



KT-Penstock

The Ideal of Water Control Gate



OPERATION & MAINTENANCE MANUAL

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WARRANTY AND LIMITATION OF LIABILITY

All equipment is sold subject to the mutual agreement that is warranted by the company to be free from defects of material and workmanship but the company shall not be liable for special, indirect or consequential damages of any kind under this contract or otherwise. The company's liability shall be limited exclusively to replacing or repairing without charge, at its factory or elsewhere at its discretion. Any material or workmanship defects which become apparent within one year from the date on which the equipment was shipped, and the company shall have no liability for damages of any kind arising from installation and/or use of apparatus by anyone. The buyer by the acceptance of the equipment will assume all liability for any damages which may result from its use or misuse by the buyer, his or its employees, or by others.

The warranties of the company do not cover, and the company makes no warranty with respect to any defect, failure, deficiency or error which is:

1. Not reported to the company within the applicable warranty period; or
2. Due to misapplication, modification, disassembly, abuse, improper installation by others, abnormal conditions of temperature, dirt, or corrosive matter; or
3. Due to operation, either intentional or otherwise, above rated capacities or in an otherwise improper manner
4. Due to the defect of sensor cause by human error or electrical shot, either intentional or otherwise.

There are no other warranties, express or implied including the implied of merchantability and fitness for a particular purpose.

1.0 Operating Mechanisms

1.1 Manually Operated Headstock

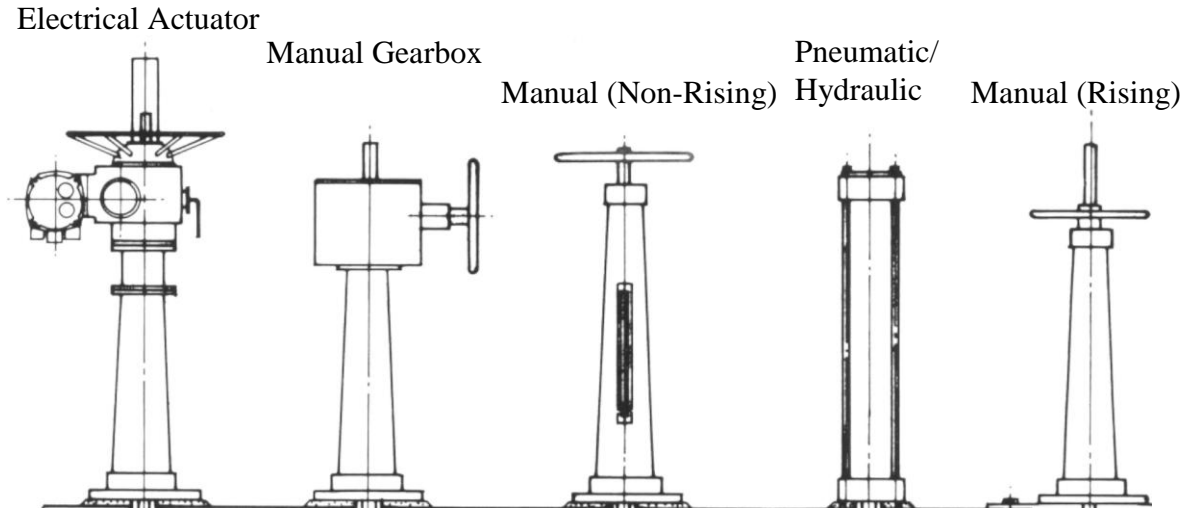


Figure 1.0, Types of Penstock Operation

All headstock and operating devices are identified by a tag showing the installation drawing number and should be used with the proper gate and stem.

1. After the stem has been completely assembled and positioned in place, the manual operator can be lowered onto the stem and turned into position by operation of the handwheel.
2. There are 3 types of headstock for selection. **Handwheel Non-rising, Rising and Reducing Gearbox.** The advise of headstock selection should be refer to the KT marketing personal.
3. KT do provide rising and non-rising indicator install in headstock for user selection.
4. Grouting should be placed between the floor and the operator so that the operator is plumb and the base of the headstock is approximately 30-50mm above the operating floor. (Figure 1.1)
5. After the grout has hardened, the nuts tightened firmly in place.
6. When the operating mechanism has been installed, tension should be applied to the stem by turning the handle in a direction that would normally open the gate. However, the gate should not be opened. The intent is merely to apply tension that will result in a straight stem.
7. The stem guide should be aligned on the bracket with uniform clearance between the stem and the bored hole in the stem guide.
8. Firmly bolt the stem guide to the stem guide bracket. Where there is likely to be vibration because of high head or high water velocity, the guide should be pinned to the bracket. Any loosening of the guide will result in the stem being unsupported. This may cause the stem to be damaged when the gate is operated.



