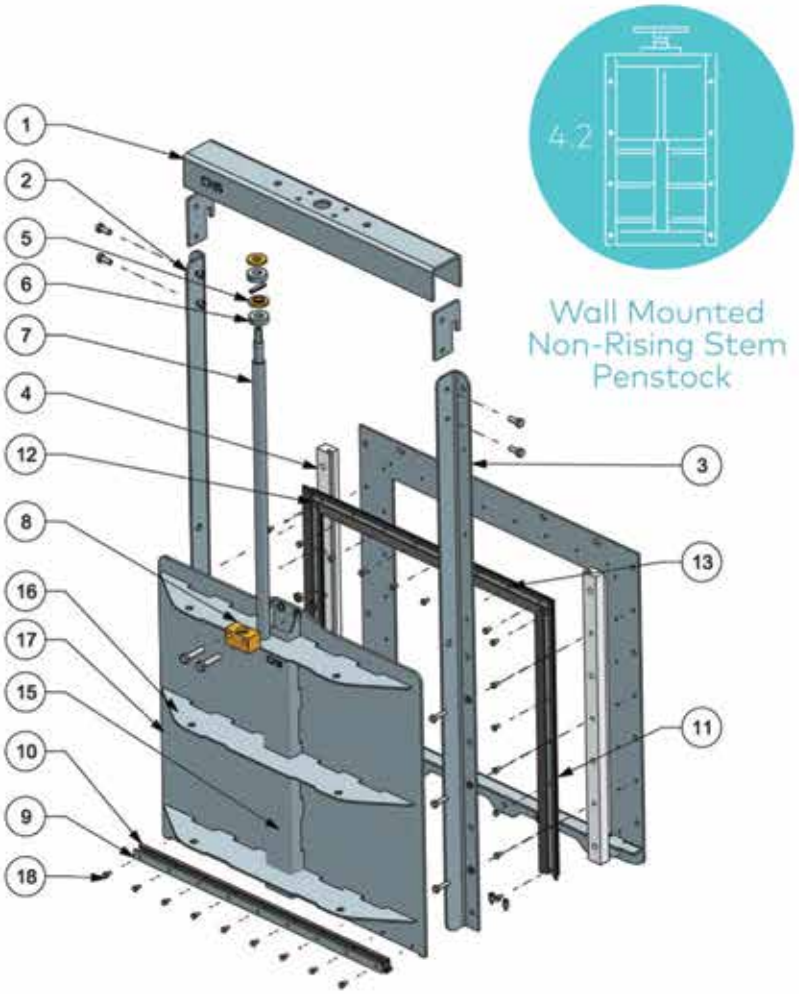
- C.H.S. penstocks are factory assembled and tested eliminating the need for on site adjustment
- All gate fasteners are stainless steel.

