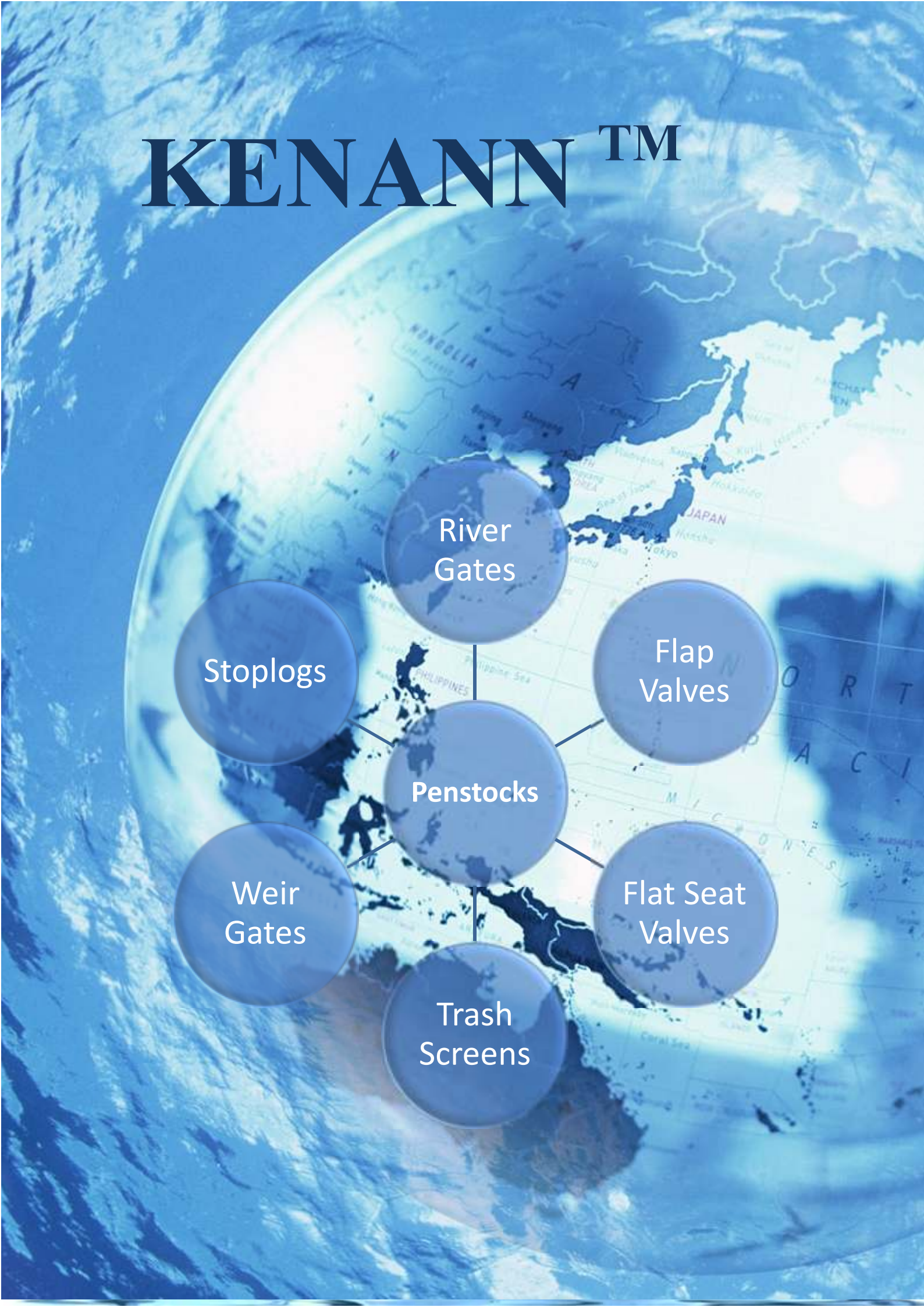
KENANN ENGINEERING (M) SDN BHD

35-2, Jalan Bandar 18, Pusat Bandar
Puchong, 47160 Puchong, Selangor
Darul Ehsan, Malaysia.
Tel: +603-8075 2533
Fax: +603-8076 9633
Email: kenneth@kenann.com.my

RTC: Kenneth Toon

31-May-14

KENANN™


River Gates
Stoplogs
Flap Valves
Penstocks
Weir Gates
Flat Seat Valves
Trash Screens

KENANN PENSTOCKS

DESIGN FEATURES

1. True Bi-directional operation with no "on/off" seat pressure differential restrictions that allows for positive shut-off in either direction

