Cascades Inc
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BTF head box with automatic dilution
PM # 3

GL&V PROJECT # 122-049

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1. INTRODUCTION

The BTF Distributor replaces the traditional taper or conical header to provide peripheral distribution of stock around the circumference. This distribution provides symmetrical flow path from the stock approach piping, through flexible hoses from the BTF distributor to the head box. This design delivers consistent stock flow across the width of the machine for a wide flow range. The BTF distributor is installed completely detached from the head box.

The BTF distributor is equipped with dilution water in the cross machine hoses. The introduction of dilution water provides a very good cross machine dry weight profile without the deformation of the lip that can be very detrimental on the fiber orientation across the width of the machine.

The micro-adjustments of the top slice lip is used to obtain a perfectly constant opening throughout the width of the machine. The adjustment of the top slice lip is done prior to the start-up and should never be used for profile correction.

By having a constant opening, there is a uniform stock jet across the machine width with respect to speed, direction and point of impact on the wire. The problems concerning the edges, which are known with most traditional head boxes are eliminated on account of machine direction stock feed.

Dilution water is injected over the distribution hoses, which is earlier than the competition. This provides better blending of the stock/dilution mixture. Ball valves control the amount of dilution water to be added for profile correction. Honeywell-Measurex ProFlow consistency profiling actuators activate the dilution valves.

The BTF Distributor also provides pulsation attenuation coming from the stock approach system (fan pump, screens…) by providing an air pad or cushion over the stock (dampening effect of the air pad). The air pad in the distributor also provides better air removal (entrained air in stock). Finally, a perforated plate inside the BTF distributor is used for deflocculating.

The BTF hydraulic head box eliminates the use of rectifier rolls and air pad which makes the BTF head box very compact. The head box is entirely constructed of 316L stainless steel. Those features promote very little maintenance.

The BTF head box has a double knuckle arrangement to provide horizontal and vertical movement of the top slice lip. The slice is opened with mechanical screw actuators in conjunction with an electric motor. The top slice can be moved horizontally to adjust jet landing on the forming fabric in relation to the forming board. To provide the horizontal adjustment of the slice lip, a set of mechanical screw actuators are set in motion by a manual wheel on the tending side of the head box.

The BTF head box is equipped with a thermal compensation system. This system prevents unwanted deflection / distortion caused by temperature gradients. Water chambers are located in many areas of the head box and are all interconnected. A pump and heater unit circulates hot water in the chambers at the same temperature as the stock flowing through the head box. Temperature probes are used to provide information to the mill's DCS for proper control.

2. GENERAL INFORMATION

2.1 MACHINE DATA

Machine Number	:	3
Paper Grade (s)	:	Kraft paper
Basis weight	:	41 gsm à 170 gsm (8.4 lbs/1000ft² to 34.8 lbs/1000ft²)
Forming fabric width	:	4,178 mm (≈164.49in)
Pond side width	:	4,100 mm (≈161.42in)
Trim width at reel	:	3,924 mm (≈154.49in)
Head box flow (actual)	:	30,000 L / min. (minimum) (≈ 7,925 gpm) 55,000 L / min. (maximum) (≈ 13,208 gpm)
Head box flow (future)	:	55,000 L / min. (min., inserts 11mm) (≈ 13,208 gpm) 70,000 L / min. (max., inserts 11mm) (≈ 18,492 gpm)
Machine operating speed	:	550 m / min. (actual maximum) (≈ 1804.5 fpm) 762 m / min. (design) (2500 fpm)
Hand of machine	:	Standing at head box looking toward the reel, drive is Left
White-water consistency	:	Depends on retention (70-90%) from pan under fabric.
Head box consistency	:	0.2 % - 0.7 %

2.2 REQUIRED SERVICE

2.2.1 Compressed air requirements

Machine data

FORMING FABRIC WIDTH: **4,178 mm**
MACHINE SPEED: **550 MPM**
GRADE: **Kraft Paper**
BASIS WEIGHT: **41 gsm – 170 gsm**

Description	Qty	Pressure psi	Operation	Type of operation *	Flow cfm
Air pad, BTF distributor	1	30	-	C	5

* : I = Intermittent
C = Continuous

2.2.2 Water requirements

MACHINE DATA

FORMING FABRIC WIDTH: **4,178 mm**
MACHINE SPEED: **550 m / min.**
GRADE: **Kraft Paper**
BASIS WEIGHT: **41 gsm – 170 gsm**

Description	Qty	Pressure psi	Flow gpm	Service *	Water **
INTERNAL DISTRIBUTOR SHOWER	1	100	20	C	CWW

* : I = Intermittent
C = Continuous

** : FW = fresh water
CWW = clarified white water (75 ppm max., same as temperature and ph of stock)

2.2.3 Fan Pump requirements

Machine Data

Forming fabric width: **4,178 mm**
Machine speed: **550 m / min.**
Grade: **Kraft Paper**
Basis weight: **41 gsm – 170 gsm**

Location	Speed m / min.	Flow L / min.	Pressure ** psi
BTF distributor inlet			
Minimum actual capacity (note 1)	330	30,000	6.44
Maximum actual capacity (note 1)	550	55,000	20.38
Maximum future capacity (note 2)	762	70,000	30.26

NOTE 1 : The values contained in this table are valid for the existing inserts in the headbox turbulence generator. For higher flow than 55,000 LPM, the plastic inserts will have to be changed. The actual values are based on the client information sent to GL&V.

NOTE 2 : The specifications at 2500 fpm are : Grade 304, 49 gsm, 5.9% moisture, retention of 71%, consistency at head box of 0.28%, white water consistency of 0.08%, 1.4% ashes, shrinkage of 2%. The head loss value is valid once inserts have been changed in the turbulence generator for a flow of over 55,000 LPM at the head box.

** Pressure shown do not include elevation difference in the system & losses in approach piping before distributor

2.2.4 Dilution pump requirements

Machine Data

Forming fabric width: **4,178 mm**
Machine speed: **550 m / min.**
Grade: **Kraft Paper**
Basis weight: **41 gsm – 170 gsm**

Location	Speed m / min.	Flow L / min.	Pressure ** psi
BTF DISTRIBUTOR DILUTION HEADER INLET			
Minimum actual capacity (note 1)	330	2,800	10.72
Maximum actual capacity (note 1)	550	4,700	33.96
Maximum future capacity (note 2)	762	6,000 (design)	52.33

NOTE 1 : The dilution pump should be selected according to the nominal flow displayed in this table. If some modifications are brought to the consistency at the head box or at the source of dilution water, the flow values should be changed accordingly.

NOTE 2 : The specifications at 2500 fpm are : Grade 304, 49 gsm, 5.9% moisture, retention of 71%, consistency at head box of 0.28%, white water consistency of 0.08%, 1.4% ashes, shrinkage S.T. of 2%.

** Pressure shown do not include elevation difference in the system & losses in approach piping before distributor

2.3 INTERLOCK AND ALARM LIST

Condition	Action
Differential pressure between dilution header & BTF lower than 5 psi (this interlock is recommended to avoid stock from going through the dilution valves)	Stop fan pump
Dilution pump is running since 20 seconds	Start fan pump
Stock pump is stopped since 20 seconds	Stop dilution pump
Dilution pump is running	Start distributor shower

3. BTF DISTRIBUTOR GENERAL DESCRIPTION

3.1 BTF DISTRIBUTOR MAIN PARTS

The BTF distributor major parts are (see Figure 1A & 1B.):

1. Inlet piping:
   Flanged tapered connection piece connected to approach piping.

2. BTF Distributor bottom piece :
   Located just ahead of the damping chamber, the inlet piping is brought up to full diameter of the distributor. An access and cleaning port is included.

3. Perforated plate :
   A micro turbulence generating plate is located at the entrance of the unit. It is made of ultra-high molecular weight plastic (UHMW).

4. Damping chamber:
   This zone slows the stock down, and distributes the stock evenly to the distributing hoses. An air pad absorbs pulsation generated in the approach system. A cleaning shower is located at the top of the tank to prevent any build up and keep the inside surfaces clean. An access port with sight glass is located at the top of the distributor tank for inspection and cleaning.

5. Distribution Zone:
   located at mid height of the distributor tank, distribution hoses and water dilution injection tubes are evenly distributed around the distributor tank.

6. Automatic Dilution System :
   Connected to the water dilution tubes are ball valves activated by Honeywell-Measurex ProFlow actuators. Those fully controlled actuators will provide basis weight control for CD sheet profiling. 4 equally spaced control panels (16 actuators per panel) will be located over the actuators. Controls and operation details by Honeywell-Measurex.

7. Dilution header:
   White water supplied to the Automatic Dilution System will be provided by a circular header/pipe located at the top of the distributor tank. Stainless steel tubes equally spaced are connected to their respective valves. The dilution tubes are centered and located just over the distribution hoses.

8. Distribution hoses :
   Flexible hoses equally spaced and of equal length, will transport the stock from the distributor to the head box transition piece. These hoses are constructed of industrial braided material with EPDM inner tube and they can sustain a wide range of pH (between 2 and 12) and chemicals.

9. Distribution tubes :
   Stock coming from the hoses is evenly distributed across the head box via equally spaced stainless steel distribution tubes. These tubes have a round to square shape to maximize open area toward the head box.

10. BTF transition piece :
    The transition connection where the distribution tubes will be connected will act as mixing / explosion chamber. A round access port is located at each end of the transition piece for inspection and cleaning. For further maintenance and thorough cleaning, a full width top panel can be opened. Two leverage points are located on the top panel for leverage, a chain block or crane winch will be used as leverage mechanism. The top panel will provide access to the headbox tube bank plastic inserts and distribution tubes (figure 1B).

