



# FOAM PROPORTIONING EQUIPMENT

## BLADDER TANK SYSTEM DESIGN INFORMATION

### IMPORTANT

Read through this complete manual prior to starting any installation.

The Buckeye Bladder Tank is one component in a balanced pressure foam proportioning fire protection system. It requires no external power other than water pressure to ensure correct operation. The bladder tanks are designed and constructed in accordance with the latest revisions to ASME Code, section VIII for unfired pressure vessels with a working pressure of 175 psi and are tested to one and one half times this pressure.

### INSTALLATION

Upon receipt of the Buckeye bladder tank and before installation, check completely around the tank, trim valves and piping for any damage that may have occurred during shipment.

When installing a vertical bladder tank, consider the possibility that in the future, the bladder or PVC center tube may require removal. Remember that it requires access from above the tank in order to remove the piping and the bladder. If possible, it should be installed in an area that is at least twice as high as the tank or a roof hatch should be installed above the tank.

When installing a horizontal style bladder tank, it also requires vertical clearance as well as a clear area at one end, which should be at least twice as long as the tank. Access through double doors is acceptable.

Locate the tank in the desired position and anchor it to the floor. If it is difficult to leave a clear area around the tank, endeavor to have at least 3 feet clearance above and around the tank from the nearest wall or obstruction. This provides 'working space' around the tank for connecting the system pipe work to the tank.

### CAUTION

**Do not weld on the bladder tank shell. Welding temperatures may cause damage to the elastomeric rubber bladder inside the tank.**

### INFORMATION

Buckeye supplies only the equipment listed in the Buckeye quotation. All interconnecting piping, valves or fittings, not specifically mentioned, are not supplied.

Fig. 1 shows a typical piping arrangement utilizing a vertical bladder tank with one proportioning controller as well as all necessary valves and components.

### WARNING

Refer to the ASME label installed on the bladder tank for the recommended working pressure. As standard, Buckeye bladder tanks are ASME coded for 175 psi working pressure. Also check the label on the tank showing the tank capacity and type of foam concentrate to be used in the tank.

The Buckeye bladder tank does not come equipped with any pressure relief device. Buckeye does not supply this device because the water supply pressure, flow capacity and full system design details must be known before a pressure relief device is installed. It is the responsibility of either the owner or the Fire Protection Engineer designing the system to establish whether or not the relief device is required.

Fig. 2 shows a two bladder tank (one main, one reserve) system.

Fig. 2 illustrates the reserve tank manually isolated from the system. Once the primary tank has been expended it



can be manually isolated from the system and the reserve tank brought 'on-line' by opening the manual valves to/from the tank and closing the manual valves to/from the main tank. This gives continuous coverage by the foam projection system over the hazard area. The main tank can now be recharged with foam concentrate while it is isolated from the system.

It is possible to cover different risk areas using the same bladder tank. Fig. 3 & 3A depict a single vertical tank supplying three different risk areas through different proportioning controllers. In this type of open discharge device installation, it is normal that each area would have its own detection system.

### DESIGN NOTE

When designing the piping arrangement to the bladder tank, it is most important to have the foam concentrate pressure arrive at the proportioning controller within 2 psi of the incoming water pressure at the same proportioning controller. The combined total equivalent length of pipe, fittings and valves in both the water supply inlet piping and the foam concentrate discharge piping must not exceed 50 equivalent feet (15.2 meters.) This will allow both pipes to be the same size as the foam liquid inlet to the proportioning controller. If the total equivalent length exceeds 50 feet (15.2 meters), call the engineering department at Buckeye for assistance.

When installing the water feed pipe to the bladder tank, ensure this water supply is installed into the system upstream from the proportioning controller.

In accordance with NFPA standards, a strainer is required in the foam concentrate line from the bladder tank to the proportioning controller. When the system is used with Buckeye manufactured foam concentrates, it is our opinion that this strainer is not necessary or desirable due to the increased friction loss.

### DESIGN NOTE

There is virtually no friction loss incurred within the bladder tank itself as the foam concentrate is pushed out of the bladder into the concentrate piping.

### DESIGN NOTE

When using Buckeye standard 1%, 3% or 6% AFFF concentrates, all hydraulic flow calculations are based on water flow rates through the pipe and fittings. Because of their high viscosity, when using the 3%-6% or the 3% type

of alcohol resistant AFFFs, hydraulic calculations for the piping from the bladder tank to the proportioning controller are very critical. Refer to the separate data sheet 'Friction Loss Data for Alcohol Resistant AFFF'.

When calculating the hydraulics of the foam fire protections system, refer to the two graphs on the proportioning controllers data sheet which refer to 'Friction Loss Curves' and 'Minimum Inlet Pressure Versus Flow'.

### DESIGN NOTE

#### Proportioning Controllers Information

Check the approved flow rate(s) of the controller(s) with the particular type of foam concentrate being used in the system.

REMEMBER, Alcohol Resistant AFFF type concentrates have higher low end approved flow rates than the proportioning controllers with the standard AFFF.

Install the proportioning controller(s) in the main distribution supply pipe that feeds the system.

