



TRUCK AND RAIL LOADING SYSTEMS

TRUCK AND RAIL LOADING AND UNLOADING SYSTEMS

The loading or unloading of either over-the-road tank trucks or rail cars with flammable/combustible liquids is considered to be a very hazardous operation. In an effort to reduce the risk to lives and property, it is recommended that a quality fixed foam fire protection system be installed. Foam is generally regarded as the only agent that can prevent a spill of a flammable or combustible from being ignited.

This section of the manual details the requirements for foam fire protection systems only. Dry chemical systems may be used, but are discussed elsewhere.

There are two basic methods to protect loading/unloading areas with foam:

Foam water sprinklers mounted in the canopy covering the loading/unloading facility (normally a deluge system) with supplementary ground sweep directional nozzles if desired.

Foam monitor nozzles positioned to discharge foam directly into the loading/unloading area.

DESIGN INFORMATION

A truck loading rack is typically defined by a low profile dike or curb which surrounds the loading area and contains a spill of any flammable/combustible liquid. If there is no low profile curb or dike surrounding the loading facility, the area under the roof or canopy including any pumps, valves or other miscellaneous equipment, would normally be considered as the hazard to be protected. It is important to remember that in some cases, the roof or canopy above the loading area may not cover the complete area when a tank truck is parked in the loading facility. In this instance, the area of the truck and trailer must also be considered as part of the fire area. The Authority having Jurisdiction should clearly define the loading area to be protected by the foam system.

A rail tank car area can be considerably longer than a truck loading facility. It may not be covered by a canopy or have a low profile dike area surrounding the hazard.

The area to be covered would be the total area where the rail tank cars are parked and could be exposed to any potential fire or spill. The protected area should cover any pumps, meters or any other miscellaneous equipment that are associated with the loading or unloading of the flammable liquids.

If a foam water sprinkler system is installed to cover a loading/unloading facility it is to be designed in accordance with NFPA 11 and NFPA 16, with the spacing of the sprinkler heads in accordance with NFPA 13, Sprinkler Systems Extra Hazard Occupancy, 100 sq. feet for each sprinkler head.

The discharge duration for any foam water sprinkler system covering a loading/unloading Facility shall be a minimum of 10 min. at a minimum design application rate of 0.16 gpm per sq. ft. The Authority Having Jurisdiction (AHJ) may require higher application rates. Some water miscible/polar solvent products can also require higher application rates. Check with the Engineering Department at Buckeye for any recommendations and assistance.

In many facilities, supplementary low-level foam/water spray nozzles are installed. There are no current requirements in NFPA standards that mandate these nozzles. However, Buckeye does recommend them for installations where bottom loading of the truck takes place. In many instances tank trucks have aluminum storage tanks and to have a spill fire start underneath could cause the aluminum tank shell to weaken and fail. The nozzles are designed to discharge foam underneath the truck to give a rapid knock down of any fire.

The following is the typical design criteria for a two bay, bottom truck loading rack 50' x 85' bounded by a curb with a central island in the middle.

Total area of risk = 50 x 85 = 4,250 sq. ft.
Hydrocarbon fuels only.

Application rate = 0.16 x 4,250 = 680 gpm through the overhead sprinkler system.



4 x Supplementary low-level nozzles required. Two each side of the island.

Each 7/16" orifice with a K factor of 3.9 = 21.37 gpm @ 30 psi.

$4 \times 21.37 = 86 \text{ gpm}$
 $86 \times 10 \text{ min.} = 860 \text{ gallons}$
 $860 \times 9 = 7,660 \text{ gallons of foam solution.}$

$7,660 \times .03 \text{ (3\% AFFF)} = 230 \text{ gallons of foam concentrate.}$

TYPICAL EQUIPMENT LIST -

1 x 250 Gallon vertical style bladder tank.

1 x 4" Between flange style ratio controller.

4 x Foam water spray nozzles.

42 x Standard pendant sprinkler heads (Approximate flow per head:
 16.2 gpm.)

250 x Gallons of 3% AFFF. 230 gallons for system fill, 20 gallons for system test.

The following drawings show the clearly defined hazard area of a typical two bay truck loading facility with curbed area.

LOADING/UNLOADING FACILITIES PROTECTED BY MONITORS

Monitor protection systems should be designed to cover the complete surface area of the hazard and can be used to protect the pumps, meters or other miscellaneous equipment associated with the operation of the loading/unloading facility.

It is recommended that a minimum of two monitors be used to protect the hazard area. The location where the monitors are to be installed should be carefully considered. Many things affect the location such as: prevailing wind direction, traffic movement, any obstructions and the range of the selected monitors and nozzles.

