WATERFRONT

INSTALLATION, OPERATION AND MAINTENANCE MANUAL

PENSTOCK VALVE

We are a Glasgow based company providing water engineering solutions in fluid control for both the UK and International markets.

Waterfront Engineering Services Ltd was formed in 1988 specialising in the installation and commissioning of Penstocks for Treatment Plants.

We offer a service to supply, refurbish and install valves, penstocks and ancillary equipment.

We have extended our range to incorporate a wide range of products for controlling Water Flows. These products cover all types of valves, penstocks and ancillary products.

Waterfront Engineering Services LTD provides consistent high quality products and services.

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HANDLING AND STORAGE

Where chains or slings are used for handling purposes the frame should be protected using cloth sacking or similar material.
HOOKS ARE ONLY TO BE USED WHERE EYEBOLTS ARE FITTED.
Penstocks should always be stored in the vertical position where safety permits so.

NOTES
1. Pressure of any locating jacks must be spread evenly using timber. AVOID point loading to any part of the frame and NEVER apply jacking pressure to the door.
2. Due to civil work tolerances, mounting of the unit must be affected by grouting between the wall and frame, without any part of the frame actually touching the wall, thus avoiding the possibility of distortion. DO NOT attempt to seal the frame to the wall by means of mastic or other resilient compounds, as this will only result in leakage.
3. The anchor bolts are of stainless steel construction. Anchor bolts should ALWAYS be tightened up, using a torque wrench to the correct setting. Please refer to the anchor bolt manufacturers literature for specific recommendations.
4. All penstock units leave the factory with the doors set in the correct closed position and pre-adjusted for operation within the frame. It is very important that the door is NEVER opened or moved within the frame until the frame is securely wedged into a channel, or bolted on to a wall.
5. Before grouting it is essential that a feeler gauge non-acceptance test of 0.1mm be carried out on all sealing faces. For example, if the soffit seal is distorted, it should be packed out until non-acceptance of the feeler gauge is achieved , though not enough that the jacked seal is proud of the opposite face.

INSTALLATION SEQUENCE

The installation of penstocks, avoiding distortion and consequent leakage, is not difficult providing these recommendations are followed.
Prior to commencing installation, check civil work is correct to all appropriate drawings and that there is no obvious obstruction or undulations on concrete surfaces.

CHANNEL MOUNTED FRAME – LOCATION

1. Support the unit in its required position, relative to the flow, in the prepared recess making sure that the invert of the frame is flush with the final invert of the channel.
2. Locate the unit in its correct final position by wedging the frame in the recess using jacks and packing pieces, of suitable thickness. Carefully check for plumb and Level in all directions and check that the invert to coping dimension is

correct.
3. Check seal faces with 0.05 or 0.1mm feeler gauge using light pressure only, to check for and gaps in the seal and use jacks or packers of sufficient thickness to close the gap. Light pressure is required as these are resilient face units and excessive pressure may give false indications.

WALL MOUNTED FRAME – LOCATION USING EXPANDING ANCHOR BOLTS
1. Supporting the frame along the whole of its bottom cross member, or by hanging from a crane, present the unit to its required position.
2. Using the frame as a template, drill holes to accept the anchor bolts specified.
3. Insert the top two anchor bolts and place packing pieces, to the recommended grouting thickness, between the back of the frame and the concrete wall, close to the inserted bolts. Tighten the bolts sufficiently to hold the packing pieces in position.
4. Insert the remaining anchor bolts and by using jacks and packing pieces of suitable thickness, locate the frame in its correct final position. Carefully check for plumb and level in all directions and check that the invert to coping dimensions is correct.
5. Check seal faces with 0.05 or 0.1mm feeler gauge using light pressure only, to check for and gaps in the seal and use jacks or packers of sufficient thickness to close the gap. Light pressure is required as these are resilient face units and excessive pressure may give false indications.
6. Having checked for plumb, correct level, alignment and location you can now grout the penstock.

SHUTTERING AND GROUTING
1. Shutter up the frame for grouting using timber, faced with a thin neoprene type sponge material to ensure a good, clean, seal without undue pressure.
2. CHECK AGAIN for plumb and position. If correct, mix and pour a fluid grout in proportions of 50kg. cement, 50kg. silver sand and 0.22kg (small tub) cebex 100 plasticized expanding grout admixture (or equivalent) between the frame and wall or recess.
3. When the grout is set, finally re-tighten the anchor bolts in sequence, i.e. when one bolt head has been dealt with, follow on with the bolt diagonally or diametrically opposite. After all bolts are tightened, remove the shuttering and generally clean up and remove any excess grout or debris from the penstock. Pay attention to the sealing faces so see that they are not damaged in any way, otherwise the unit may leak.