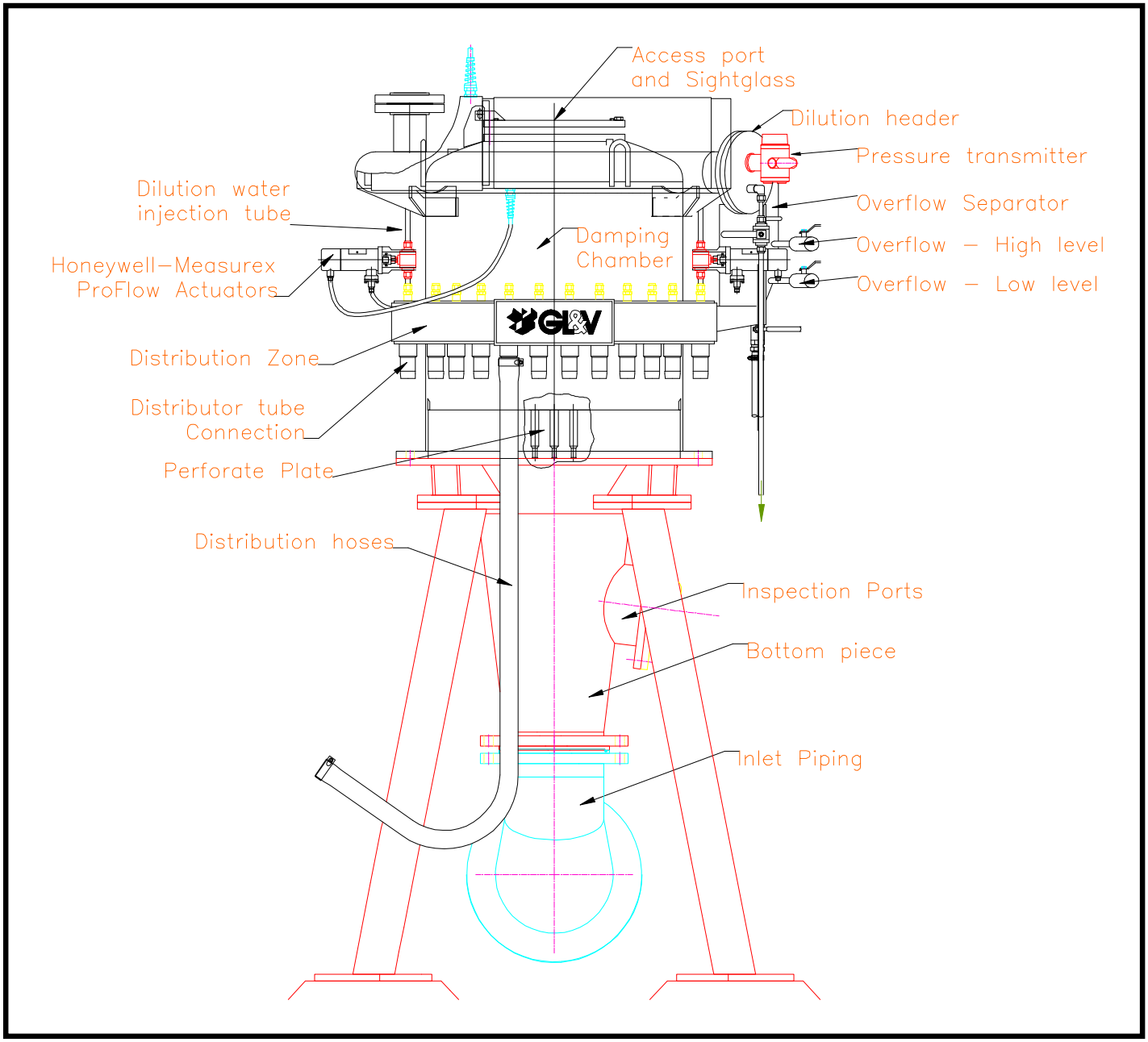
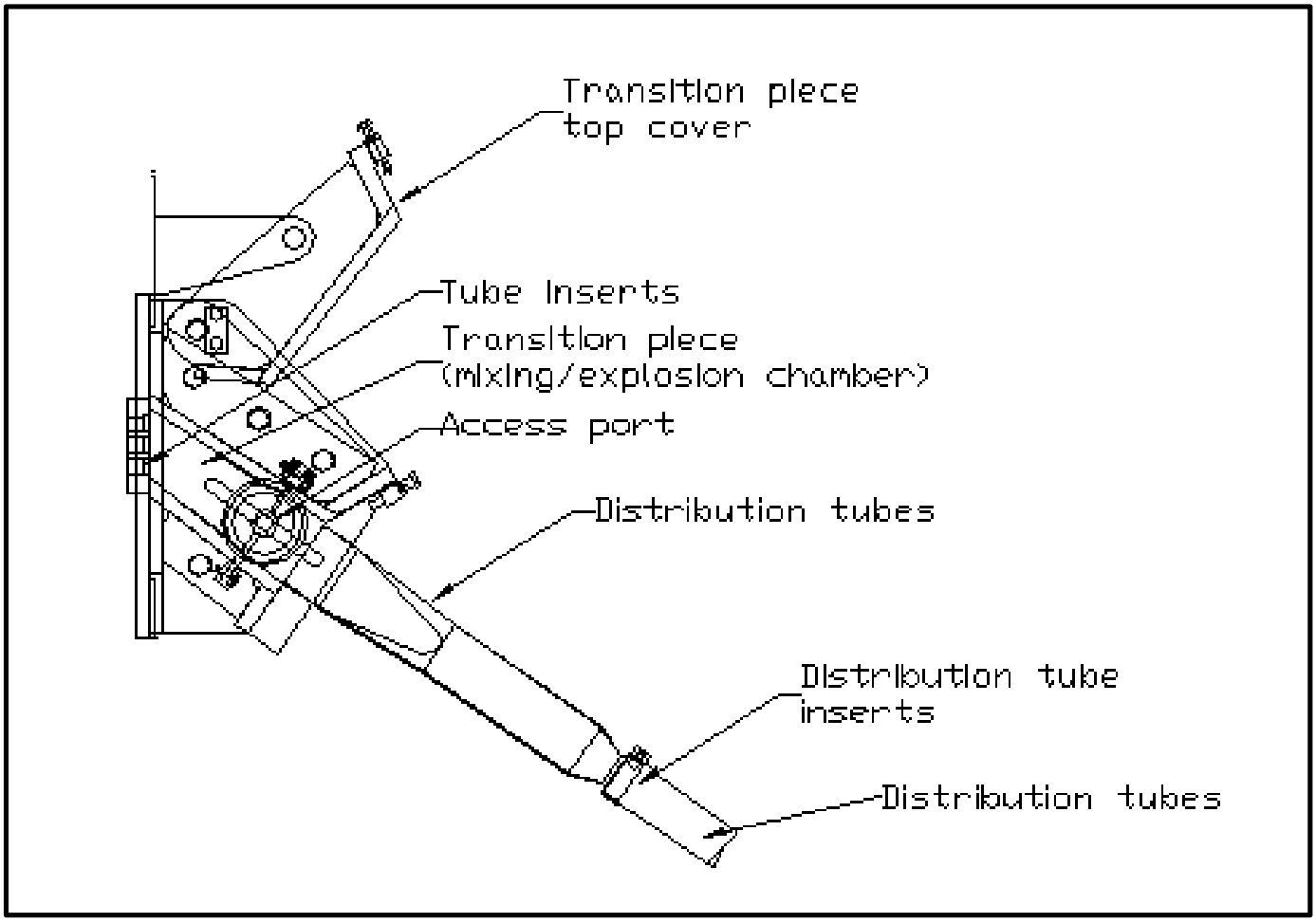


Figure 1A. BTF distributor main parts

Figure 1B. Transition piece



3.2 LEADING DIMENSIONS

Tank inside diameter	:	1200 mm
BTF height	:	2500 mm
Number of distribution hoses	:	48
Inside diameter of feeding pipe	:	20''
Distribution hoses internal diameter	:	63 mm
Maximum temperature	:	60 °C (140°F)
Maximum operating pressure	:	35 psi

Note: BTF Universal Distributor is not considered a pressure vessel.

3.3 DILUTION CONTROL VALVES

The dilution control valves are used to control the amount of dilution water to be added. This will allow cross machine basis weight profile adjustment. Honeywell-Measurex actuators actuate each control valve. All dilution valve logic and control is by Honeywell-Measurex.

Refer to Honeywell Measurex for actuator mounting on control valve.

Valves description

Valve type	:	Ball valve
Valve diameter	:	1 in
Valve supplier	:	Swagelok
Valve material	:	Stainless Steel
Model number	:	#SS-65TS16

