BLADDER TANK FOAM PROPORTIONING SYSTEM

Installation, Operation, Maintenance Manual

With Filling Instructions

HD FIRE PROTECT PVT.LTD

Protecting what matters most to you

Corporate Headquarters:
D-6/2, Road No.34, Wagle Industrial
Estate, Maharashtra, India
Tel: +91-22-21582600
Email: Info@hdfire.com
www.hdfire.com

Manufacturing Plant:
K-98, MIDC, Ajanta Road,
Jalgaon – 425003,
Maharashtra, India
Email: Info@hdfire.com
www.hdfire.com

TABLE OF CONTENTS

CHAPTER 1 - INTRODUCTION

1.1 SAFETY INFORMATION AND MEANING OF SAFETY SIGNAL WORDS:

This manual has been prepared as an aid and guide for personnel involved in the installation, operation and maintenance of Bladder Tank Proportioning System. All instructions must be read and understood thoroughly before attempting any installation, operation or maintenance of this system. Failure to follow any instruction could result in personnel injury and/or damage to this equipment.

The international safety Alert Signals ⚠ are used with one of the following signal words to alert operating personnel to the potential for death, personal injury or damage to equipment or property.

⚠ **DANGER** : Danger indicates hazardous situation which if not avoided, will result in death or serious injury.

⚠ **WARNING** : WARNING indicates a hazardous situation, which, if not avoided, could result in death or serious injury.

⚠ **CAUTION** : CAUTION indicates a potentially hazardous situation which if not avoided, could result in minor or moderate injury.

NOTE : Indicates special instructions which are very important and must be followed.

It is responsibility and duty of all persons involved in the operation and maintenance of this equipment to fully understand above procedure by which hazards are to be reduced or eliminated.

1.2 GENERAL DESCRIPTION:

The Bladder Tank Foam Proportioning System utilizes the water pressure to inject foam concentrate into water supply and automatically proportions foam concentrate over wide range of flow and pressure, vwith very low pressure drop. This system does not require a foam concentrate supply pump.

1.3 SPECIFICATION:

The Bladder Tank Foam Proportioning Systems are available with vertical and horizontal bladder tanks. The carbon steel tanks are designed and constructed in accordance with ASME Code Section Vlll Div.1 for unfired pressure vessels. 'U' stamp and/or CE mark is optional.

The maximum working pressure is 12 Bar (175 PSI), unless higher working pressure is ordered. The vertical tank assembly is supported by legs welded to tank with provision for anchoring. The horizontaltanks are supported by two saddles/legs welded to the tank and drilled for anchoring. Tank is provided with lifting lugs, designed to use with empty tanks.

The system is supplied with pressure vessel, bladder, fill and drain valve for water and foam concentrate, ratio controller and vent valve. Ladder and sight gauge assembly are supplied as optional items on request.

All valves are labeled showing normal working position and function.

All tanks are oversized for allowing thermal expansion of the foam concentrate, if any.

Some of valves, one side is plugged or blank flange is bolted. This is to avoid Foam Concentrate leakage with accidental opening of valve.

NOTE: This manual is for horizontal and vertical Bladder Tank, as well as with few optional requirements. Please select the data for installations as per ordered specification and approved drawings only.

1.4 PRINCIPLE OF OPERATION:

The instructions for filling are provided with the equipment. Once the main water flow is established and water inlet and foam outlet valves are opened, the water enters the area between vessel wall and bladder, applying pressure to the bladder. The foam concentrate is forced out of the bladder through the foam concentrate outlet pipe and into the ratio controller through metering orifice. The concentrate pressure and water inlet pressure at ratio controller will be same, as the main water supply pressure is utilized to expel the foam from the bladder. The water flowing through the ratio controller jet creates a low pressure area common both to downstream water and foam concentrate. This injects the concentrate in to the ratio controller through an accurate sized orifice proportioned to water venturi. This ensures correct proportioning over a wide range of flow condition. The bladder tank proportioning system operates on same principle as that of a balance pressure proportioning system. In bladder system, the bladder is used as diaphragm to separate the water and foam concentrate within the tank. The foam concentrate is injected into the ratio controller utilizing water pressure.

The system is also supplied with foam concentrate control valve as an optional item. The valve allows concentrate flow only when minimum of 2.1 kg/sq.cm. water pressure is established in the system. For pressure drop and flow characteristics refer catalogue of ratio controller.

Refer : Catalogue for Ratio Controller, Bladder Tank and Concentrate Control Valve are available

on website www.hdfire.com

CHAPTER 2 - BLADDER TANK INSTALLATION

1. Lift only through lifting lugs provided on the tank for unloading, moving to installation site or securing to installation foundation. Do not allow lifting forks, crane attachment devices to contact Ratio Proportioner or piping, valves during moving/lifting operation.

2. Remove the Bladder Tank from crate. Remove all wrapping support blocks or belt. Inspect the entire unit for damage before securing in place. Sometimes, for easy transport, the piping are packed separately on same pallet with tags. Verify all such boxes. Level Gauge/ Sight Glass are always packed separately to avoid transit damage.

3. The Bladder Tank must be located on concrete flat surface. Shims and/or grout may be used to obtain proper level. The tank must be bolted in place using the bolt holes provided on the tank tie-down pads.

4. Connect all interconnecting piping. All interconnecting piping must be self-supported firmly to prevent stress on the Bladder Tank Proportioning system piping network.

NOTE : Ref Fig 1 to 4 for identifying the value nomenclature on installed equipment.

5. During transportation due to vibration, fittings might be loosened. Check all fittings and nuts on all bolted fittings. If required, tighten them before the tank is placed in service.

6. Install sight glass/ gauge (optional) if provided.

NOTE : If Bladder Tank is purchased without pre-piped, then field piping needs to be as defined in our drawing/ data-sheet.

