Spill Prevention Control and Countermeasure (SPCC) Plan

Single Horizontal Cylindrical Tank inside a rectangular or square dike or berm

Gas and Care Express **EXAMPLE**

This worksheet calculates the secondary containment volume of a rectangular or square dike or berm for a single horizontal cylindrical tank. In this example, there are no other objects or structures within the dike or berm that will displace the volume of the secondary containment.

Steps:

1. Determine the volume of the secondary containment, V_{SC}

2a. Determine the volume of the tank when the tank shell capacity is unknown, V_{Tank}

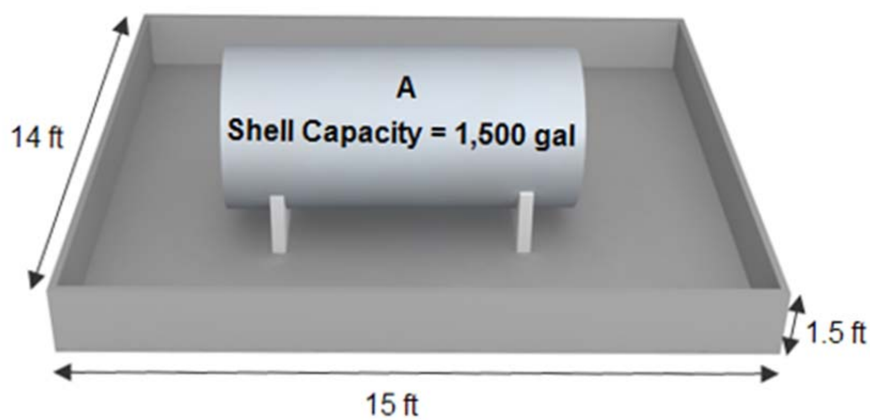
2b. Determine the volume of the tank when shell capacity is known, V_{Tank}

3. Determine the percentage of the secondary containment volume, V_{SC} to the tank volume, V_{Tank}

4. Determine whether the secondary containment can contain the entire tank shell capacity with additional capacity to contain rain.

Information needed to use this worksheet:

- Tank shell capacity
  In this example, the tank is 1,500 gallons.
- Secondary containment length, width, and height
  See diagram for dimensions.
- Rainfall amount
  Rainfall can collect in the secondary containment; the selected rain event for the location is 5.6 inches.



Tank A Shell Capacity (gal) = 1,500
A

Disclaimer: Please note that these are simplified calculations for qualified facilities that assume: 1) the secondary containment is designed with a flat floor; 2) the wall height is equal for all four walls; and 3) the corners of the secondary containment system are 90 degrees. Additionally, the calculations do not include displacement for support structures or foundations. For Professional Engineer (PE) certified Plans, the PE may need to account for site-specific conditions associated with the secondary containment structure which may require modifications to these sample calculations to ensure good engineering practice.

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1. Determine the volume of the secondary containment, V_{SC}

Secondary Containment Area, A_{SC} = [15] Length (ft) x [14] Width (ft)

= [210] ft^2 **b**

V_{SC} (ft^3) = [210] b (ft^2) x [1.5] Height (ft) = [315] ft^3 **c**

To convert the secondary containment volume from cubic feet to gallons for the template, then:

V_{SC} (gallons) = [315] c (ft^3) x [7.48] (ft^3/gal) = [2,356] gal **c**

2a. Determine the volume of the tank when the tank shell capacity is unknown, V_{Tank}

(In this example we know the tank capacity so we skip this step.)

N/A for this example because we know the volume of the tank

Tank radius (ft) = [ ] Diameter (ft) ÷ 2 = [ ] ft

V_{Tank} (ft^3) = 3.14 X [( )^2] Radius^2 (ft)^2 x [ ] Tank Height (ft) = [ ] ft^3 **d**

2b. Determine the volume of the tank when shell capacity is known, V_{Tank}

***a** is the tank shell capacity from page 1*

V_{Tank} (ft^3) = $\boxed{1,500}$ x 0.1337 = $\boxed{200.5}$ ft^3

a (gal)		ft^3/gal		**e**

3. Determine the percentage of the secondary containment volume, V_{SC} to the tank volume,

V_{Tank}[1](to determine whether the volume of the containment is sufficient to contain the tank's entire shell capacity).