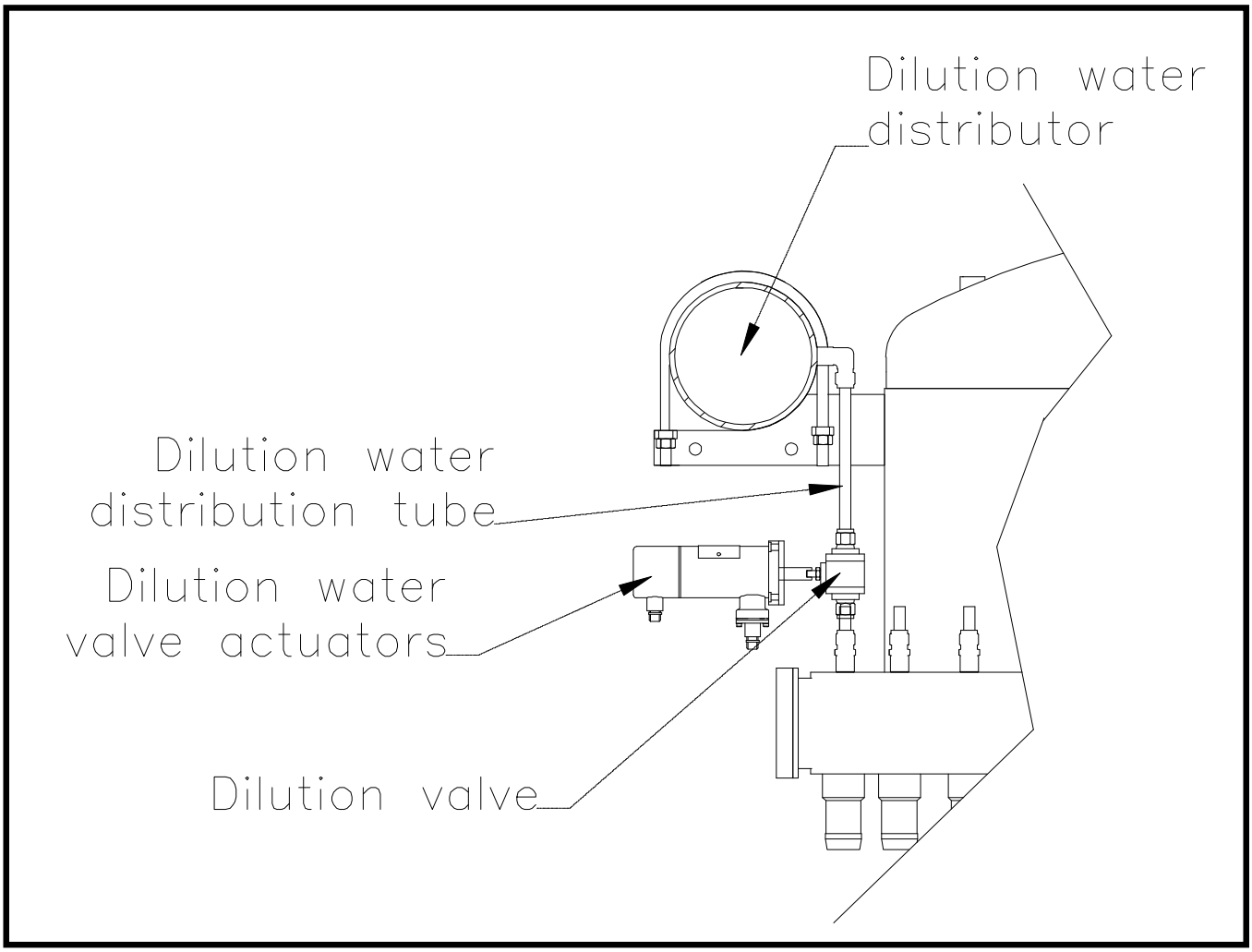


Figure 2 . Dilution valve

3.4 DISTRIBUTION HOSES

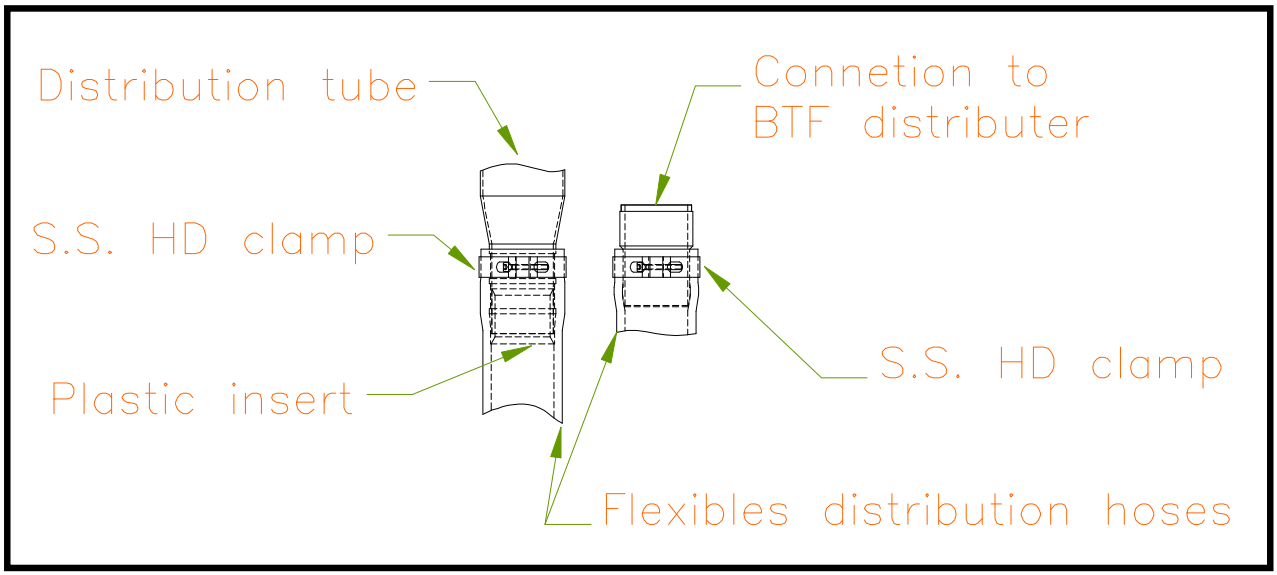
The installation of the flexible hoses for the BTF to the transition piece will be done as per installation drawing EL0122-0341004. All hoses must have the same length. Thus, the maximum length must be determined before cutting the hoses. The distribution hoses are cut using a circular bench saw / disc.

Flexible hoses are made of EPDM rubber with steel spiral inserted for strength. The inside diameter of the flexible hoses is the same as the inside diameter of the stainless steel distribution tubes end connector. To mount the flexible hoses on the stainless steel tubes, the ends of the flexible hoses must be expanded using a special tool. It is important that the internal protective layer of the flexible hoses is not damage. To facilitate installation of the hoses, glycerin or hand soap can be used. Stainless steel heavy-duty hose clamps are used to secure the flexible hoses to the pipes (see figure 3.).

To supply the dilution water to the head box, injection tubes are located over and centered to the distribution hoses (see figure 4.).

The flexible hoses are designed to handle a wide range of chemicals. Suitability to be consulted in the chemical resistance tables (consult section 5. of this manual). The flexible hoses are not suitable for hydrocarbons.

Figure 3. Distribution hose mounting



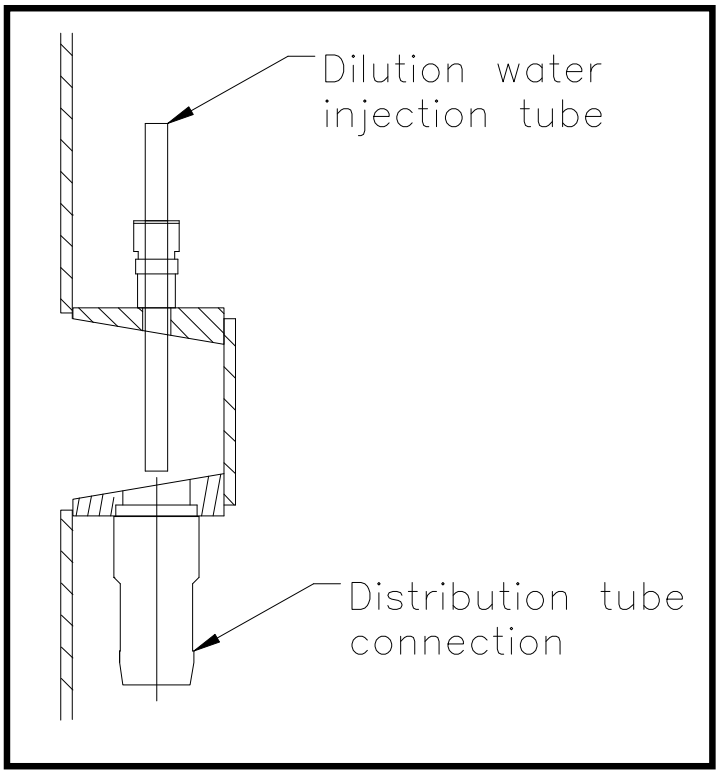


Figure 4. Dilution water injection

4. BTF HEADBOX GENERAL DESCRIPTION

4.1 BTF HEADBOX MAIN PARTS

The BTF headbox major parts are (see Figure 5.):

Slice body: this main part on which is attached many key components including slice lip and screw jacks. This high rigidity structure provides slice straightness with minimal mechanical and thermal deflection. This slice body is linked to the rest of the headbox by a double knuckle setup for vertical and horizontal adjustments of the slice lip in relation to the bottom lip.

Top slice (slice lip): this key component provides precise jet delivering on the forming fabric. The slice is optically adjusted so the slice opening is constant in reference to the apron lip. It should be noted that with BTF headboxes, the slice lip should not be bent for sheet profiling as with conventional headboxes.

Apron lip: this highly rigid, highly polish and precise surface will act as horizontal support for the stock jet. The bottom slice is a fixed element and optically adjusted for precise jet landing on the forming fabric.

Tube bank: The tube bank consists of rows of turbulence generating tubes. This section is used for critical turbulence generation.

Vertical slice adjustment mechanism: this mechanism will permit up and down movement of the slice lip to control flow out of the headbox. The slice body assembly rotates around a knuckle. The mechanism is composed of screw jacks, transversal shaft and coupled to a gear box with electric motor. The motor has an electrical brake to ensure no movements of the screw jacks during operation. This arrangement will provide from 0.25” to 4.5” slice opening in reference to the apron lip. Limit switches prevent extreme movement of the mechanism. If those switches would fail, mechanical stopper will stop any further movements to prevent damage to headbox parts.

Horizontal slice adjustment mechanism: this mechanism will allow horizontal movement of the slice lip in relation to the breast roll centre. The slice body assembly rotates around a knuckle. This horizontal movement provide to the papermaker the flexibility to control the jet angle and landing point on the forming fabric. The mechanism is composed of screw jacks, transversal shaft and coupled to a hand wheel.

Pond side: massive stainless steel plates which seal both ends of the headbox. The distance in between each pond side precisely matches the slice width. Paper stock will flow along those pond sides.

Control panel: a control panel is mounted on the tending side of the headbox for fast and easy reading of the slice lip position. Also, located on this box are the “Up” and “Down” buttons to control slice opening. This control panel gets input from the LVDT positioning system located in the back of the headbox.

BTF Transition piece: The transition connection where the distribution tubes will be connected will act as mixing / explosion chamber. Located in the middle of the explosion chamber are two speed bumps used to equalize the flow. A round access port is located at each end the transition piece for inspection and cleaning. For further maintenance and thorough cleaning, a full width top panel can be opened. Two leverage points are located on the top panel for leverage, a chain block or crane winches will be used as leverage mechanism. Structural arms on the back of the headbox are provided with a hole to insert the safety pins while the transition piece cover is open. The top panel will provide access to the headbox tube bank plastic inserts and distribution tubes.