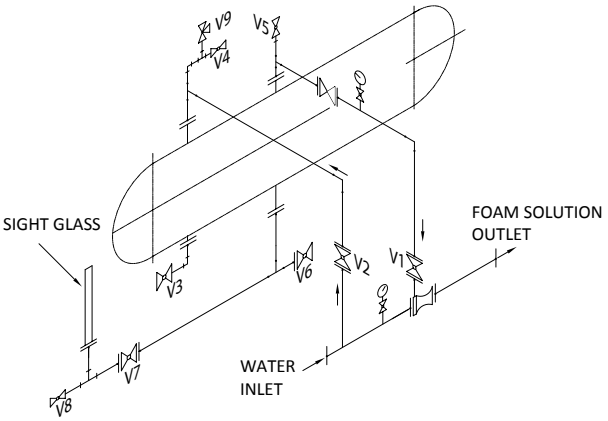


FIG - 1

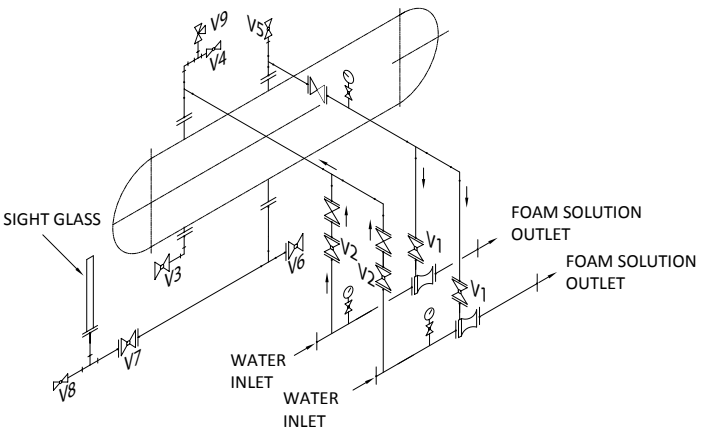


FIG - 2

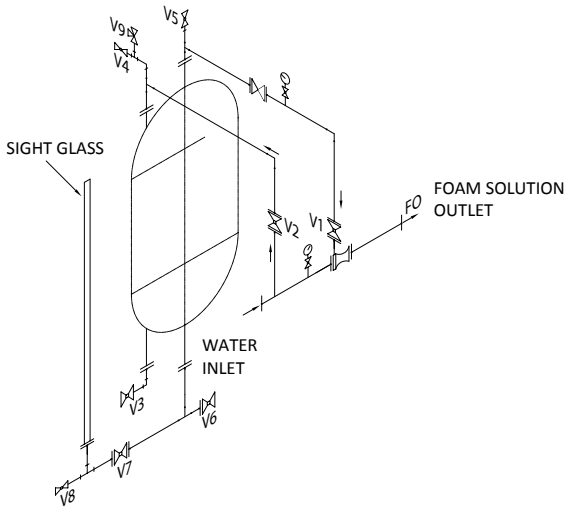


FIG - 3

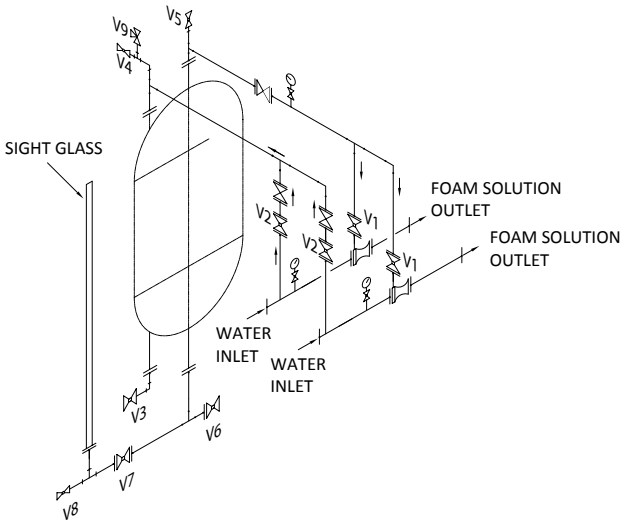


FIG - 4

NOMENCLATURE :-

ELBOW	NON-RETURN VALVE
TEE	BALL VALVE
FLANGE JOINT	SAFETY VALVE
PRESSURE GAUGE	RATIO CONTROLLER

7. Follow filling instructions as given in Chapter -3.

⚠ **CAUTION:** Do not weld on the tank, as it may damage the Bladder fitted inside the tank.

⚠ **CAUTION**: While designing a foam system, steps should be taken for allowing removal of the internal center tube(s). The center tube(s) are of full length and/or height of the Black Tank.

⚠ **CAUTION**: Customer modification or alteration of this equipment or use of replacement parts other than specified by HD may affect the performance and may void the warranty.

⚠ **CAUTION**: Never use galvanized piping in foam concentrate line.

⚠ **WARNING**: ASME Code may require over pressure protection before pressurizing the system. HDFIRE does supply over pressure relief valve with the tank. It is the owner's responsibility to provide over pressure protection for the tank in accordance to ASME code.

⚠ **WARNING**: The Bladder Tank must be installed in controlled temperature location above 4.5°C, to protect from freezing temperatures. The Bladder Tank Proportioning system must be stores or installed under a shade to avoid direct sunlight on the tank.

CHAPTER 3 - FOAM CONCENTRATE FILLING PROCEDURE FOR BLADDER TANK

3.1 FOLLOWING EQUIPMENT ARE REQUIRED FOR INITIAL FILLING:

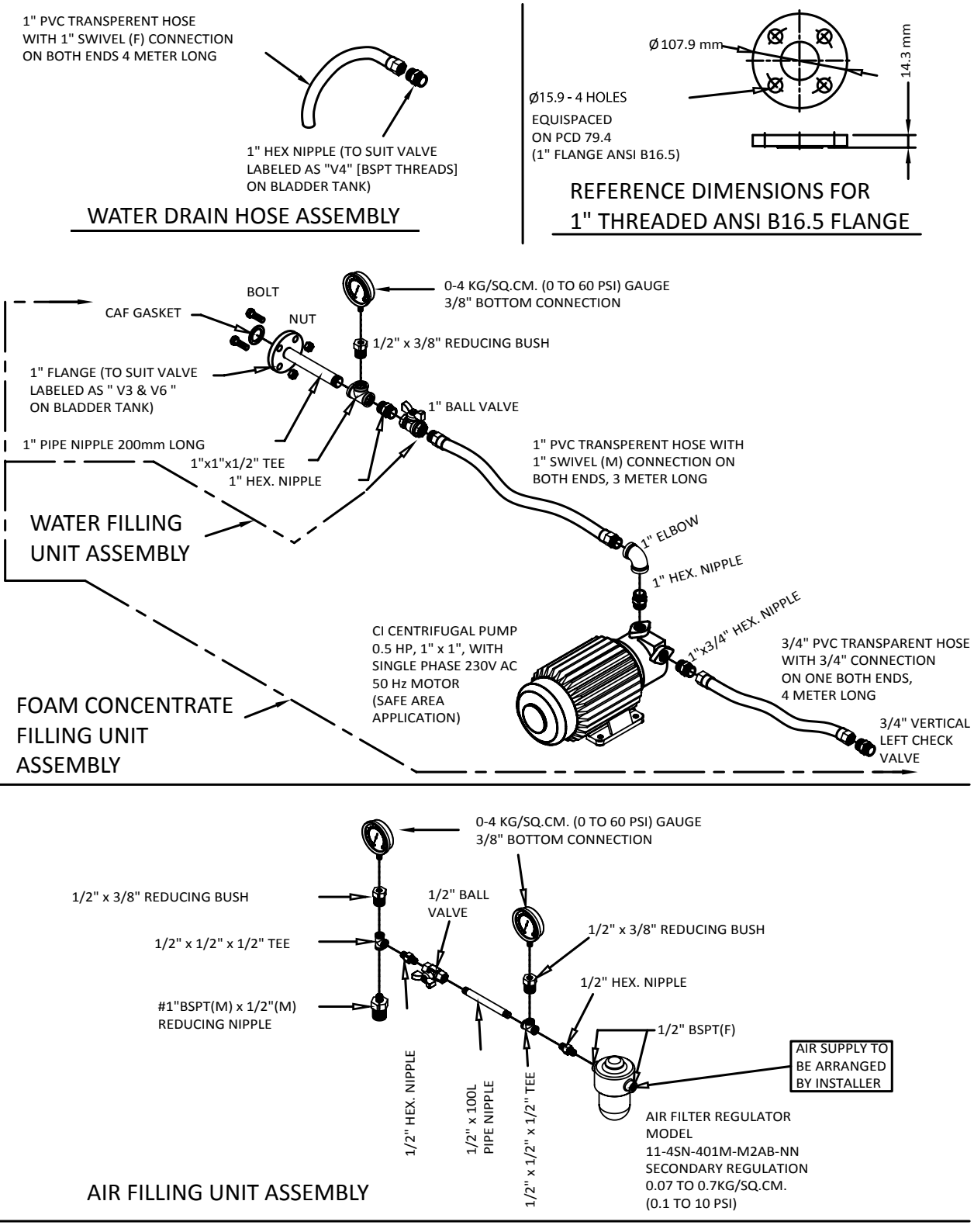
(a) Filling kit - The filling kit as per Fig.-5 is required for initial fill. The kit is an optional supply. One kit can be used for multiple filling operations/ Bladder Tanks.