2. Compression sealing for drip-tight shut off using polyurethane or synthetic rubber seals

3. Compression sealing eliminates grit and fines seat wear common in metal seated cast iron penstocks

4. Low friction operation using UHMWPE (Ultra-High Molecular Weight Polyethylene) guides to take up lateral loads

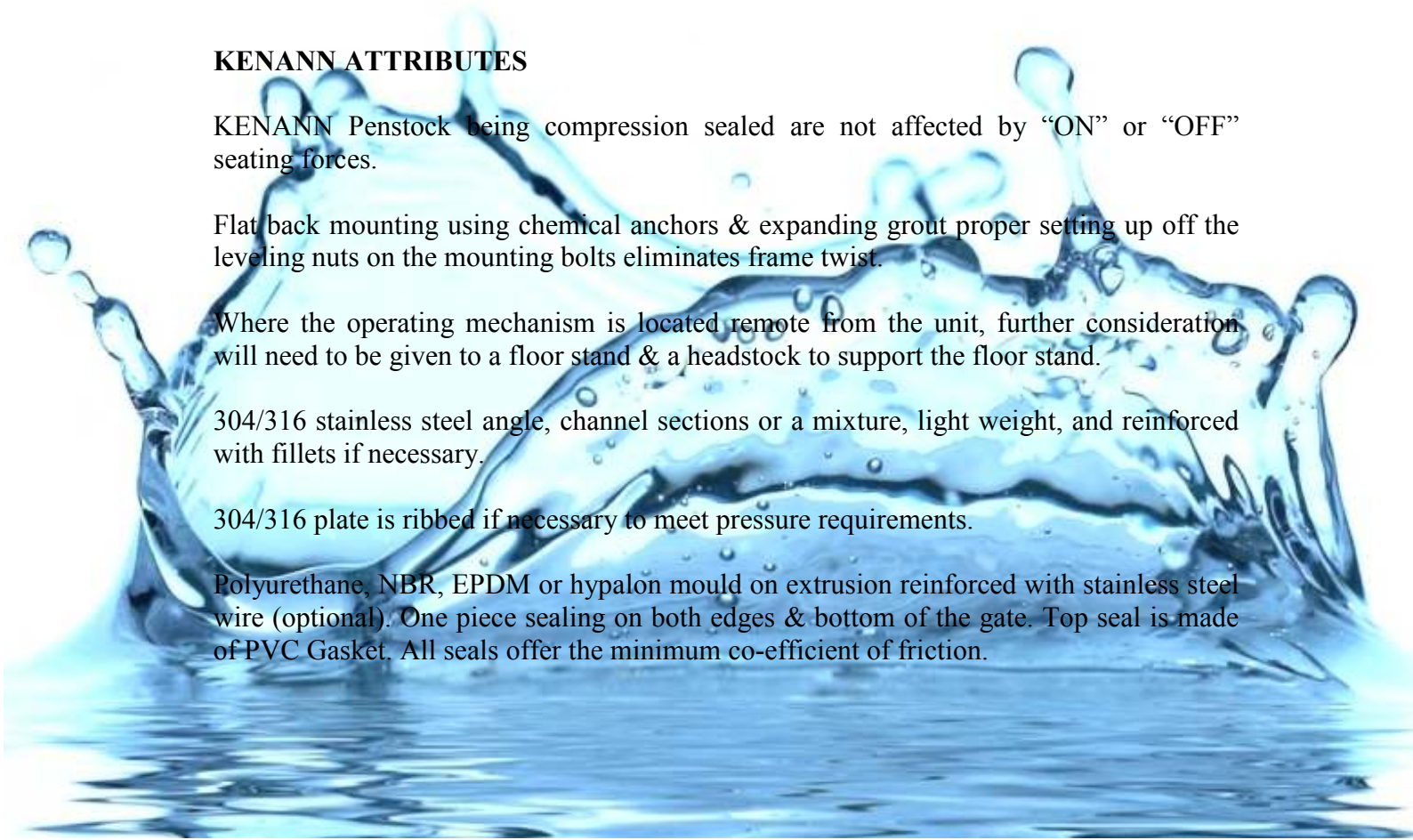
5. Light weight, simple installation

6. Unlimited custom built options for unequal width & height requirements, including materials composition

7. Standard flush bottom design eliminates debris build-up

8. Reduced operating torque

9. Design head up to 20m



KENANN ATTRIBUTES

KENANN Penstock being compression sealed are not affected by "ON" or "OFF" seating forces.

Flat back mounting using chemical anchors & expanding grout proper setting up off the leveling nuts on the mounting bolts eliminates frame twist.

Where the operating mechanism is located remote from the unit, further consideration will need to be given to a floor stand & a headstock to support the floor stand.

304/316 stainless steel angle, channel sections or a mixture, light weight, and reinforced with fillets if necessary.

304/316 plate is ribbed if necessary to meet pressure requirements.

Polyurethane, NBR, EPDM or hypalon mould on extrusion reinforced with stainless steel wire (optional). One piece sealing on both edges & bottom of the gate. Top seal is made of PVC Gasket. All seals offer the minimum co-efficient of friction.

PENSTOCK LEAKAGE RATES

Metal seated Cast Iron Penstocks are acceptable under BS 7775, Clause 3.1, Table 13, "Penstock Leakage Rate" at 1.25 liters per minute per meter sealing surface for on-seat operation and 1.50 liters per minute for off-seat operation. KENANN compression sealing however can achieve a leakage of 0.25 liters per minute per meter. Below is an abstract of Table 13 from the BS 7775 Standard.

Table 13. Penstock leakage rate		
Direction of head	Maximum static head	Leakage rate: per minute per metre of seal perimeter
On-seating	< < 6 metres	1.25 1
Off-seating	< < 6 metres	1.50 1

Volumes shown are based on a 24 hour period.

500 x 500	On-seat	:	3600	liters	(Equivalent to 18 - 200L drums)
	Off-seat	:	7200	liters	(Equivalent to 36 - 200L drums)
	Compression	:	720	liters	(Equivalent to 3.6 - 200L drums)
1000 x 1000	On-seat	:	7200	liters	(Equivalent to 36 - 200L drums)
	Off-seat	:	14400	liters	(Equivalent to 72 - 200L drums)
	Compression	:	1440	liters	(Equivalent to 7.2 - 200L drums)
1500 x 1500	On-seat	:	10800	liters	(Equivalent to 54 - 200L drums)
	Off-seat	:	21600	liters	(Equivalent to 108 - 200L drums)
	Compression	:	2160	liters	(Equivalent to 10.8 - 200L drums)

PENSTOCK SPECIFICATION

GENERAL

Each penstock shall be of the flush invert, rising stem design.

All penstocks shall have frames and gates of 304/316 stainless steel construction. All assembly Bolts, Nuts and Washers shall be 304/316.

All components of the penstocks and actuators shall be designed that no parts thereof will be stressed beyond their safe working limits.

FRAMES

Frames shall be of rigid construction to resist all loads reasonably expected to be encountered in service for the life of the penstocks. Frames shall be suitably reinforced and provided with corner and/or side gussets where necessary.

Wall-mounted penstocks shall have frames suitable for bolting direct to concrete structures. Sealing between the frames and concrete structures will be achieved by grouting. Channel-mounted penstocks will be cast into rebates in the concrete walls.

Frames shall provide a guide rail along which the gate slides to fully open and close unobstructed and shall be of a length sufficient to support at least one-half of the gate in the fully opened position. Design of the guide rail shall be such that it is self-cleaning and that clogging is minimal.

For wall mounted penstocks the bolts securing the penstocks to the wall shall not impose any loads on the gate.

Flush bottom closure design shall incorporate a resilient seal securely contained at the invert of the frame to preclude loosening in service. The seal shall provide a flat plane across the bottom of the gate without projections into the opening to obstruct flow.

Stainless steel gates shall be made up of a single piece except for larger sizes where a two (2) piece composition is required, whereby the gates will be joined by means of welding. Gates will be adequately ribbed when necessary to resist in-service loads. Sliding surfaces that come into contact with the seat facings shall be accurately machined.