Hot water chamber: the BTF headbox is provided with hot water chambers in the slice body and under the apron lip. Water heating system is supplied with all necessary hardware in place. Hot water chambers are used for thermal stability during operation. It also provides thermal stability during prolonged shut downs for faster start-up. This system is required for wide machine to prevent distortion in the slice opening.

Positioning chart: A stainless steel plate with graduation provides fast reading of the position of the slice lip.

Pressure transmitter: The total head pressure transmitter is located on the front pond side.

LVDT: The BTF headbox has 2 LVDT to relate the exact position of the slice lip. LVDT is connected to the control panel which has digital readouts. The readouts display SLICE OPENING and HORIZONTAL measurements. The LVDT system is located outside on the back pond side of the headbox.

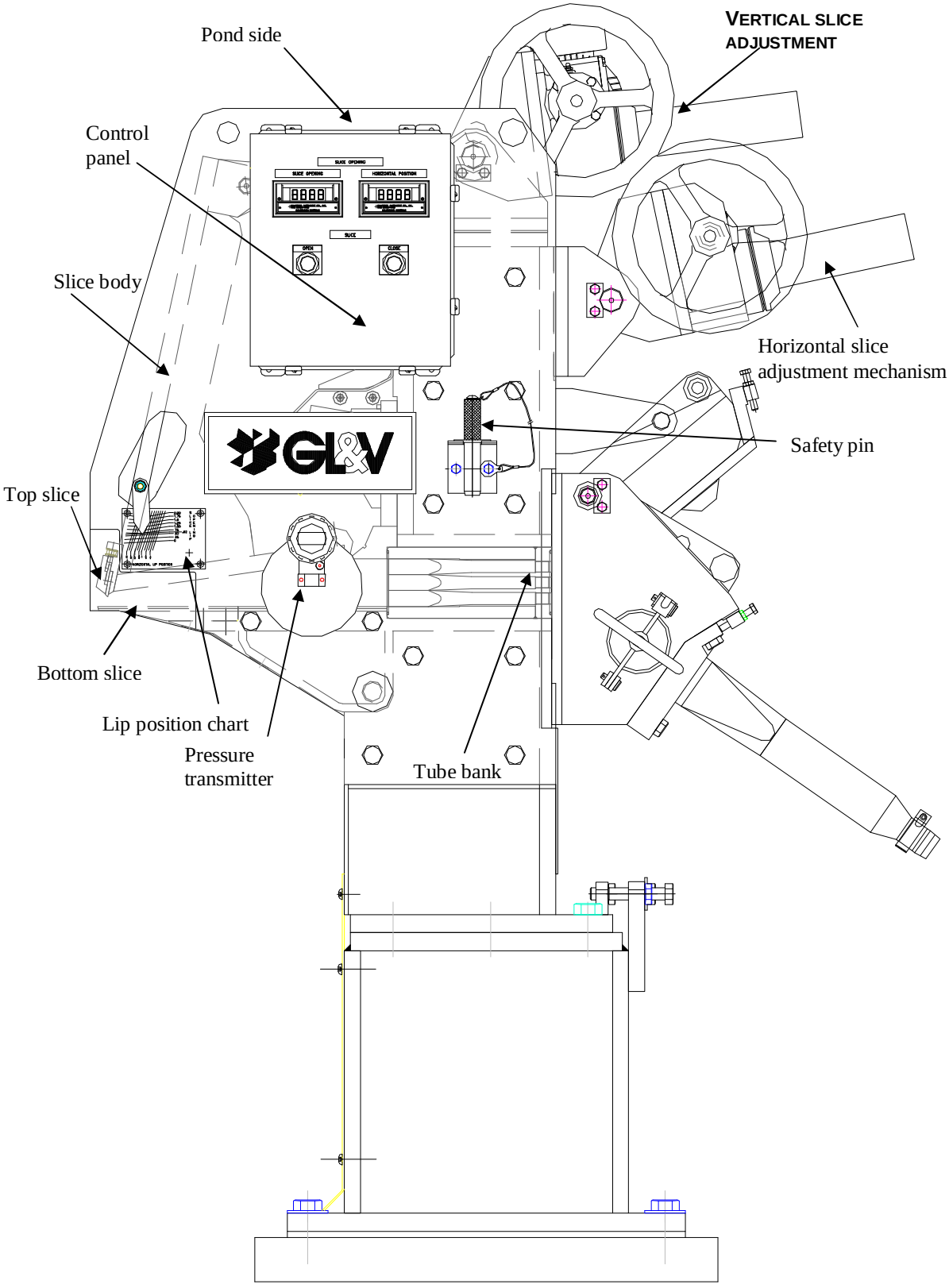


Figure 5 : BTF Headbox

4.2 LEADING DIMENSIONS

Headbox overall height	:	2375 mm
Headbox overall length (CD)	:	4550 mm
Headbox overall width (MD)	:	1500 mm
Slice width	:	4100 mm
Distribution hoses diameter	:	63 mm (I.D.)
Number of distribution hoses	:	48

5. START UP AND OPERATION

5.1 LEVEL CONTROL

During operation, an air cushion above the liquid level inside the distributor must be kept. To keep this air cushion, level control must be performed. The air cushion helps to reduce pulsation.

Two levels of operation are possible: low and high level. The operational level required should be determined by the stability of the stock in the distributor. The sight glasses on the top and on the side of the distributor is the appropriate method of determining the stability of the stock. The low level must first be used during start-up. There are two ball valves to control the low and high levels: for desired level of operation, one must be opened and the other closed (see figure 6.). The drain line of the level separator is returned to the white water system or wire pit.

A pressure regulator and a needle valve are used to adjust the pressure and flow of air entering the distributor in order to keep the air cushion. The air pressure should be 10 psi higher than the operating pressure in the distributor. Once theses adjustment are done at the start-up of the headbox, no further adjustment are required.

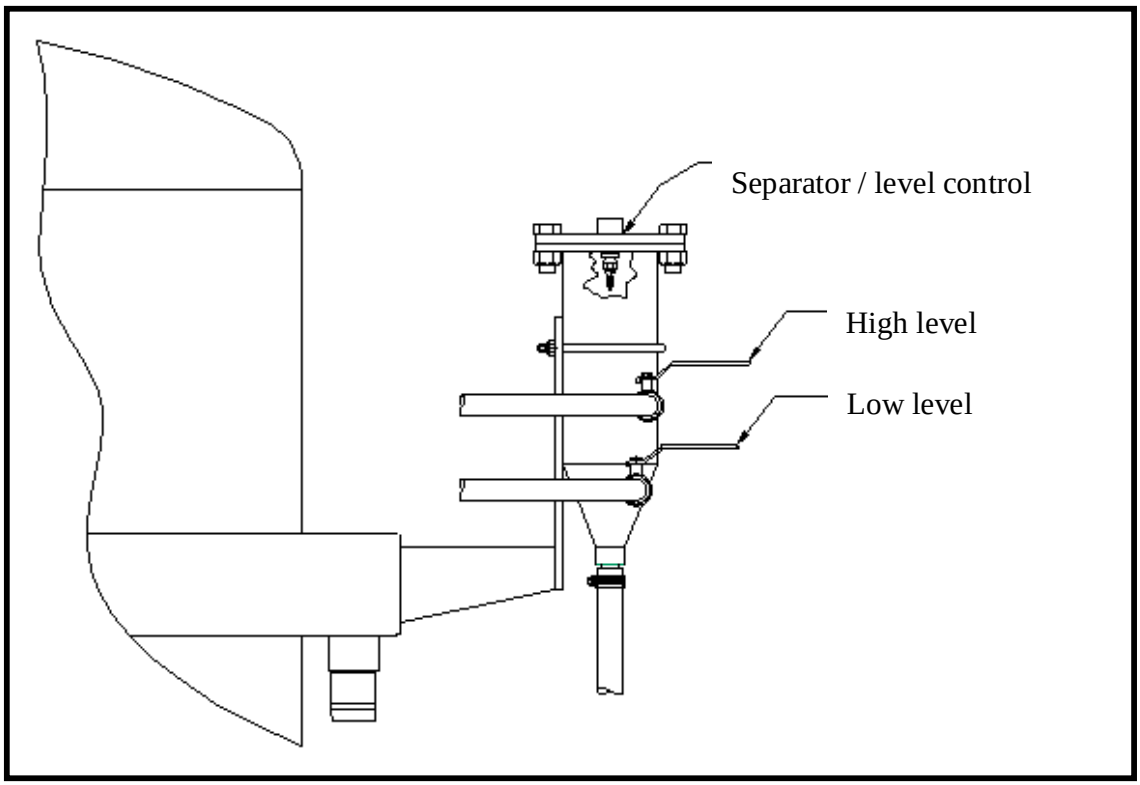


Figure 6. Level control

5.2 DILUTION WATER FLOW CONTROL

A variable speed flow pump must supply the white water feeding line. A pressure differential must be kept between the BTF distributor and the dilution water header to maintain the dilution water flow. Two differential pressure transmitters are located on the BTF distributor and on the dilution water header in order to control the variable speed controller of the pump. An increase in differential pressure will cause an increase in the water dilution flow.

Pressure indicators are located on the BTF tank and water dilution header for quick field reference.

The pressure differential will be determined and optimized during start-up procedures of the unit. The amount of dilution water should be optimized according to the paper grade produced. The amount of dilution water is affected by fan pump flow and consistency, and necessary amount of profile correction required.

5.3 PRESSURIZED WATER SUPPLY FOR CLEANING PURPOSES

One or more rotating cleaning showers are located inside the BTF distributor in order to maintain the inside surfaces clean. The water supply for the cleaning showers is regulated to minimize level fluctuations. A local pressure indicator is installed on the water supply line for quick reference. Pressurised water will be supplied to the level control separator and BTF tank to prevent stock build-up.

