DIKE AND SPILL PROTECTION

DIKED AREA

Dikes are typically constructed around above ground storage tanks. They are contours of land or physical barriers that will retain fuel to a depth greater than 1".

At many manufacturing or storage facilities, the flammable liquid storage area can be a number of small tanks within a common diked area. These tanks are often surrounded by pipe rack arrangements and pumps. In instances like this, the total dike area and not the storage tanks could be considered the hazard to be protected by a suitable fixed foam fire protection system. This could be achieved by using:

- Low level fixed mounted foam makers.
- Monitors.
- Foam water spray nozzles or a foam sprinkler system over the hazard area.
- Supplementary support with portable foam application equipment should also be available.

See following chart for application rates.

For flammable liquids requiring AR-AFFF type foam concentrate, the discharge duration shall be 30 minutes with the application rate as recommended by Buckeye applications engineering department.

If the dike to be protected is located outdoors, additional considerations should be made during the design stage when using either a monitor or foam/water sprinkler system. Climatic conditions such as wind or rain, can affect the performance of these systems. It may be necessary to increase the application rate to compensate for the adverse conditions. If within the dike area there are many obstructions that could impede the performance of the overhead or monitor system, supplementary low level foam discharge devices may be required.

If an overhead foam/water sprinkler system is used it should be designed in accordance with NFPA 16 Installation of Foam-Water Sprinkler Systems. The application rate using AFFF on hydrocarbon fuels is 0.16 gpm per sq. ft.

On products that are water miscible/polar solvent, the application rate may increase. Contact the Applications Engineering Department at Buckeye for assistance and recommendations.

DIKE PROTECTION WITH FIXED MOUNTED LOW LEVEL FOAM MAKERS

When using fixed mounted foam makers as the primary protection system for a dike it shall be designed in accordance with the following. A foam solution supply pipe should be installed on the outside perimeter wall of the dike and at equally spaced intervals also mounted on the outside wall, foam makers are attached to the supply pipe. Both the Buckeye 1 1/2" (38mm) and the Buckeye 2 1/2" (63 mm) foam maker should have a minimum of 12" of straight pipe upstream from the foam maker inlet. The discharge pipe from each foam maker is designed to allow for an increase in foam expansion and decrease the velocity of the discharging foam which will then supply a low velocity mass of foam uniformly over the dike area.

On the discharge side of the Buckeye 1 1/2" (38 mm) foam maker, it is recommended that a length of 3" diameter pipe be connected to the foam maker outlet and used as the discharge pipe. This pipe should have a minimum length of 28" with a maximum of 100" and shaped to dis-charge the foam against the inside wall of the dike at approximately 12" above the maximum expected level of any flammable liquid spill. With the Buckeye 2 1/2" (63 mm) foam maker the recommended diameter of the dis-charge pipe is 4" with the minimum length being 28" and the maximum 120".

The maximum spacing between fixed mounted foam makers is 30 feet when the discharge rate from each foam maker is 60 gpm or less and no point within the dike area should be more than 30 feet from any discharge outlet. If the flow rate is above 60 gpm, the maximum distance between each foam maker around the dike perimeter can be increased to 60 feet and no point within the dike being more than 60 feet from any discharge outlet. Large dike areas are permitted to be subdivided to keep the total design solution within practical limits.

Fig. 11 shows a typical dike protection system using low level foam makers.

