Secondary Containment:

Regulations & BMPs

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Federal Secondary Containment

Safeguarding method in addition to the primary containment system

Specific/Sized

- Indoor: Sump capacity should contain 10% of the volume of total containers or the total volume of the largest container, whichever is greater
- Outdoor: Plus sufficient freeboard to contain precipitation

General

- Address typical failure mode and the most likely quantity
- Passive or Active

Regulations

and Best Practices

EPA

PA DEP

STRONGER
API
MSC

Advisory Commissions & Boards

SPCC

Spill Prevention, Control, and Countermeasure (SPCC)

- 40 CFR 112
- Monitors plans to prevent oil spills at facilities
  - **Oil, oil-like and oil/water mixtures**
  - 1320 gallons of above-ground storage capacity
  - Potential to reach “navigable waters”
  - **Defines oil pollution as a “sheen” on the water**
- Clarifies “facility”; can be considered **mobile or portable**
- Sets compliance date of November 10, 2011 for facilities that came into operation after August 12, 2002

http://www.epa.gov/osweroe1/docs/oil/spcc/spcc_101_prod.pdf

SPCC 40CFR112.7(c)

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 or pipe, **will not escape the containment system before cleanup occurs**.

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;

(iii) Culverting, gutters, or other drainage systems;

(iv) Weirs, booms, or other barriers;

(v) Spill diversion ponds;

(vi) Retention ponds; or

(vii) Sorbent materials.

SPCC Examples

Methods	Description of Secondary Containment Examples
Dikes, berms, or retaining walls sufficiently impervious to contain oil	Raised earth embankments or concrete containment walls used in areas with potential for large discharges, such as single or multiple aboveground storage tanks and certain piping.
Curbing	Permanent concrete or asphalt apron surrounded by a curb. Can be used where only small spills are expected and also used to direct spills to drains or catchment areas.
Culverting, gutters, or other drainage systems	Types of permanent drainage systems designed to direct spills to remote containment or treatment areas.
Weirs	Dam-like structures with a notch through which oil may flow to be collected. Used in combination with skimmers to remove oil from the surface of water.
Booms	Form a continuous barrier placed as a precautionary measure to contain/collect oil. Typically used for the containment, exclusion, or deflection of oil floating on water, and is usually used to address oil spills that have reached surface waters.
Barriers	Spill mats, storm drain covers, and dams used to block or prevent the flow of oil.
Spill diversion and retention ponds	Designed for long-term or permanent containment of storm water capable to capture and hold oil or runoff and prevent it from entering surface water bodies.
Sorbent materials	Materials include spill pads, pillows, socks, mats, clay, vermiculite, and diatomaceous earth. Used to isolate and contain small drips or leaks until the source of the leak is repaired.
Drip pans	Used to isolate and contain small drips or leaks until the source of the leak is repaired. Drip pans are commonly used with product dispensing containers (usually drums), uncoupling of hoses during bulk transfer operations, and for pumps, valves, and fittings.
Sumps and collection systems	A permanent pit or reservoir and the troughs/trenches connected to it that collect oil.

SPCC § 112.10 Provisions

- If you are the **owner or operator** of an onshore oil drilling and workover facility, you must:
- (a) Meet the **general requirements** listed under §112.7, and also meet the specific discharge prevention and containment procedures listed under this section.
- (b) Position or locate mobile drilling or workover equipment so as to prevent a discharge as described in §112.1(b).
- (c) Provide **catchment basins or diversion structures** to intercept and contain discharges of fuel, crude oil, or oily drilling fluids.
- (d) Install a blowout prevention (BOP) assembly and well control system before drilling below any casing string or during workover operations. The BOP assembly and well control system must be capable of controlling any well-head pressure that may be encountered while that BOP assembly and well control system are on the well.

RCRA

Resource Conservation & Recovery Act (RCRA)

- 40 CFR 260-265 (generator standards)
- Restricts hazardous waste collection and storage
- Defines “characteristic” and “listed” hazardous wastes
  - Ignitability
  - Corrosivity
  - Reactivity
  - Toxicity
- **Exempts flowback fluids** at federal level--state laws may apply
- **May not exempt fracturing fluids** at federal level

NPDES

National Pollutant Discharge Elimination System (NPDES)

- 40 CFR 122
- Limits water pollution through permits
- **Defines oil pollution as a "sheen" on the water**
- Regulates **stormwater** discharges from construction sites (1 acre plus), industrial facilities and municipalities
- Considers sediment to be the most common pollutant
- **Requires E&P sites to have sediment controls**
- Delegates permitting to states; all Marcellus/Utica Shale states have received delegation

API Recommend Practice

Environmental Protection for Onshore Oil and Gas Production Operations and Leases (51R)