**NOTE:** Refer to the proportioning controller data sheet regarding the length of straight pipe upstream and downstream from the controller.

This straight pipe minimizes the turbulence inside the controller which gives more accurate proportioning.

When installing the proportioning controller(s) higher in the system than the top of the bladder tank, **REMEMBER** to calculate for the friction loss due to head pressure from the bladder tank to the controller foam concentrate inlet.

When using a bladder tank with a proportioning controller(s) in a closed head foam fire protection system, a number of discharge sprinkler heads will have to open before the necessary flow rate is reached through the proportioning controller. This allows the correct proportioning of the foam concentrate into the water stream. At flow rates below the recommended approved rate, very lean or no proportioning of the foam concentrate into the water stream will take place. The size of the proportioning controller is the controlling factor. The larger the controller, the higher the low end flow rate. Subsequently, more heads must open before accurate proportioning is achieved. **REMEMBER**, if using the alcohol resistant AFFF type agents, the low end flow rate of the proportioning controller(s) is even higher.



## INSTALLATION INFORMATION

Once the tank has been located in the correct position and anchored to the floor, it can be piped into the system. On both the horizontal and the vertical style tanks, the water inlet into the tank is located approximately midway down the side of the tank. Unscrew the plug and connect the water supply piping.

## DESIGN NOTE

### Automatic Hydraulic Actuated Valve

This valve is used in the foam concentrate line to prevent foam concentrate from entering into the proportioning controller when the system is not in operation. When installed correctly, this valve will open automatically and allow the foam concentrate into the controller. The valve is normally in the closed position and is activated by water pressure. In normal installations when the system is activated, a small 1/4" or 3/8" ID copper tube feeds water to the hydraulic valve from the alarm side of either a deluge or an alarm valve.

For further information on this valve, refer to the data sheet 'Hydraulic Actuated Concentrate Control Valve'.

If an electric driven concentrate control valve is required, contact the engineering department at Buckeye for further information.

If supplying only one proportioning controller from the bladder tank and the foam system is of a 'Deluge' type system, an automatic normally closed concentrate control valve is not necessary on the foam concentrate line if the proportioning controller is installed higher in the system than the top of the bladder tank. If installed below the top of the tank, siphoning of the foam concentrate out of the tank may take place. In this instance, an automatic concentrate control valve should be installed.

If the foam system is of the 'Closed Head' type, it is recommended that a normally closed concentrate control valve be installed in the foam concentrate line going to the proportioning controller.

## DESIGN NOTE

It is suggested that a union or a grooved coupling be installed between the foam concentrate swing check valve and the inlet to the proportioning controller. This will facilitate servicing of the controller if necessary.

Fig. 3 shows one bladder tank supplying three different systems. The water supply to the tank is supplied from each system. The check valve on each water supply system is necessary as this will prevent water being back fed into a system that has not operated.

Fig. 4 shows a horizontal bladder tank piping arrangement supplying foam concentrate to one proportioning controller.

A hydraulic actuated valve is necessary because the proportioning controller is located below the top of the tank.

Fig. 5 depicts a four flange horizontal bladder tank piping arrangement supplying foam concentrate to one proportioning controller.

A hydraulic actuated valve is not required in this instance as the proportioning controller is located above the top of tank.

## DESIGN NOTE

The water supply feeding the bladder tank can be taken from a constant pressurized water supply source. It will not damage the bladder tank if left under constant pressure. The foam concentrate will be forced out of the tank but not into the proportioning controller because of the normally closed automatic valve. Even on a closed head system, after the piping grid work has been primed with foam solution, the automatic valve should be closed and left in the normally closed position. Upon system actuation, water from the alarm valve will pressurize the valve and cause it to open allowing the foam concentrate to flow into the controller.

## GENERAL INFORMATION

Piping Materials: Standard schedule 40 black steel or stainless steel pipe are suitable for use with Buckeye manufactured AFFF types of foam concentrates. Galvanized pipe is not suitable for use with AFFF concentrate.

AFFF's have a solvent included in their formulation which may dissolve standard pipe joint compound (pipe dope) normally used with plain water sprinkler systems. When installing a foam water fire protection system using AFFF concentrates, it is recommended where the concentrate or the solution is in contact with any pipe joints, that a quality Teflon<sup>®</sup> tape in accordance with MIL-T-27730 and a Teflon<sup>®</sup> based pipe joining compound be used on all threaded fittings.



**GENERAL INFORMATION**

If any AFFF concentrate spills on any painted surface, immediately wash the area with water. The solvents in the AFFF may cause streaking of a painted surface.

It is recommended that any area where a bladder tank is installed be heated to a minimum of 35°F. Freeze protected AFFFs are manufactured for storage in temperatures as low as -20°F; however, after a bladder tank system has been flow tested and drained, a small amount of water could still be left inside the tank around the bladder. If subjected to temperatures below 32°F, it could freeze and damage the bladder.

Before any testing of the foam system is initiated, isolate the bladder tank from the system by closing the manual ball valves and flush the rest of the system with water to remove any rocks or other foreign material that may be in the pipe work.

All isolation valves or check valves, shown on sketches in this information are recommended to be installed within the piping arrangements to or from the bladder tank.