NOTE: After each filling operation, the filling kit consisting the pump and all pipes with fittings need to be flushed with fresh water and dried.

(b) About 200 ltrs. Drum filled with water.

(c) A clean air or nitrogen supply with Pressure Regulator to regulate air pressure for supply to Bladder Tank at 0.4 to 0.7 Bar (6 to 10 psi)

FIG. -5



NOTE:

1)WHEN ORDERED ALONG WITH BLADDER TANK ALL THE THREADS ARE BSPT.

2)WHEN ARRANGED BY INSTALLER CARE TO BE TAKEN TO ENSURE THAT #MARKED THREADING COMPATIBILITY WITH THE BLADDER TANK FITTING IS MAINTAINED TO AVOID MISMATCH.

3.2 FIRST TIME FILLING OF THE BLADDER TANK WITH FOAM CONCENTRATE.

STEP 1: Water filling. (Ref FIG.-6 OR FIG.-7)

- Close all the valves V1 To V8 .
- Open tank vent valve V4 , tank drain valve V3 and bladder vent valve V5,V6. (Remove plug/ blank flange for filling, needs to be re-fitted after filling is completed)
- Connect the valve V4 to drain
- Connect the valve V3 to water supply
- Fill the tank with water (do not exceed 1.5 KG/SQCM of water pressure) till the water starts coming out of valve V4. (Do not close V4 with water pressure at V3)
- Close valve V3t

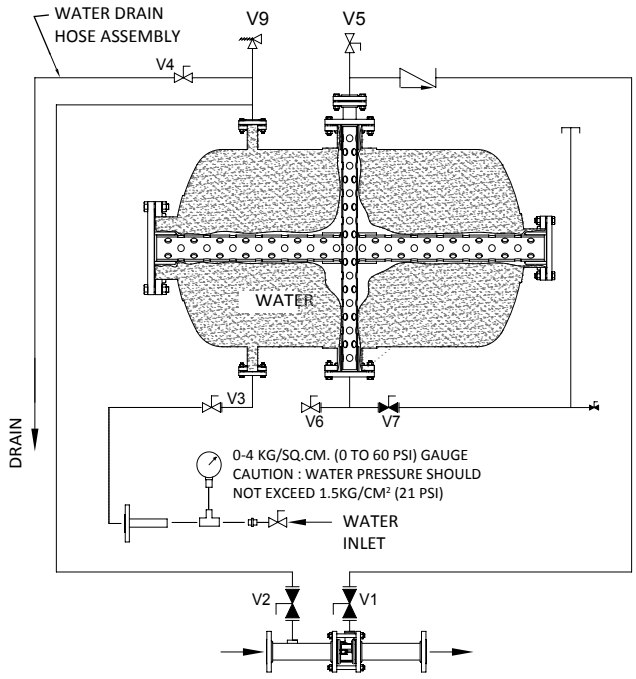


FIG.-6

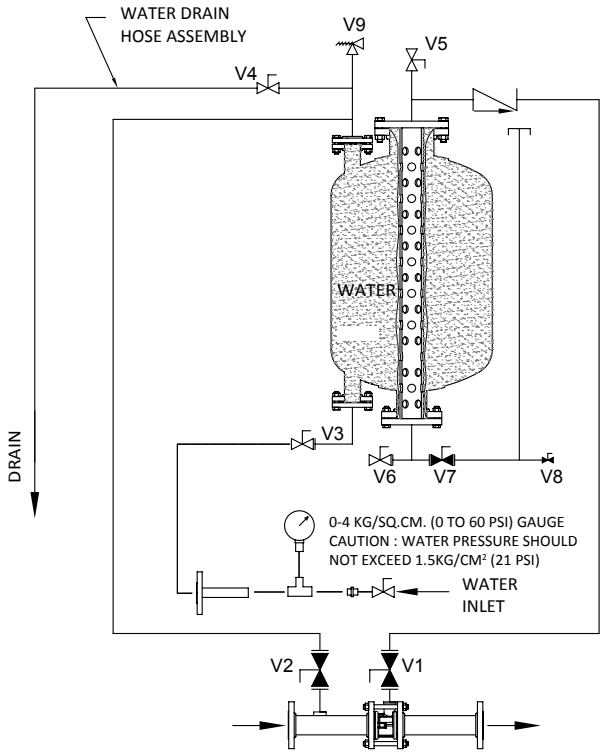


FIG.-7

STEP 2: Air filling (Ref FIG.-8 OR FIG.-9)

- Place the low range pressure gauge assembly having the range of 0-4 KG/SQCM on valve V5 as shown in the drawing. Open the pressure gauge cock so that the pressure gauge is in service.
- Connect air source to air valve.
- Fill the bladder with air to 0.4 to 0.7 KG/SQ.CM. (6 to 10 psi), while displacing the water through valve V4 , for vertical tank 10 to 15 % of the water (i.e. 10 to 15 % of tank capacity) is to be drained out and for horizontal tank 25 to 30 % of water (i.e. 25 to 30 % of tank capacity). (measure it by collecting in the drum of known volume)
- Stop the compressor close V4 and air valve.
- Remove the air source pipe

NOTE : A nitrogen cylinder with regulator can be used in place of air compressor.