Manual Operated Headstock

9. The stem should be thoroughly cleaned and lubricated with a heavy duty grease, such as **Shell Alvania #2** or any similar heavy duty grease.
10. The handwheel should turn easily. If there is any binding in operation, check to be sure that the stem guides, headstock and stem are properly aligned. This alignment check is important before the gate is operated.
11. All KT manually operated headstock are lubricated prior to leaving the factory and do not need lubrication at time of installation.

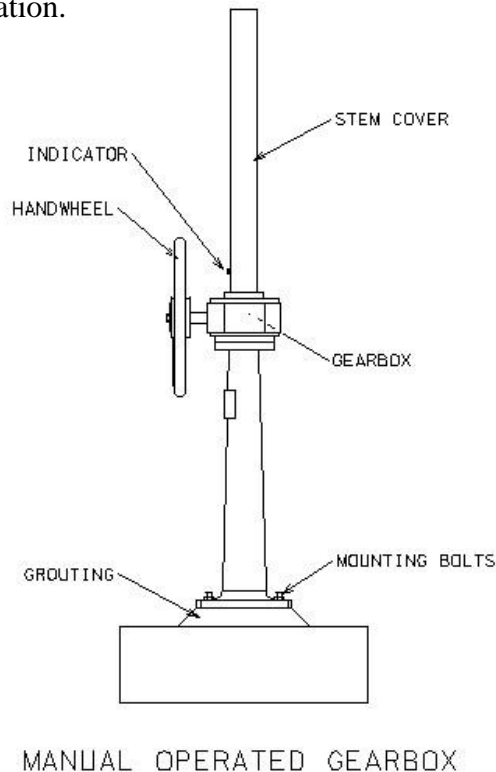


Figure 1.1, Manual Operated Headstock Mounting

1.2 Electric Motor Driven Headstock

1. As the manual operated headstock, the electrical motor driven headstock also request 30-50mm of grout to be placed between the base of the headstock and the operating floor.
2. The unit should be wired following the wiring diagrams and instructions provide by the electrical actuator manufacturer.
3. **The penstock should be opened by the actuator handwheel at least 3 inches before using the electrical controls.** In this manner, the direction of rotation of the motor can be determined without damaging the stem or gate.
4. Once the unit has been installed, the actuator manufacturers directions should be followed closely in setting the closing and opening limit switches. The torque switches have been properly set at the factory and **should not** need adjustment. Follow the manufacturers instructions if it appears that adjustment is necessary.

1.3 Hydraulic Cylinder Operators

Hydraulic cylinders should be stored in a vertical position and filled with hydraulic fluid. If it is necessary to store them horizontally for a short period, they should be rotated every two weeks so that the seals are not damaged.

1. Hydraulic cylinders should be mounted on the anchor bolts in such a way that the piston rod and stem are in proper alignment.
2. The coupling between the piston rod and the stem should be screwed into place and locked.
3. With the gate in the closed position, the piston should be lowered so that it is in contact with the bottom head of the cylinder.
4. With the piston in this position, the muff coupler should be adjusted on the stem so that it is in contact with the mounting hole. Bolts & nuts should be tightened to lock it in place. In most cases, the top area of the piston is larger than the underside. Therefore, if pressure applied to both surfaces is the same, more force will be applied in the closing direction than in the opening direction. For that reason, pressure-reducing valves should be provided in the line to the top of the cylinder to lower the pressure to that required to properly close the gates. In this way, full operating pressure can be applied to the bottom of the piston resulting in more opening than closing force. All piping should be thoroughly flushed and cleaned prior to making connection to the hydraulic cylinder.

2.0 Operating Instructions - Penstock

WARNING – Weir Gate

Locking plates for Weir gate should not be removed until the operating mechanism is securely attached to the gate.

For electric and manual operators, the alignment of stem with stem guide and muff coupling is important to prevent the bending of the stem during operation. For Hydraulic Cylinder operators, the gate should be supported externally until the cylinder and all connecting lines have been filled with pressurized fluid and then only when the directional valves are in the neutral or up positions.