OPERATING EQUIPMENT
1. Whenever possible, units are dispatched completely assembled with their operating gear. However, if units have to be dispatched in separate section, each section will be labelled with the Tag Reference Number.
2. When required, coping brackets or guide brackets for extension spindles, or floor pillars for operating gear, should also be bolted and grouted to the wall, coping or floor, in the manner previously described for the type of anchor bolts specified. Refer to the appropriate Arrangement Drawing as necessary.
3. When fitting extension spindles on single spindle penstocks, it is essential that the door and the remote operating equipment, through the spindles, are in perfect vertical alignment.

GROUT SPECIFICATION
50kg Ordinary Portland Cement
50kg Silver Sand
1 x Tub Cebex 100 (0.227kg)
22-24 litres Water or less as required
Available from any Builders Merchants

INSTALLATION RECOMMENDATIONS FOR MANUAL GEARBOXES

HANDLING
If chains or slings or used for handling purposes, the unit should be protected with cloth, sacking or similar material. NEVER USE HOOKS UNLESS EYEBOLTS ARE FITTED.
Combined units i.e. penstock with a gearbox fitted direct on the frame, should NEVER be slung from the gearbox.

STORAGE
1. If gearboxes are supplied separately they should be stored in a clean, dry, warehouse. If supplied unpacked, the gearboxes should be stored on a shelf or wooden pallet. Other materials must not be stored on top of the gearboxes.
2. If gearboxes must be stored outside (because they are fitted direct on a penstock frame), they should be covered by a suitable waterproof sheet.
3. Input shafts should be rotated every three months to mix the lubricant.
4. Most standard gearboxes are weatherproof to IP67 after correct installation and are capable of operating within a temperature range of at least minus 20 degrees Centigrade to plus 70 degrees Centigrade.
If gearboxes are required for submerged use in a liquid or, for use outside the quoted temperature range, they must be specifically ordered for that purpose.
The installation of gearboxes is not difficult providing these recommendations are followed.
1. CHECK that you have the correct gearbox with the correct ratio to fit the unit, which is being installed.
2. CHECK that the gearbox is properly lubricated. Most gearboxes are factory lubricated 'for life' with grease. If the unit has been dismantled, the base plate must be resealed, with a silicone sealant, or other gasket compound, on reassembly and any thrust elements or bearing cavities must be greased.
3. If the gearbox drive nut is supplied separately, on the spindle, care must be taken when fitting it into the gearbox to make sure that the thrust bearings are also fitted correctly.
4. If the gearbox has been supplied with a hand wheel it is recommended that this be fitted to the gearbox before trying to mount the unit; this will make it easier to rotate the gearing to pick up the start of the thread or key location.
5. On a KEYED NON-RISING SPINDLE, once the key and keyway are lined up, the gearbox can be rotated until a positive engagement occurs. Rotate the gearbox to the correct orientation and align fixings. Bolt gearbox to mounting flange. NOTE: - With gearboxes designed to be thrust taking with non-rising stems, the drive sleeve will be fitted to the stem. Insert the stem through the bottom bearing set and the thrust plate and lower into position. You may have to screw the stem into the door nut or fit to muff coupling. Either way screw stem down to lightly grip and locate the lower bearing set (pre-greased) and plate. Position the top bearing set on to the drive sleeve (pre-greased) and lower the gearbox over the top, the gearbox will need rotating until it engages on the drive

sleeve splines. Rotate the gearbox to the correct orientation and align fixings.
6. On a SCREWED RISING SPINDLE, once the threaded nut and spindle are lined up, the gearbox can be rotated until a positive engagement occurs. Rotating the hand wheel will then screw the gearbox down the spindle and when in the correct position, the gearbox can be bolted down on to the mounting flange. With this arrangement the gearbox may well have the drive sleeve fitted, if not repeat as for non-rising for the assembly of drive sleeve, bearings (1 set either side of the drive sleeve collar/shoulder) to gearbox and screw onto stem.
7. Refer to Manufacturers Instruction Manual for Installation Procedure.

INSTALLATION RECOMMENDATIONS FOR ELECTRIC ACTUATORS

HANDLING
If chains or slings are used for handling purposes, the unit should be protected with Cloth sacking or similar material. NEVER USE HOOKS UNLESS EYEBOLTS ARE FITTED. Combined units, i.e. Penstock with an electric Actuator fitted direct on the frame should NEVER be slung from the actuator.