- Containment should be constructed so spilled fuels or chemicals **do not reach the ground**
- Control the spread to the smallest possible area
  - **Drip pans** under equipment and storage containers
  - **Retaining walls or dikes** around tanks and other spill prone equipment
  - Secondary **catchment basins**
  - **Permanent booms** in the adjoining water basin
  - **Temporary booms** deployed after the spill occurs
  - Cleanup materials sufficient to handle small spills stocked on site

API Guidance Document

Practices for Mitigating Surface Impacts Associated with Hydraulic Fracturing (HF3)

- Spill prevention, response and cleanup procedures as part of SOP manual for **storing oil, chemicals or other fluids**
- Installation of containment, BMPs, barriers and response equipment
  - Sloping well location away from surface water
  - **Retaining walls or dikes** around tanks
  - Secondary **catchment basins**
  - **Absorbent** between sites and surface waters
  - **Temporary containment and liners during drilling and completions**

Surface Spills vs. Fracking

Secretary of Energy Advisory Board

Incidents causing problems have been unrelated to fracking itself but have arisen from surface spills, poor cementing jobs in wellbores and other operational failures

Energy Institute—University of Texas at Austin

Surface spills of fracturing fluids appear to pose greater risks to groundwater sources than from hydraulic fracturing itself

Governor's Marcellus Shale Advisory Commission

The primary concerns regarding hydraulic fracturing relate to surface spills of fluids, well control and lost containment of production and flowback water on the surface

PA DEP Oil & Gas Spill Policy

- Recommends reporting a spill or release of more than five gallons of a regulated substance **to the surface of the ground**
- Recommends notifying if the spill/release **exceeds 42 gallons in competent secondary containment**
- Remove the spilled material from the secondary containment within 24 hours
- When spilled onto the ground, the material is usually either residual waste or hazardous waste

PA Act 13 of 2012

Unconventional well sites must be designed and constructed to prevent spills to the ground surface or off the well site. Containment practices must be in place **during both drilling and hydraulic fracturing operations** and must be **sufficiently impervious** and able to contain spilled materials, and be **compatible** with the waste material or waste stored within the containment. Containment **plans must be submitted** to the department and describe any equipment that is to be kept onsite to prevent a spill from leaving the well pad.

Containment systems shall be used wherever **drilling mud, hydraulic oil, diesel fuel, drilling mud additives, hydraulic fracturing additives, and/or hydraulic fracturing flowback** are stored. Containment areas must be sufficient to hold the volume of the largest container stored in the area plus ten percent. (§3218.2 of the Act)

Master Containment Plans

Shall Include:

1) General well site construction plans with expected containment **systems** placement
2) Overall containment **practice**
3) Detailed installation, utilization, integration and maintenance plan
4) Manufacturer's specifications on materials used, installation directions, maintenance requirements, chemical compatibility, warranted uses and reuse/disposal considerations
5) List of all equipment that may be onsite that could be used to prevent/contain a spill
6) Name, address and contact information of the companies contracted by the operator that may assist with spill response, containment and remediation

http://www.portal.state.pa.us/portal/server.pt/community/act_13/20789/act_13_faq/1127392

System vs. Practice

A **system** is a type of **containment method**.

Examples:

- Well pad lining system
- Manifolded pallet-style secondary containment system

A **practice** is the **specific way in which a containment system is used**.

Examples:

- A liner (system) used just under the drilling rig as localized containment (practice)
- A liner (system) installed to cover the entire well site for complete containment (practice)

Containment System Examples

- Diking (Diking Fields)
- Curbing or berming
- Double-walled tanks
- Open-top tanks and containers
- Manifold containment tanking systems
- Portable collapsible containment systems
- Liquid transfer containment kits
- Modular spill decks
- Pipe sleeves
- Surface liners
- Spill kits, booms, and absorbent pads, mats, pillows and socks

Local Containment Practice

Deployed **only at the site of the reservoir** (tanks), such as diesel fuel tanks, chemical tanks, roll offs, drilling rigs and trucking transfer stations.

These systems may also include using a spill deck under all chemical storage tanks of a certain size or deploying a collapsible portable containment system around all diesel fuel tanks.

These could also consist of any **impermeable** container made of a material that is **compatible** with the waste stored or used within the containment. Any containment material that meets the coefficient of permeability of no greater than 1×10^{-10} cm/sec and has **supporting documentation** of the permeability, chemical compatibility and other applicable QA/QC standards, is acceptable for use for containment.

Complete Containment Practice

Complete containment is deployed under the entire well pad operation.

Choose a liner that is

- **Durable**--Able to support the weight of heavy equipment, such as drilling rigs and trucks.
- **Impervious**--Constructed from a synthetic material with a coefficient of permeability of no greater than 1 x 10^{-10} cm/sec and with sufficient strength and thickness to maintain the integrity of the liner.
- **Chemically Compatible-**-Designed, constructed and maintained so that the physical and chemical characteristics of the liner are not adversely affected by the waste and the liner is resistant to physical, chemical and other failure during transportation, handling, installation and use.