MONITOR PROTECTION

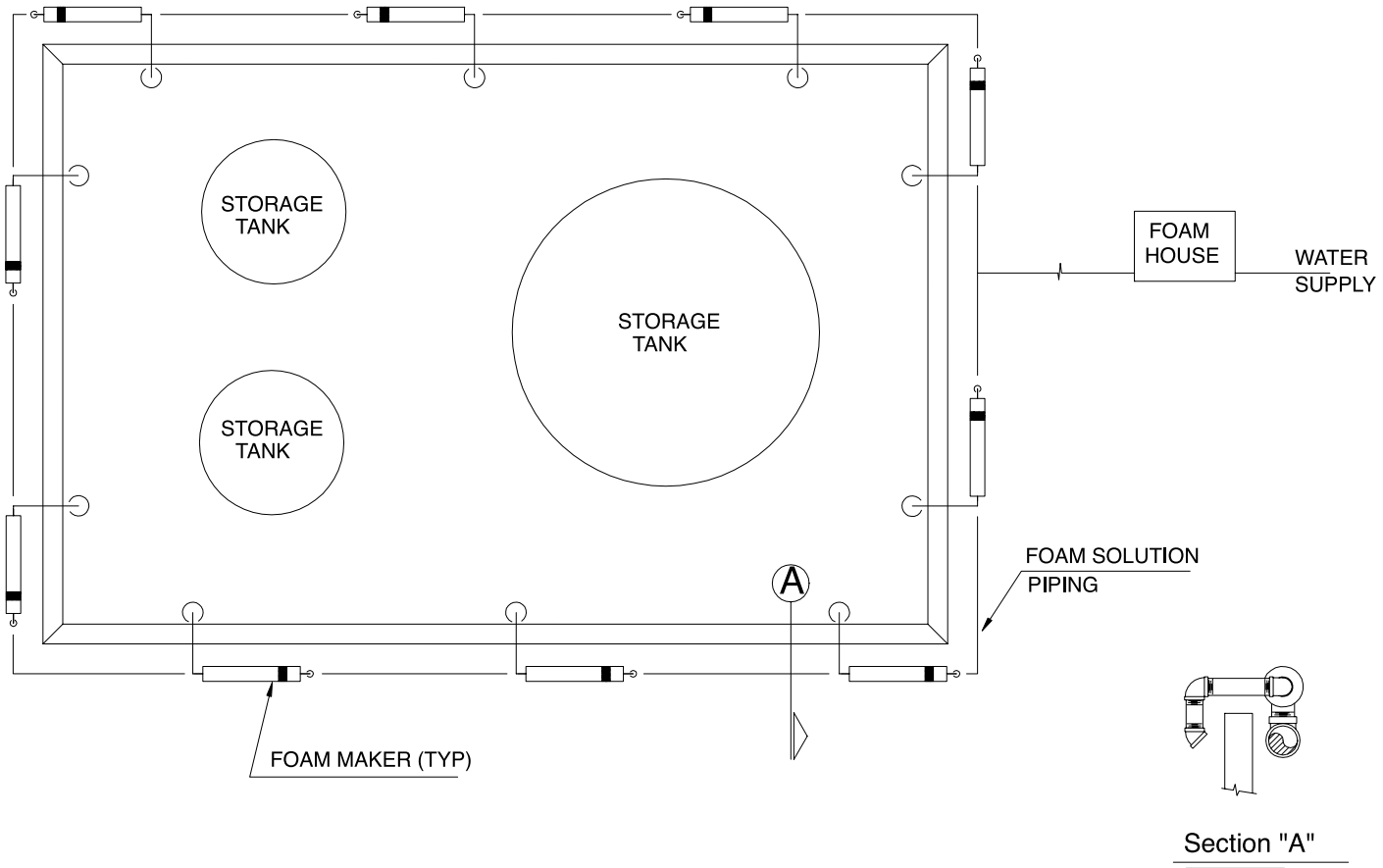
If foam monitors are used as the primary protection method, they should be located outside the dike area. If non air-aspirating type nozzles are used or the monitor has a high velocity discharging stream. It should be directed against the dike wall, tanks, or other structures within the dike to lessen the impact of the discharging foam stream on the fuel surface. Application rate and discharge duration shall be in accordance with the chart for fixed foam application discharge devices.

Fig. 12 shows a typical dike protection system using automatic oscillating monitors.
The minimum application time and discharge durations for fixed foam application discharge devices on a diked area involving hydrocarbons is per the following table.