Note that filling the cylinder with fluid while the piston is fully retracted can result in a trapped air pocket, which could allow the gate to drop a few inches.

2.1 Before Operating Sluice Gate / weir gate

1. MAKE SURE THAT ALL LOCKING PLATES HAVE BEEN REMOVED.
2. CLEAN THE TOP OF THE GATE OF ALL SAND, CONCRETE DROPPINGS AND OTHER DEBRIS.
3. CHECK TO MAKE SURE THAT STEM GUIDES AND BRACKETS ARE SECURELY FASTENED & ALIGN.
4. CLEAN AND LUBRICATE THE STEM, THRUST NUT & STEM GUIDE.

2.2 Initial Operation - Penstock

1. Before using the penstock, seat facings should be thoroughly cleaned. The paint, which may have been deposited on the seat facing, should be removed. Seats and wedges should be coated with light grease.
2. Operating stems should be thoroughly cleaned and greased with a high grade, heavy duty lubricant such as: **Shell Alvania #2**.
3. The gate should be operated to the fully open and fully closed positions slowly, and carefully, to check for misalignment or problems in operation.

2.3 Manual Operators

1. Manual operators are lubricated at the factory before initial operation and do not require additional lubrication.
2. If operation becomes difficult, check stem lubrication.

2.4 Electric Operators

The Instruction Manual furnished with electric actuator should be read carefully before the unit is installed and operated. The gate must be manually opened about 3” before initial electric operation is attempted. Check motor rotation by activating the “close” circuit making certain the gate travels in the “close” direction. Revise motor leads to obtain proper rotation if necessary.

The gate should not be operated electrically through its full travel until both “close” and “open” geared limit switches have been properly set. Adjust the “open” switch so that the opening cycle does not allow the end of the thread of the operating stem to enter the floor stand nut. **Geared limit switches cannot be factory set and must be set by the contractor at the job site. Follow all safety precautions for electric operators.**

2.5 Hydraulic Operators

The Instruction Manual furnished with the hydraulic equipment should be read carefully before the units are installed and operated. Hydraulic systems vary considerably in terms of operating characteristics and in the types of equipment available. Specific operating modes, start-up instructions, and safety precautions **must** be understood prior to initial operation. All hydraulic systems use a pressurized fluid and should be operated with care.

3.0 Operating Instructions - Slide Gates

KT fabricated slide gates/penstock are constructed to operate satisfactorily under the specified operating conditions. These gates should be operated with care so as not to exceed the specified conditions. If, in the operation of the gate, an obstruction is met, either in the opening or closing direction, the obstruction should be removed before continuing in the operation. When the gate is fully opened or closed, excessive force should not be placed on the gate or gate stem by the operator in an effort to move the gate further.

If a problem arises in the operation of the gate, such as an unusual head condition or evidence of excessive corrosion, the factory should be consulted before the gate is used or operated.

3.1 Installation Inspection Check List

3.2 Manually Operated Slide Gates

1. Check headstock, headstock bracket, stem guide, and gate attaching bolts for proper tightness.
2. Apply tension to stem and check any stem guides for proper alignment. There must be a uniform clearance between the operating stem and all stem guides.
3. Check gate guide groove and clean off any foreign matter.
4. With gate in fully opened position, check seating surfaces of slide and frame for paint, concrete or other foreign matter. Also check the threaded portion of the stem. It must be clean and lubricated with a heavy duty grease such as: **Shell Alvania #2**.
5. If J-seals are supplied, clean contact surfaces on gate and adjust seal.
6. Check the invert of flush bottom gates for concrete splatter or other debris.
7. Install stem cover if furnished.

3.3 Penstock Install arrangement and Spare parts

The common penstock installation arrangement for manual operation and electrical actuator operation are show in figure 1.2 below.

That is the most common penstock installation arrangement. For other types of installation method, please refer to the penstock installation manual or contact our technical support for more information.

The penstock spare parts or component list is show in figure 1.3. The table show the penstock parts description and the standard material specification. For other material specification, please refer to our marketing personal for detail.