STORAGE
1. If electric actuators are supplied separately, they should be stored in a clean, dry warehouse. The internal heaters (if supplied) should be connected up to the power supply. If necessary, a suitable desiccant can be placed in the switch compartment.
2. Plastic plugs or caps, fitted for transportation, should be replaced with metal pipe plugs or caps and all covers fastened tight.
3. Drive shafts should be rotated at least every three months to mix the lubricant.
4. If actuators must be stored outside (because they are fitted direct on a penstock frame), the penstock unit must be stored vertically, so that the actuator motor and switch compartment is horizontal and well off the ground. The actuator unit should be covered by a suitable waterproof sheet. Paragraphs 1, 2 and 3 above also apply.
5. Most standard actuators are weatherproof to at least IP67 BUT ONLY AFTER correct installation. They are usually capable of operating within a temperature range of at least minus 20oC to plus 70oC.

INSTALLATION SEQUENCE
The installation sequence is not difficult providing these recommendations are followed:
1. READ these instructions AND the actuator manufacturers instruction book, which has either been supplied to you separately, or may be found attached to, or inside the switch compartment.
2. CHECK that you have the correct actuator to fit the unit which is being installed.
3. It is recommended that all the actuators be inspected for proper lubrication, in accordance with the manufacturer's instructions, before being operated, especially if they have been in storage for a long time.
4. If the actuator drive nut is supplied separately, on the spindle, care must be taken when fitting it into the actuator, to make sure that the thrust bearings are also fitted correctly.
5. With the DETACHABLE actuator thrust base and a KEYED NON-RISING spindle, when the key and keyway are lined up the thrust base can be lowered

onto the mounting flange and bolted down. The actuator can then be fairly easily located onto the thrust base and bolted down.
6. With a DETACHABLE actuator thrust base and a SCREWED RISING spindle the thrust base must be rotated until a positive engagement occurs. The thrust base can be rotated down the spindle onto the mounting flange and bolted down The actuator can be fairly easily located onto the thrust base and bolted down.
7. With an INTEGRAL actuator thrust base and a KEYED NON-RISING spindle; the actuator must be supported during the engagement operation. Engage "HAND OPERATION" and offer up the actuator to the spindle, and then turn the handwheel until the key and keyway are lined up. Finally, bolt down onto the mounting flange.
8. With an INTEGRAL actuator thrust base and a SCREWED RISING spindle; the actuator must be supported during the engagement operation. Engage "HAND OPERATION" and rotate until a positive engagement occurs. Rotating the handwheel will then screw the actuator down the spindle, and when in the correct position, the actuator can be bolted down onto the mounting flange.
9. After the actuator has been fixed into position engage "HAND OPERATION" and check for freedom of movement and correct operation BEFORE connecting up all electrics.
10. The 'torque cut out switch', designed to protect the unit, is normally set by the actuator manufacturer based on information previously supplied. If, adjustment is necessary, please refer the actuators manufacturers instruction book.
11. The 'geared limit cut out switch', designed to protect the unit, is normally set by the penstock manufacturer in the factory, for actuators which are fitted direct on the frame. Actuators which are supplied separately will have to set on site after installation. Please refer to the manufacturer's instruction book.

COMMISSIONING

1. BEFORE switching on power to the actuator, engage "HAND OPERATION" and move the penstock door well away from its end of travel position.
2. AFTER switching on power, check the results using the local open and close switches, and make sure that you have the correct rotation of the spindle. Finally check the cut-out switches by fully opening and closing the unit. Be prepared to stop the unit quickly, if it does not stop automatically at the end of travel position.
3. CHECK any remote operation of the unit to make sure that it is also correct.

OPERATION RECOMMENDATIONS FOR CHANNEL OR WALL MOUNTED PENSTOCKS

OPERATION
Operation of the penstock is simple and straightforward, providing the Installation recommendations have been carried out correctly.
1. The seals on a penstock are specially designed to give the best degree of water tightness, assuming that the unit is installed correctly. However, whilst many units will be nearly drop-tight, a leakage tolerance has to be applied, and this is:
'The maximum leakage rate under normal operating and on-seating conditions, up to a 6.0 metres head, is 1.25 litres per minute pr metre of

periphery. For off- seating conditions, the figure is 2.5 litres.
2. If excessive leakage occurs, the most likely explanations are:
(a) That the frame has been distorted during installation.
(b) That the door adjusters have been moved prior to, during, or after installation.
(c) That there is grout or debris between the door and the frame at the invert.
(d) That the seals have been scored or damaged in some way.
(e) That any limit or torque switches may need re-setting.
(f) That the operating equipment is out of alignment.
3. The majority of penstocks are fitted with wedging or pressure devices, to ensure contact between the frame and door sealing faces in the fully closed position, in order to achieve water tightness, particularly, in the off-seating condition. These wedging or pressure devices can be either self-adjusting or are fully adjustable in-situ by means of adjusting screws and locking nuts or pins.
4. DO NOT use excessive force when opening or closing a penstock door, as damage could occur.

