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SPCC Secondary Containment Real-World Challenges

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MECC

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Agenda

1. Secondary Containment Requirements
2. Pond Example
3. WWTP Example
4. Railcar Example
5. Oil-filled Operational Equipment Example
6. Piping Example
7. Building Example

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“General” Secondary Containment Requirements

40 CFR 112.7(c)

- **Applies to all SPCC-regulated activities** (bulk storage tanks, mobile/portable equipment, oil handling, oil-filled operational equipment, oil-filled manufacturing equipment, etc.)
- Focus on “**typical failure mode**” and “**most likely quantity of oil that would be discharged**”
- Cannot “**escape the containment system before cleanup occurs**”

(c) Provide appropriate containment and/or diversionary structures or equipment to prevent a discharge as described in § 112.1(b), except as provided in paragraph (k) of this section for qualified oil-filled operational equipment, and except as provided in § 112.9(d)(3) for flowlines and intra-facility gathering lines at an oil production facility. The entire containment system, including walls and floor, must be capable of containing oil and must be constructed so that any discharge from a primary containment system, such as a tank, will not escape the containment system before cleanup occurs. In determining the method, design, and capacity for secondary containment, you need only to address the typical failure mode, and the most likely quantity of oil that would be discharged. Secondary containment may be either active or passive in design. At a minimum, you must use one of the following prevention systems or its equivalent:

(1) For onshore facilities:

- (i) Dikes, berms, or retaining walls sufficiently impervious to contain oil;
- (ii) Curbing or drip pans;
- (iii) Sumps and collection systems;
- (iv) Culverting, gutters, or other drainage systems;
- (v) Weirs, booms, or other barriers;
- (vi) Spill diversion ponds;
- (vii) Retention ponds; or
- (viii) Sorbent materials.

(2) For offshore facilities:

- (i) Curbing or drip pans; or
- (ii) Sumps and collection systems.

“Sized” Secondary Containment Requirements

40 CFR 112.8/12(c)(2) – Bulk Storage Containers

40 CFR 112.8/12(c)(11) – Mobile/Portable Storage Containers

40 CFR 112.7(h)(1) – Loading/Unloading Racks

- **Applies to certain SPCC-regulated activities** (bulk storage tanks, mobile/portable equipment, rack transfers)
- Must hold **entire capacity** plus **sufficient freeboard for precipitation** (except racks)
- Must be “**sufficiently impervious**”

(2) Construct all bulk storage tank installations (except mobile refuelers and other non-transportation-related tank trucks) so that you provide a secondary means of containment for the entire capacity of the largest single container and sufficient freeboard to contain precipitation. You must ensure that diked areas are sufficiently impervious to contain discharged oil. Dikes, containment curbs, and pits are commonly employed for this purpose. You may also use an alternative system consisting of a drainage trench enclosure that must be arranged so that any discharge will terminate and be safely confined in a facility catchment basin or holding pond.

(11) Position or locate mobile or portable oil storage containers to prevent a discharge as described in § 112.1(b). Except for mobile refuelers and other non-transportation-related tank trucks, you must furnish a secondary means of containment, such as a dike or catchment basin, sufficient to contain the capacity of the largest single compartment or container with sufficient freeboard to contain precipitation.

(1) Where loading/unloading rack drainage does not flow into a catchment basin or treatment facility designed to handle discharges, use a quick drainage system for tank car or tank truck loading/unloading racks. You must design any containment system to hold at least the maximum capacity of any single compartment of a tank car or tank truck loaded or unloaded at the facility.

Practical Example – Claiming the Pond

Common issue – Claiming onsite retention/detention pond as secondary containment

Questions to ask yourself:

- How often does the pond discharge?
  - Oil floats on water…
    - How much stormwater (and potentially wastewater) is routed to the pond?
  - Can the pond's outfall be blocked?
    - How quickly can it be blocked?
    - How much can the pond hold?
  - Is the pond "sufficiently impervious"?
  - How will a potential discharge reach the pond?
    - Is the route to the pond "sufficiently impervious"?
    - How will you inspect the route?