Complete Containment FAQs

When employing this type of system, the plan must:

- Identify the type and thickness of the material.
- Identify the installation procedures to be used.
- Ensure that adjoining sections of liners be sealed together to prevent leakage in accordance with the manufacturer's directions.
- Ensure that liner systems must be designed to allow spilled material or waste to be collected and removed efficiently.
- Ensure that the site must be designed to handle large spills and to also manage runoff that occurs on the well site. Supporting calculations may be required by the Department.
- Ensure that the collection system must be designed to handle both contaminated and uncontaminated runoff on the well site.
- Ensure that all complete well site containment plans include berming of the entire pad that meets the permeability standard.

http://www.portal.state.pa.us/portal/server.pt/community/act_13/20789/act_13_faq/1127392

Master Containment Plans

- **Inspection and Maintenance Plan**
  - To ensure the timely and quality repair of damage that is caused to any containment systems including, but not limited to: tears, punctures or any condition that compromises the maximum permeability requirements of the liner system.

- **Appendix to be attached to PPC**
  - General drawing showing locations of all containment systems, including GPS coordinates
  - Brief description of each system, along with cross reference to Master Containment Plan
  - Names and contact information of all companies contracted to assist with spill response, containment and remediation

Well Site Containments

Pad

- Large square footage, typically centered off the wellheads
- 6 to 8 inch high berms