3.0 STANDARD MATERIALS OF CONSTRUCTION

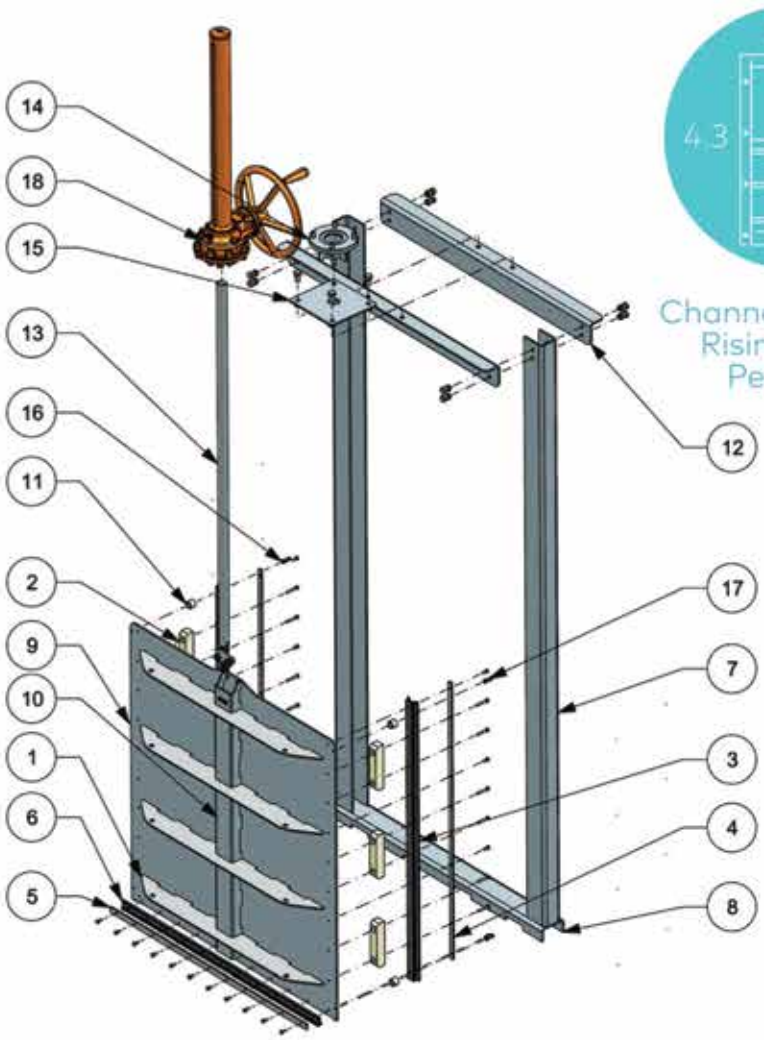
Wall Mounted Rising Stem Penstock



ITEM	DESCRIPTION	MATERIAL (STANDARD)
1	Left Frame Guide	Stainless Steel 304 or 316
2	Right Frame Guide	Stainless Steel 304 or 316
3	Side Slider	High Molecular Weight Polyethylene (HMWPE)
4	Body Frame	Stainless Steel 304 or 316
5	Bottom Retainer Plate	Stainless Steel 304 or 316
6	Bottom L Gasket	EPDM
7	Damper Gasket Joint	EPDM
8	Lateral Retainer Plate	Stainless Steel 304 or 316
9	Top Retainer Plate	Stainless Steel 304 or 316
10	Hex Bolt	Stainless Steel 304 or 316
11	Gate Horizontal Stiffener	Stainless Steel 304 or 316
12	Gate	Stainless Steel 304 or 316
13	Gate Vertical Stiffener	Stainless Steel 304 or 316
14	Gate Coupling Bracket	Stainless Steel 304 or 316