WALL MOUNTED PENSTOCKS OPERATING EQUIPMENT – GEARBOX

OPERATION OF THE GEARBOX
Operation of the gearbox is simple and straightforward providing the installation recommendations have been carried out correctly.
1. For ease of operation, the input effort is usually limited to about 250N on the crank handle, 'T' key or handwheel.
2. If the gearbox is stiff to operate, find out the cause. DO NOT apply any additional leverage to create a higher input torque, or you may damage the unit or the equipment it is operating.

OPERATION RECOMMENDATIONS
OPERATING EQUIPMENT - ELECTRIC ACTUATORS

OPERATION
Operation of the electric actuator is simple and straightforward providing the installation and commissioning recommendations have been carried out correctly.
1. An electric actuator can be operated locally either manually or by power. Remote operation can be either by direct power connection or by a control signal.
2. Standard electric actuators are normally supplied fitted with a 15 minute rated motor, unless otherwise specified at the time of ordering.
3. If the actuator proves difficult, or fails to operate, check that there is a power supply and that it is at the correct voltage on a continuous basis. If the power supply is alright, check the individual local and/or remote control systems and the fuses on the internal circuit board and the "cut-out" switches. Finally, check that the motor has not overheated.
4. If there is no apparent electrical or "cut-out" fault, engage "hand operation" and check for freedom of movement. If there is free movement by manual operation, then there is still a fault in the power supply or in the actuator, and you should refer to the actuator manufacturer's instruction book.
5. If the unit is difficult to operate manually, refer to the manufacturer's

recommendations for checking the unit which is being operated.

MAINTENANCE RECOMMENDATIONS CHANNEL OR WALL MOUNTED PENSTOCKS

MAINTENANCE
The penstock should give years of trouble-free operation, providing the following simple inspection procedures are adopted.

THE FREQUENCY OF INSPECTION SHOULD BE BASED ON THE PARTICULAR REQUIREMENTS OF THE INSTALLATION.

1. Clean the unit by hosing down to remove any grit or debris.
2. Check for leakage between the frame and the concrete wall. Make good any faults.
3. Check the tightness of the bolts and nuts.
4. Check there is no damage to the frame, door or seals.
5. Check the operating equipment for damage and freedom of movement, and check to ensure that there are no damaged or worn parts.
6. Moving parts should be lightly oiled or greased as appropriate.
7. When carrying out any maintenance work with the penstock door in the open position, ALWAYS ENSURE that the door is securely and independently supported from underneath.

GREASE
Recommended Grease: BP Energrease Ref. No. L21M
Whilst every care is taken that the information given herein is reliable, Waterfront Engineering Services Ltd cannot accept responsibility for any damage resulting from the application of these recommendations, intended for guidance only.

WALL MOUNTED PENSTOCKS MAINTENANCE OF GEARBOXES

The gearbox should give years of trouble-free operation providing the following simple inspection procedures are adopted.

THE FREQUENCY OF INSPECTION SHOULD BE BASED ON THE PARTICULAR REQUIREMENTS OF THE INSTALLATION.

1. Under normal operating conditions no maintenance is required other than to keep the unit clean.
2. Check the tightness of all bolts and nuts.
3. If the equipment which is being operated is taken out of service for an overhaul, the gearbox base/thrust plate may be removed and the grease changed, using one of the recommended lubricants. The base/thrust plate must be sealed on re-assembly.
4. Refer to the gearbox manufacturers recommendations.

LUBRICANTS

MANUFACTURER	NAME OF GREASE	COMMENT
Century Oils	Lacerta CL2X	Never mix one type of oil or grease with

		another.
Shell	Alvania EP1	As above.
Esso	Beacon EP2	As above.

MAINTENANCE RECOMMENDATIONS OPERATING EQUIPMENT WITH ELECTRIC ACTUATORS

MAINTENANCE

The electric actuator should give years of trouble free operation, providing the following simple inspection procedures are adopted. THE FREQUENCY OF INSPECTION SHOULD BE BASED ON THE PARTICULAR REQUIREMENTS OF THE INSTALLATION/OPERATION

1. Clean the actuator and CHECK for oil leaks. If oil leaks are present, take out of service, flush out, renew seals and refill with fresh oil to the actuator manufacturers recommendation. NEVER mix one type of oil or grease with another.
2. Check the tightness of all bolts and nuts.
3. If the actuator is normally only used very occasionally, a routine operation plan should be established.
4. Refer to the actuator manufacturers recommendations.
5. DO NOT CARRY OUT ANY MAINTENANCE WORK WITH THE POWER CONNECTED.

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