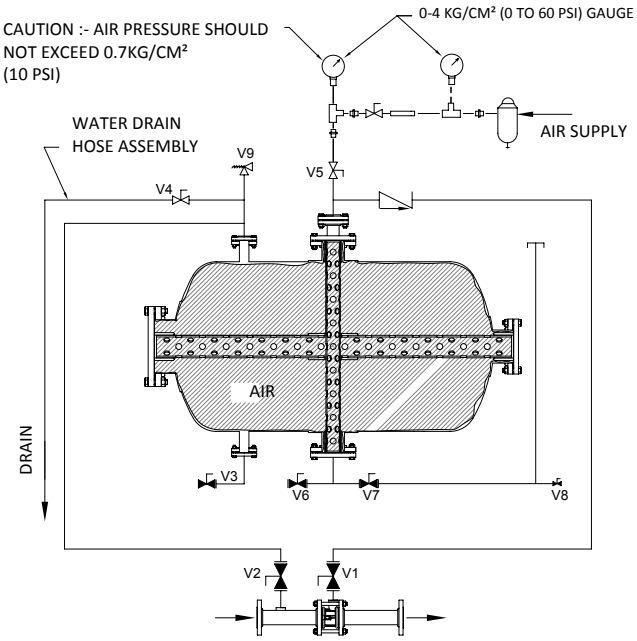


FIG.-8

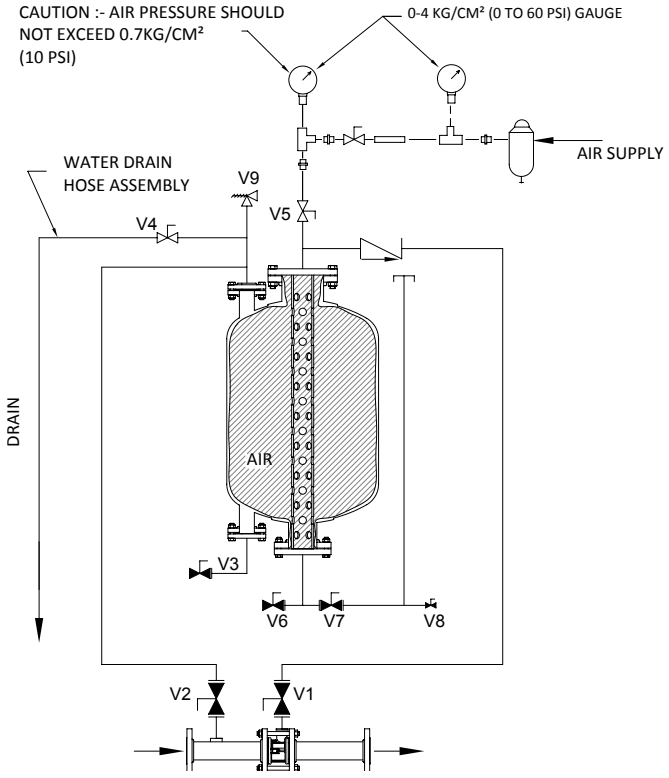


FIG.-9

STEP 3: Foam concentrate filling. (Ref FIG.-10 OR FIG.-11)

- Connect concentrate pump fill connection to valve V6
- Open valve V4 (leading to drain)
- Start pump and open the Valve V6
- Fill foam concentrate, maintain the air pressure of 0.4 to 0.7 KG/SQCM (6 to 10 PSI) by controlling the opening/closing air valve connected to V5. Maintain foam con. pressure around 1 .5 to 2 kg/sq.cm.
- When approximately 90% of foam concentrate is filled, water will stop coming out of valve V4 and tank air pressure will begin to exceed.
- Now slowly open the air valve and make the air pressure to zero. Carry out the filling until the bladder is filled up with foam concentrate to the rated capacity of the tank.
- Stop pump and close valve V6 and valve V4
- Remove foam concentrate pump fill connection and low range air pressure assembly.
- Close valve V5

NOTE : Overfilling may damage the bladder

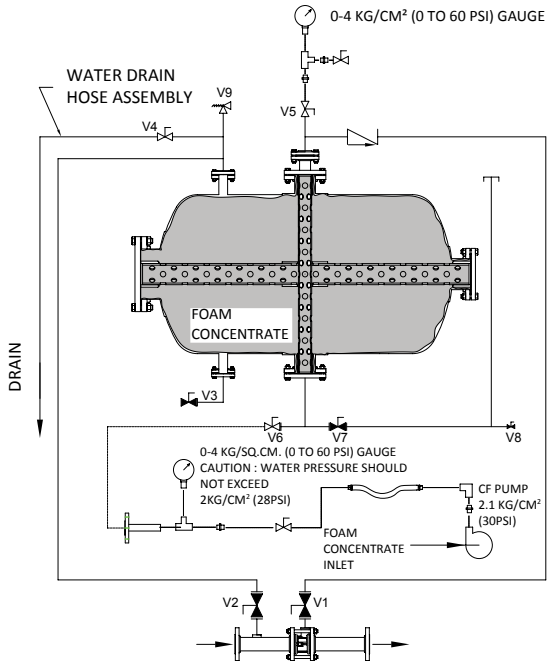


FIG.-10

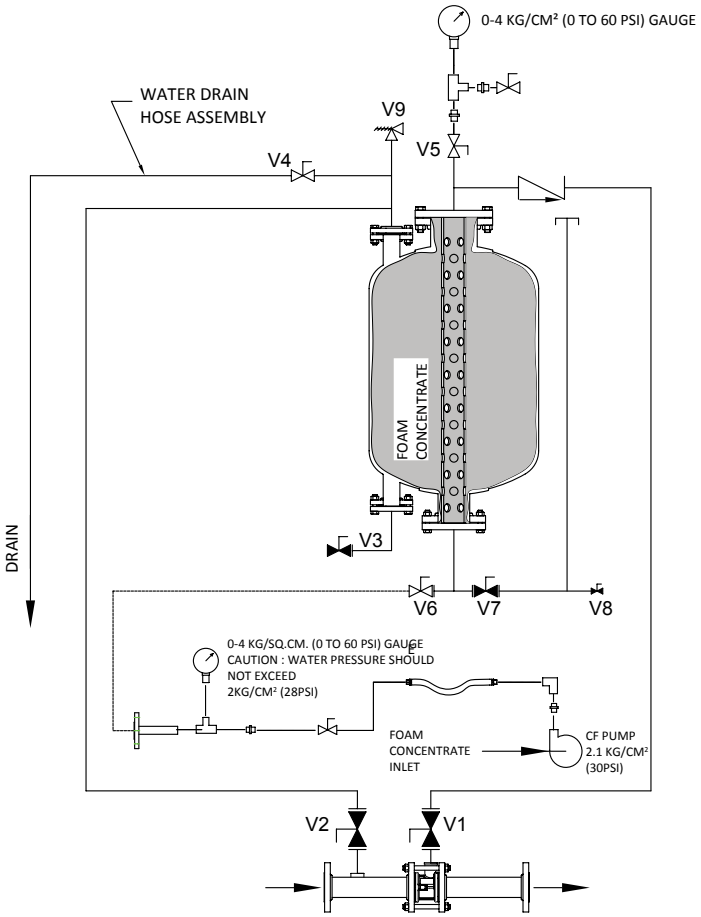


FIG.-11

STEP 4: Checking of the foam concentrate level. (Ref FIG.-6 OR FIG.-7)