Tank

- 110% of the largest tank
- 18 to 36 inch high berms

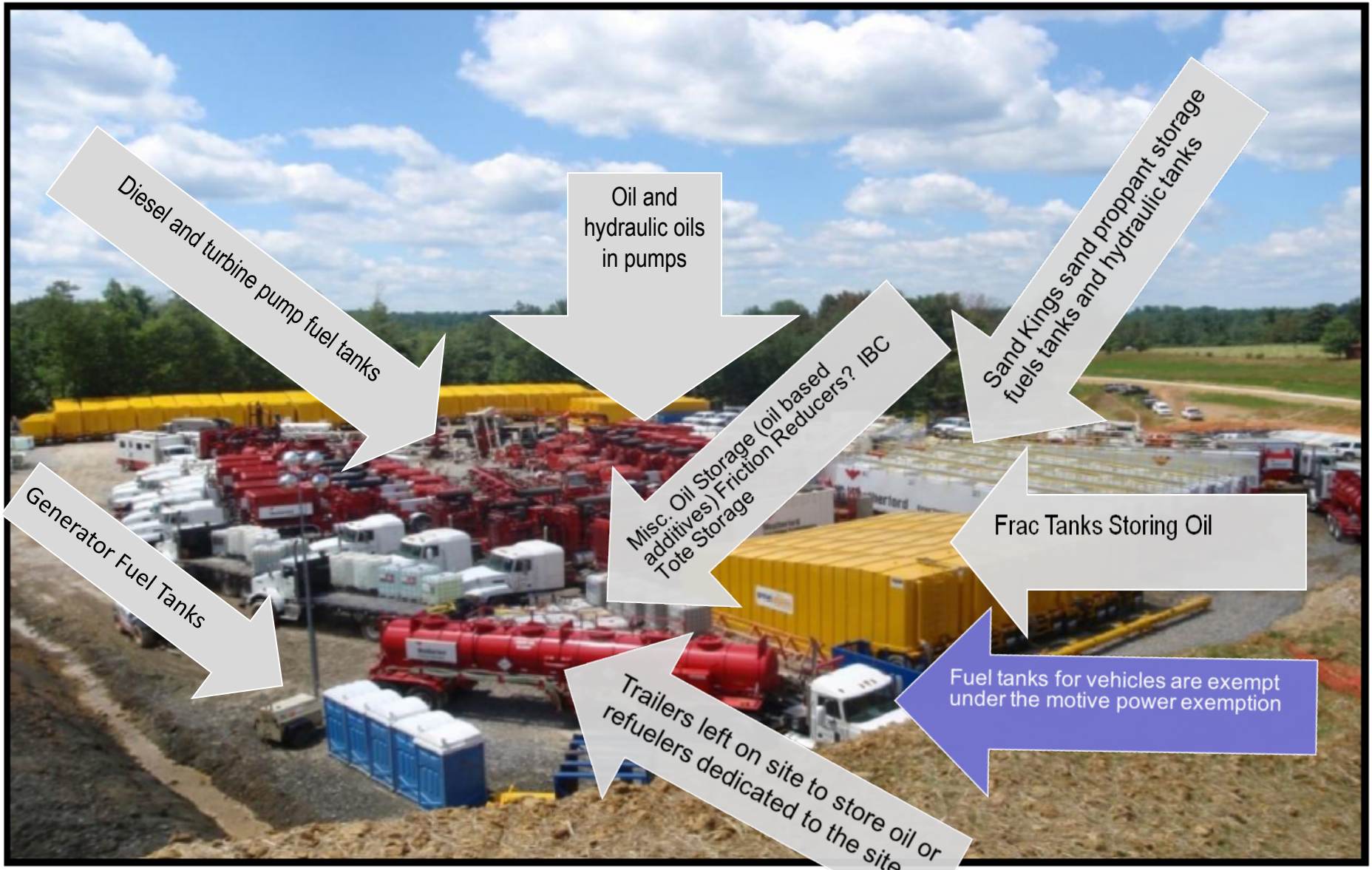
Equipment

- Placed under equipment that is leak prone
- 6 to 8 inch high berms

Chemical Storage

- Placed under liquid and dry chemicals
- 6 to 8 inch high berms

Completions Site

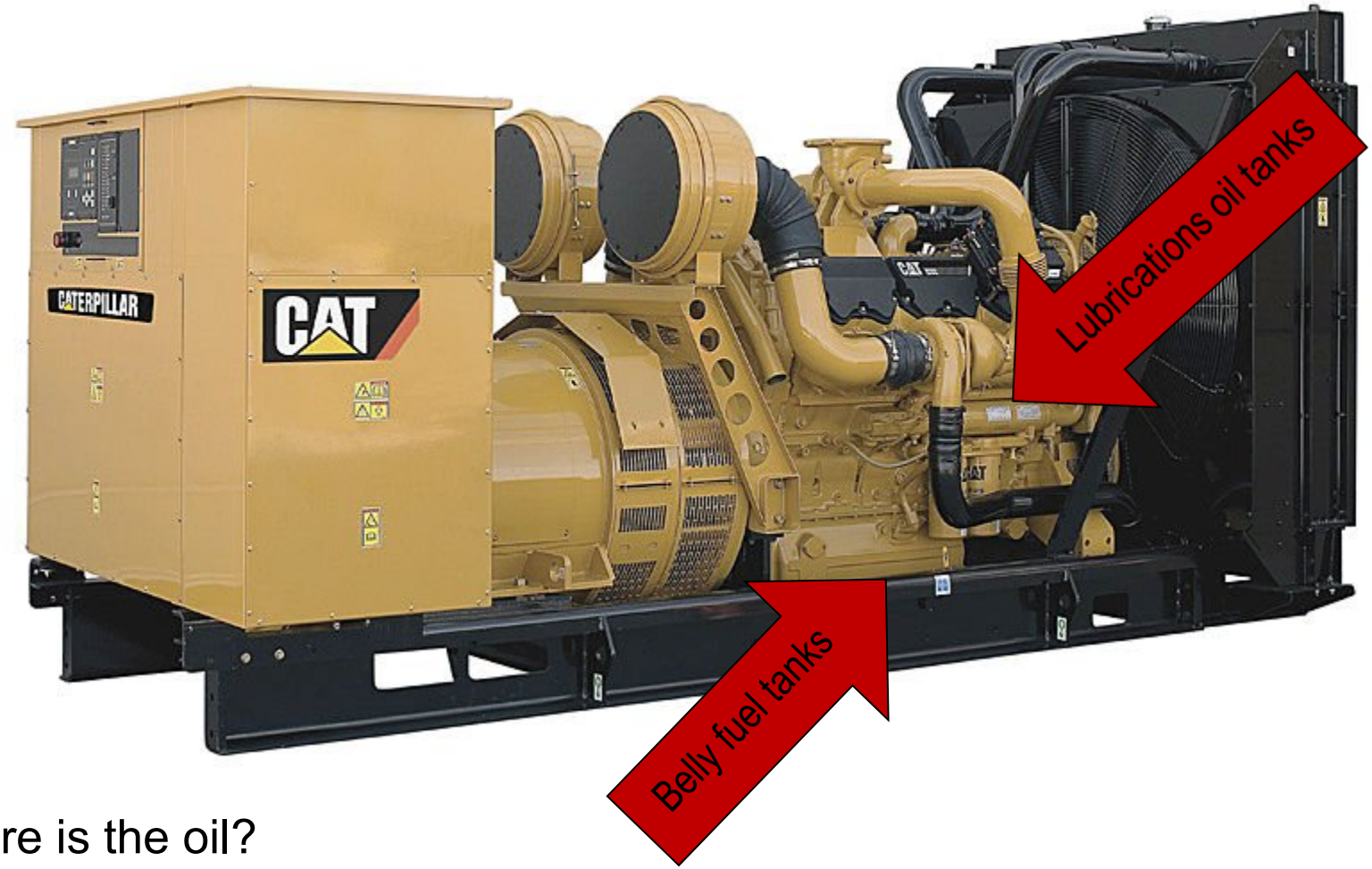


Source: Chesapeake Energy Corporation, 2008

Proppant Equipment

Mounted Hydraulic Pumps

Generator Sets



Where is the oil?