A pressure differential of 40 to 50 psi between the water supply line and BTF distributor internal pressure must be maintained at all time (water line being at higher pressure).

IMPORTANT: The water supply should be stock temperature or higher and should be at same pH to prevent any build-ups in the distributor.

5.4 CLEANING

If deposits occur, the BTF distributor must be cleaned. For cleaning, the BTF distributor system has 2 inspection / cleaning ports and access to the inside of the distributor (man hole) by removing the drilled plate centre column.

5.4.1 BTF Distributor cleaning

Open the 2 access ports on the BTF tank: one on the tapered base will permit cleaning and visual inspection of the perforated plate for any holes obstructed by paper stock. The access port on the top of the BTF distributor will also permit cleaning and visual inspection for top part of the BTF distributor.

Frequency: every machine shut down.

Note: Do not use any abrasive material or metallic brushes for cleaning which could deteriorate surface finish.

5.4.2 BTF Distributor thorough cleaning & maintenance

During a prolonged shut down, it is recommended to do a complete cleaning of the BTF distributor.

During boil outs, the distributor should be filled at 100% to make sure all internal surfaces are reached. To do so, close the level control valves and the air supply line. Once the boil out is completed, well rinse every internal surfaces. Make sure one of the two level control valves and the air supply line are opened before machine starts.

It is very important to follow each and every security protocol in place at the mill for boil outs.

5.4.3 Dilution valve flushing cylce

Before the BTF distributor dilution system is put in operation or when machine is shut down a flushing sequence must be performed to prevent fibre build-up in the dilution valves.

The dilution valves are flushed by cycling pre-selected groups of valves. A flush cycle is full travel of a valve from closed to open and back closed.

Flushing the valves in small groups increases the flow velocity for better cleaning.

NOTICE

DURING THE FLUSH SEQUENCE "OPENING" AND "CLOSING" THE DILUTION VALVES MEANS 0-90 DEG. OF TRAVEL NOT 20-80 DEG. AS IN NORMAL OPERATION.

A control loop incorporated in the DCS must be responsible for automatically flushing the dilution valves. The time duration for the flush sequence is indirectly proportional to the number of dilution valves per flush-group.

We recommend 8 dilution valves per flush-group. When the flush-sequence is initiated the following steps should occurred:

1. Close all dilution valves except those in first flush-group (8 dilution valves)
2. Open second flush-group & close first flush group
3. Close second flush-group & open first flush-group
4. Open second flush-group & close first flush-group
5. Close second flush-group & open first flush group
6. Open second flush-group & close first flush-group
7. Close second flush-group & open third flush-group
8. Iterate same steps for remaining pairs of flush groups, until every group is flushed three times.
9. Flush-cycle is done – all dilution valves are closed except those in last flush-group.

5.4.4 BTF Headbox cleaning

During shutdown, or when the headbox is suspected to be the source of deposits in the sheet, a simple cleaning procedure is suggested.

1. Circulate hot fresh water through the headbox before shutting fan pump. Stop fan pump.

2. Open the upper slice body to its full opening.

3. Inspect the interior of the headbox in order to locate any accumulation of paper stock.

4. If deposits are located, use a high volume medium pressure hose to dislodge the deposits. DO NOT USE ABRASIVE MATERIAL ON INTERIOR SURFACES OF THE HEADBOX.

5. Inspect bottom and upper lip for knicks or stock accumulation. Use a piece of cloth to dislodge any deposits on the slice lips.

6. In addition to what is stated previously, the top panel or lid of the transition piece can be lifted for easy access to the mixing chamber, headbox inserts and distribution tubes. Structural arms on the back of the headbox are provided with a hole to insert the safety pins while the transition piece cover is open. It is recommended to inspect the inserts in the headbox tube bank to evaluate wear.

7. Note: do not use high pressure jet which could damage plastic inserts in the headbox and in distribution tubes. Do not use any abrasive material or metallic brushes for cleaning which could deteriorate surface finish.

8. Adjust slice lip for proper operation.

9. Inspect BTF distributor (see BTF distributor cleaning sections).

5.5 PROFILE CORRECTION

Cross machine profile correction is accomplished by the dilution valves. All control logic is by Honeywell-Measurex.

The total flow to the BTF must remain constant for a fixed machine speed. Thus when the flow in one of the valves is reduced (or increased), the flow to another valve must be increased (or reduced) by the same amount. Flow reduction in a valve will result in a basis weight increase in the sheet where this valve is connected to the headbox. Increase in flow will result in basis weight reduction.

5.6 START-UP AND OPERATION

Before start-up, the BTF tank has to be inspected and cleaned with fresh water through access ports. If visual inspection shows that the holes on the perforated plate are plugged, they must be cleaned.

The BTF headbox also needs to be inspected and cleaned with fresh hot water.

Start-up sequence:

1. Start water dilution feeding pump.
2. Start stock pump 20 seconds after starting the dilution feeding pump.
3. Insure that showerhead water flow and pressure are sufficient (usually set 60 psi higher than air pad pressure).
4. Verify air supply to distributor.
5. Verify stock level within the distributor.
6. Adjust lip opening and position
7. Adjust jet to wire ratio

Basic dilution control description:

At first start-up, following installation, all dilution control valves should be opened by 50%. In normal start-up opening of dilution valve should remain to their last position, when machine was stopped. Profile adjustment should then be performed as per Honeywell-Measurex control operation. At all-time the average opening of all valves must remain between 20° to 80° which represent 0 to 100% in the Honeywell system. The valve opening difference between adjacent valves should be less than 50%.

5.7 SLICE OPENING AND POSITIONING

The BTF headbox is provided with horizontal and vertical slice lip adjustments for optimal operation. While your vertical adjustment will permit to adjust flow, the horizontal adjustment will permit to adjust jet impingement on the forming fabric. The vertical adjustment mechanism is driven by an electric motor for fast and easy operation. Also, motor will provide faster vertical opening when full slice opening is needed for maintenance and cleaning purposes.

Vertical adjustments (slice opening):

- Simply use the buttons “UP” and “DOWN” on the control panel. Use control panel vertical display for precise location of the top lip. In addition a position chart is fixed on the headbox to show the exact opening of the slice. Proximity switches are installed on the headbox to stop the motor if the mechanical end stroke is reached. In addition, mechanical stoppers are also in place as a backup in case of proximity switches failure. They are in place to prevent any damage to the slice of the headbox.
- In the case of a motor failure, a hand wheel on the vertical screwjack will also provide vertical lip adjustments. Note that the brake release must be activated.

Horizontal adjustments:

- Use the hand wheel on the horizontal adjustment screw jack, use control panel horizontal display or lip position chart for precise location of the top lip. Mechanicals stoppers are in place to prevent further movement when mechanical end stroke is reached.

5.8 TRANSITION PIECE INSPECTION COVER OPENING

The following procedure describes how to open the inspection cover on the headbox transition piece:

1. Remove all the bolts on the top cover

2. Use the lifting lugs and lift the cover using come-along. Both sides have to be lifted at the same time to avoid cover damage.

3. Once the cover is completely open, insert the sunday pin to hold the cover in place.

5.9 BTF HEADBOX LUBRIFICATION

The BTF headbox has few moving parts and they require to be lubricated periodically.

Three grease points are located on each pond side for easy access. They supply grease to the knuckle area. Periodically, open and close the slice to its extreme positions (0.25" to 4.5") while lubricating will help distribute evenly the grease to all moving parts and friction areas.

All pivot points on the headbox are greasable.

NOTE: Refer to manufacturer's manual for lubrication of other headbox equipments (ex. Screw jack – Duff Norton).

6. INSTALLATION INSTRUCTIONS

6.1 ASSEMBLY DRAWINGS AND BILLS OF MATERIAL LIST

Bill of material #	Drawing #	Description
0122-049-4101-01	LE0122-0341004	Headbox and distributor -BTF
0122-049-4102-01	CL4102-0005	Sole Plates
0122-049-4118-01	DL4118-0006	Head box frame assembly
0122-049-4120-01	DL4120-0023	Hoses and Transition Piece
0122-049-4121-01	DL4121-0004	Head Box Turbulence Generator
0122-049-4126-01	DL4126-0005	Headbox skirts assembly
0122-049-4128-01	DL4128-0019	Dilution System
0122-049-4130-01	DL4130-0004	Slice body assembly
0122-04-4131-01	DL4131-0005	Head Box Slice Lip Adjustment Mechanism
0122-049-4132-01	DL4132-0006	Head Box Vertical Slice Adjustment Mechanism
0122-049-4135-01	EL4135-0005	Head Box Horizontal Slice Lip Adjustment Mechanism
0122-049-4155-01	DL4155-0007	Deckles assembly
0122-049-4160-01	DL4160-0008	Walkway assembly
0122-049-4170-01	DL4170-0012	Distributor assembly
0122-049-4171-01	DL4171-0003	HeadBox Heating System Assembly

6.2 PRE-ASSEMBLED MODULES, HANDLING WEIGHTS AND DIMENSIONS

The BTF Distributor and BTF headbox are mainly shipped as complete assemblies. Balance of hardware will be shipped in a separate crate. Each item will be identified by their bill of material number for an easy identification.

Description	**Qty**	**Unit Weight (lbs)**	**Dimension (in.)**
Headbox	1	22000	60 X 180 X 94 h.
Distributor	1	8220	76 X 76 X 80 h.

6.3 SOLE PLATE INSTALLATION (DRAWING DL4102-0005)

1. Check the level and alignment of the breast roll before starting installation of sole plates. Adjust the roll to be levelled and aligned within 0.005''.

2. Set, level and grout sole plate as per drawing DL4102-0005 and mill specifications. A good levelling of sole plate (within 0.002") is very important at this stage. Contractor shall take good care on levelling sole plates. Good setting will ease levelling of the headbox. Sole plate elevation shall be confirmed in reference to the breast roll elevation.

   Note: Levelling screws and pads are supplied by GL&V.
   (items # 2 et # 100, B.M. # 0122-049-4102-01)

3. Starting with specified breast roll centreline, establish centrelines of each piece of equipment which sits on the sole plate.

