

## STORAGE TANK PROTECTION SUMMARY

		Fixed-Roof (Cone) Tanks	Pontoon or Double-Deck Floating Roof Tanks
<b>Foam Outlets Under Floating Roof Tank Seals or Metal Secondary Seal</b>	Number Required	Not applicable.	Mechanical Shoe Seal. 1 - For each 130 ft. (39.6 m) of tank circumference (no foam dam required) Tube Seal - Over 6 in. (15.2 cm) from top of seal to top of pontoon with foam outlets under metal weather shield or secondary seal. 1 - For each 60 ft. (18.3 m) of tank circumference (no foam dam required) Tube Seal - Less than 6 in. (15.2 cm) from top of seal to top of pontoon with foam outlets under metal weather shield or secondary seal. 1 - For each 60 ft. (18.3 m) of tank circumference [foam dam at least 12 in. (30.5 cm) high required].
	Hydrocarbon Application Rates	Not Applicable.	0.30 gpm. (12.2 L/min.) per sq. ft. (sq. m) of annular ring area with foam dam or with foam application under metal weather seal or secondary seal. 0.50 gpm (20.4L/min.) per sq. ft.. (sq. m for all other applications).
	Discharge Times	Not Applicable.	20 min. - with foam dam or under metal weather shield or secondary seal.
	Polar Solvents	Not Applicable.	Not covered by NFPA 11.
<b>Foam Handlines and Monitors for Tank Protection</b>	Size of Tank	Monitors for tanks up to 60 ft. (18.3 m) in diameter. Hand hoselines for tanks less than 30 ft. (9.2 m) in diameter and less than 20 ft. (6.1 m) high.	Monitors not recommended.  Handlines are suitable for extinguishment of rim fires in open-top floating roof tanks.
	Hydrocarbon Application Rates	0.16 gpm/ft <sup>2</sup> [(6.5 L/min.)/(m <sup>2</sup> )]	0.16 gpm/ft <sup>2</sup> (6.5 L/min./m <sup>2</sup> ) For rim fires in open-top floating roof tanks.
	Discharge Times	Flash point below 100°F (37.8°C)      65 min. Flash point 100°F - 140°F      50 min. Crude Oil      65min.	Use same times as for open-top floating roof tank rim fires.
<b>Substrate Application Outlets</b>	Number Required	Same as table for foam chambers.	Not Recommended.
	Hydrocarbon Application Rates	Minimum 0.1 gpm/ft <sup>2</sup> [(4.1 L/min.)/m <sup>2</sup> ] of liquid surface. Maximum 0.2 gpm/ft <sup>2</sup> [(8.2 L/min.)/m <sup>2</sup> ] Foam velocity from outlet shall not exceed 10 ft. per sec. (3.05 m per sec.) for Class 1B liquids or 20 ft. per sec. (6.1 m per sec.) for all other liquids.	Not Recommended.
	Discharge Times	Flash point 100°F (37.8°C)      30 min. to 140°F (194.4°C) Flash point below 100°F (37.8°C)      55 min. Crude Petroleum      55 min.	Not Recommended.
	Polar Solvents	Not Recommended.	Not Recommended.

For S1 units: 1 gpm/ft.<sup>2</sup> = 40.746 (L/min.)/m<sup>2</sup>; 1 ft. = 0.305 m; 1 ft<sup>2</sup>. = 0.0929 m<sup>2</sup>; 1 in. = 0.0245 m; °C = °F - 32/1.8.