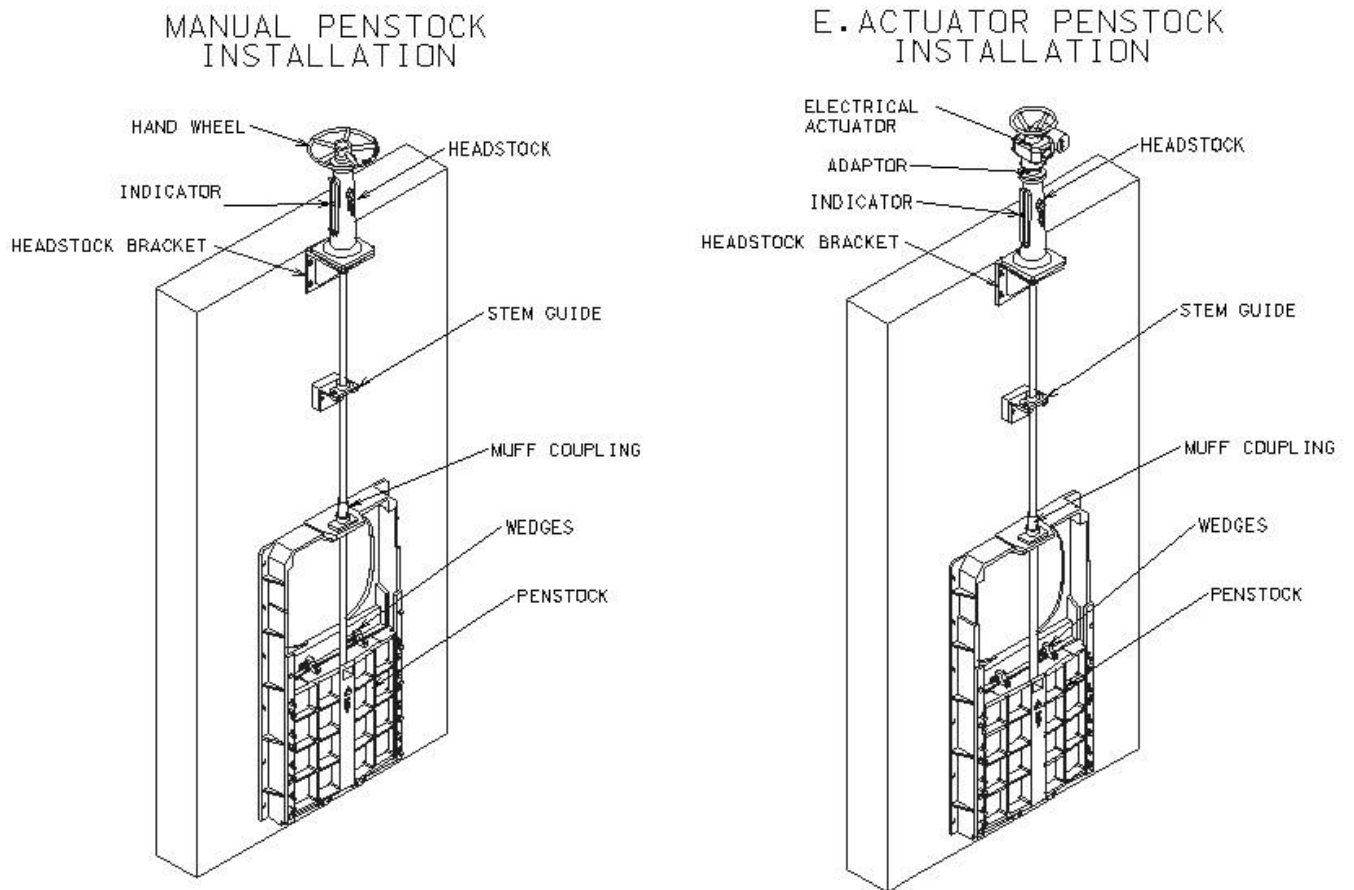
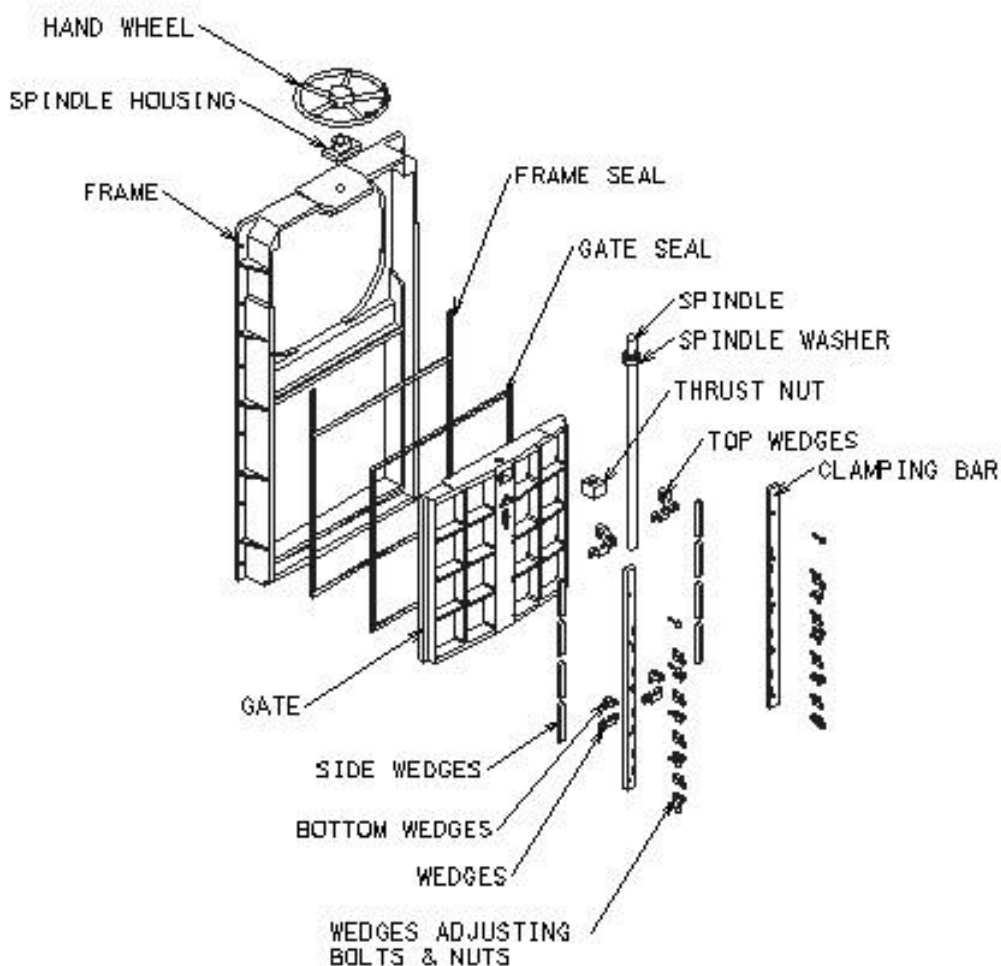