4. Using provided templates (items # 3 et # 4, B.M. # 0122-049-4102-01), mark off hold down bolting holes.

5. Drill and tap holes previously marked off.

6.4 HEADBOX INSTALLATION

1. Install nominal shims of 0.44" (items # 17, B.M. # 0190-060-4118-01) on the sole plates.

2. Install the headbox on the sole plates. Align punch marks with centreline previously marked. Check the level of the apron lip. Level variation should not exceed 0.001''/foot and should not be more than 0.004'' total. 2. Check distance between top of breast roll and top of apron lip. Distance should be 0.5″. Correct with shims (items # 17, B.M. # 0190-060-4118-01) underneath headbox supports if necessary.

3. Check alignment of apron lip compare to the breast roll centreline and correct alignment by moving headbox to be within 0.002''.

4. Install deflectors on the head box (item # 8 and bolt items # 101, B.M. # 0190-060-4126-01). Install all other deflector that might have been removed for transport. Do the required adjustment in order to have a sealed system.

5. Install dowel pins #7 between supports and sole plates and between supports & headbox on tending side only. Two dowel pins on each spot should be used.

6. Install cross walk over wire EL4160-0008.

7. Before installing the deckles, make sure all drainage elements of the forming table are aligned and levelled. Respect the standards of section 7.6 in this manual. In addition, the blades of the drainage units covered by deckles are going to have to be replaced by new blades before aligning and levelling. This is done in order to be sure to have a uniform gap between deckles and the wire.

8. Install deckles according to drawing DL4155-0007. Use the crane and lifting lugs to hold the deckles and fix them on the headbox. To fix the deckles on the headbox, put the bolts in positions without tightening them, then install the locating pin while making sure the deckles are levelled. Still while holding the deckles with the crane, install the adjustable supports. Tighten the bolts fixing the deckles on the headbox. Install the holding cable system (items # 8, # 103 and # 104, B.M. 0122-049-4155-01) on the deckles and adjust the turnbuckles to create a small tension in the cable. Adjust the deckles plastic strips after the wire installation.

9. Complete electrical connections on the headbox.

6.5 BTF INSTALLATION

1. Determine the right length for the new approach piping. Do the required welds. All approach piping connections shall be smooth and polished to a surface of 16RMS. IMPORTANT: APPROACH PIPING MUST BE SUPPORTED AND NOT HELD BY THE PILOTED FLANGE ON DISTRIBUTOR INLET. WELDED SUPPORT ON NEW APPROACH PIPING MUST BE INSTALLED.

2. Install new approach and fit on existing piping. Make sure that the new approach piping is well supported with independent supports.

3. Install BTF unit on concrete platform and layout anchor bolts location using BTF supports as template

4. Drill concrete floor and install anchor bolts at recommended torque.

5. Level BTF with levelling bolts installed on the BTF support legs and make sure bottom connecting piloted flanges are well fitted together.

6. Bolts piloted flanges together using torque specified in torque table (section 5.7). WARNING: EXCESSIVE TORQUE WILL DEFORME PILOTED FLANGED AND CREATE AN OPENING BETWEEN THEM.

7. Install flexible hoses on BTF connections and on the distribution tubes using drawing EL0122-0341004 for connecting pattern. Hoses are already cut to good length. Hoses installation is a critical part of the installation. During installation of hoses, make sure that they are installed on connecting tubes to cover the entire machined surface. Collars needs to be installed after the diameter step change to make sure it is tight (see figure 4).

<u>The following sequence have to be followed for hoses installation :</u>

A. The first series of hose to be installed are #17 to #24 and # 25 to # 32. Note these two series can be installed simultaneously. Make sure to pull the exceeding length towards the distributor.
B. Then, Install hoses # 9 to # 16.
C. Then, Install hoses # 33 to # 40.
D. Then, Install hoses # 1 to # 8 and # 41 to # 48. Note these two series can be installed simultaneously

8. Connect all service to BTF (Air, water and control).

6.6 INITIAL FLUSHING

1. Flush dilution line with fresh water without being connected to the dilution header.

2. Flush dilution line with connection to the dilution header and keep the dilution header cover open. Keep the pump running for 30 seconds at low speed. Stop & lock the dilution pump. Inspect the dilution water header and make sure it is clean. Once it is cleaned, install the cover.

3. Flush BTF distributor main stock line with fresh water. Use the inspection cover on the tapered header and a cleaning hose to clean the approach piping line.

4. Open the drain on the screen and make sure the approach piping is clean.

5. Once it is cleaned, make sure all the inspection doors are closed on the head box and distributor.

6. Make sure that the air pressure and air flow for the air pad are sufficient.
7. Open the water shower in the distributor.

8. Open the low level valve and close the high level valve on the distributor level controller.

9. Set the headbox opening at 2'' to allow a slow water speed on the wire.

10. Start the dilution pump and proceed to a flush cycle.

11. Once the flush cycle is completed, set all the dilution valves at 50% opening and start the dilution pump.

12. Start the stock pump with fresh water a low speed during few minutes to clean all the approach piping.

13. Check all the interlocks, control sequences for the pumps and all the new equipment installed.

14. Stop the stock pump and after the dilution pump and lock.

15. Open all the inspection doors and check if all the parts are cleaned (distributor, transition piece on headbox and headbox). Open the headbox lip and make sure turbulence generator is cleaned.

6.7 RECOMMENDED TORQUE TABLE

This table is valid for stainless steel bolts only.

Screw size	Recommended torque lb-ft (lubricated bolt)
3/8	8
1/2	20
5/8	40
3/4	65
7/8	110
1	160
1 1/4	320
1 1/2	550
2	1300

7. HEADBOX AND RELATED EQUIPMENT INSPECTION

A number of items should be inspected annually on any headbox for trouble free operation. These verifications must be performed by specialist and require optical equipment for measurements. GL&V can supply the service engineers and technicians for the proper work at the customer demand. GL&V personnel are highly qualified to adjust, repair or replace equipment respecting strict requirements.

The items to be inspected are the following:

- Headbox thermal condition;
- Headbox slice body;
- Headbox apron lip;
- Headbox slice lip;
- Breast roll;
- Forming and fourdrinier drainage units;
- Deckles.

7.1 HEADBOX THERMAL CONDITION

Prior to any measurements or adjustments, the headbox should reach thermal stability that represents the normal operating conditions. To reach thermal stability, follow these steps:

1) Headbox element temperature verification

During down time of the machine, using an infrared thermometer, check that the temperature of the headbox is even everywhere. Compare temperature found in the lip region (over the top lip and under the bottom lip) with temperature of the upper lip's top frame (slice body) and of the lower lip's bottom frame. If the temperatures are within 2 degrees F then the headbox inspection can begin.

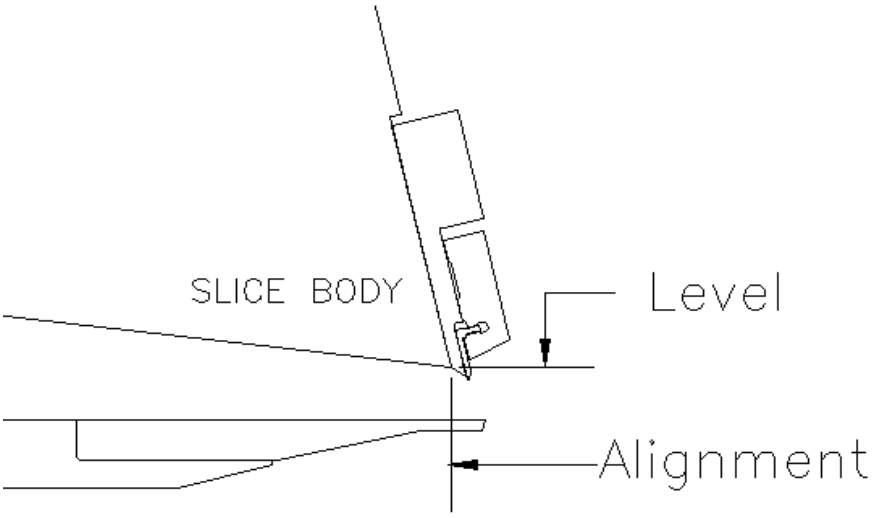
2) Headbox element temperature standardization.

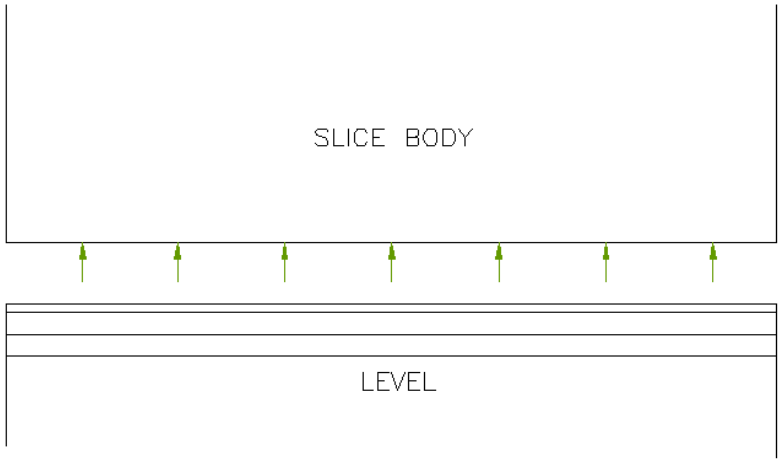
To standardise the headbox's temperature, you will probably have to circulate cold water in the temperature control system of the upper frame's lip compartment. Measure frequently temperature of the upper frame until you reach the desired temperature. This step can take a few minutes (almost an hour). Redo a systematic verification of the temperature after a few minutes because the frame stores thermal inertia (i.e. the metal in question will store heat). If the temperature is still too high, redo step 2 until you reach the desired temperature.