The gate shall be of sufficient strength to withstand the maximum unbalanced head without deflection or distortion that would affect the operation of the penstock or reduce the water tightness.

Stems shall be of ample cross section to prevent buckling or permanent distortion under all operating conditions. The threads of the stem shall be machined out ACME type, ¼ pitch, single start, and anti-clockwise closing. Rising stems shall be provided with stops to prevent over-travel of the gate in either direction.

Drive nuts shall be machined from gunmetal (LG2) or bronze unless otherwise specified.

On rising stem penstocks, the drive nut shall be threaded and keyed or threaded and pinned to the stem. On non-rising stem penstocks, the drive nut shall be threaded but not keyed or pinned to the stem so that the nut gate can move up the stem as the stem turns.

SEALING

Frames shall be fitted with moulded, synthetic rubber, EPDM (70A durometer) or double density polyurethane seats with wire reinforcing (optional).

Seats shall be in one piece and provide continuous contact with the gate along the bottom and sides of the frame.
Seats shall be held in position by Ultra-High Molecular Weight Polyethylene (UHMWPE) retainers attached to the gate guides at bottom of the frame, with stainless steel bolts and nuts.

Retainers shall be fitted to both sides of the moulded seat sections. Retainers fitted to the gate guides shall be machined to a smooth surface and positioned to minimize transverse gate movement and provide a low friction surface to carry gate loads.

Sealing across the horizontal gate face shall be by means of PTFE packing strips.

The seats shall be trimmed back to the thickness of the gate so that contact between the packing and the gate/seat interface is uninterrupted.

HAND WHEEL

Hand wheels may be fabricated or cast in mild steel, stainless steel or cast iron. Castings shall be free from laminations and fins.

EXTENSION SPINDLES

Extension spindles and wall brackets shall be fabricated from stainless steel type 304. Spindle tubes shall be of sufficient interval diameter to provide adequate stem clearance. When tubes are joined, welds shall be ground smooth and polished.

Wall brackets shall have UHMWPE stem guides to suit the extension spindle. Brackets shall be spaced so that the maximum unguided length of the extension spindle is 2.5m.

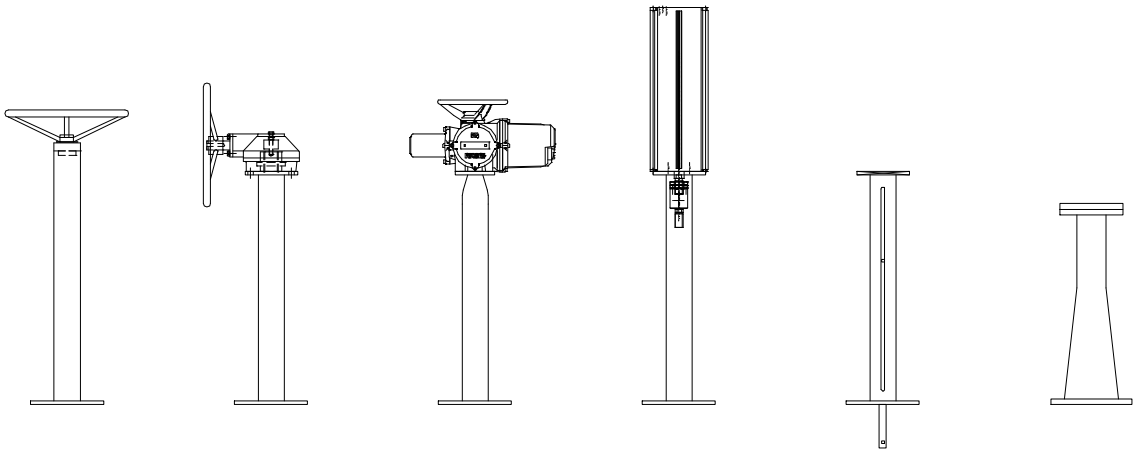
PEDESTALS / HEADSTOCKS

Where pedestals, commonly known as headstocks are required, they shall be suitable for bolting onto concrete floors and shall rigidly support the actuator or hand wheel. Each pedestal shall be of such height that the horizontal axis of the hand wheel, both in the

case of hand wheel operated penstocks and actuated penstocks is approximately 900mm above the operating level, which corresponds to the base of the pedestal.

By default, hand wheel operated pedestals are fabricated at a height of 900mm while actuated or gearbox operated pedestals are at 800mm total height.

AVAILABLE PEDESTAL / HEADSTOCK CONFIGURATION



Manual | Gearbox | Actuator | Pneumatic | Indicator | Cast Iron

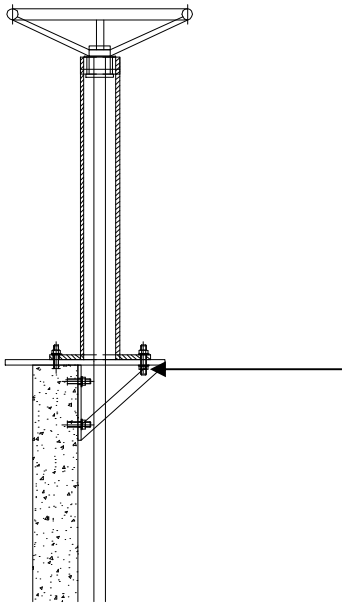
Our series of KENANN Penstocks are made to accommodate a variety of headstocks with different operator types, ranging from our standard manual operators using hand wheel to gearbox, electric actuator, pneumatic actuator, and custom made bare shaft headstocks complete with optional level indicator. The headstock base plate (mounting plate) is machined to fit all ISO flange standards, and also custom fit sizes based on customer requirements.

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

Please refer to the table below for the available options:

Description / Flange Type	**Material Type**			
	Mild Steel	SS304 / SS316	Cast Iron	Galvanized
Manual	✓	✓	✓	✓
F-10	✓	✓	✓	✓
F-14	✓	✓	✓	✓
F-16	✓	✓	✓	✓
F-25	✓	✓	✓	✓
Others	✓	✓	✓	✓

FLOORSTAND



In the event where the site structural works does not provide for headstock installation, a floorstand (headstock mounting bracket) can be used to provide support the headstock. Our standard floorstands are fabricated using mild steel, complete with standard black paint finishing.