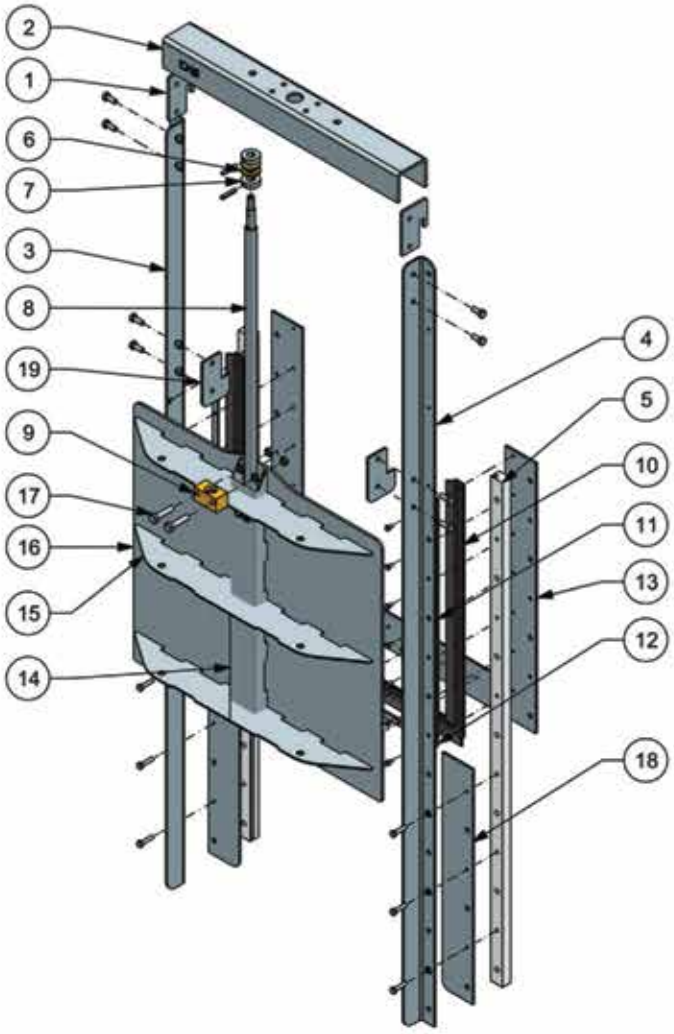


ITEM	DESCRIPTION	MATERIAL (STANDARD)
1	Yoke	Stainless Steel 304 or 316
2	Left Frame Guide	Stainless Steel 304 or 316
3	Right Frame Guide	Stainless Steel 304 or 316
4	Side Slider	High Molecular Weight Polyethylene (HMWPE)
5	Stem Bearing	Bronze
6	Stem Retaining Washer	Stainless Steel 304 or 316
7	Spindle Stem NRS	Stainless Steel 304 or 316
8	Stem Nut NRS	Bronze
9	Bottom Retainer Plate	Stainless Steel 304 or 316
10	Bottom L Gasket	EPDM
11	Damper Gasket Joint	EPDM
12	Lateral Retainer Plate	Stainless Steel 304 or 316
13	Top Retainer Plate	Stainless Steel 304 or 316
14	Body Frame	Stainless Steel 304 or 316
15	Gate Vertical Stiffener	Stainless Steel 304 or 316
16	Gate Horizontal Stiffener	Stainless Steel 304 or 316
17	Gate	Stainless Steel 304 or 316
18	Hex Bolt	Stainless Steel 304 or 316



Channel Mounted Rising Stem Penstock

ITEM	DESCRIPTION	MATERIAL (STANDARD)
1	Gate Horizontal Stiffener	Stainless Steel 304 or 316
2	Face Slide	High Molecular Weight Polyethylene (HMWPE)
3	Damper Gasket	EPDM
4	Lateral Retainer Plate	Stainless Steel 304 or 316
5	Bottom Retainer Plate	Stainless Steel 304 or 316
6	Bottom L Gasket	EPDM
7	C Channel - Side	Stainless Steel 304 or 316
8	C Channel - Bottom	Stainless Steel 304 or 316
9	Gate	Stainless Steel 304 or 316
10	Gate Vertical Stiffener	Stainless Steel 304 or 316
11	Gate Bearing	High Molecular Weight Polyethylene (HMWPE)
12	Yoke	Stainless Steel 304 or 316
13	Spindle Stem RS	Stainless Steel 304 or 316
14	ISO Top Flange	Stainless Steel 304 or 316
15	Yoke Base Plate	Stainless Steel 304 or 316
16	Hex Bolt	Stainless Steel 304 or 316
17	Bearing Bush	Stainless Steel 304 or 316
18	Bevel Gear	Ductile Iron



Non-Rising
Stem
Weir Gate

ITEM	DESCRIPTION	MATERIAL (STANDARD)
1	Yoke Stiffener	Stainless Steel 304 or 316
2	Yoke	Stainless Steel 304 or 316
3	Left Frame Guide	Stainless Steel 304 or 316
4	Right Frame Guide	Stainless Steel 304 or 316
5	Side Slider	High Molecular Weight Polyethylene (HMWPE)
6	Stem Bearing	Bronze
7	Stem Retaining Washer	Stainless Steel 304 or 316
8	Spindle Stem NRS	Stainless Steel 304 or 316
9	Stem Nut NRS	Bronze
10	Damper Gasket Joint	EPDM
11	Lateral Retainer Plate	Stainless Steel 304 or 316
12	Top Retainer Plate	Stainless Steel 304 or 316
13	Body Frame	Stainless Steel 304 or 316
14	Gate Vertical Stiffener	Stainless Steel 304 or 316
15	Gate Horizontal Stiffener	Stainless Steel 304 or 316
16	Gate	Stainless Steel 304 or 316
17	Hex Bolt	Stainless Steel 304 or 316
18	Body Frame Leg	Stainless Steel 304 or 316
19	Stop Plate	Stainless Steel 304 or 316