- Open valve V5, V4.
- Open valve V3, completely drain the water from the tank.
- Open V7, the foam will rise in the sight glass.
- After the level is verified, MARK THE LEVEL. The marking of level will help in future for identifying and determining the quantity of foam concentrate and consumption. Close valve V7 and drain the foam concentrate from the sight glass by opening the valve V8.
- Close valve V8

STEP 5 : Placing bladder tank into service. (Ref FIG.-6 OR FIG.-7)

- Connect valve V3 to water line.
- Open valve V4
- Allow the water to enter tank pressure not exceeding 1.5 KG/SQCM (25 PSI) by opening the valve V3 till you get water flow from valve V4.
- Close valve V3 and then V4
- Now set the valve position as given in Table I and Table IV

Table I

VALVE	NORMAL POSITION		DESCRIPTION
	MANUAL OPERATION	AUTOMATIC OPERATION	
V1	CLOSE	--------	FOAM CONCENTRATE SHUT OFF VALVE
V1#	--------	CLOSE	AUTOMATIC FOAM CONCENTRATE VALVE
V2	OPEN	OPEN	WATER SHUT OFF VALVE
V3	CLOSE	CLOSE	TANK DRAIN VALVE
V4	CLOSE	CLOSE	TANK VENT VALVE
V5	CLOSE	CLOSE	BLADDER VENT VALVE
V6	CLOSE	CLOSE	BLADDER DRAIN VALVE
V7	CLOSE	CLOSE	SIGHT GLASS FILL VALVE
V8	CLOSE	CLOSE	SIGHT GLASS DRAIN VALVE

Valve V1 is automatic valve (i.e Foam Concentrate Control Valve – Model H), as optional, when automatic operation is required. Refer Chapter 9 & Table- IV for setting/operation of this valve.

NOTE:

1. V1 is manual Ball Valve supply with UL Listed tank.
2. For non-aproved system, Model H is supplied as optional for automatic operation.
3. For FM Approved system, Model CV is supplied as standard supply and is for automatic operation

3.3. SHELL WATER FILL PROCEDURE (REF FIG.-6 OR FIG.-7)

- Connect valve V3 to water line.
- Open valve V4
- Allow the water to enter tank , pressure not exceeding 1.5 KG/SQCM (25 PSI) by opening the valve V3 till you get water flow from valve V4.
- Close valve V3 and V4
- Now set the valve position as given in Table I

3.4. SUBSEQUENT REFILLING OF THE BLADDER TANK WITH FOAM CONCENTRATE.

3.4.1 Fill cup procedure.

This is to be followed when 5 %-10% of foam is discharged from tank.

(Ref Fig.-6 OR Fig.-7)

- Attach a funnel to the valve V5
- Open valve V4
- Open valve V3 and drain water from tank.
- Open valve V7 and observe the level.
- Add foam concentrate via the funnel till the level is attained.
- Close valve V7, drain the sight glass tube by opening the valve V8
- Carry out shell water fill procedure. 3.3
- Set the valve position as shown in the TABLE-I

3.4.2 Refilling if less than 30% of foam concentrate is discharged.

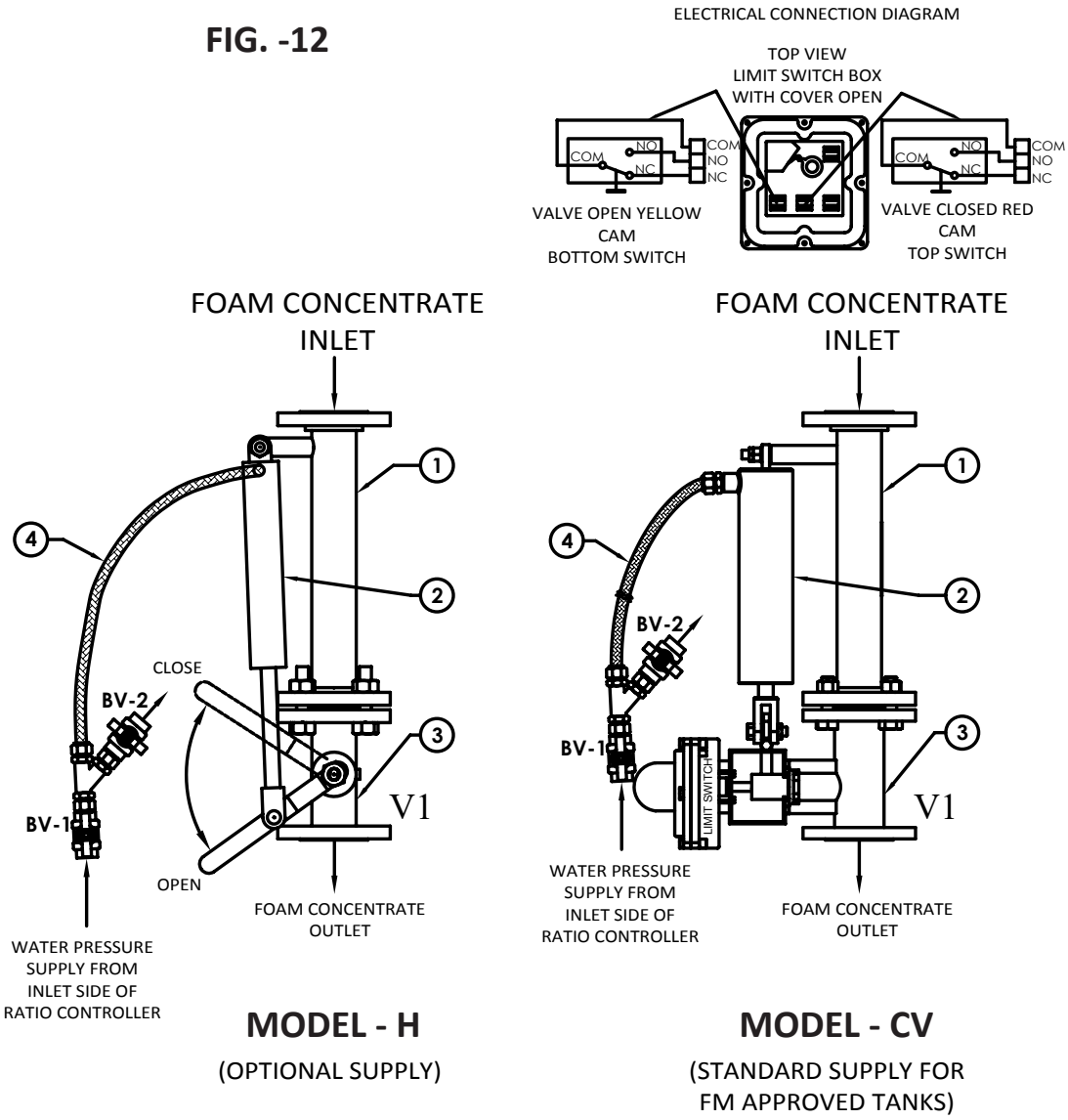
- Concentrate level is ascertained as per procedure 3.2 STEP 4
- Connect concentrate filling pump to valve V6.
- Continue to fill till the tank is full. i.e. the foam concentrate attains level mark (marked in the 3.2 STEP 4) on the indicator.
- Close valve V6
- Carry out shell water fill procedure. 3.3
- Set the valve position as shown in the TABLE-I