Fig. 19 shows the minimum recommended application rates and discharge times for monitors when used to protect a loading/unloading facility.

If automatic oscillating monitors are used in lieu of fixed monitors, the discharging foam stream range will typically be reduced by approximately 10% when the monitor is oscillating at approximately 10 degrees per second.

* Non air-aspirating nozzles flowing AFFF have a greater stream reach than air-aspirating type nozzles.

The drawings depict typical examples of the fire protection systems for loading/unloading facilities.



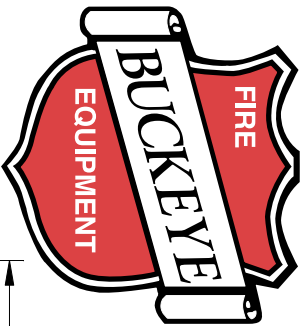
FIGURE 19

TABLE FROM NFPA 11

Foam Type	Minimum Application Rate		Minimum Discharge Time (min.)	Product Being Loaded
	gpm/ft ²	[(L/min.)/m ²]		
Protein Fluoroprotein	0.16	(6.5)	15	Hydrocarbons
AFFF, FFFP, & AR-AFFF	0.10*	(4.1)	15	Hydrocarbons
Alcohol resistant foam AR-AFFF	Consult Buckeye Engineering Department for recommendations on specific products		15	Flammable and combustible liquids requiring alcohol resistant foam

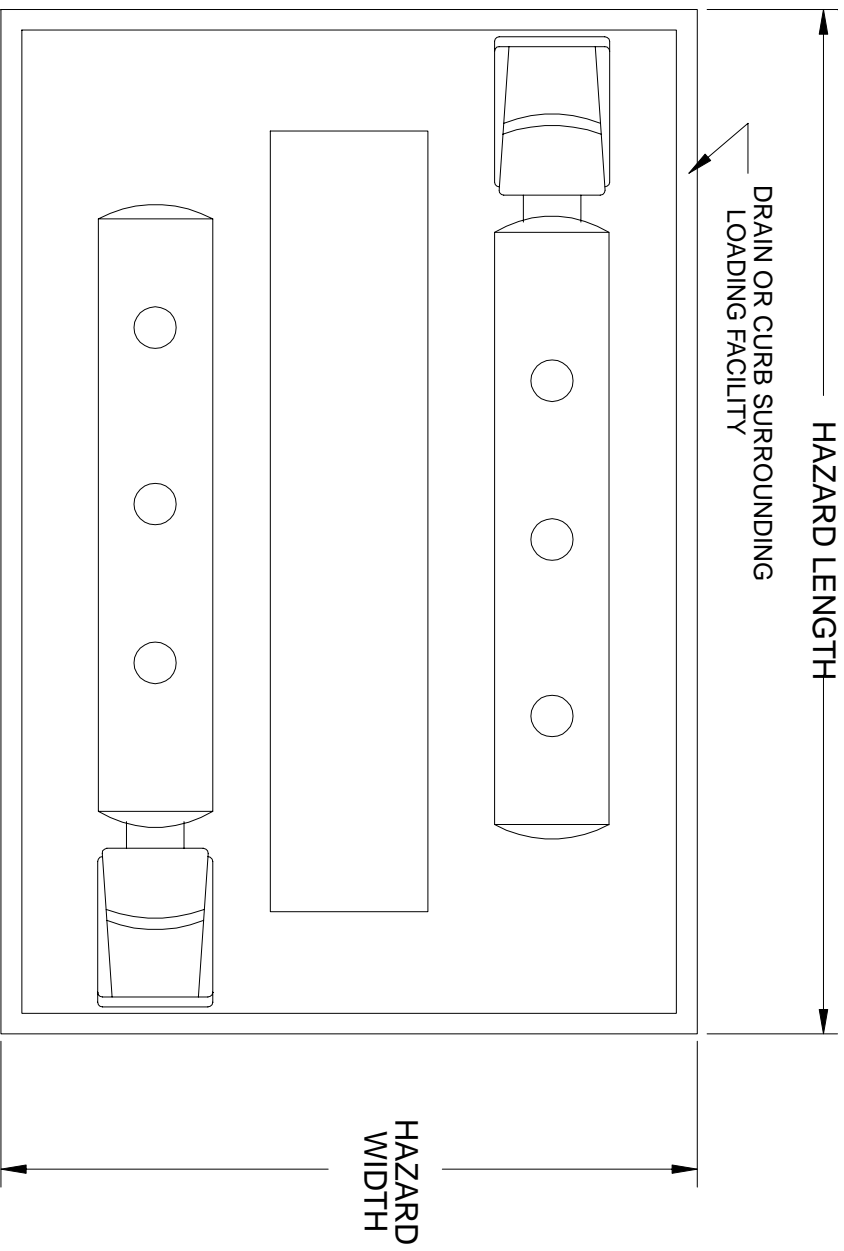
* If a fuel depth of more than 1 in. (2.5 cm) can accumulate within the protected area, the application rate shall be increased to 0.16 gpm/ft² [(6.5 L/min.)/m²]