This is one of the common questions from the SPCC FRP Oil Hotline

Pad Containment
Best Management Practices

Surface Liners

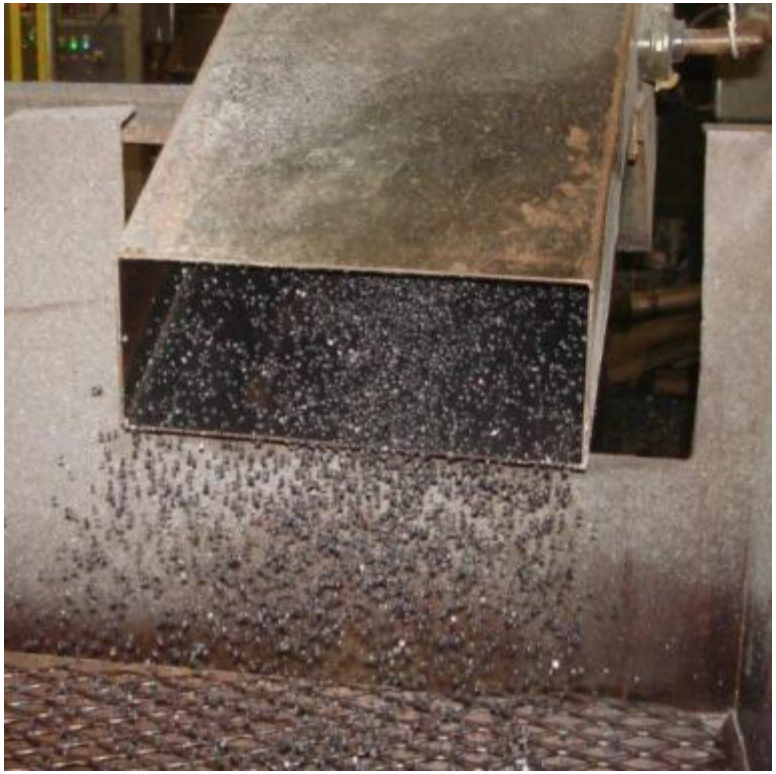
Work surfaces should be as clean and dry as possible to prevent slips and falls.

Tip: Cover polyethylene liners in felt to increase the coefficient of friction.

Tip: Limit wrinkled, loose layers of material to reduce tripping hazards.

OSHA 29 CFR 1910.22
SPCC 40 CFR 112.7
NPDES 40 CFR 122.26
RCRA 40 CFR 264.175

Composite Liners



New Pig Patents Pending

Composite liners are slip resistant and 5X more puncture resistant.

Tip: Withstands rigging up and down.

Tip: Able to last through multiple operations.

Tip: Holes are readily detectable and easily repairable.

Tip: Recyclable to reduce landfill burden.

OSHA 29 CFR 1910.22
SPCC 40 CFR 112.7
NPDES 40 CFR 122.26
RCRA 40 CFR 264.175

Pad Sub-base

Avoid mud.

Tip: Cement dirt should be capped with at least 2 inches of stone.

Tip: Stone should be 2 inches or less in diameter (2A-Modified, Crusher Run, #57).

Tip: Stone should rolled and firm (no rolling or pumping).

Tip: 2-4” of 2A-Modified or 2B covered by 1” of 1B is highly recommended.

Pad Layout

Start square to end square.
This is important when using rig mats.

Tip: Square off of the main wellhead.

Tip: Mark side and account for berming width.

Tip: Use sand bags to keep panels in place.

Tip: Starting and stopping lines reduce wasted material.

Seam Welding

Automated wedge welders should be used for all liners to join large panels together.

Tip: Set to correct temperature and speed depending on liner and site conditions.

Tip: Liner should be spotted during welding.

OSHA 29 CFR 1910.22
SPCC 40 CFR 112.7
NPDES 40 CFR 122.26
RCRA 40 CFR 264.175

Leak Testing

Split welder seams can be tested by pressure.

Solid wedge welder seams can be tested by air lance and vacuum.