***c** is the secondary containment volume*
***d / e** is the tank volume calculated in Step 2 of this worksheet*

V_{SC}/V_{Tank} = $\boxed{315}$ ÷ $\boxed{200.5}$ = $\boxed{1.57}$

c (ft^3)	d or e (ft^3)	**f**

% = $\boxed{1.57}$ x 100 = $\boxed{157}$

f		**g**

Percentage, **g**, is 157% which is greater than 100%. The capacity of the secondary containment is sufficient to contain the shell capacity of the tank. However, we must also account for rain that can collect in the dike or berm. See Step 4.

4. Determine whether the secondary containment can contain the entire tank shell capacity with additional capacity to contain rain.

If rain can collect in a dike or berm, the SPCC rule requires that secondary containment for bulk storage containers have additional capacity to contain rainfall or freeboard. The rule does not specify a method to determine the additional capacity required to contain rain or the size of the rain event for designing secondary containment. However, industry practice often considers a rule of thumb of 110% of the tank capacity to account for rainfall. A dike with a 110% capacity of the tank may be acceptable depending on the shell size of the tank, local precipitation patterns, and frequency of containment inspections. In a different geographic area, a dike or berm designed to hold 110% for the same size tank may not have enough additional containment capacity to account for a typical rain event in that area. The 110% standard may also not suffice for larger storm events. If you want to determine a conservative capacity for a rain event, you may want to consider a 24-hour 25-year storm event. It is the responsibility of the owner or operator[2] to determine the additional containment capacity necessary to contain rain. A typical rain event may exceed the amount determined by using a 110% "rule of thumb" so it is important to consider the amount of a typical rain event when designing or assessing your secondary containment capacity.

Rainfall data may be available from various sources such as local water authorities, local airports, and the National Oceanic and Atmospheric Administration (NOAA).

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[1] Steps 3 and 4 in this worksheet determines whether the volume of the secondary containment is sufficient to contain the tank's entire shell capacity and rainfall (freeboard for precipitation) as required by the SPCC rule. Step 3 primarily determines whether the volume of the secondary containment is sufficient to contain the entire shell capacity of the tank. Step 4 is necessary to determine whether the secondary containment can also contain the expected volume of rainfall (the volume of rain that falls into the containment).

[2] The SPCC rule does not require you to show the secondary containment calculations in your Plan. However, you should maintain documentation of secondary containment calculations to demonstrate compliance to an EPA inspector.

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Selected Rainfall Event:

24— Hr 25— Yr Rainfall (in) = **5.6** in (**h**)

Rainfall (ft) = 5.6 h (in) ÷ 12 in/ft

= 0.5 ft (**i**)

Volume of Rain to be Contained, V_{Rain} (ft^3) = 0.5 i (ft) x 210 b (ft^2) = 105 ft^3 (**j**)

***b** is the area of secondary containment calculated in Step 1 of this worksheet*

Total Containment Capacity Required (ft^3) = 105 j (ft^3) + 200.5 d or e (ft^3)

***d / e** is the tank volume calculated in Step 2 of this worksheet*

= 305.5 ft^3 (**k**)

The volume of the secondary containment in **c** is 315 ft^3, which is greater than the required containment capacity in **k** (305.5ft^3). Therefore, the secondary containment is sufficient to contain the shell capacity of the tank and has sufficient additional capacity to contain a typical rainfall amount.

The percentage of the secondary containment volume to the tank shell capacity volume is 157% (**g** in Step 3). This percentage, which is greater than 100%, indicates that additional secondary containment capacity is available to contain rain as the containment is exposed to rain. Subtracting the tank shell capacity volume V_{Tank} of 200.5 ft^3 (**d** or **e** in Step 3) from the containment volume V_{SC} of 315 ft^3 (**c** in Step 3) yields 114.5 ft^3 of additional containment capacity for rain. V_{Rain}, the volume of rain falling into the secondary containment in a 24-hour 25-year rainfall event that produces 5.6 inches of rain, is 105 ft^3 (**j** in Step 4). V_{Rain} is less than the 114.5 ft^3 of additional containment capacity by 9.5 ft^3; consequently, the additional secondary containment capacity is sufficient to also contain the rain from the selected rainfall event. As concluded at the end of Step 4 in this example, the secondary containment is sufficient to contain the shell capacity of the tank and the selected typical rainfall amount.