Practical Example – Claiming the WWTP

Common issue – Claiming Wastewater Treatment Plant (WWTP) as secondary containment

Questions to ask yourself:

- Is the WWTP designed to contain a slug load of oil?
  - DAF systems, oil-water separators, etc. capable?
  - Automatic monitoring for turbidity, dissolved oxygen, etc. that would automatically stop the discharge at the outfall?
    - Where would wastewater back-up?
  - How much wastewater is the WWTP treating?
    - “The clarification tank may be huge, but its always full!”
  - Is the WWTP ever bypassed due to excessive rainfall events?

Practical Example – Claiming the WWTP

- **Watchout for oil-water separators!**
  - Typically not designed to meet sized secondary containment requirements
    - More focused on removing sheens
  - Larger API units used by refineries, chemical manufacturers, etc. may have these capabilities
- Example OWS Unit:

Oleopator P – Oil/water separator system

2. NS3/450
   a. Total capacity: 205 gallons
   b. Volume solids trap: 119 gallons
   c. Volume oil storage: 64 gallons
   d. Maximum flow: 50 gpm
      1) Maximum flow indicated is for optimum performance – under 5mg/L hydrocarbons in effluent; higher flows can run through separator.

Count 5 – Violations of 40 C.F.R. § 112.7(c): General Secondary Containment

3.31.1. The Plan does not comply with 40 C.F.R. § 112.7(c) because implies incorrectly at Part 6.6 that the three oil/water separators' 550/1,200-gallon capacities are oil retention capacities; the Plan's references to the separators do not accurately represent the operational design oil retention capacities of the separators apparently installed at the Facility and therefore the separators cannot contain sufficient oil so that any discharge from a primary containment system will not escape the containment system before a cleanup occurs.

3.32. The Plan indicates that the Facility's sewer lines are equipped with an oil/water separator capable of processing 200-gallons per minute; however, the models used at the Facility have either 100- or 50-gallons per minute flow rates. The Plan does not describe what rain flow contributions occur from Facility office and warehouse roofs to the separator watersheds that could affect average peak flow rate estimates. Consequently, Respondent has not demonstrated that the system is constructed so that any discharge from a primary containment system will not escape the containment system before a cleanup occurs.

Practical Examples – Railcar Complications

requirements would apply. In the same vein, the Agency believes that rail cars cannot be provided with sized secondary containment when entering, moving within, or exiting the confines of a facility. Conversely, when they are situated in defined locations at an otherwise regulated facility, sized secondary containment, such as a catchment basin, could be provided. See Chapter 4 of the *SPCC Guidance for Regional Inspectors* for further explanation regarding when sized secondary containment is required for mobile or portable containers that are in a stationary, unattended mode.

71 FR 77266 (December 26, 2006)

General or Sized Secondary Containment?

Eligible for "non-transportation related tanker truck exemption?

73 FR 74263 (December 5, 2008)

However, EPA disagrees with commenters that the exemption should be extended to tank cars or rail cars. EPA believes that tank cars and rail cars typically operate in fixed areas of a facility where sized secondary containment can be provided, given the land area that is generally dedicated to a rail spur. Similarly, the exemption is not being extended to mobile/portable containers because the Agency believes that sized secondary containment can be provided for containers that generally operate in fixed locations at a facility, but are occasionally moved to other fixed locations within the facility for similar service.

Conclusion: Needs Sized Secondary Containment or an Impracticability Determination!

Practical Example – Oil-filled Operational Equipment

- Transformers not in operation
  - Typically stored/staged containing oil for rapid deployment and to prevent interior corrosion
- Subject to general or sized secondary containment?
  - Is this now a “storage” container?