4.0 CHS Penstock Accessories

Headstock Floor Stand or Pedestal

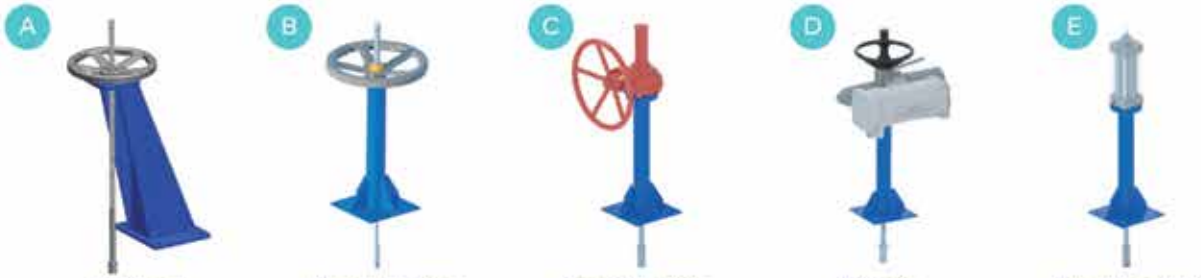
Extension Spindle and Spindle Guide

Floor Stand/ Headstock Mounting Bracket

Muff Coupler

Spindle Cover

Headstock Floor Stand or Pedestal 4.1



All C.H.S. actuators can be yoke or pedestal mounted, below are some examples of the most common types:

(A) Handwheel on inclined floor stand.

(B) Handwheel on straight floor stand.

(C) Bevel Gear operator on headstock/ pedestal.

(D) Electric actuator on straight floor stand.

(E) Hydraulic or pneumatic actuator.

(F) Square nut. (BS 5163-2, DIN 3223 or 2" sqr)(Only for Non-Rising stem)

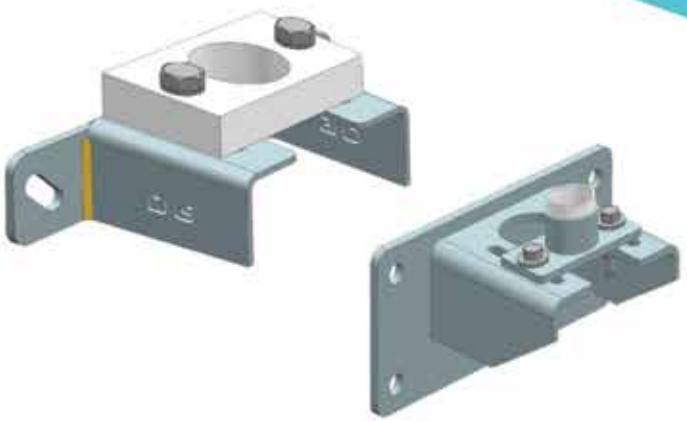
(G) Yoke mounted handwheel.

As default, these headstocks are fabricated from mild steel with epoxy coating but are also available in hot dip galvanized mild steel, stainless steel, and cast iron upon request.

4.2 Extension Spindle and Spindle Guide

In most cases, the operating floor level is located substantially higher than the opening. In order to be able to operate the gate, stem extensions are necessary. Stem guides are used to limit the "supported" length of the stem extension in order to avoid any buckling failure.

The stem guide has a HWMPE guide to reduce friction between the guide and the extension spindle.



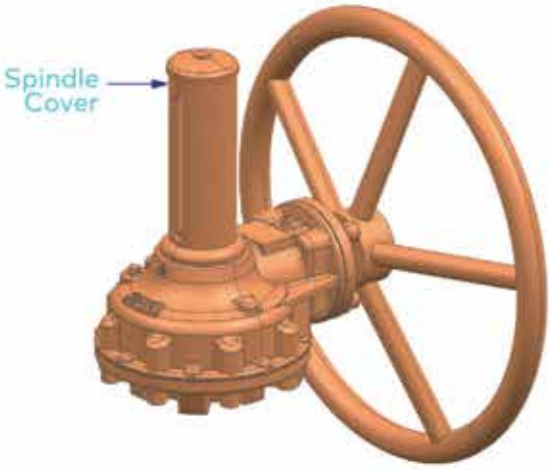
4.3 Headstock Mounting Bracket

In the event where the site structural works does not provide for headstock installation, a floor stand/ headstock mounting bracket can be used to provide support the headstock. C.H.S. standard headstock mounting bracket are fabricated using mild steel, complete with standard epoxy coating finishing.

4.4 Muff Coupler

As standard, C.H.S. muff coupler are manufactured in SUS304 / SUS316 for joining straight lengths of spindle in-line. For use with axial and torsion loads (rising and non-rising spindle application).