Tip: Vacuum tester can be moved 30 inches every 10 seconds

OSHA 29 CFR 1910.22
SPCC 40 CFR 112.7
NPDES 40 CFR 122.26
RCRA 40 CFR 264.175

Patching

Plastic Liner:

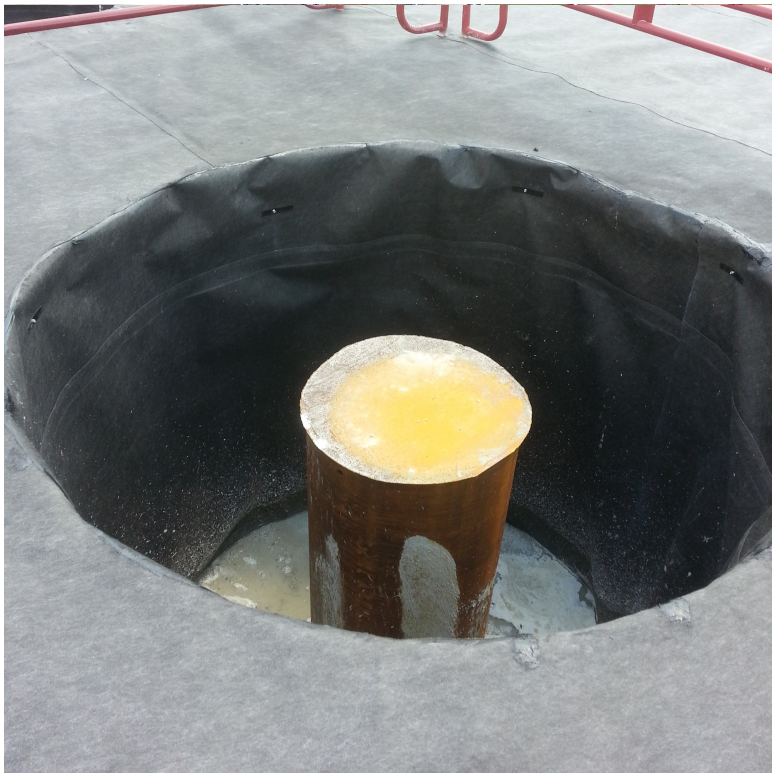
1) Dry surface
2) Heat tack patch
3) Grind edge
4) Extrusion weld

Composite Liner:

1) Dry surface
2) Surround with sealant
3) Heat tack patch
4) Surround with sealant

OSHA 29 CFR 1910.22
SPCC 40 CFR 112.7
NPDES 40 CFR 122.26
RCRA 40 CFR 264.175

Attachment to Cellar



Prevents leak in cellar from backing up under the liner.

Tip: Attach with ice guard.

Tip: Attach with metal ring.

Tip: Spray coat with polyurea.

Tip: Build liner tube, cement in place, and weld surface liner to it.

Low-Wall Berming

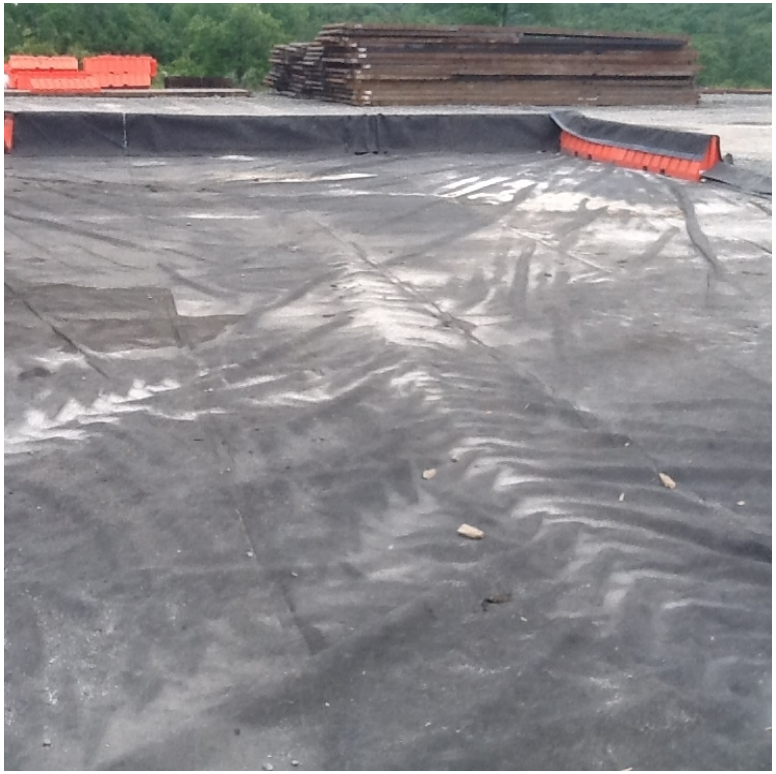
Most common materials are railroad ties, corrugated pipe or foam.

Tip: Tie corrugated pipe corners together to prevent kick out.

Tip: Edges of liner should at least reach the top of the berm to maintain sump capacity.

