## IMPORTANT

WHEN WORKING AT HIGH LEVELS, ENSURE THAT ALL FALL PROTECTION PROCEDURES HAVE BEEN IMPLEMENTED.

Read through this manual before starting any installation. Any flow rates discussed are displayed in U.S. GPM.

NFPA 11 defines the following two types of outlets:

**TYPE I Discharge Outlet:** An approved discharge outlet that will conduct and deliver foam gently onto the liquid surface without submergence of the foam or agitation of the surface.

**TYPE II Discharge Outlet:** An approved discharge outlet that does not deliver foam gently onto the liquid surface but it is designed to lessen submergence of the foam and agitation of the surface.

Buckeye Foam Chambers and Buckeye Foam Makers are approved Type II Discharge Devices which are designed to lessen submergence of the foam and agitation of the flammable liquid surface.

They are suitable for use with all low expansion foam concentrates, i.e. Protein, Fluoroprotein, FFFP, AFFF and AR-AFFF.

## FOAM CHAMBERS

The Foam Chambers are typically used as part of a fixed or a semi-fixed surface application fire protection system on exterior fixed cone roof or on internal floating roof storage tanks.

When correctly installed, the foam chamber has a foam deflector mounted on the inside of the tank wall. When the system is activated, the expanded foam mass discharges from the foam chamber and flows against the deflector which diverts the expanded foam back against the inside wall of the tank.

There are two types of deflectors used in conjunction with foam chambers; the split deflector and the solid deflector.

The number of foam chambers required for any fixed or semi-fixed fire protection system is based on the diameter of the storage tank to be protected.

The following is in accordance with NFPA 11

Number of Foam Discharge Outlets required:

| Tank Diameter Feet | Meters | Minimum Number Of Discharge Outlets |
|---|---|---|
| Up to 80 | 24 | 1 |
| Over 80 to 120 | 24 to 36 | 2 |
| Over 120 to 140 | 36 to 42 | 3 |
| Over 140 to 160 | 42 to 48 | 4 |
| Over 160 to 180 | 48 to 54 | 5 |
| Over 180 to 200 | 54 to 60 | 6 |

For tanks over 200' Diameter (60 m.) it is suggested that for each 5,000 sq. ft. (465 sq. m) or part thereof of liquid surface, one additional discharge outlet be added.

Review the Buckeye Foam Chamber data sheet. This data sheet will supply all of the necessary information, to enable the size and flow rate of the chambers required to be selected.

The foam solution design application rate is to be at least 0.10 gpm/sq. ft. of flammable liquid surface area on tanks containing liquid hydrocarbons.

Storage tanks containing water-miscible/polar solvent type flammable or combustible liquids which are normally destructive to regular foams require the use of special AR-AFFF type foam solutions. In most cases, the recommended application rate will be higher than the 0.10 gpm/sq. ft. as used on tanks containing liquid hydrocarbons. Check with the engineering department at Buckeye for the recommended application rate.

The duration of discharge can vary from 30 minutes to 55 minutes.

This is dependent on the type of flammable liquid being contained in the storage tank.

## INSTALLATION

The Foam Chamber is normally mounted vertically on the cone roof storage tank wall shell just below the roof joint or approximately between 8" to 12" down from the roof joint to the center point of the foam chamber outlet.

The Buckeye Model FP 2.5 is mounted approximately 8" down from the roof joint through to the model FP 6.0 which is mounted approximately 12" down from the roof joint.

When the Foam Chamber is mounted correctly, the internal glass seal of the chamber will be just slightly higher in elevation than the roof joint on the storage tank.

The Foam Chamber inlet and outlet are standard flat faced flanges. Refer to the Foam Chamber data sheet for the correct size inlet and outlet flanges on the selected foam chamber.

If the storage tank is of new construction and the foam deflector can be installed from inside the tank, a solid deflector is normally used. This style deflector can either be bolted or welded to the inside wall of the storage tank so that the deflector covers the foam discharge port from the foam chamber. If bolted, the studs / bolts holding the solid deflector in place can be used for the mounting of the foam chamber onto the outside wall of the tank.

The split deflector is used where the installation of the foam chamber/deflector cannot be carried out from the inside of the storage tank. The split deflector allows for insertion of half of the deflector through the flange opening in the side wall of the tank and mounted to existing studs or the studs from a mounting pad that protrude through the tank wall into the tank. When attached to the tank, the second half of the split deflector can then be passed through the flange opening in the tank wall and bolted to the other half of the deflector. Once the split deflector is correctly mounted, covering the foam discharge port, the foam chamber can then be bolted onto the studs on the other side of the mounting pad or to existing studs that go through the tank wall and hold the split deflector in place.

## IMPORTANT

Ensure that after the installation of the foam chamber(s) and before placing them in service, the glass seal inside of the foam chamber is seated in place. This seal will prevent any vapors from escaping from inside the storage tank down through the foam chamber piping. In the event of an accidental overfill, the glass seal will prevent product from escaping down the foam chamber piping.

When there are two or more foam chambers mounted on a storage tank, they are to be equally spaced around the tank periphery and each foam chamber outlet should be sized to deliver foam solution at approximately the same application rate.

Each individual foam chamber is to have its own individually valved lateral riser feed pipe that terminates at a safe distance from the tank and outside of any dike area.