Ductile iron muff coupler are available upon request.



Spindle Cover 4.5

It is used for rising stem penstock. It helps to protect the spindle when the spindle position protruded from the top of operation equipment like handwheel, gearbox, actuator and etc. It is useful, especially the penstock use in outdoor application. The material can be select from Mild Steel, Acrylic and Polycarbonate.

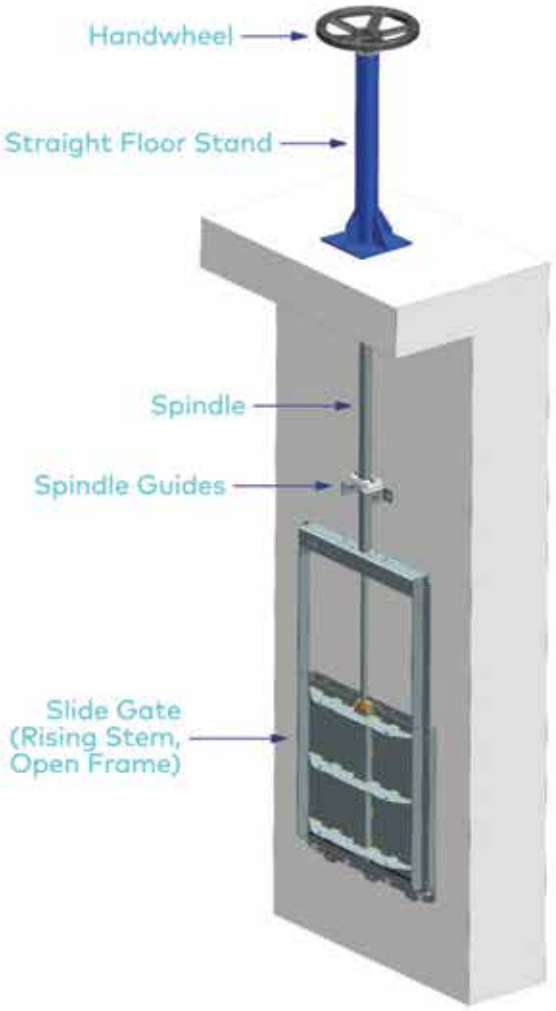
4.6 Installation, Operation and Maintenance

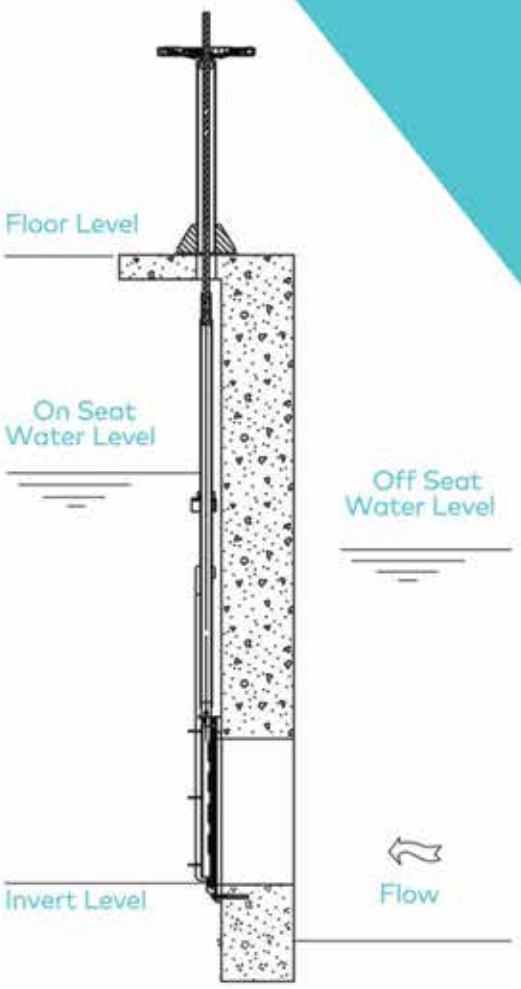
This section briefly describes the installation, operation and maintenance of WM/CM/WG penstocks. For more detailed information please refer to the "WM/CM/WG IOM Manual"

Installation:
WM/CM/WG penstocks are installed by means of Anchor Bolts. Depending on the size and working conditions they shall be either of the mechanical or chemical type (see table below). In order to avoid leakage between the concrete wall and the frame, CHS recommends the use of construction sealant equivalent to Sikaflex 11FC sealant (200ml per meter of opening perimeter).