OSHA 29 CFR 1910.22
SPCC 40 CFR 112.7
NPDES 40 CFR 122.26
RCRA 40 CFR 264.175

Maintaining the Berm



Control access to either ramps or foam berms.

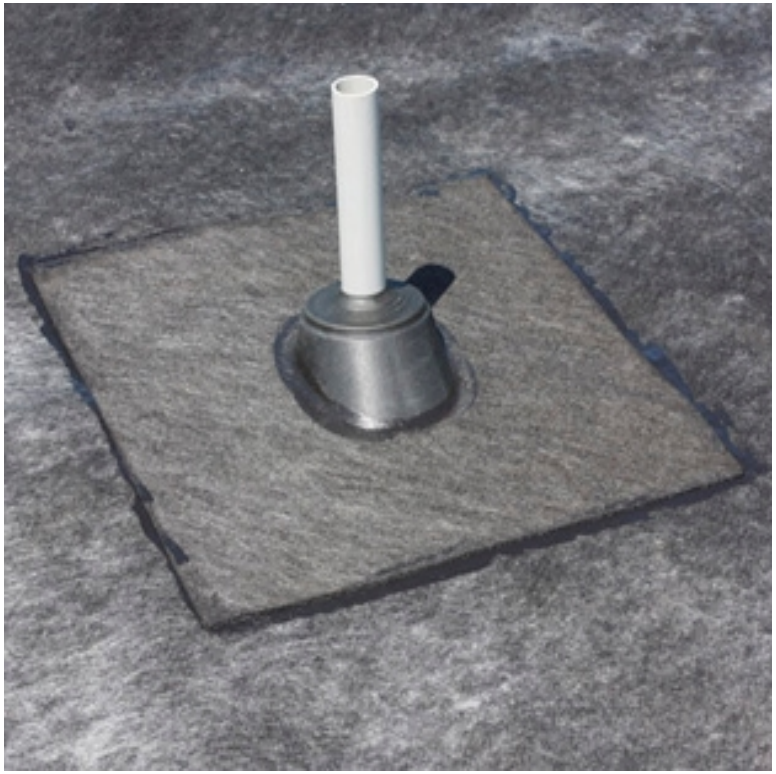
Tip: Don't park on the berm.

Tip: Don't cut away the berm.

Tip: Plastic barricades seem to have the most success in limiting traffic.

OSHA 29 CFR 1910.22
SPCC 40 CFR 112.7
NPDES 40 CFR 122.26
RCRA 40 CFR 264.175

Grounding Rods



Ideally grounding rods should be outside of the pad containment.

Tip: Use a boot with standing pipe. Pipe should be as tall as the berm.

OSHA 29 CFR 1910.22
SPCC 40 CFR 112.7
NPDES 40 CFR 122.26
RCRA 40 CFR 264.175

Hole Prone Areas

Pipe Racks

- Use plastic mats

  OR

- Keep liner tight to catwalk

Backyard

- Use rig mats for trackhoe path to drill cutting bins

Outriggers

- Use outrigger pads when positioning heavy equipment

Tank Containment

Frac Tank Containment

110% of largest tank. Berm walls are typically metal, concrete or plastic barricades.

Tip: Subtract out tank displacement when calculating capacity.

Tip: Keep separate from pad containment. Berm should terminate, meaning no hats.

Tip: Higher sidewalls increase sump capacity for smaller areas.

Fuel Tank Containment

Fuel tanks should be double wall construction so that secondary containment travels with the tank.

Tip: Tertiary containment

Tip: Quaternary containment

OSHA 29 CFR 1910.22
SPCC 40 CFR 112.7
NPDES 40 CFR 122.26
RCRA 40 CFR 264.175

Brine Tank Containment

Infrared photograph of storage tank with a two foot oil layer on top of water

Brine tanks are permanent structures and should have permanent secondary containment.

Tip: Install a ladder to prevent falls.

Tip: Load-line containment can prevent spills during transfer.

OSHA 29 CFR 1910.22
SPCC 40 CFR 112.7
NPDES 40 CFR 122.26
RCRA 40 CFR 264.175

Equipment Containment

Equipment Containment

Typically used under generators, light posts, and sewer treaters.

Tip: Can be reused from site to site.

OSHA 29 CFR 1910.22
SPCC 40 CFR 112.7
NPDES 40 CFR 122.26
RCRA 40 CFR 264.175

Collapsible Storage

Lightweight and reusable spot containment can be used for tanks, separators and vehicles.

Tip: Float-up walls reduce impalement and tripping concerns.

Tip: Drive-through options eliminate need to drop and raise walls.

SPCC 40 CFR 112.7
NPDES 40 CFR 122.26
RCRA 40 CFR 264.175

Fluid Dispensing

Fluid dispensing is a **high-risk area** for spills.

Tip: Place quick-throw berms or basins under hose connections and valves.