7.2 HEADBOX SLICE BODY (SEE FIGURE 7)

1. The level for the tip of the slice body must be within 0.004".
2. The alignment of the tip of the slice body must be within 0.002" measured at 5 points across the width of the headbox.
3. Slice body mechanism (vertical & horizontal) must be checked for backlash. Using dial indicator mounted on headbox pond sides, this should be performed with and without stock pressure.
4. The Surface finish of the slice body should be well polished and exempt of scratches.

Figure 7 : Headbox slice body





7.3 HEADBOX APRON LIP (SEE FIGURE 8)

1. Cross machine level must be 0.001” per 12” and at a maximum of 0.004” across the lip. Should be checked at tip and at support.
2. Machine direction level must be within 0.001” from support to tip of the apron slice. Must be verified every 6” on the total width of the apron slice.
3. Alignment of the edge of the apron slice must be within 0.002”. It should be checked at 5 points across the width of the slice.
4. The apron lip tip must be sharp (no nicks).
5. There should be no gap between apron lip and its support.
6. The apron slice and headbox interior surface must be flush or “step down”.
7. Surface finish of the apron slice should be well polish. Any scratches must be polished.

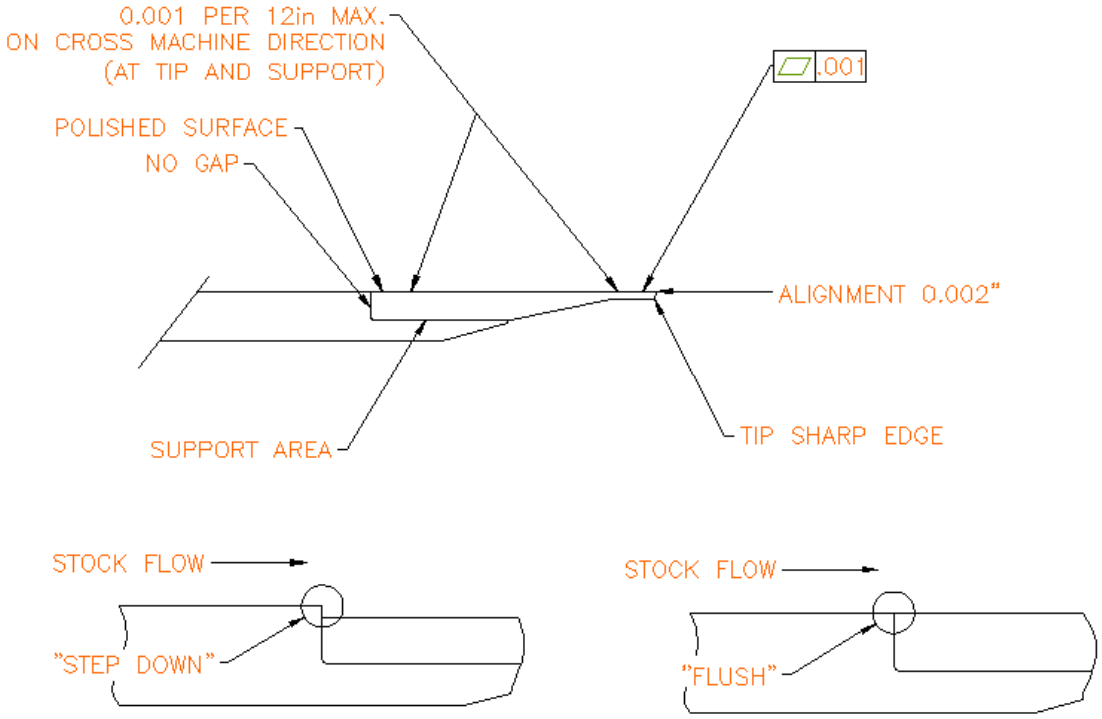


Figure 8 : Apron lip

7.4 HEADBOX SLICE LIP (SEE FIGURE 9)

1. Prior to any adjustments / measurements, the slice lip should be inspected to make sure it is not permanently bent.
2. The slice lip tip must be sharp (no nicks).
3. There should be a gap of 0.004”-0.005” between the edges of the slice lip and headbox pond sides.
4. Slice lip tip overhang must be set according to the headbox manufacturer specification.
5. The slice opening must be gapped to within 0.001” continuously across the machine using special dial indicator tool. The gap should be measured at normal operating opening as well as horizontal position in relation to the tip of the apron slice

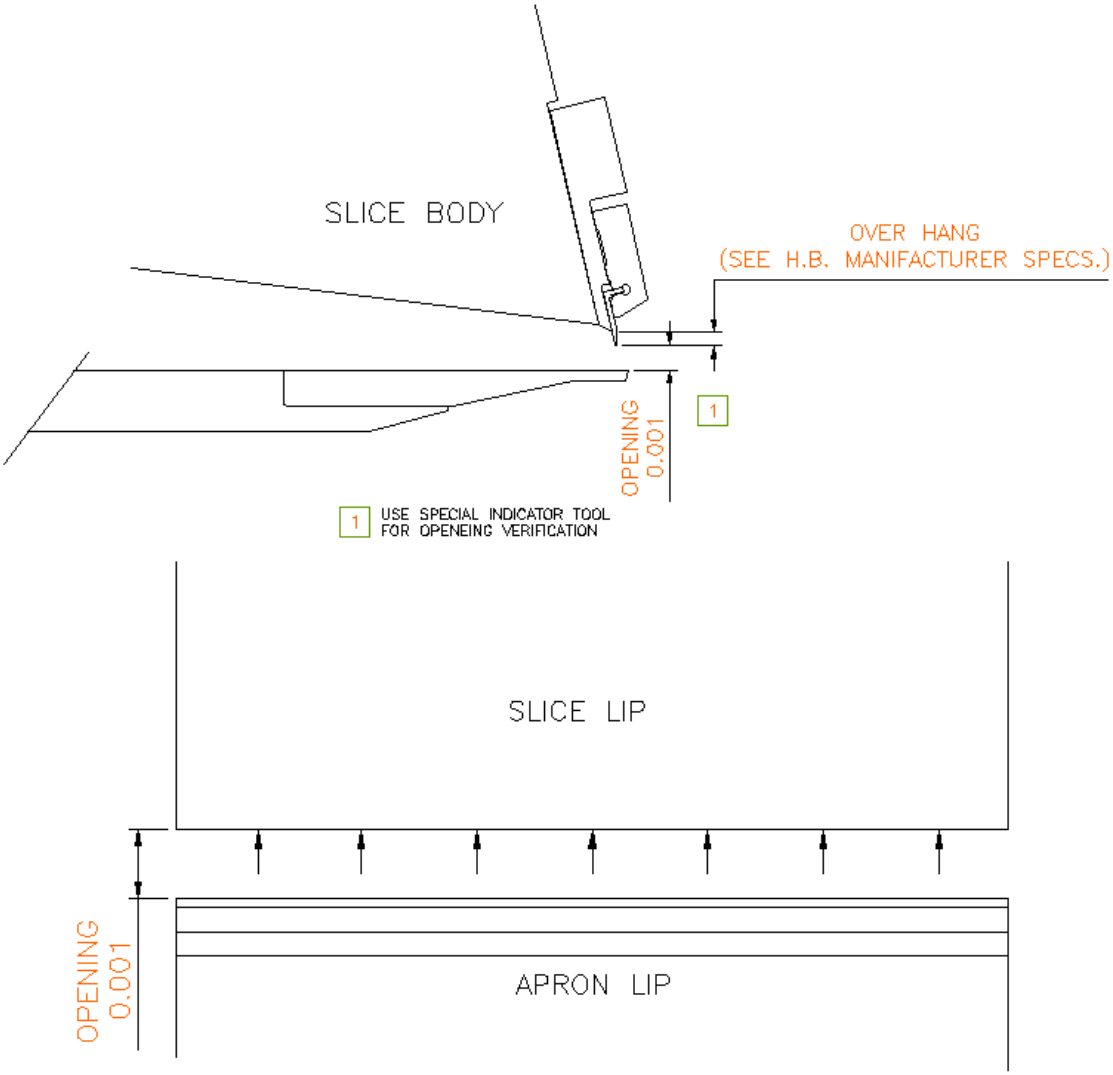


Figure 9: Slice lip

7.5 BREAST ROLL (SEE FIGURE 10)

1. The breast roll should be levelled and aligned within 0.005". This procedure should be performed without forming fabric installed.
2. The gap between the surface of the breast roll and bottom of the apron slice should follow headbox manufacturer's recommendation.
3. The breast roll shower water must be stock temperature to avoid thermal distortion of the apron slice. (if a shower is present)