Practical Example – Piping

- Piping across a public roadway
  - Subject to general secondary containment
- What type of containment is adequate to prevent an offsite discharge of oil during a typical failure scenario?
- What if my piping is always full of oil?
  - “Storage” vs. “oil handling”

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Practical Example – Claiming the Building

Common issue – Claiming building as secondary containment

Questions to ask yourself:

- Are there floor drains nearby?
  - Where do the floor drains discharge? POTW vs. Sump
    - Does the sump automatically discharge to another location?
- Are the oil containers near a doorway or other opening?
  - Is the building lipped?
  - Are there cracks in the building's floor or walls?

Containment Caution – Claiming the Building

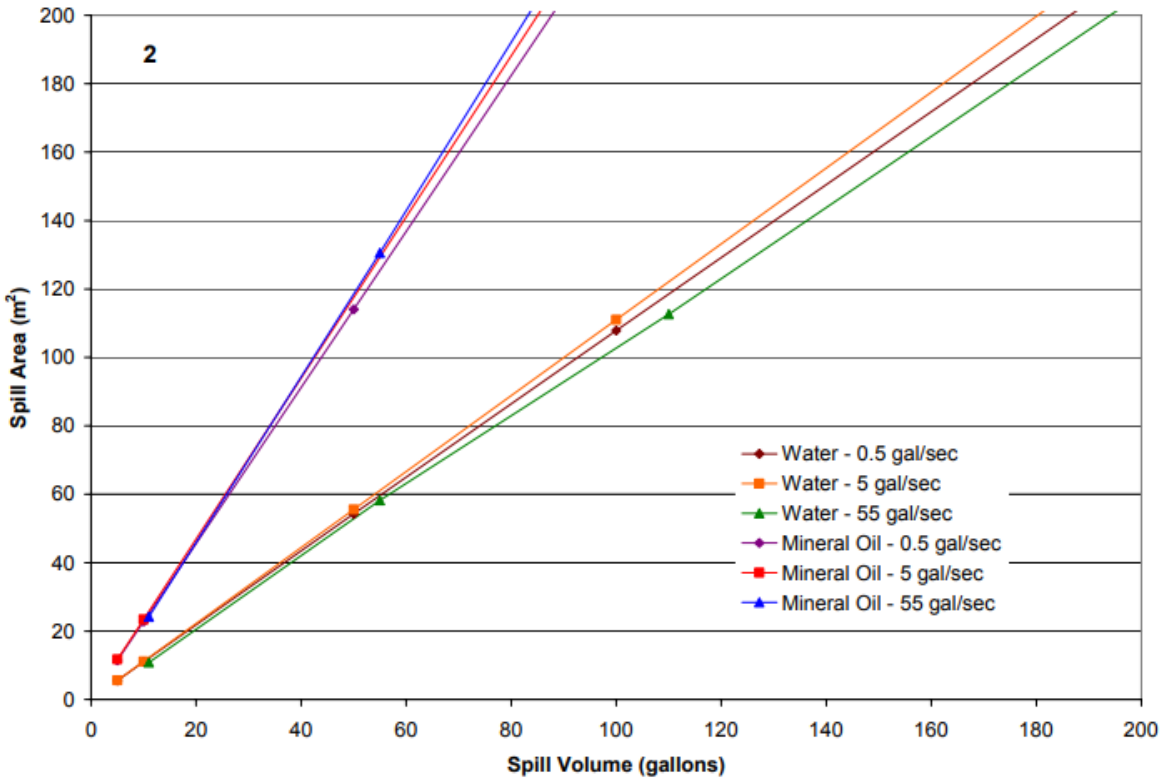


Figure 4.3 Spill Area as a Function of Total Spill Volume for a Concrete Surface at a One-Degree Slop

Source: Simmons, Keller, & Hylden, *Spills on Flat Inclined Pavements*, PNNL-14577, DOE (2004)

Count 12 – Violations of 40 C.F.R. § 112.8(c): Sized Secondary Containment

.46.3. The Revised Plan indicates that the warehouses contain oil storage containers including totes. While the Plan asserts that the warehouse walls provide secondary containment, the containment volume provided is not specified, nor does the Revised Plan discuss the impact of doors, loading dock entries, etc. on secondary containment. Therefore, the Revised Plan does not provide for adequate containment for the entire capacity of the largest single container and sufficient freeboard to contain precipitation.