Type of Foam Minimum Discharge Outlet	Application Rate		Minimum Discharge Time (min.)	
	gpm/ft²	[(L/min.)/m²]	Class I Hydrocarbon	CLASS II Hydrocarbon
Fixed low-level foam discharge outlets	0.10	(4.1)	30	20
Foam monitors	0.16	(6.5)	30	20

DIKE AND SPILL PROTECTION

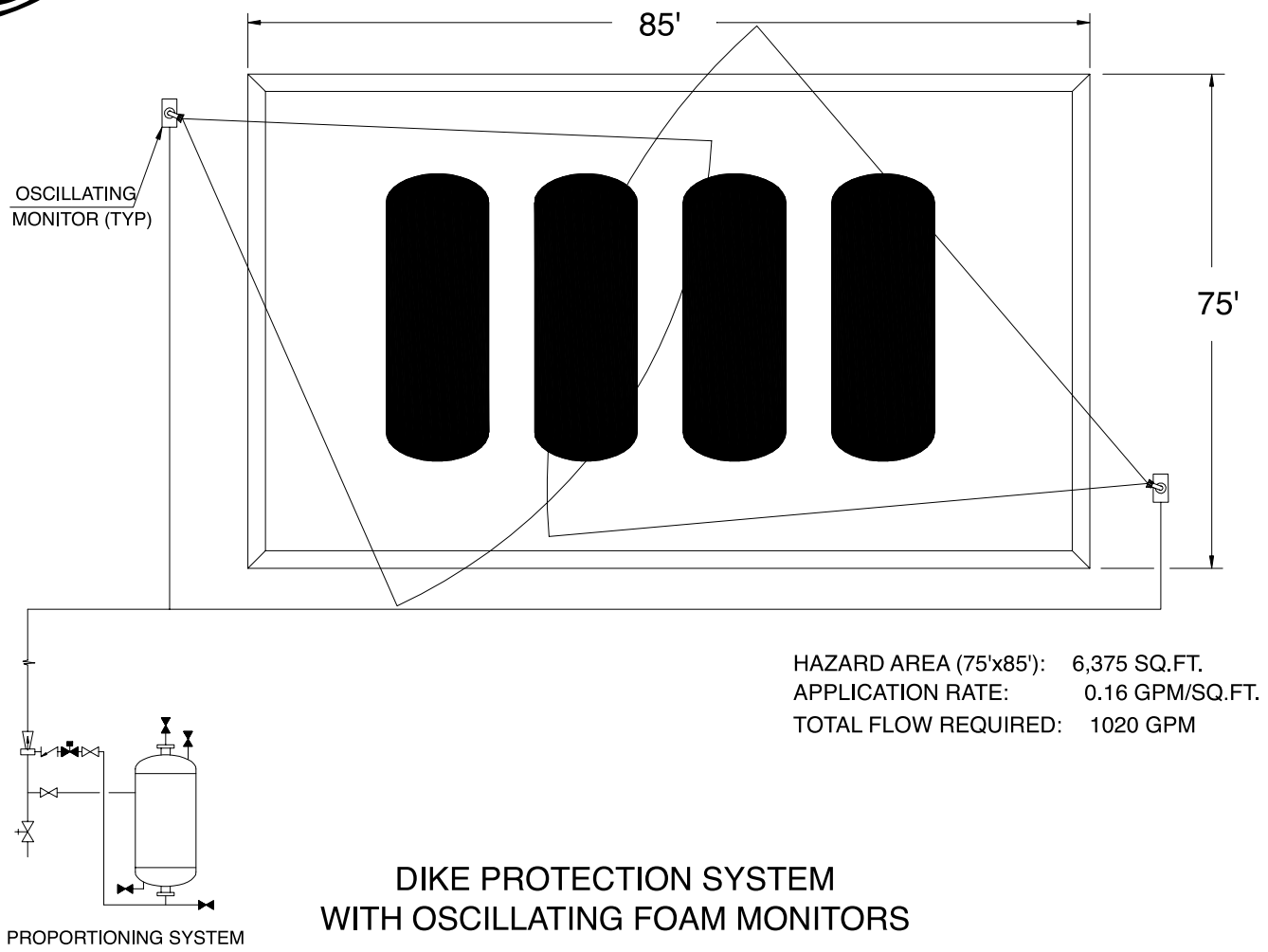
FIG - 11 DIKE PROTECTION



EXAMPLE OF DIKE PROTECTION SYSTEM