The minimum concrete strength shall be 20.7 MPa. The tolerance of the concrete construction shall be in accordance to DIN 18202. For detailed information about type, size and quantity of the required anchor bolts at the installation, please refer to the notes on the "General Arrangement Drawing".

Maintenance and Operation:
The WM/CM/WG penstocks need practically no maintenance. The stem shall be kept lubricated and seals shall be replaced if damaged. The WM/CM/WG penstock is closed by applying a clockwise rotation. Applying too much force when closing the gate may cause damage to the stem





Seating / Unseating Design Head:		
Size	**Water Pressure**	**Standard Mounting Type**
BI-Directional (Standard Range) 150mm x 150mm - 1200mm x 1200mm	Seating and Un-Seating (Bi-Directional)	Wall Mount: • Stud Type Mechanical Anchor Bolts
BI-Directional 1300mm x 1300mm - 4000mm x 4000mm	Seating and Un-Seating (Bi-Directional)	Wall mount + chemical anchor bolt Optional embedded in concrete.

PENSTOCK INQUIRIES FORM

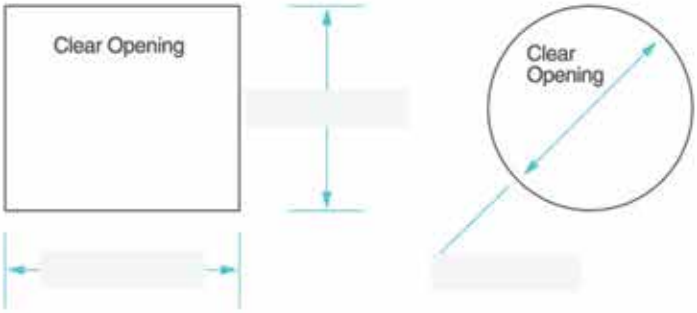
Company: Date: / /

Mobile: Tel:

Email: Name:

PENSTOCK APRETURE SIZE

Units in: ☐ mm ☐ cm



Qty:

Qty:

HEADSTOCK OPTION

☐ Inclined Headstock

☐ Manual with Handwheel

☐ Manual with Gear Box

☐ Electric Actuator

☐ Pneumatic

☐ Hydraulic

MATERIAL

☐ Stainless Steel SS304
☐ Stainless Steel SS316
☐ Cast Iron
☐ Ductile Iron
☐ Carbon Steel

SEALING

☐ 4 Sides Sealed
☐ 3 Sides Sealed

CLOSING

☐ Downward Closing
☐ Upward Closing

SPINDLE

☐ Rising Spindle
☐ Non-rising Spindle

MATERIAL

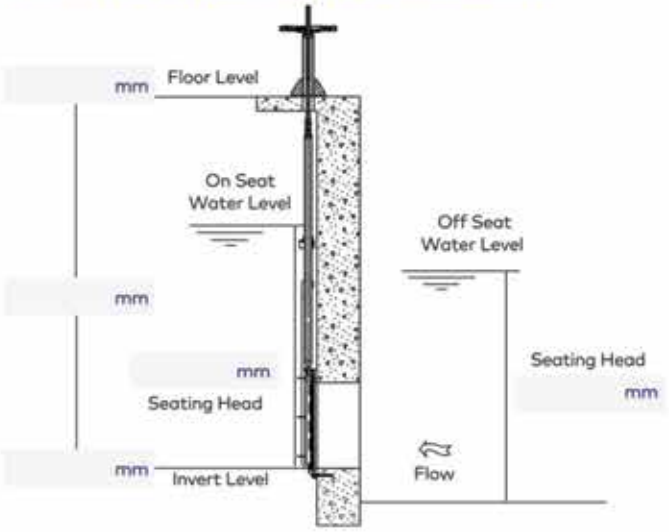
☐ Concrete Wall
☐ Wall Timble
☐ Channel / Drain
☐ Other, Pls Specify

HEADSTOCK MOUNTING

☐ Headstock Mounted on Slab

☐ Headstock Mounted Z-type Bracket

PENSTOCK DESIGN REQUIREMENT



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