OSHA 29 CFR 1910.106
SPCC 40 CFR 112.7
NPDES 40 CFR 122.26

Chemical Storage Containment

Chemical Storage

Both liquid and dry chemicals should be on containment.

Tip: Maintain a driveway between pad containment and chemical storage containment to reduce high-traffic area.

Tip: Compartmentalize flammables and incompatible materials.

OSHA 29 CFR 1910.106
SPCC 40 CFR 112.7
NPDES 40 CFR 122.26

Active Containment

Universal Spill Removal

Surround spill with booms to prevent spreading.

Tip: Choose socks filled with earthen materials to create stronger containment dikes.

Tip: Absorbent mats cover large surface areas to soak up spills.

NPDES 40 CFR 122.26
25 Pa. Code §§ 78.55
25 Pa. Code §§ 91.34

Oil/Diesel Spill Removal

Oil-only absorbents will not pick up water, which reduces disposal costs.

Tip: Place booms at an angle in water basins as a preventative measure.

Tip: Select UV-resistant absorbents if installed in the field for more than 3 months.

SPCC 40 CFR 112.7
NPDES 40 CFR 122.26
25 Pa. Code §§ 78.55
25 Pa. Code §§ 91.34

Response Trailers

Equipment available for cleanup of a given spill must be listed.

Tip: Use GPS coordinates to mark locations of the off-site trailers.

Tip: Keep first responder boom supplies on site to surround perimeter.

OSHA 29 CFR 1910.120
SPCC 40 CFR 112.7
25 Pa. Code §§ 78.55
25 Pa. Code §§ 91.34

Truck Kits

Address the typical failure mode and the most likely quantity.

Tip: 5- to 8-gallon kits fit inside cabs.

Tip: Consider pop-up pools for fuel tank damage and shovels for spills to soil.

OSHA 29 CFR 1910.120
SPCC 40 CFR 112.7
25 Pa. Code §§ 78.55
25 Pa. Code §§ 91.34

Drain Covers

Storm drains are a major entry point into U.S. waters, which can trigger multiple violations.

Tip: Cover drains during bulk transfer as a precaution.

SPCC 40 CFR 112.7
NPDES 40 CFR 122.26

Waste Collection – Solid

Reduce air pollutant emissions from storage containers with continuous gaskets.

Tip: Latching lids provide easy access for frequently opened and closed containers.

RCRA 40 CFR 262.34
RCRA 40 CFR 264.1086

Waste Collection – Liquid

Hazardous waste can be collected in satellite accumulation drums in quantities of 55 gallons or less.

Tip: Use a funnel with integral venting and overflow prevention to reduce spills.

OSHA 29 CFR 264.1086
RCRA 40 CFR 262.34
RCRA 40 CFR 264.173

Recommended Reuse Steps

Reuse Steps

Note: Highly suggest reusing on same site as many times as possible (air to fluid to completions to flow-back).

1. Clean liner surface
2. Determine what to keep
3. Cut and roll
4. Mark each section with dimensions
5. Store as dry as possible
6. Patch damaged areas during re-install

Same Site: Air to Fluid to Completions to Flow-back

Clean Liner Surface

Rotary brush with collection basket.

Determine What to Keep

Heavily damaged areas and contaminated liner should be cut out and disposed of properly.

Cut and Roll

Cut into 36’ (fold in half) or 18’ wide strips.
Roll onto large OD pipe for easier rolling and dispensing.
Rolling into big ball = Excessive time to straighten.

Mark Each Section

Smaller sections of liner are often used to make duck ponds or tank/equipment containments.

Store As Dry As Possible

- Dry liner is faster to install
- Avoid freezing layers together in colder months
- Raise off the ground
  - Pipe or railroad ties under rolls
  - Pallets under folded
- Cover stacks with a tarp

Process to Install Used Liner

1. Lay out the pad – same as using new.
2. Have a clean cut edge to the inside.
3. Overlap 5” off the clean edge and mark every 6’ to 8’. This will give you a reference to overlap.
4. Roll out second row with 5” overlap. May need to pull 8” to 9” over first piece to mark and cut straight line.
5. Weld following butt seam instructions. Speed of welder 499 Max and temperature will be 650F min. Dampness will determined speed and temperature.
6. After seam is welded, apply silaprene sealant to the entire seam and rub into soft fibers
7. Patch any damaged areas
8. NEVER connect the used end to a poly tab. Always cut off poly tab.

Pad Layout

Rolling out first row.

Second Row

5” overlap.

May need to pull more than 5” and cut straight line.

Welding Used Liner

Double the time to install versus new liner.
Apply sealant to entire seam and rub into soft fibers.

Patching Damaged Areas

Patching after reinstallation avoids patching areas that my not be used.

THANKS!