Mild Steel Floorstand

INSTALLATION INSTRUCTIONS

1. Wall mounted Penstocks may be fixed to the wall face using "cast in" anchor bolts or inserts. Bolts are to be sufficient in length (recommended at 170mm) to allow for full projection through the frame with nuts and washers on the outer frame face. See *Figure 1* below:

Figure 1: M12 Stainless Steel Stud

2. Ensure the frame is square and plumb to the vertical

3. Ensure the frame is straight and not twisted. Distortion induced by bolting the frame into a twisted position may cause seat failure.

4. When extension spindles are required it is essential that any guide brackets be accurately aligned both plumb and square to the Penstock centerline.

5. It is essential that the floorstand and extension spindle are both square and plumb with Penstock frame. Out of square/plumb mounting will cause excessive wear on the actuator drive mechanism and unacceptable loads on the Penstock frame.

6. Mounting surface for the Penstock frame should be smooth, without twist. They mush be plumb (Refer to ***Appendix A***). If it is not, the alternative is:

   a. The mounting surface should have a cement mortar screed bed applied. Bed should be the full width of the frame channel section plus 50mm. Care should be taken to avoid mortar build-up around mounting bolts or anchors.

   b. The Penstock frame may be shimmed off the wall and lightly bolted. The space between Penstock frame and the wall may be packed with an expanding mortar grout.

   NOTE: Take care that the grout does not extrude into the space behind the follower, this space MUST be kept clear of grout to allow the follower bolts to be adjusted.

7. Mounting surfaces for the headstock should be treated in the same manner as the Penstock's frame in step 6 above i.e. cement mortar screed bed or expanding grout.

OPERATING INSTRUCTIONS

Penstock operation should only commence with the following points adhered to.

1. Packing box surface of Penstock should be free from sand grains, mortar, grout and other forms of foreign matters to avoid rapid damage to seals.

2. If painting works are carried out at site, make sure that the paint (especially epoxy paint) is not left to flow into the packing box surface as this will damage the seals.

3. Inspect and ensure back of Penstock gate is free from mortar, grout, mud etc. In no circumstance should the stainless steel gates be painted on. If any stains are found on the back portion of the gate, they should be first removed to make certain a smooth surface for operation.

4. Threaded portion of shaft should be lubricated at all times with grease. Apply sparingly to ensure even distribution of grease on the threaded shaft.

5. For manually operated Penstocks, ensure the self-lubricating Vesconite rings are properly positioned around the drive bush to reduce friction and noise during operation. (Refer to ***Appendix B***)

6. The Penstock gate pressure pad bolts should only be gradually tightened if leaking is visible at the packing box surface. Once the desired condition is met, tighten the nut to hold the jam nut in place. See *Figure 2* below:

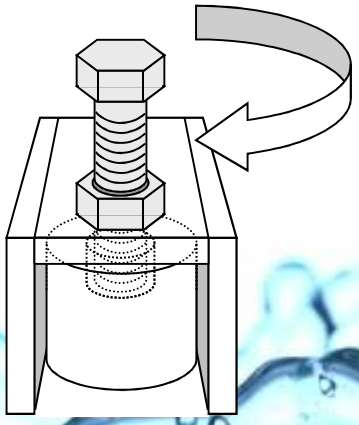


Figure 2: Pressure Pad for tightening gate

IMPORTANT: It is essential that the Pressure Pad bolts are not over tightened. Over tightening places unnecessary stress on the Top Seal and undue effort on the operating mechanism that result in faster wear and tear.

MAINTENANCE INSTRUCTIONS

Regular scheduled inspection to be made at least every 90 days. The following points should be examined.

1. Stem Threads and drive nut, for lack of lubrication. Check thrust washer and grease seat.

2. Ensure Penstock gate jam nut is still in place and tighten or loosen if necessary.

3. If possible, open and close the Penstock every 90 days, this ensures it is functioning properly, and avoids adhesive of stainless steel blade to urethane seat.

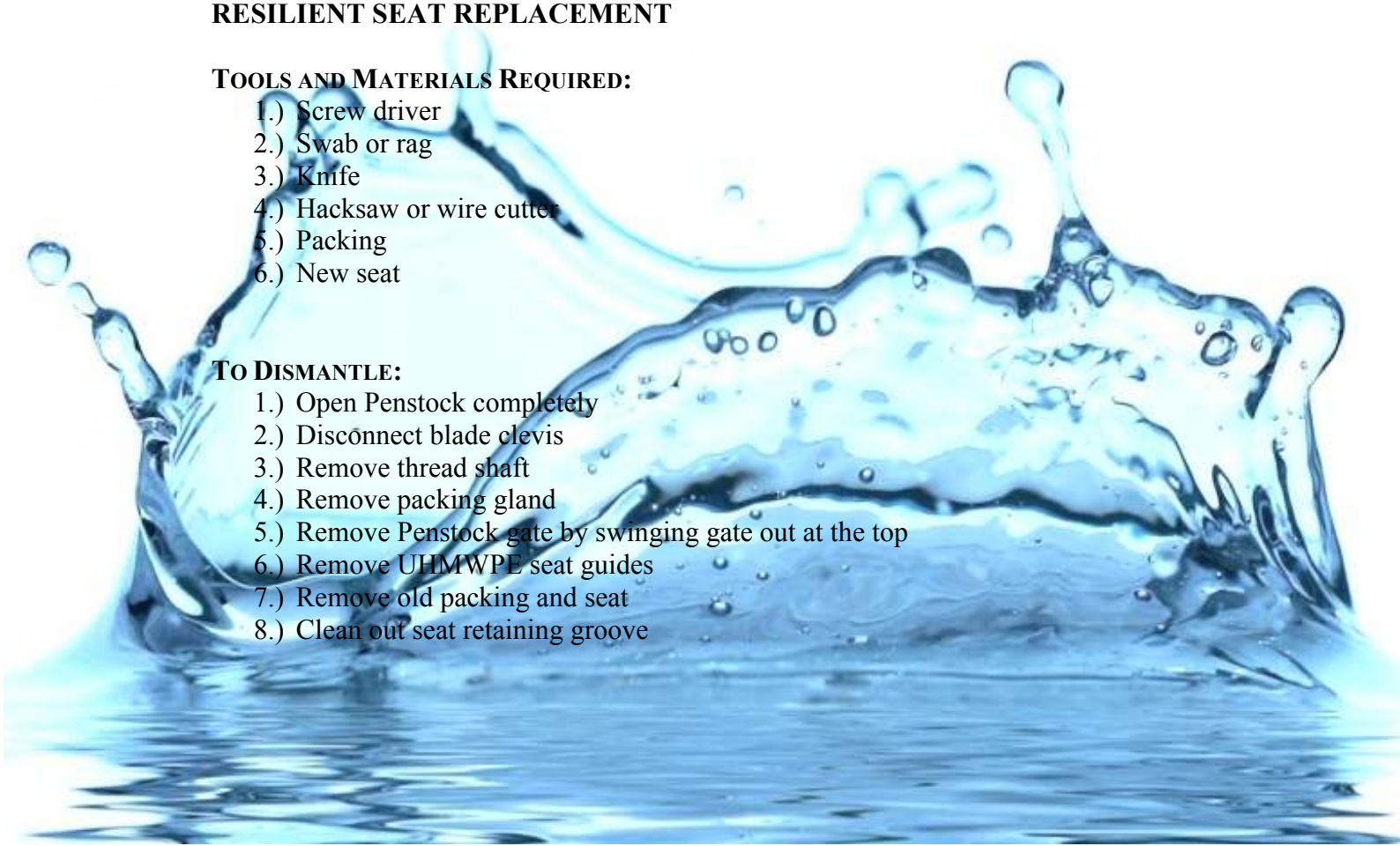
4. Ensure that there is no build up of sand grains or objects at the Penstock gate packing surface to protect the seals from being damaged. These foreign matters should be flushed out for optimal lifespan of seals.