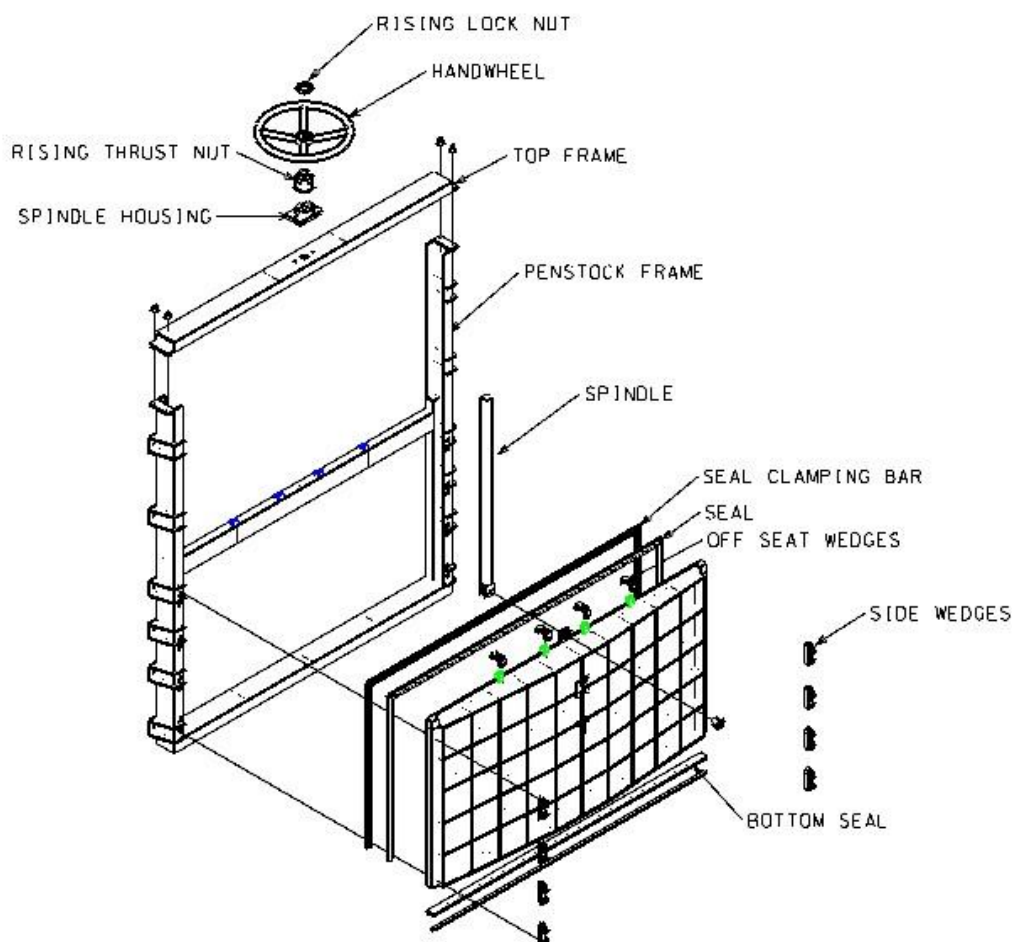
Figure 1.2, Penstock Common installation arrangement