Refer to the latest edition of NFPA 11, Standard for Low Expansion Foam and Combined Agent Systems, for information concerning the pipework design.

At the inlet to the foam chamber, an orifice is sized to be able to pass the necessary required flow rate in gpm at the residual foam solution pressure that is available at the chamber inlet. A minimum of 40 psi through to a maximum of 125 psi must be available at the inlet flange into the foam chamber for this discharge device to work correctly.

To be in accordance with NFPA 11, supplementary fire protection must also be supplied. This is in addition to any fixed system that is installed on the storage tank(s). The supplementary protection can either be portable monitors, towers or hand hose line devices. When handline application devices are used, they must have a minimum foam solution flow rate of 50 gpm. The number of handlines required is dependent on the diameter of the storage tank being protected.

| Diameter of Largest Tank | Number of Handlines Required |
|---|---|
| Up to 65 ft. | 1 |
| 65 ft. to 120 ft. | 2 |
| Over 120 ft. | 3 |

| Duration of Discharge of Handline(s) | Diameter of Largest Tank |
|---|---|
| 10 min. | Up to 35 ft. |
| 20 min. | 35 ft. to 95 ft. |
| 30 min. | Over 95 ft. |

## MAINTENANCE

Buckeye Foam Chambers have been designed and manufactured to give many years of problem free service. However, like any item of emergency equipment, it is recommended that the following maintenance procedures be carried out on an annual basis.

## FOAM CHAMBERS

Remove the foam chamber lid.

- Check that the glass seal is intact.
- Check the inside of the chamber foam expansion area for any debris or bird nests that could degrade the foam quality or performance.
- Remove the glass seal and look down the main inlet pipe of the chamber to make sure that the pipe is free from any foreign objects.
- Check the screen around the air inlet ports and make sure that it is still in place and intact.
- Inspect the complete foam chamber to ensure no corrosion that could effect the performance of the chamber in an emergency.
- Check to see that the glass seal is correct and scored on one side to the correct depth. (Buckeye can supply spare glass seals.)
- If possible, block off the discharge from the chamber into the storage tank and flow test the chamber(s) to ensure the system will work as designed. After the foam solution has been discharged, flush the system with water.
- Replace the glass seal in the chamber with the scored side of the seal facing UP.

Replace the lid on top of the chamber.

## FOAM MAKERS

Buckeye Foam Makers can be used in fixed or semi-fixed foam fire protection systems. They are designed to supply foam to the annular ring area between the foam dam and the tank wall on Open-Top Floating Roof storage tanks. Foam makers are also used to protect against a spill fire by supplying foam to diked areas where flammable liquids are stored or processed.

When used with Open-Top Floating Roof storage tanks and used for the application of foam to the top of the floating roof seal, the number of foam makers required is determined by the circumference of the tank that is to be protected. When using a 12" high foam dam on the floating roof, a maximum spacing of 40 feet between the discharge outlets of the foam makers is allowed. If a 24" high foam dam is being used, a maximum spacing of up to 80 feet is allowed between any discharge point. A minimum application rate of 0.30 gpm / sq. ft. is to apply with the necessary foam concentrate available to supply the system with a minimum discharge duration of 20 minutes.

When mounted on a storage tank or used in a dike protection system, the foam maker can be mounted in either a horizontal or vertical position without any detrimental effect on foam performance.

When using the foam makers for a dike fire protection system, the foam makers should be installed on the outside wall of the dike. A maximum recommended distance between each foam maker is 30 feet, when the flow from each foam maker is 60 gpm or less. The spacing may be increased up to 60 feet when the flow rate is above 60 gpm.

If using the Buckeye Model BFFM 1.5 Foam Maker for a dike fire protection system, a length of 3 inch diameter pipe must be connected to the foam maker outlet (down stream side). A minimum length of 28 inches is suggested with a maximum length of 100 inches being used. This length of discharge pipe allows for the correct foam expansion to take place and slows the discharging velocity. When using the Model BFFM 2.5 Foam Maker a length of 4 inch pipe should be connected to the discharge side of the maker. This length of pipe should be a minimum of 28 inches and a maximum length of 120 inches. The discharge pipe in both instances should be directed back against the inside wall of the dike. This will allow a more gentle application to any flammable liquid within the dike and lessen submergence of the foam.

When Foam Makers are used with a fire protection system on an open-top floating roof tank, they should be mounted above the top of the tank. A splash board is installed to which the foam maker(s) is/are attached. The correct size discharge pipe from the maker should be installed as per the dike protection system above. This pipe should be installed so that the discharging foam is diverted against the splash board, not directly into the seal area. This will allow a gentle application of the foam to the seal area.

It is recommended that when installing a foam maker, a minimum 12 inch length of straight pipe be installed upstream from the foam maker.

## MAINTENANCE

Buckeye designed and manufactured Foam Makers are built to give many years of problem free service. However, like any item of emergency equipment, it is recommended that the following maintenance procedures be carried out on an annual basis.

- Inspect all piping and the foam maker(s) to ensure that the system is intact as designed with no visible signs of corrosion.

As there is no internal seal used with foam makers, it is most important that the system be flushed with water on a minimum 3 month basis to ensure that no bird nests or any other foreign objects are inside the piping system that could affect the proper operation of the system.