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TRUCK LOADING RACK



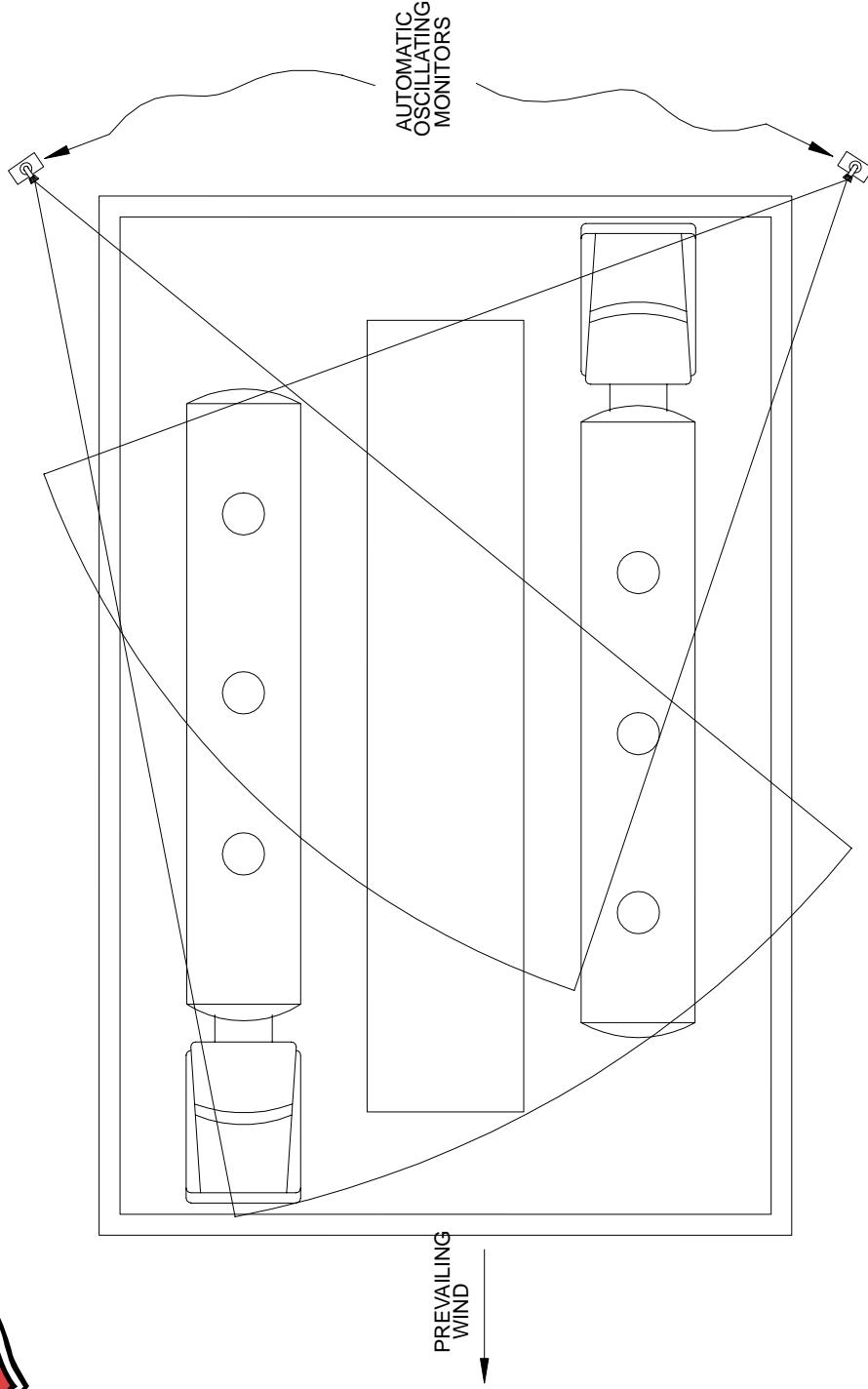
CLEARLY DEFINED HAZARD AREA OF
A TYPICAL TWO BAY TRUCK LOADING
FACILITY WITH CURB/DRAIN AREA





TRUCK AND RAIL LOADING SYSTEMS

TRUCK LOADING RACK



TYPICAL EXAMPLE OF TWO MONITORS
COVERING A TWO BAY TRUCK LOADING RACK

