Coffee Break Training - Fire Protection Series

Hazardous Materials: Aboveground Flammable and Combustible Liquid Tank Emergency Venting – Part 5: Calculating Wetted Area

No. FP-2013-5 January 29, 2013

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

Last week's Coffee Break Training FP-2013-4 explained the principle of wetted area for measuring emergency venting for atmospheric pressure flammable and combustible liquid storage tanks that rely solely on pressure-relieving devices for emergency venting. (NOTE: Aboveground tanks operating at a gauge pressure of more than 1 pound per square inch (6.9 kPa) employ different guidelines.) Once a tank's wetted area is established, the required emergency ventilation capacity can be determined from a table in National Fire Protection Association 30, *Flammable and Combustible Liquids Code*.

The wetted area of these horizontal storage tanks is based on a percentage of the tanks' surface area. (See Coffee Break Training 2006-18 for a discussion of steel tank supports.)

Here we reprint the table for adjusting surface area based on a tank's shape:

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

The following formulas are used to determine the wetted area of the various tank configurations. The dimensions provided are only examples.

Sphere or Spheroid Tank Having a Radius of 18 feet (10.7 m)	Wetted area= $(4\pi r^2)x(0.55)$ Where, π = 3.14, r= tank radius, and 0.55 = adjustment due to shape. In U.S. Customary Units: (4)x(3.14)x(18x18)x(0.55)= 2,238.2 ft^2 wetted area In SI Units: (4)x(3.14)x(10.7x10.7)x(0.55) =790.9 m^2 wetted area
Horizontal Tank Measuring 10 feet by 17 feet (3.04 by 5.18)	Wetted area= $[(\pi d^2 \div 2) + (\pi dL)](0.75)$ Where, π = 3.14, d=tank diameter, L = tank length, and 0.75 = adjustment due to shape. In U.S. Customary Units: $[((3.14)x(10^2) \div 2) + (3.14)x(10)x(17)]$ x 0.75= 518 ft^2 wetted area In SI Units: $[((3.14x3.04^2) \div 2) + (3.14)x(3.04)x(5.18)]$ x 0.75 = 48.1 m^2 wetted area
Horizontal Rectangular Tank Measuring 14 by 12 by 6 feet (4.2 by 3.6 by 1.8 m)	Wetted area= [(LxW) +2 (LxH) +2 (WxH)] Where, L = tank length, W = tank width, and H = tank height. In U.S. Customary Units: [(14x12) +2 (14x6) +2 (12x6)] = 480 ft^2 wetted area In SI Units: [(4.2x3.6) +2 (4.2x1.8) +2 (3.6x1.8)] = 44.6 m^2 wetted area

Vertical tank calculations were provided in the previous Coffee Break Training. Subsequent Coffee Break Training items will explain ventilation requirements derived from the wetted area calculation.