3.4.3. Refilling if more than 30 percent of foam concentrate is discharged.

- Concentrate level is ascertained as per procedure 3.2 Step-4
- Carry out :
- Water filling as per 3.2. Step–1, with the exception of valve V6 which is to be kept closed to prevent draining of foam concentrate from tank.
- Air filling procedure as per 3.2. Step–2
- Concentrate filling procedure as per 3.2. Step–3
- Checking of foam concentrate level as per 3.2 Step–4
- Placing the bladder tank in to service as pert 3.2 Step–5

3.5 OPERATION OF FOAM CONCENTRATE CONTROL VALVE (MODEL-CV & MODEL-H)

FIG. -12



SR.NO.	DESCRIPTION	MATL. SPECIFICATION
1	BODY	STAINLESS STEEL 304
2	CYLENDER	STAINLESS STEEL 304
3	VALVE	STAINLESS STEEL 304
4	HOSE	TEFLON HOSE WITH SS, BRAIDED

⚠ **WARNING:** Filling procedure should be followed strictly. Incorrect filling procedure can damage the internal bladder and will void the warranty.

NOTE :

1. Avoid long-term storage of foam concentate above the minimum recomended temperature.
2. Never mix different foam concentrate in the storage tank.
3. Never dilute foam concentrate with water.
4. Model H is not approved with UL Listed or FM Approved Tank and is optional supply.
5. Model CV is standard supply for FM Approved Bladder Tank.

CHAPTER 4 - FOAM CONCENTRATE LEVEL CHECKING PROCEDURE

⚠ **CAUTION :** Drain all water and relieve all pressure from tank before operating any valves or sight gauge. Do not put your face or stand in front of valve outlets or rear sight gauge tube while operation. Failure to comply may result in personal injury or damage to sight gauge.

NOTE: Make sure all valves are in their normal stand-by position as per Table-I & Table-II.

The following is procedure for tanks provided with sight gauge for measuring level:

- Open Valve V5, V4
- Open Valve V3, completely drain the water from the tank.
- Open V7, the foam will rise in the sight glass.
- After the lever is verified, MARK THE LEVEL. The marking of the level will help in future for identifying and determining the quantity of the foam concentrate and consumption. Close valve V7 and drain the foam concentrate from the sight glass by opening Valve V8.
- Close valve V8.
- Valve V8 is provided with plug to avoid accidental flow of foam concentrate. The plug need to be removed for drain & refixed.

NOTE: After level check, follow shell water fill procedure, close all the valves and check for their standby mode to put the system back in operation.

⚠ **CAUTION :** AR-AFFF Alcohol type from concentrate level measurement may not give accurate indication in sight glass, therefore monitoring through Vent Valve V5 is essential as given in following procedure. Sometimes it may be necessary to remove and clean the sight glass. The level checking may take long time.

⚠ **WARNING :** Filling procedure should be followed strictly. Incorrect filling procedure can damage the internal bladder and will void the warranty.

CHAPTER 5 - OPERATING PROCEDURE

A. MANUAL OPERATING SYSTEM (Non-Automatic)

1. Open required system valve in the required hazard area.
2. open slowly the water flow valve of Ratio Flow Proportioner.
3. Open the foam concentrate supply valve if required ratio flow proportioner.

B. AUTOMATED SYSTEM:

In automated system, following sequence will start automatically.

1. Foam discharge valve(s) to the discharge device(s) in required hazard area(s) will open.
2. Water flow through ratio proportioner will start.
3. The appropriate concentrate control valve for required hazard area(s) will open.

NOTE:

1. If the system is in combination of auto & manual (manual valve for supply of concentrate) then person should operate manual valve in above sequence.
2. In case of Bladder Tank with multiple Ratio Controllers, only two Ratio Controllers to be operated at a time.

CHAPTER 6 - INSPECTION AND MAINTENANCE

6.1 GENERAL

A qualified and trained person must commission the system . After a few initial successful test, an authorized person must be trained to perform the inspection and testing of the system.

The system should be fully tested at least once a year or in accordance with applicable NFPA code or in accordance to the guidelines of the organization having local jurisdiction.

Do not turn off the system or any other valve to repair or test the system without placing a roving fire patrol in the area covered by the system. The patrol should continue until the system is put back in service . Also inform the local security guard and the control alarm station, so that a false alarm is not signaled.

⚠ **WARNING:** Do not weld on the tank as it may damage the bladder and tank.

⚠ **WARNING:** Remove pressure before inspection and maintenance of the system.

⚠ **WARNING:** Sight glass is not pressure tight so before checking foam concentrate level reading tank pressure must be released.

⚠ **WARNING:** During hydro testing of the system piping isolate the piping connection to the tank to prevent the tank from being pressurized.

⚠ **WARNING:** The equipment is to be installed as per the manual provided by HD FIRE and in accordance to the guidelines of the local authority having jurisdiction. Site handling and installation control is beyond our reach; hence we give no guarantee for results and take no liability for damages, loss or penalties whatsoever resulting from our suggestion, information, recommendation or damage due to our product.

NOTE:

The foam bladder tank proportioning system is recommended to be kept in fully charged with foam concentrate and operational condition. Immediately after trials or use in actual fire condition, the bladder tank system must be refilled or topped up so that it is ready to be used again and foam supply is adequate for the desired duration for fighting fire as per the calculated system data for which the system is designed.

The owner is solely responsible for maintaining the Bladder tank proportioning system and device in proper operating condition.