## STORAGE TANK PROTECTION SUMMARY

		Fixed-Roof (Cone) Tanks and Pan-Type Floating Roof Tanks	Pontoon or Double-Deck Floating Roof Tanks, (Open-Top or Covered) Annular Seal Area
Top Side Foam Application	Number of Foam Outlets Required	Up to 80 ft. (24.4 m) dia. 1 Foam Chamber 81 to 120 ft. (24.7 - 36.6 m) dia. 2 Foam Chambers 121 to 140 ft. (36.9 - 42.7 m) dia. 3 Foam Chambers 141 to 160 ft. (43 - 48.8 m) dia. 4 Foam Chambers 161 to 180 ft. (49 - 54.9 m) dia. 5 Foam Chambers 181 to 200 ft. (55.2 - 61 m) dia. 6 Foam Chambers Over 210 ft. (64.0 m) 1 additional for each 5,000 sq. ft.	1 for each 40 ft. (12.2 m) of circumference with a 12-inch (30.5 cm) high foam dam.  1 for each 80 ft. (24.4 m) of circumference with a 24-inch (61 cm) high foam dam.
	Hydrocarbon Application Rates	0.10 gpm per sq. ft. (4.1 L / min. sq. m) of liquid surface.	0.30 gpm per sq. ft. (12.2 L/min. sq. m) of annular ring area between tank wall and foam dam.
	Polar Solvent Rates	See Manufacturer's Approval Report.	Not covered by NFPA 11.
	Hydrocarbon Discharge Times	Flash Pt. 100°F - 140°F (37.8°C - 194.4°C) Type I 20 min. Type II 30 min. Flash Pt. below 100°F (37.8°C) 30 min. 55 min. Crude Petroleum 30 min. 55 min.	20 min.
	Polar Solvents	Type I 30 min. Type II 55 min.	Not covered by NFPA 11.



## SURFACE APPLICATION

Determining Discharge Time and Application Rate (Cone Roof Tanks)

Discharge time and application rates are determined according to the type of fuel contained in the storage tank being protected. The following are minimum discharge rates recommended by Buckeye.

<u>Fuel Protected</u>	<u>Foam Concentrate</u>	<u>Foam Chambers As Primary Protection</u>			<u>-OR-</u>	<u>Monitors/Hand Hose Lines As Primary Protection</u>		
		<u>Application Rate gpm/f t<sup>2</sup></u>	<u>(Lpm/m<sup>2</sup>)</u>	<u>Discharge Time</u>		<u>Application Rate gpm/ft<sup>2</sup></u>	<u>Lpm/m<sup>2</sup></u>	<u>Discharge Time</u>
<b>Hydrocarbon</b>								
Flash point between 100°F and 200°F (38°C and 93°C)	AR-AFFF Fluoroprotein AFFF	0.10 0.10 0.10	(4.1) (4.1) (4.1)	30 min. 30 min. 30 min.		0.16 0.16 0.16	(6.5) (6.5) (6.5)	50 min. 50 min. 50 min.
<b>Hydrocarbon</b>								
Flash point below 100°F (38°C) or liquid heated above flash point	AR-AFFF Fluoroprotein AFFF	0.10 0.10 0.10	(4.1) (4.1) (4.1)	55 min. 55 min. 55 min.		0.16 0.16 0.16	(6.5) (6.5) (6.5)	65 min. 65 min. 65 min.
Crude Petroleum	AR-AFFF Fluoroprotein AFFF	0.10 0.10 0.10	(4.1) (4.1) (4.1)	55 min. 55 min. 55 min.		0.16 0.16 0.16	(6.5) (6.5) (6.5)	65 min. 65 min. 65 min.
<b>Alcohols</b>								
Methanol	3/3 3/6	0.10 0.10	(4.1) (4.1)	55 min. 55 min.		0.16 0.16	(6.5) (6.5)	65 min. 65 min.
Ethanol	3/3 3/6	0.10 0.10	(4.1) (4.1)	55 min. 55 min.		0.16 0.16	(6.5) (6.5)	65 min. 65 min.
Isopropanol	3/3 3/6	0.15 0.15	(6.1) (6.1)	55 min. 55 min.		0.16 0.16	(6.5) (6.5)	65 min. 65 min.
<b>Ketones</b>								
Methyl Ethyl Ketone	3/3 3/6	0.10 0.10	(4.1) (4.1)	55 min. 55 min.		0.16 0.16	(6.5) (6.5)	65 min. 65 min.
Acetone	3/3 3/6	0.15 0.15	(6.1) (6.1)	55 min. 55 min.		0.24 0.24	(9.8) (9.8)	65 min. 65 min.
Aldehydes	3/3 3/6	0.17 0.17	(6.9) (6.9)	55 min. 55 min.		0.16 0.16	(6.5) (6.5)	65 min. 65 min.
Esters	3/3 3/6	0.10 0.10	(4.1) (4.1)	55 min. 55 min.		0.16 0.16	(6.5) (6.5)	65 min. 65 min.
Ethers	3/3 3/6	0.15 0.15	(6.1) (6.1)	55 min. 55 min.		0.24 0.24	(9.8) (9.8)	65 min. 65 min.