USING FOAM MAKERS

DIKE AND SPILL PROTECTION

FIG - 12 DIKE PROTECTION



HAZARD AREA (75'x85'): 6,375 SQ.FT.
APPLICATION RATE: 0.16 GPM/SQ.FT.
TOTAL FLOW REQUIRED: 1020 GPM

DIKE PROTECTION SYSTEM
WITH OSCILLATING FOAM MONITORS

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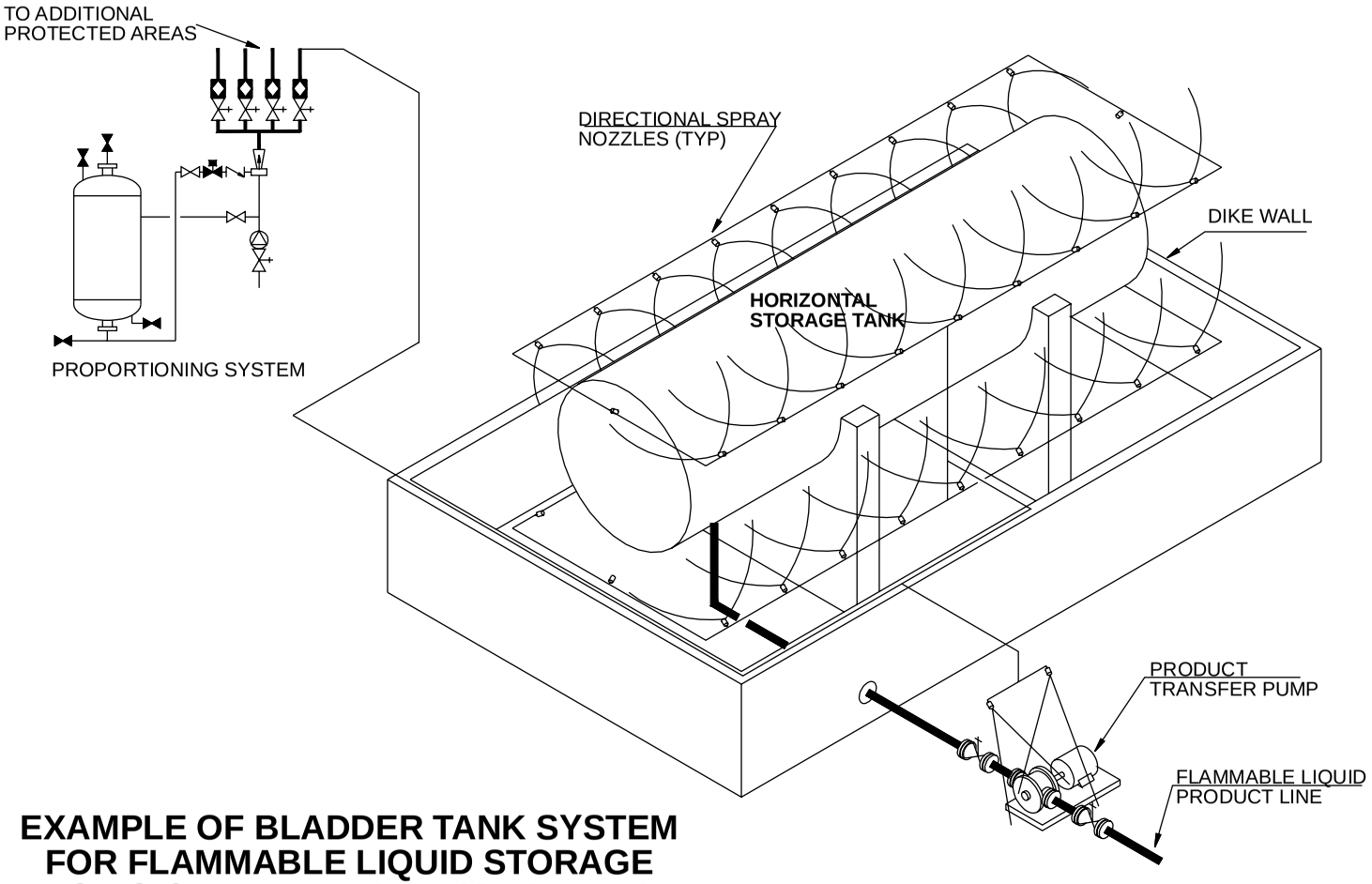
DIKE AND SPILL PROTECTION