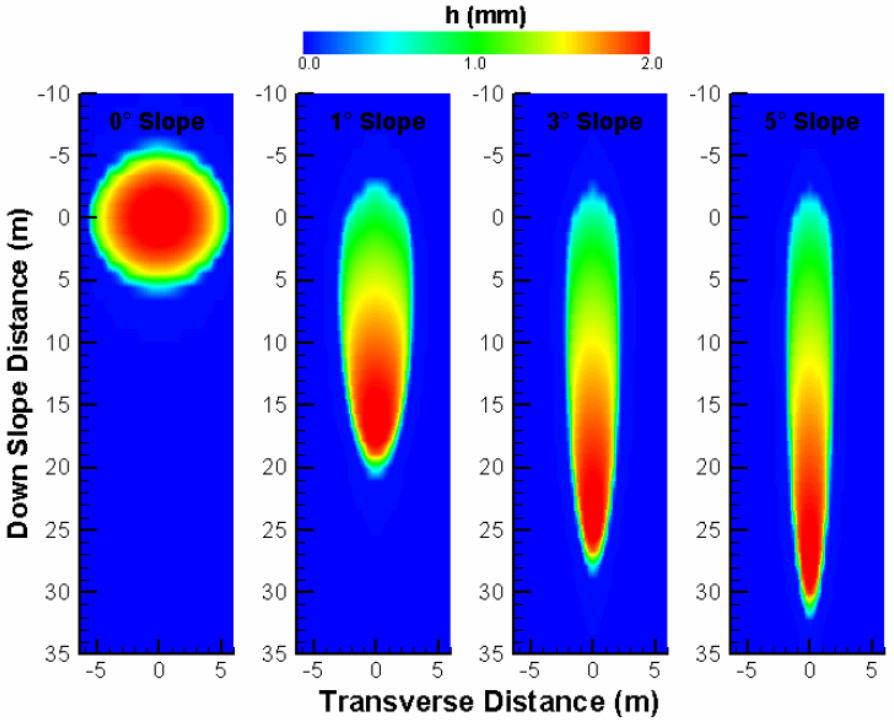
Your Daily Dose of Science…

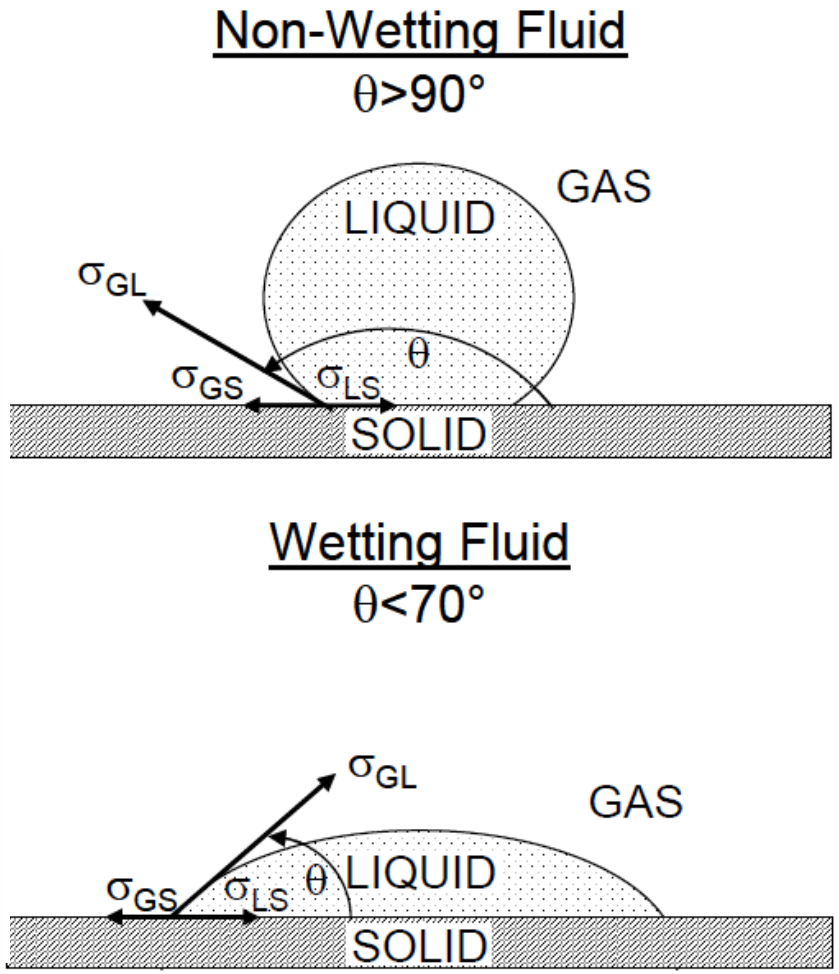
- "Contact angle" plays a key role in determining spill distance
  - Non-wetting vs. wetting
  - Specific to material and surface type
    - Limited research/data available on contact angle