RECOMMENDED INSPECTION & MAINTENANCE SCHEDULE Table - II

Sr No.	Description	Start up	After Opera-tion	Weekly	Monthly	Semi-annual	Annual	Other
1	Check all valves to insure that they are in the normal stand-by position. Refer Table-I.		✓	✓				After all main. procedures
2	Inspect system for physical damage and repair.		✓		✓			
3	Check the complete system, all valves, fittings & connections for leakage.		✓	✓			✓	
4	Perform normal maintenance and inspection of the fire water supply system to insure that it will be operational when required.			✓				
5	Perform the After installation Test as prescribed in Chapter2, Sec. 2-7 of this manual.	✓						
6	Perform the annual system test as prescribed in Chapter5, Sec. 5-3 of this manual.						✓	
7	Flush proportioning system. See flushing instructions Sec. 4-2.A. Shutdown of System (Manual Operation) or Sec. 4-3. Automatic System Flushing.		✓					
8	Operation of automated valve(s) can be done manually or by control system.				✓			After maintenance to piping
9	Operate manual valves to insure freedom of movement.				✓			
10	Check flange bolts for tightness.	✓				✓		
11	Check system for any external damage to the paint surfaces.		✓			✓		
12	The bladder tank shall be drained of foam concentrate. Thoroughly clean the inside of the tank. Scrap any rust or sediment which may be present. If necessary, scrub with a detergent solution. Thoroughly flush with clean water. (Foam concentrate shall be permitted to be salvaged and reused. If concentrate is to be reused, before returning it to tank, make sure to run it through a strainer or screen to remove any solid particles present.							Every Ten (10) years (As per NFPA)
13	Inspect for internal and external corrosion while the bladder tank is drained of foam concentrate. After verifying that the tank and components are suitable for return to service, fill the tank with clean water and hydrostatically test the pressure vessel to specified working pressure							Every Ten (10) years (As per NFPA)
14	Strainers Total System: Remove screens, check, clean and reinstall.		✓					
15	Water Powered concentrate Control Valve -Make sure that the water pressure supply valve is open.		✓		✓			
16	Paint						✓	

NOTE:

1. The inspection & maintenance recommendations are based on normal operating condition. The additional inspection & maintenance procedure may be required or frequency may be increased depending on site condition and as per authority having jurisdiction.
2. Refer the bladder replacement procedure, if bladder found punchured or damaged.

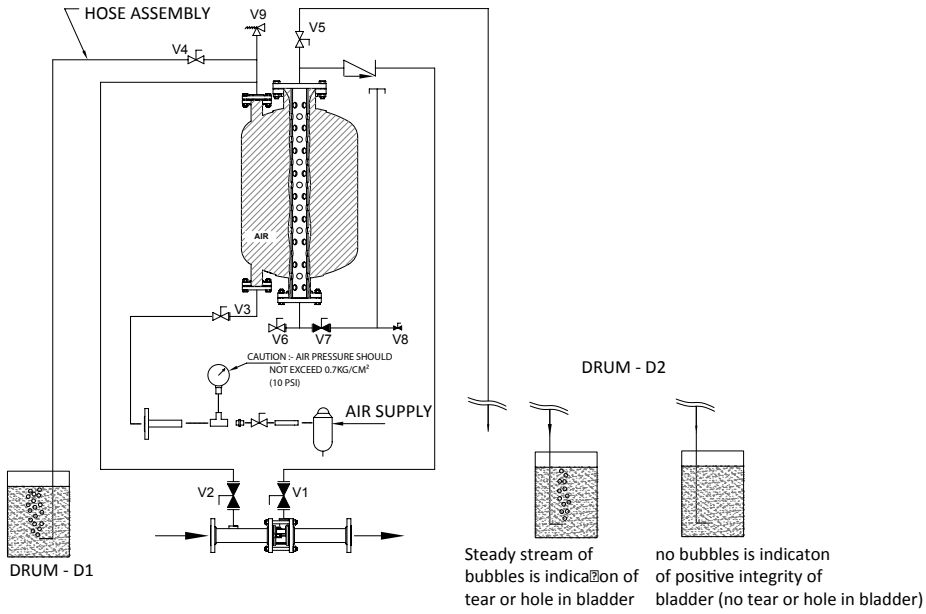
Step 1 : Removal of Foam Concentrate from the tank

- Isolate the tank from the system by closing valve V1 and V2. Ensure V6 and V7 are closed.
- By opening the valve V4 release residual pressure (if any) of the tank.
- Open valve V4 and V5
- Drain the water from tank by opening the valve V3
- Remove the foam concentrate from the tank by opening the valve V6. Collect and store the foam concentrate in the clean dust free container for refilling.

Step 2 : Air filling

- Connect air supply kit to the valve V3 as shown in the drg. Close V3
- Connect hose to valve V4 and dip it in the drum D1 filled with water.
- Connect the hose to valve V5 and dip it into another drum D2 filled with water.
- Start filling the air by opening the valve V3 to compress the bladder and crack open the valve V4. The air used to compress will start escaping from V4 in form as bubbles in the Drum D1. And the air in the bladder will escape in from bubbles in drum D2.
- As the bladder is being compressed the air in the tank ,the rate of bubbles in drum D2 will slow down while the rate of bubbles in the drum D1 will increase.
- When the bladder is fully collapsed and the tank shell is completely filled with air, the rate of bubbles in the drum D1 will be in steady state. At this point the bubbles in drum D2 should completely stop.
- If no air bubbles are noted in drum D2, then it is indication of bladder is free from any holes or tears i.e. positive integrity. Follow foam con filling procedure described earlier.
- If steady stream of bubbles are noted in the Drum D2. then it is indication of tear or hole in bladder. Contact HD FIRE sales for replacement of bladder.

FIG.-13



CHAPTER 8 - TROUBLE SHOOTING TABLE III

	POSSIBLE CAUSE	CORRECTIVE ACTION
7.1	**Improper or no foam induction:**	
1	Check the level of the foam concentrate.	If insufficient level, then refill the concentrate & restart.
2	The Foam Concentrate Supply Valve may be closed or partially closed.	Check valve position & open the Foam Concentrate Control Valve fully.
3	The water supply valve may be closed or partly open.	Check valve position and open the water supply valve fully.
4	Swing Check Valve may not be or partially open.	Check the valve for clapper movement, it may be struck. Clean the internals.
5	Concentrate Control Valve if installed then may not be opening. (Water powered Ball Valve).	Check the water flow to the valve and lever movement. If valve does not open using manual override, then valve is jammed. Remove valve, repair or replace.
6	Valves not in proper stand by position.	Place valves in normal condition as marked on each valve or refer table I & II.
7	Insufficient water supply due to blockage in water supply to Ratio Proportioner.	Determine blockage location and remove blockage.
8	Inadequate quality of foam.	The water flow/pressure to Ratio Proportioner, the system may be operating below minimum proportioning inlet pressure or flow demand. Refer Ratio Proportioner flow/ pressure range.

CHAPTER 9 - OPERATION OF FOAM CONCENTRATE CONTROL VALVE (WATER POWERED BALL VALVE)

8.1 AUTOMATIC OPERATION OF VALVE

1. Opening of the Valve

The concentrate control valve operates on water pressure. The water pressure is sensed through the valve BV-1. When the water pressure reaches above 2.1 kg/sqcm the cylinder forces the ball valve to open automatically.

2. Closing of the Valve

Closing of the valve is manual. To close the valve manually, first close the valve BV-1., the trapped water which is under pressure in the cylinder is to be relieved by opening the valve BV-2. Now close the ball valve through the valve handle.