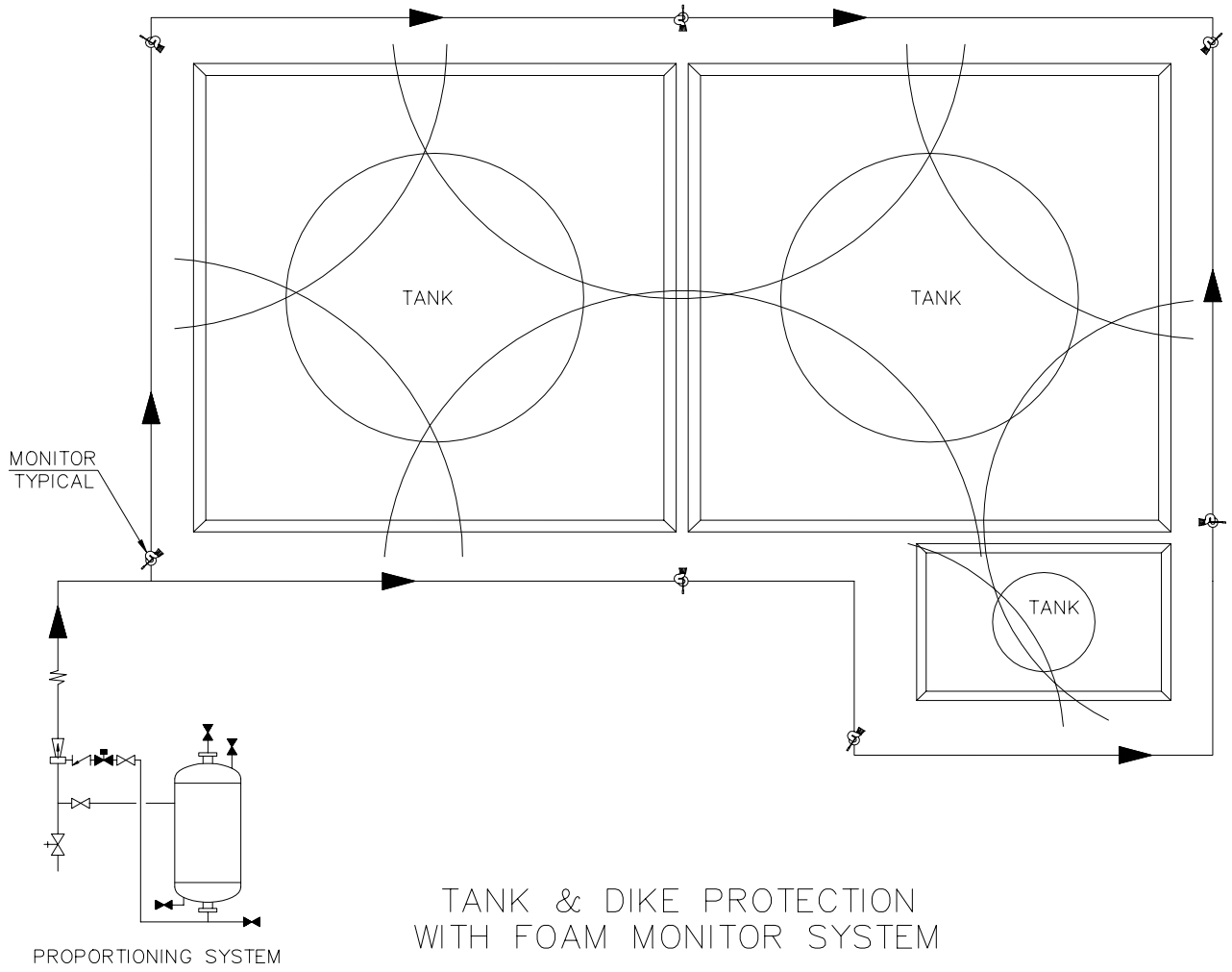
HORIZONTAL STORAGE TANK



EXAMPLE OF BLADDER TANK SYSTEM FOR FLAMMABLE LIQUID STORAGE USING OVERHEAD SPRAY NOZZLES

DIKE AND SPILL PROTECTION

TANK AND DIKE PROTECTION



TANK & DIKE PROTECTION
WITH FOAM MONITOR SYSTEM