Slope (°)	Spill Area at Static Equilibrium (m^2)	Time to Reach Static Equilibrium (sec)
0	134.2	3513
1	138.8	599
3	138.8	244
5	138.8	163

$$(1-\cos(\theta))\cdot\sigma = \rho\cdot g\cdot h^2$$

$$V = A\,\delta\,\phi + A\,h$$





Source: Simmons, Keller, & Hylden, *Spills on Flat Inclined Pavements*, PNNL-14577, DOE (2004)

And to make it practical…

- Various material spills on concrete
- Key assumptions using this model:
  - **Total spill area remains constant** with slope
  - **Footprint geometry:** circular on flat surfaces; elliptical on 1%–2% slopes (area-preserving)
  - **No evaporation or infiltration** considered during equilibrium spreading

Fluid	Contact Angle Range (θ)	Spill Distance, ft		
		Flat Floor	1% Slope	2% Slope
Gasoline	30-85	16.5-24.4	20.3-29.9	23.4-34.5
Diesel	30-85	16.7-24.6	20.4-30.1	23.6-34.8
Lube oil	30-85	15.6-23.3	19.1-28.5	22.1-32.9
Used oil	30-85	15.9-23.7	19.5-29.0	22.5-33.5

Fluid Properties

Fluid	Density (g/mL)	Surface Tension (dyne/cm)
Gasoline	0.731	20.5
Diesel	0.85	23
Lube oil	0.88	32
Used oil	0.9	30

1. PNNL-14577: Spills on Flat Inclined Pavements (DOE Battelle, 2004).
2. Yaws, C. L. (ed.). Chemical Properties Handbook. McGraw-Hill, 1999.
3. CRC Handbook of Chemistry and Physics (gasoline, diesel, oil property ranges).
4. ASTM D975 (diesel) and D4052 (density measurements for petroleum liquids).
5. EPA Technical Bulletin 'Used Oil Burned As A Fuel' (section 2.3, referencing Bartlesville Energy Technology Center studies on used motor oil properties).

Concrete Properties

Surface	Porosity[1] (Void Fraction)	Texture Depth[2] (mm)
Concrete	0.16	2

1. Hall, C., & Hoff, W.D. (2002). Water Transport in Brick, Stone and Concrete. Spon Press.
2. American Concrete Pavement Association (ACPA). Concrete Pavement Surface Characteristics – Texturing. Available from www.pavement.com.

Source: Simmons, Keller, & Hylden, *Spills on Flat Inclined Pavements*, PNNL-14577, DOE (2004)

Questions?

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