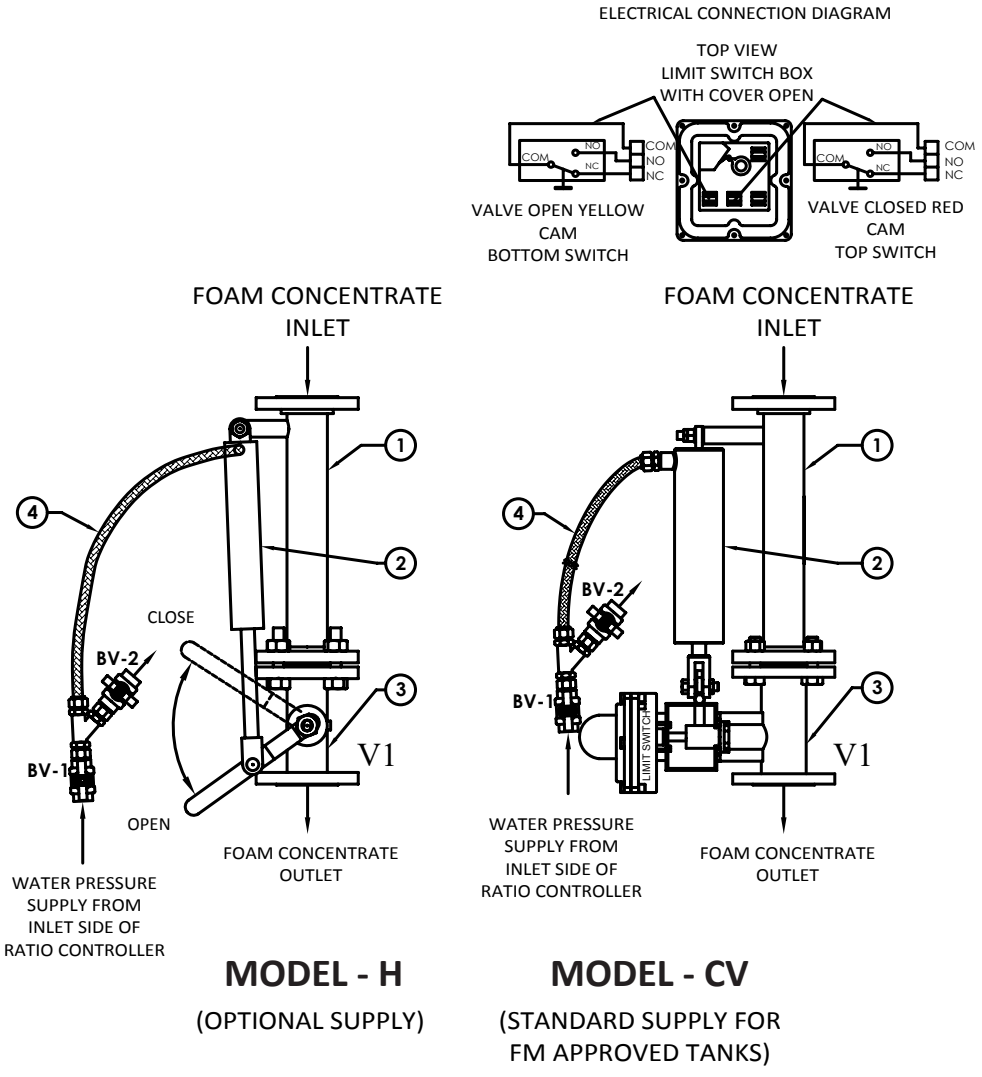
⚠ **CAUTION-** Do not stand in line of the ball valve BV-2. (The jet may cause injury)

3. Manual operation of the Valve.

Keep valve BV-1 closed so that the system pressure is isolated and keep valve BV-2 in open condition. Now the vale can be opened and closed manually through the handle on the ball valve.

TABLE IV (Valve positions on Concentrate Control Valve)

Type of Operation	Position of valve V1	Position of valve BV-1	Position of valve BV-2
Automatic	Close	Open	Close
Manual	Close	Close	Open



MODEL - H

(OPTIONAL SUPPLY)

MODEL - CV

(STANDARD SUPPLY FOR FM APPROVED TANKS)

SR.NO.	DESCRIPTION	MATL. SPECIFICATION
1	BODY	STAINLESS STEEL 304
2	CYLENDER	STAINLESS STEEL 304
3	VALVE	STAINLESS STEEL 304
4	HOSE	TEFLON HOSE WITH SS, BRAIDED

NOTE:

1. Model-H is not approved for UL Listed or FM Approved tank and is optional supply.
2. Model-CV is standard supply for FM Approved Bladder Tanks. Refer product catalogue HD194 for electric connection.This valve is always for automatic operation only.

LIMITED WARRANTY

HD FIRE PROTECT PVT. LTD. hereby referred to as HD FIRE warrants to the original purchaser of the fire protection products manufactured by HD FIRE and to any other person to whom such equipment is transferred, that such products will be free from defect in material and workmanship under normal use and care, for two (2) years from the date of shipment by HD FIRE. Products or Components supplied or used by HD FIRE, but manufactured by others, are warranted only to the extent of the manufacturer's warranty. No warranty is given for product or components which have been subject to misuse, improper installation, corrosion, unauthorized repair, alteration or un-maintained. HD FIRE shall not be responsible for system design errors or improper installation or inaccurate or incomplete information supplied by buyer or buyer's representatives. HD FIRE will repair or replace defective material free of charge, which is returned to our factory, transportation charge prepaid, provided after our inspection the material is found to have been defective at the time of initial shipment from our works. HD FIRE shall not be liable for any incidental or consequential loss, damage or expense arising directly or indirectly from the use of the product including damages for injury to person, damages to property and penalties resulting from any products and components manufactured by HD FIRE. HD FIRE shall not be liable for any damages or labour charges or expense in making repair or adjustment to the product. HD FIRE shall not be liable for any damages or charges sustained in the adaptation or use of its engineering data & services. In no event shall HD Fire's product liability exceed an amount equal to the sale price. The foregoing warranty is exclusive and in lieu of all other warranties and representation whether expressed, implied, oral or written, including but not limited to, any implied warranties or merchantability or fitness for a particular purpose. All such other warranties and representations are hereby cancelled.

NOTICE :

The equipment presented in this bulletin is to be installed in accordance with the latest publication standards of NFPA or other similar organisations and also with the provision of government codes or ordinances wherever applicable. The information provided by us is to the best of our knowledge and belief, and consist of general guidelines only. Site handling and installation control is not in our scope. Hence we give no guarantee for result and take no liability for damages, loss or penalties whatsoever, resulting from our suggestion, information, recommendation or damages due to our product. Product development is a continuous programme of HD FIRE PROTECT PVT. LTD. and hence the right to modify any specification without prior notice is reserved with the company.