STANDARD CAST IRON PENSTOCK SPLIT COMPONENTS



Items	Parts	Material	Standard
1	Frame	Cast Iron G250 or higher	BSEN 1561:11
2	Gate	Cast Iron G250 or higher	BSEN 1561:11
3	Handwheel	Cast Iron G250 or higher	BSEN 1561:11
4	Frame Seal	PB102	BSEN 12163:11
5	Gate Seal	PB102	BSEN 12163:11
6	Spindle	SUS 304 or 316	BSEN 10088-3:14
7	Thrust Nut	Gunmetal LG2	BSEN 1982:08
8	Clamping Bar	Cast Iron G250 or higher	BSEN 1561:11
9	Spindle Housing	Cast Iron G250 or higher	BSEN 1561:11
10	Wedges	Gunmetal LG2	BSEN 1982:08
11	Fastness	SUS 304 or 316	BSEN ISO 3506
12	Muff Coupling	SUS 304 or 316	BSEN 10088-3:14
13	Headstock	Cast Iron G250 or higher	BSEN 1561:11
14	Ext. Spindle	SUS 304 or 316	BSEN 10088-3:14
15	Stem Guide	Cast Iron G250 or higher	BSEN 1561:11
16	Headstock Bracket	Cast Iron G250 or higher	BSEN 1561:11

STANDARD STAINLESS STEEL PENSTOCK SPLIT COMPONENTS



Items	Parts	Material	Standard
1	Frame	Stainless Steel SS304 or SS316	BSEN 10088:14
2	Gate	Stainless Steel SS304 or SS316	BSEN 10088:14
3	Handwheel	Stainless Steel SS304 or SS316	BSEN 10088:14
4	Frame Seal	EPDM	MS 672:12
5	Gate Seal	EPDM	MS 672:12
6	Spindle	Stainless Steel SS304 or SS316	BSEN 10088-3:14
7	Thrust Nut	Gunmetal LG2	BSEN 1982:08
8	Clamping Bar	Stainless Steel SS304 or SS316	BSEN 10088:14
9	Spindle Housing	Stainless Steel SS304 or SS316	BSEN 10088:14
10	Side Wedges	UHMWPE	ASTM D6712:09
11	Fastness	Stainless Steel SS304 or SS316	BSEN 10088:14
12	Muff Coupling	Stainless Steel SS304 or SS316	BSEN 10088:14
13	Headstock	Cast Iron G250 or higher	BSEN 1561:11
14	Ext. Spindle	Stainless Steel SS304 or SS316	BSEN 10088-3:14
15	Stem Guide	Cast Iron G250 or Stainless steel	BSEN 1561:11 BSEN 10088:14
16	Headstock Bracket	Cast Iron G250 or Stainless steel	BSEN 1561:11 BSEN 10088:14

4.0 Maintenance Instructions

4.1 Gates

No periodic maintenance is required for penstock or slide gates. However, gates should be operated periodically (at least every three months). Slide gates should be checked at regular intervals (at least every six months) for signs of corrosive attack.