SPARE PARTS

- 1 set of packing seals
- 1 length of urethane seat

When ordering replacement parts for a KENANN Penstock please indicate the valve size and the valve number. The valve serial number is stamped on the edge of the top right portion of the Penstock frame. Alternatively, it can also be found on the marking plate mounted to the top left portion of the Penstock frame (if available).

RESILIENT SEAT REPLACEMENT



TOOLS AND MATERIALS REQUIRED:

1.) Screw driver
2.) Swab or rag
3.) Knife
4.) Hacksaw or wire cutter
5.) Packing
6.) New seat

TO DISMANTLE:

1.) Open Penstock completely
2.) Disconnect blade clevis
3.) Remove thread shaft
4.) Remove packing gland
5.) Remove Penstock gate by swinging gate out at the top
6.) Remove UHMWPE seat guides
7.) Remove old packing and seat
8.) Clean out seat retaining groove

INSTALLING A NEW SEAT

Seat is a urethane section with/without a wire core (identical to old seat). By default, wire core is not included with the seat. If required, the wire core can be placed into the seat to ease the new seat installation process.

1.) Bend new seat material to "U" shape (only possible with wire core). Else proceed to place the seat firmly into position.

2.) Trim one end as old seat. Take care not to stretch or elongate seat material. Start top left, and push seat firmly into corner then the other corner trim as previous.

3.) When seat is firmly in place reposition UHMWPE seat guides and remount them accordingly.

4.) Insert gate, forcing it to completely closed position.

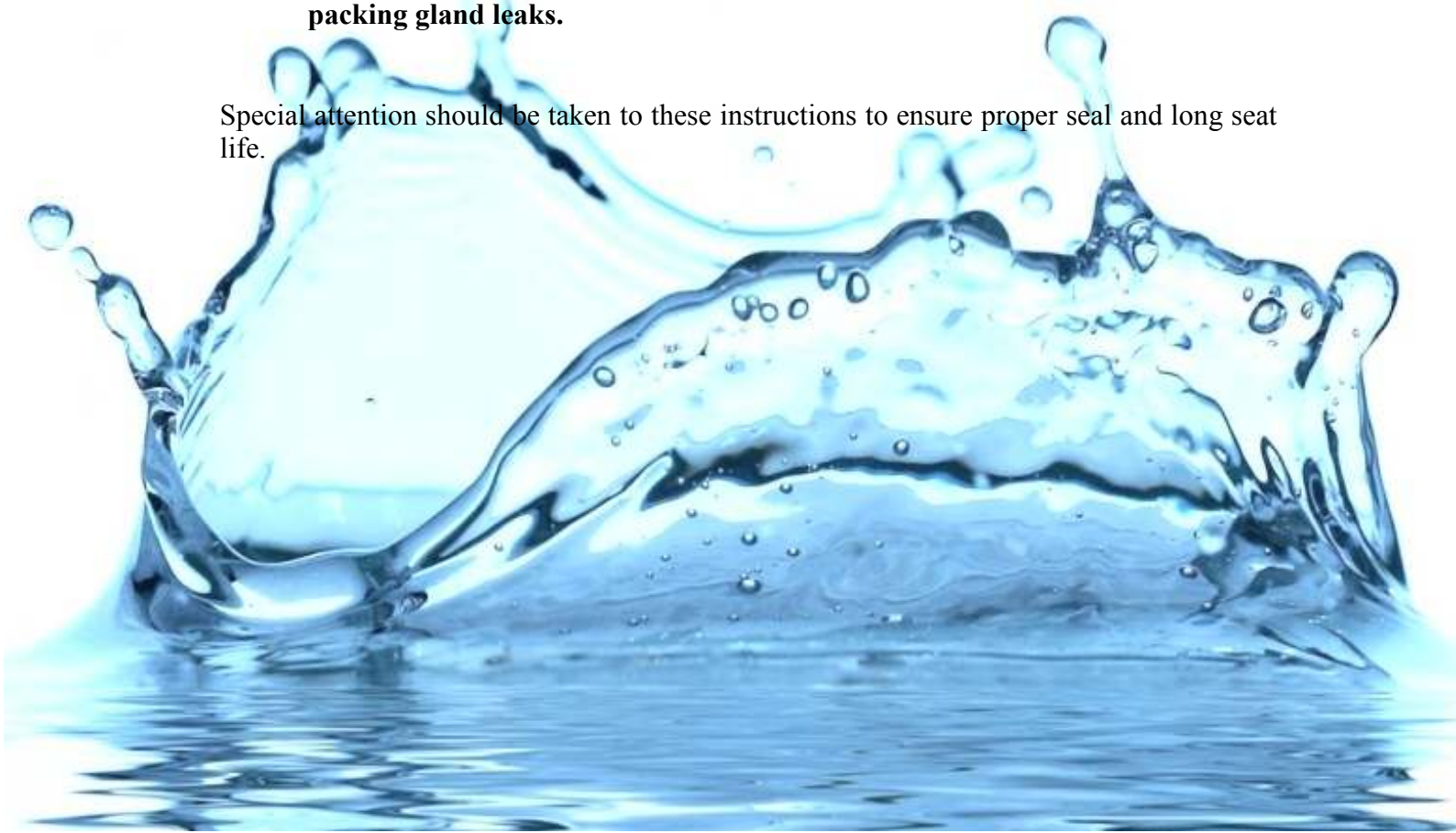
5.) Install packing on both sides of the gate, one row at a time. Cut packing 10- 20mm longer than length of the stuffing box or *bolting hole*. Packing must be forced into the slightly narrower portion of box on each end between seat and side of packing box. Alternatively a slight portion of the seat may be removed (cut off). Be careful not to cut off in excess of what is required to prevent any leaks from occurring.