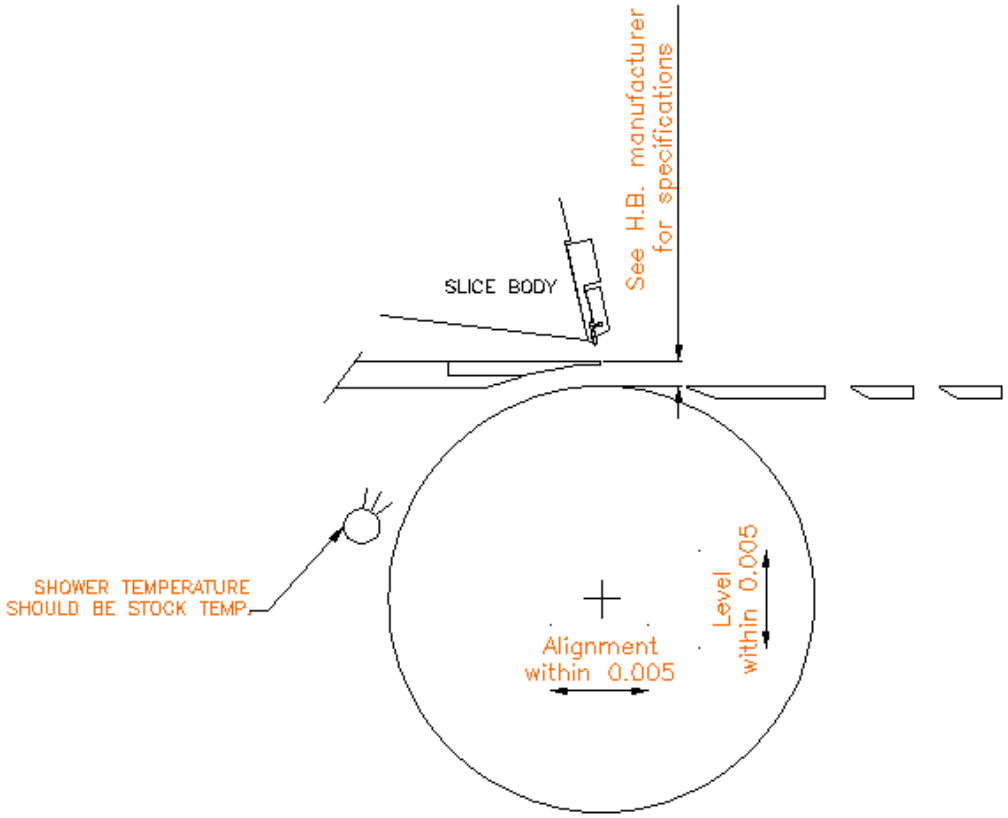


Figure 10: Breast roll

7.6 FORMING BOARD AND FOURDRINIER DRAINAGE UNITS (SEE FIG. 11)

1. The distance from the tip of the forming board blade to the tip of the apron slice must be aligned within 0.025". This must be checked at the front and back side of the machine.
2. The forming board unit must be levelled within 0.005" (leading blade and last trailing blade).
3. When forming board is aligned and levelled, all remaining drainage units must be aligned and levelled.

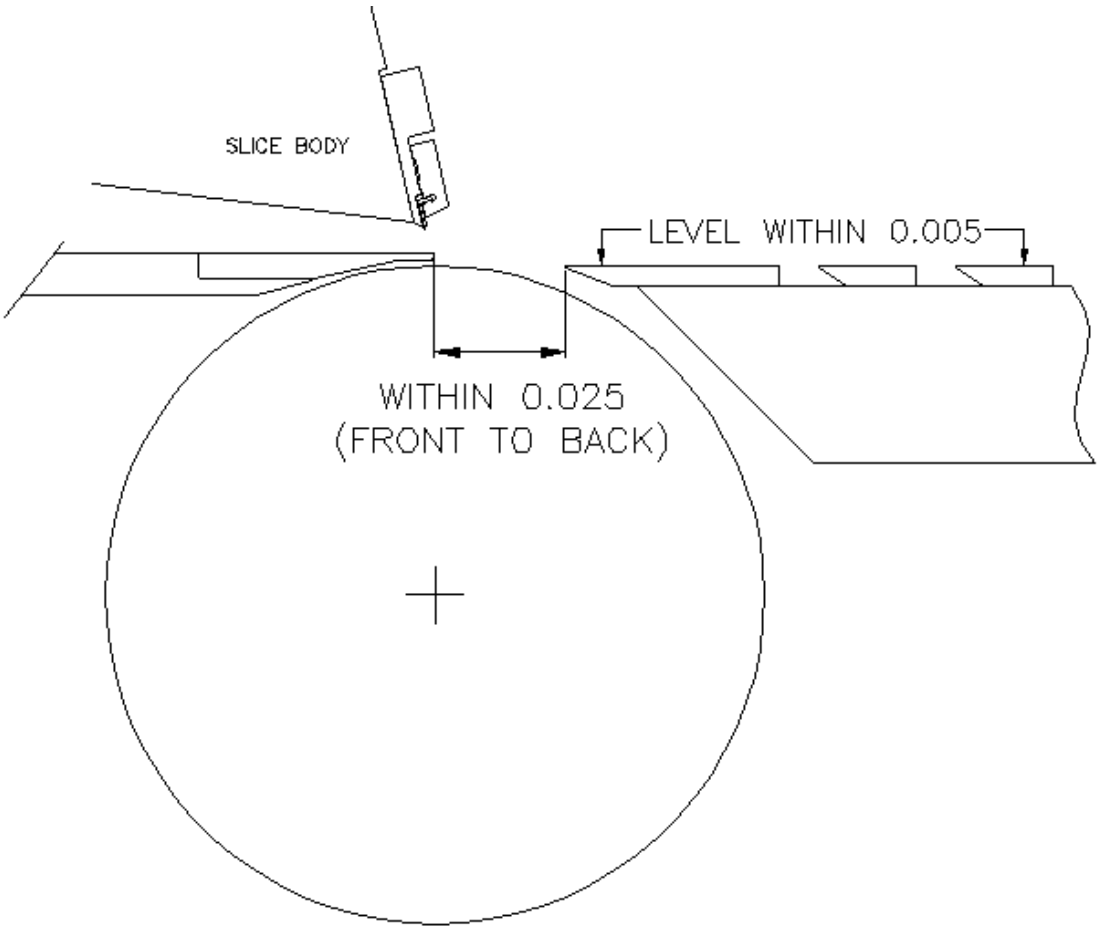


Figure 11 Forming board

7.7 DECKLES (SEE FIGURE 12)

1. Deckles should be flush and parallel to headbox pond sides.
2. The deckles should be in good condition (no scratches, nicks, etc.)

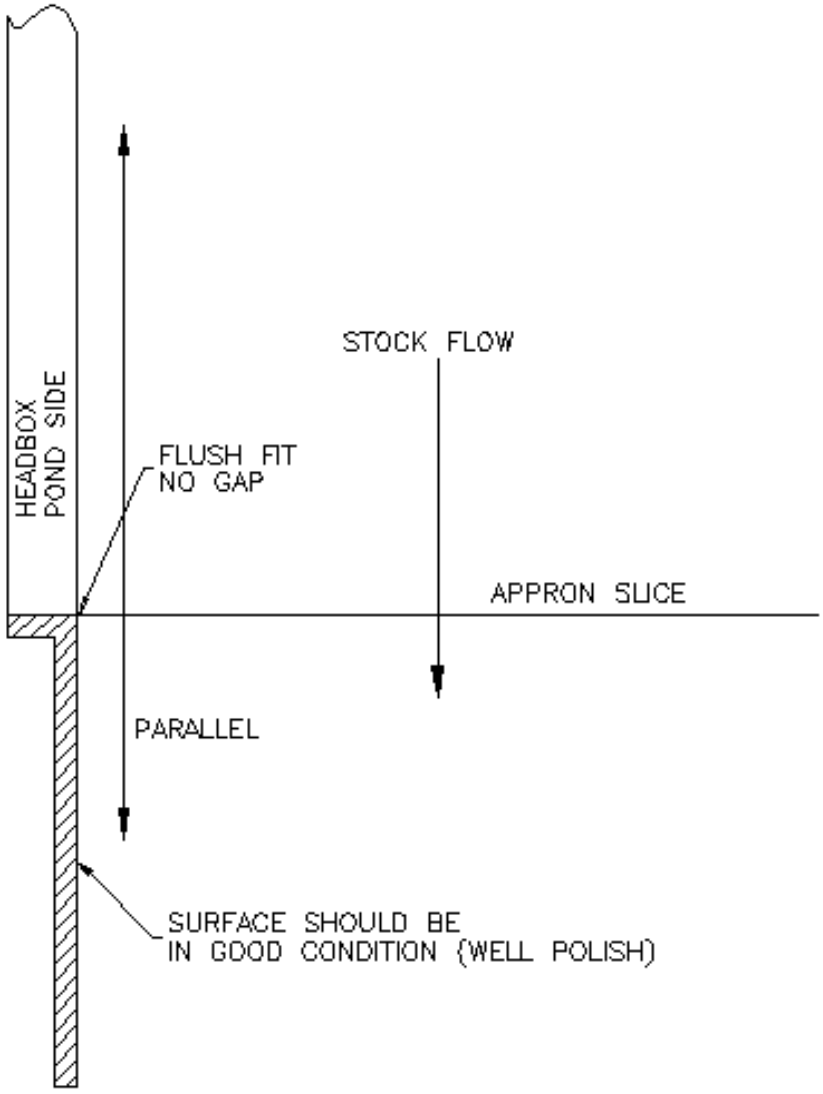


Figure 12 : Deckles

8. DRAWINGS & BILLS OF MATERIAL

9. CONTROL COMPONENTS

13. RECOMMENDED SPARE PARTS

Description	Bill of material, item number and drawing	Recommended quantity
Apron lip	0122-049-4118-01 item # 6 et # 11 Drawing DL4140-1005	1
Hose, length adjusted and expanded at both ends	0122-049-4120-01 item 100	5
Collar	0122-049-4120-01 item # 101	10
Plastic inserts, distribution tube	0122-049-4120-01 item # 21 Drawing BL4120-1127	5
Plastic inserts, turbulence generator	0122-049-4121-01 item # 6 Drawing BL4121-1024	25
Dilution valve	0122-049-4128-01 item # 5	2
Slice lip	0122-049-4131-01 item # 3 Drawing BL4131-1023	1
Jack, vertical slice lip adjustment mechanism	0122-049-4132-01 item # 2 Drawing BL4132-1053	1
Motor, vertical slice lip adjustment mechanism	0122-049-4132-01 item # 3	1
Jack, vertical slice lip adjustment mechanism	0122-049-4135-01 item # 1 Drawing BL4135-1033	1
Deckle Strip	0122-049-4155-01 Item # 4 Drawing BL4155-1044	2
Nozzle, Distributor shower	0122-049-4170-01 item # 26	9
Description	Bill of material, item number and drawing	Recommended quantity
Pressure transmitter, distributor	0122-049-0770-01 item # 1	1

Pressure indicator 0-60 psi	0122-049-0770-01 item # 7	1
Air pressure regulator	0122-049-0770-01 item # 8	1
Water pressure regulator	0122-049-0770-01 item # 9	1
Pressure indicator 0-100psi	0122-049-0770-01 item # 6	1
Pressure transmitter, Headbox	0122-049-0770-01 item # 14	1
Proximity switch	0122-049-0770-01 item # 15	1
Indicator 4 to 20	0122-049-0760-01 item # 3	1