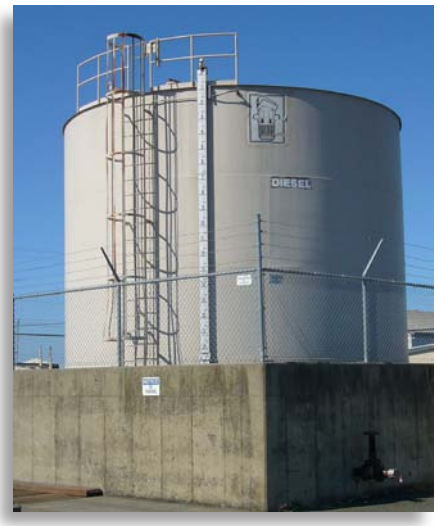
Coffee Break Training - Fire Protection Series

Hazardous Materials: Aboveground Flammable and Combustible Liquid Tank Emergency Venting — Part 4: Wetted Area

No. FP-2013-4 January 22, 2013

Learning Objective: *The student shall be able to explain and calculate the wetted area of an aboveground flammable and combustible liquid tank.*

Atmospheric, aboveground flammable and combustible liquid storage tanks that rely solely on pressure-relieving devices for emergency venting must have normal and emergency vents capable of preventing the rupture of the shell or bottom of a vertical tank or the shell or ends of a horizontal tank. An aboveground tank is one that is installed above grade, at grade or below grade without backfill, leaving its exterior surfaces exposed to the atmosphere.



This vertical storage tank is less than 30 feet (9 m) tall, so its entire height should be included in wetted area calculations.

The combined air flow capacity of the normal and emergency vents is measured in cubic feet per hour (m^3/hour) of free flowing air through the venting assemblies. The minimum air flow is derived from the "wetted area" of a storage tank, which is the surface area of the tank that normally is in contact with the liquid contents. Once the wetted area is established, minimum air flow volumes are found in a table in National Fire Protection Association 30, *Flammable and Combustible Liquids Code*.

To calculate the wetted area, NFPA 30 measures it as a portion of the entire tank external surface area that is exposed to the atmosphere. An adjustment is based on the shape of the tank as follows:

Aboveground Tank Type*	Amount of Exposed Area for Calculation
Sphere or spheroid	55%
Horizontal tank	75%
Rectangular tank	100%, excluding the top surface of the tank
Vertical tank	First 30 feet (9 m) above grade

*Aboveground tanks operating at a gauge pressure of more than 1 psi (6.9 kPa) employ different guidelines.

For example, the illustrated tank is less than 30 feet (9 m) tall, so its entire surface area is included in the wetted area calculation. Assuming that the tank is 20 feet (6.1 m) in diameter and 28 feet (8.5 m) tall, the formula to determine its wetted area is

$$\text{Wetted area} = (\pi d)H$$

Where,

$\pi = 3.14$
d = tank diameter
H = tank height

In U.S. Customary Units:	(3.14)x(20)x(28) = 1,758.4 ft^2 wetted area
In SI Units:	(3.14)x(6.1)x(8.5) = 162.8 m^2 wetted area

Next week's Coffee Break Training will provide calculation examples of other tank configurations. Subsequent Coffee Break Training items will explain ventilation requirements derived from the wetted area calculation. For additional information, refer to NFPA 30, Chapter 22.