6.) Reassemble packing gland and threaded shaft, then reconnect the clevis.

IMPORTANT:

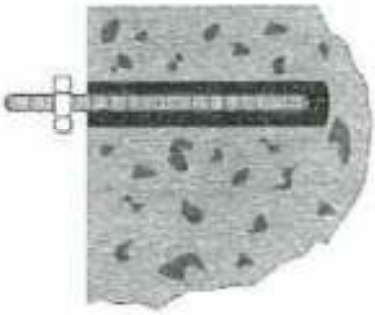
Do not take up packing gland bolts any further than necessary to stop packing gland leaks.

Special attention should be taken to these instructions to ensure proper seal and long seat life.



APPENDIX A

INSTALLATION PROCEDURES

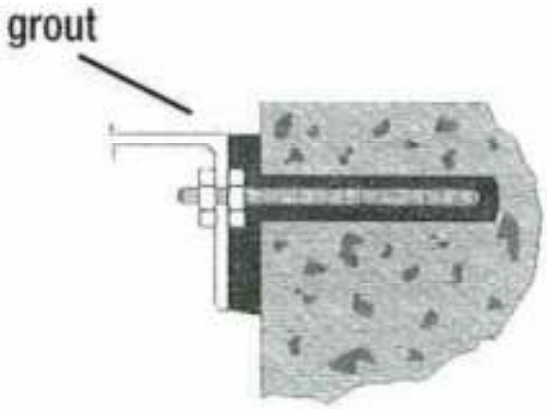


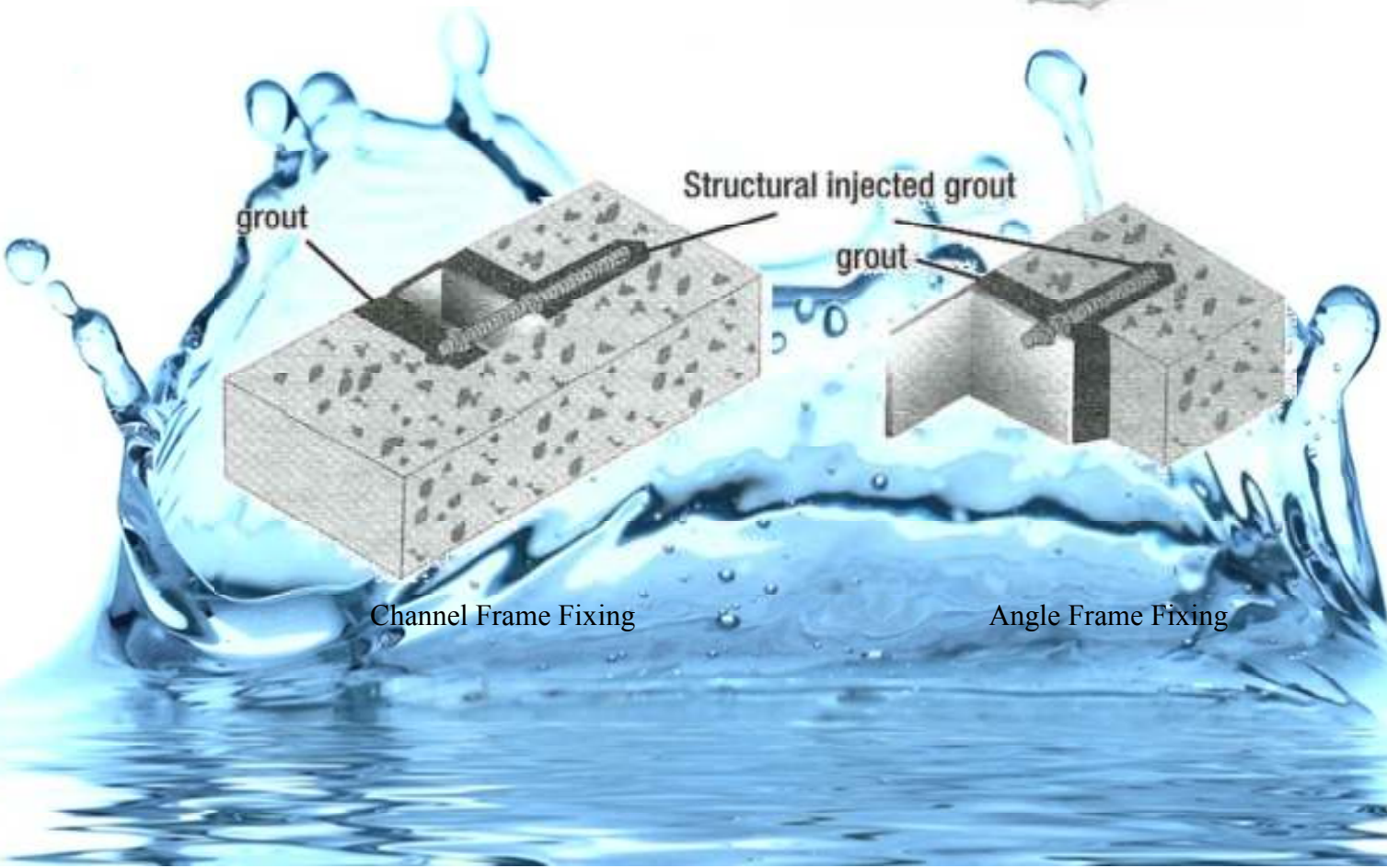
Back Nut Location

1.) Set all anchor
2.) Adjust back nut so that:
   i. Grout thickness is at minimum 15mm
   ii. Nuts are in line and plumb
   iii. Nuts are in wind so there will be no twist in the Penstock Frame