WARNING: Non-Rising Stem Gates

Non-rising stem gates generally require a special maintenance program. If the level of the water or sewerage rises above the top of the opening, the threads on the stem may become coated with grit. Under these conditions, frequent use of the gate will wear the threads in the thrust nut creating a potentially dangerous situation since an excessively worn thrust nut may not support the weight of the gate, causing it to fail. Therefore, the following maintenance procedure must be followed:

- A. The stem and thrust nut must be clean and greased at all times (at least 3 months).
- B. If the gate is cycled on the average of once a week, the thrust nut should be removed every year and inspected for wear. (More frequent inspection is required after the first signs of wear or if the frequency of operation is greater or the conditions are very severe.)
- C. Replace the thrust nut as soon as excessive wear is evident.

4.2 Manual Operators

At least once a year, all grease fittings on manual floor stands should be lubricated with a small amount of heavy duty grease which will not harden in cold weather nor become liquid in warm weather. The following lubricant is recommended:

Shell Alvania #2

4.3 Electric And Hydraulic Operators

Periodic maintenance schedules should be set-up in accordance with the equipment supplied and outlined in the manufacturer's instruction manual.

4.4 Operating Stems

It is critical that operating stems be periodically cleaned and greased. Even though some environmental conditions are harsher than others and the use of pipe covers will protect stems, they still need to be cleaned and greased at least once every **six months**, more often if the grease becomes dirty. The following lubricants are recommended:

Shell Alvania #2

**WARNING: Electric and Modulating
Electric Operators**

These operators can cause accelerated wear in the operating nut since the stem and gates are operated more frequently and at times continuously. This condition can cause a potentially dangerous situation since an excessively worn operating gearing may not support the weight of the gate, causing it to fail. Therefore, the following maintenance procedure must be followed:

- A. The stem and operating nut must be clean and greased at all times. (Stem covers provide protection of the stem).
- B. The operating nut should be removed and inspected for wear after three months of operation and every year thereafter.
- C. Replace operating nut as soon as excessive wear is evident.

4.5 Storage Instructions

I) Electric Operators

- A. Protect from weather store indoors.
- B. Energize heaters upon receipt of units to prevent corrosion of controls.

**II) Hydraulic Systems and Cylinders
Operating Stems**

- A. Protect from weather store indoors to prevent corrosion of components.
- B. Store cylinders vertically to prevent damage to seals.

PROBLEMS	CAUSES	SOLUTIONS
Excessive Leakage	<ol style="list-style-type: none"> 1. Foreign debris on seating surface 2. Inordinate amount of operation force. 3. Wedges out of adjustment. 	<ol style="list-style-type: none"> 1. Open gate and clean the foreign debris. 2. Excess loading of the thrust nut may cause gate to unseat off. Back off the operation. 3. Readjust the wedges.
High Pitched Noise	<ol style="list-style-type: none"> 1. The stem threads may need lubrication. 2. The stem guides are not properly aligned. 	<ol style="list-style-type: none"> 1. Lubricate the thread of the stem with high pressure grease. 2. Check alignment of the stem.
Intermittent Bang During Operation (Down)	<ol style="list-style-type: none"> 1. This normally result of water head equal to the weight of gate high cause the thrust nut move at the clearance distance in nut pocket each time the gate drop. 	<ol style="list-style-type: none"> 1. To eliminate this, shims may be inserted to take up the clearance of the thrust nut in the pocket.
Gate Will Not Open When Stem Turns ON	<ol style="list-style-type: none"> 1. Wedges adjustment too tight. 2. Muff coupling's locking bolts not install. 	<ol style="list-style-type: none"> 1. Readjust the wedges. 2. Check installation of muff coupling and install the locking bolts.
Inordinate Amount Of Force Required To Operate Gate	<ol style="list-style-type: none"> 1. The stem needs lubrication. 2. The stem guide not properly aligned. 	<ol style="list-style-type: none"> 1. Lubricate the threads of the stem with high pressure grease. 2. Check and reinstall the stem guide.
Gate Will Not Completely Shut	<ol style="list-style-type: none"> 1. Foreign object between gate or bottom of the gate. 	<ol style="list-style-type: none"> 1. Remove foreign object.
Bowling Stem	<ol style="list-style-type: none"> 1. Misaligned operator. 2. Stem guide not aliged or mislocated. 3. Inordinate amount of operation force. 	<ol style="list-style-type: none"> 1. Check alignment of operator. 2. Check alignment of stem guides and verify location with drawing. 3. Back off slightly on the operator and readjust the stop collar.