Frame Installation

1.) Set frame on back of nuts. Bolts firmly in position
2.) Form up for and pour grout



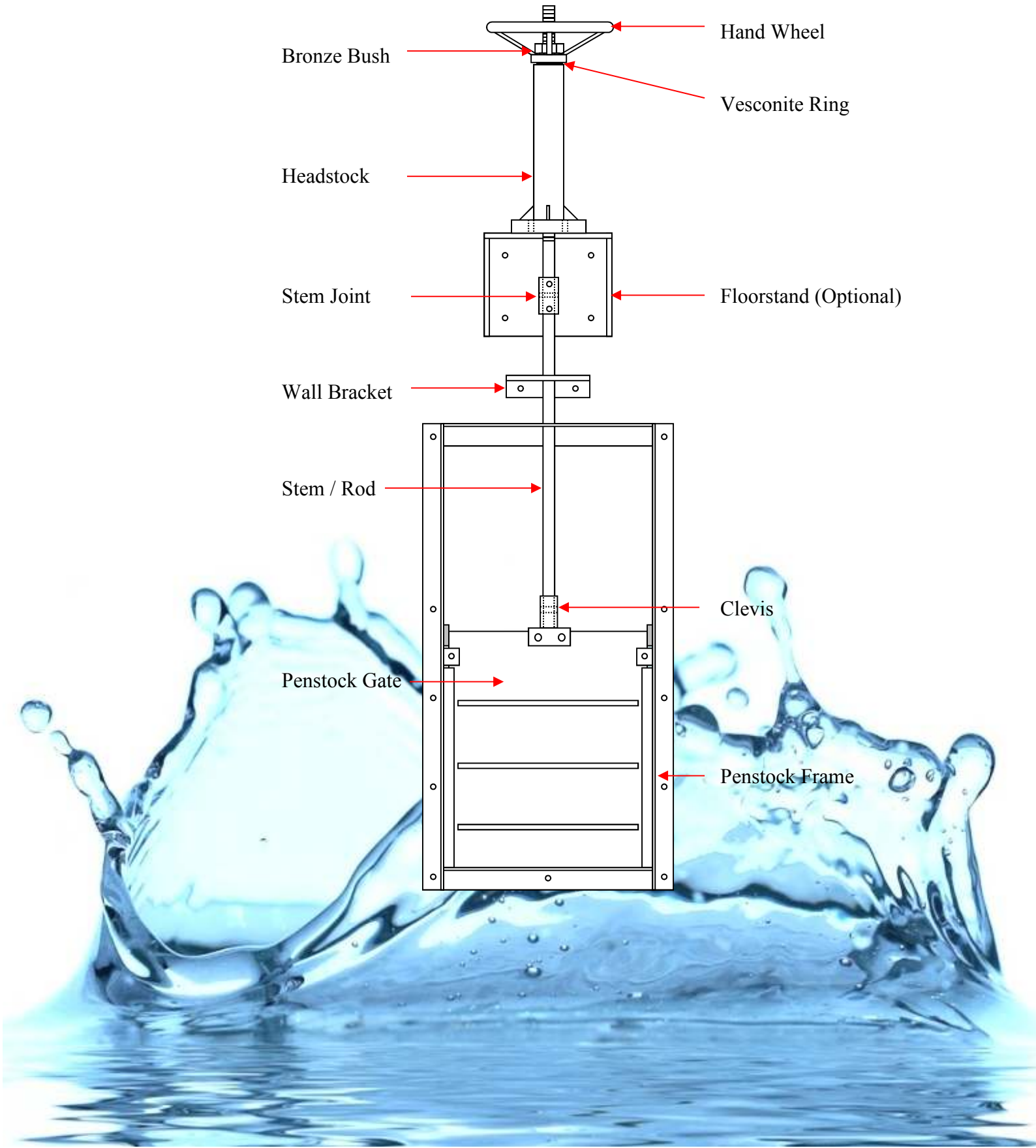


Channel Frame Fixing

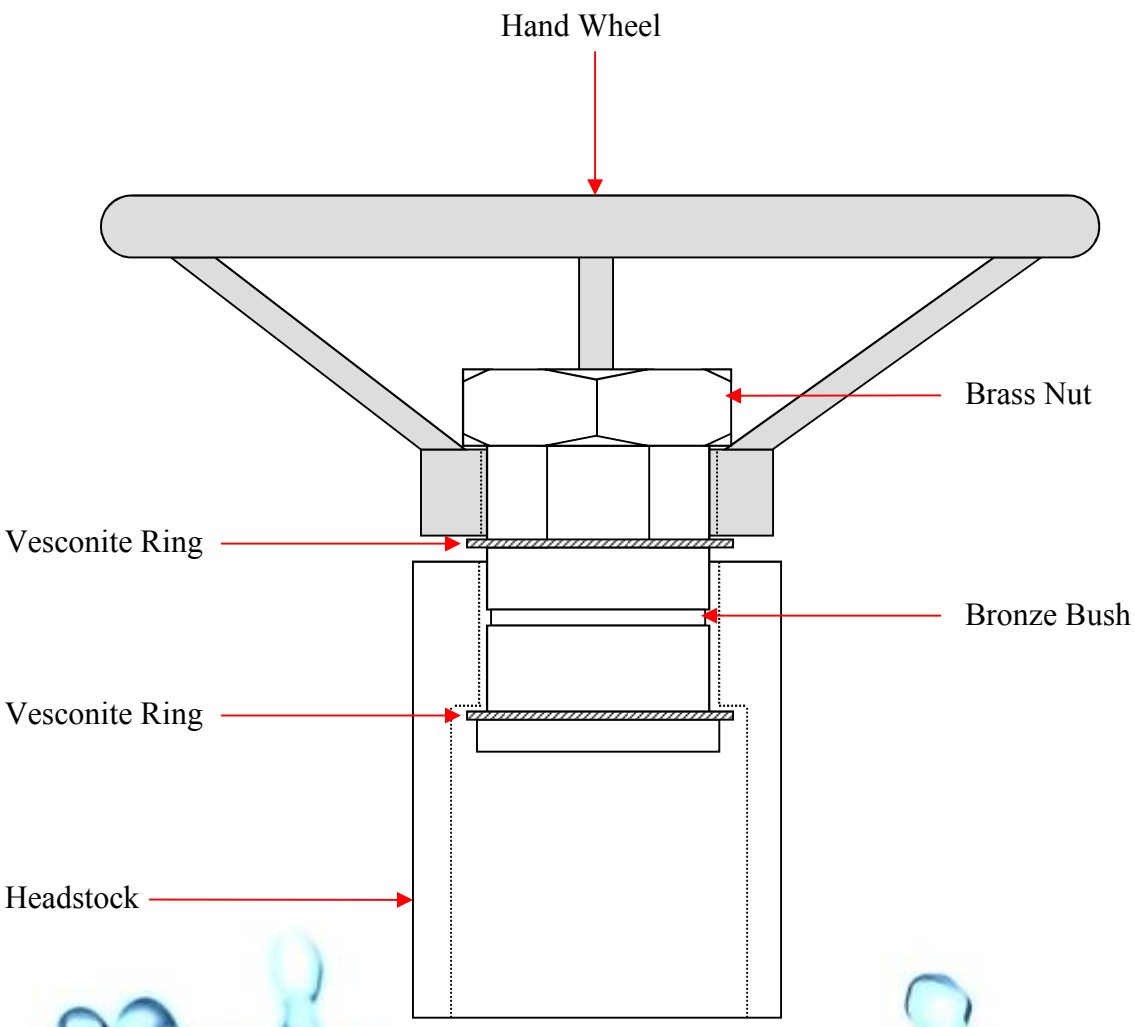
Angle Frame Fixing

APPENDIX B

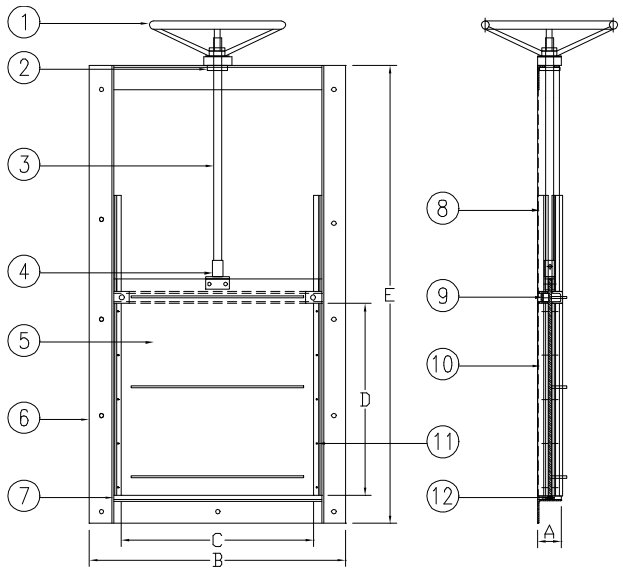
PENSTOCK ASSEMBLY (MANUAL OPERATED)



BUSH INSTALLATION AND VESCONITE POSITION



Standard Materials		
No.	**Part**	**Material**
1	Handwheel	Mild Steel / SS304
2	Drive Nut	LG2 / Bronze
3	Stem / Spindle	SS304 / SS316
4	Clevis	SS304
5	Gate	SS304 / SS316
6	Frame	SS304 / SS316
7	Guides	UHMWPE
8	Top Guide	UHMWPE
9	Packing	PVC Gasket
10	Guides	UHMWPE
11	Bolt & Nut	SS304 / SS316
12	Seat	EPDM



Size	A	B	C	D	E	Average Weight (kg)	Permissible Leakage Rate (On Seat: ℓ/min)	Permissible Leakage Rate (Off Seat: ℓ/min)
100	75	300	100	100	430	12.5	0.50	1.00
150	75	350	150	150	530	16.5	0.75	1.50
200	75	400	200	200	630	21.0	1.00	2.00
225	75	425	225	225	680	23.5	1.13	2.25
250	75	450	250	250	730	26.0	1.25	2.50
300	75	500	300	300	830	31.5	1.50	3.00
350	75	550	350	350	930	37.5	1.75	3.50
375	75	575	375	375	980	41.5	1.88	3.75
400	75	600	400	400	1030	45.0	2.00	4.00
450	75	650	450	450	1130	52.5	2.25	4.50
500	75	700	500	500	1230	61.5	2.50	5.00
600	75	800	600	600	1430	77.0	3.00	6.00
700	75	900	700	700	1630	94.0	3.50	7.00
750	75	950	750	750	1730	103.0	3.75	7.50
800	75	1000	800	800	1830	120.0	4.00	8.00
900	75	1100	900	900	2030	145.0	4.50	9.00
1000	75	1200	1000	1000	2230	155.0	5.00	10.00
1050	75	1250	1050	1050	2330	195.0	5.25	10.50
1100	75	1300	1100	1100	2430	195.0	5.50	11.00
1200	75/100	1400/1480	1200	1200	2680/2740	260.0/295.0	6.00	12.00
1300	75/100	1500/1580	1300	1300	2900/3000	280.0/335.0	6.50	13.00
1400	75/100	1600/1680	1400	1400	3100/3200	315.0/375.0	7.00	14.00
1500	75/100	1700/1780	1500	1500	3300/3400	360.0/420.0	7.50	15.00
1600	100	1880	1600	1600	3600	480.0	8.00	16.00
1700	100	1980	1700	1700	3800	520.0	8.50	17.00
1800	125	2130	1800	1800	4050	700.0	9.00	18.00
1900	125	2230	1900	1900	4250	770.0	9.50	19.00
2000	125	2330	2000	2000	4450	830.0	10.00	20.00

PS: In line with our continuing product development, Kenann Engineering (M) Sdn. Bhd. Reserves the RIGHT to change and improve the design, specifications, dimensions, etc. without prior notice

NOTES: