RISK NAVIGATOR

Aboveground storage tanks and spill prevention, control and countermeasures

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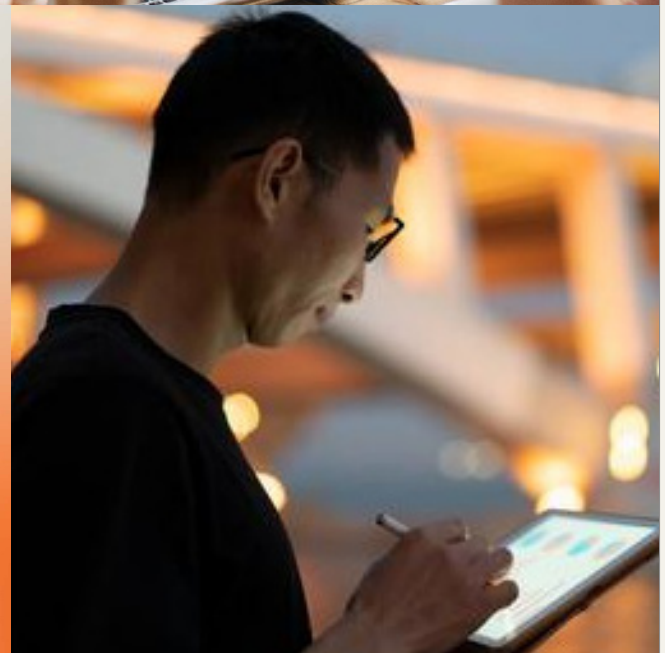

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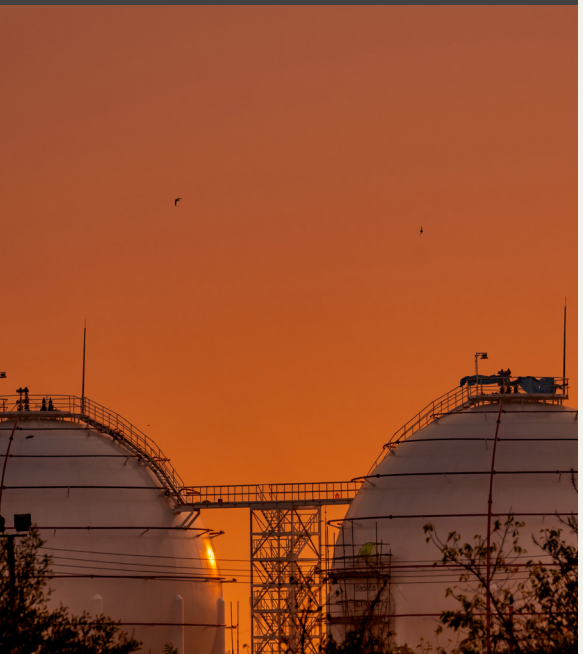

Aboveground storage tanks (ASTs), also listed under bulk storage container nomenclature for Environmental Protection Agency (EPA) Spill Prevention, Control, and Countermeasure (SPCC) regulations, are storage tanks located aboveground generally consisting of a tank or combination of tanks, the piping and ancillary equipment connected to it within its containment structure.

Generally for ASTs, aboveground usually denotes above the surface of the surrounding soil, ground or pavement, but not in an area that is not open completely for tank inspection such as in some mine installations, basements or vaults.

For federal (e.g., EPA) or state jurisdictions, there is usually a system volume and use requirement involved which invokes the EPA's SPCC rules for bulk storage containers unless a specific exemption is allowed. The intent of this article is to not include reference to underground storage tanks (USTs) which can also fall under SPCC requirements. This document is focused on ASTs used for the storage of petroleum products—many of which are regulated primarily under SPCC rules. The EPA regulation does not actually use the term "aboveground storage tank"; instead the term "bulk storage container" is used and is defined as "any container used to store oil, used for purposes including, but not limited to, the storage of oil prior to use, while being used or prior to further distribution in commerce."

Tanks have been utilized since before Greco-Roman times to store liquids including water, wines and oils. Steel tanks have been used as ASTs since the early 1900s. All tanks, whether ancient stone, tile, baked clay or modern metal, have inherent limitations in use and potential for leakage. Currently, facilities with ASTs holding oils of any kind may be subject to the EPA's SPCC regulation (40 CFR Part 112). The SPCC

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Aboveground storage tanks (ASTs)

regulation does not specifically use the term “AST” but rather includes ASTs under the term bulk storage container.[1] A bulk storage container is “any container used to store oil. These containers are used for purposes including, but not limited to, the storage of oil prior to use, while being used or prior to further distribution in commerce. Oil-filled electrical, operating or manufacturing equipment is not a bulk storage container.”[2]

Stand-alone, oil-filled electrical, operating or manufacturing equipment is not considered a bulk storage container. However, oil-filled equipment may also be subject to the SPCC regulation–especially in those cases where it is an integral component(s) of the bulk storage container—and should be included with the bulk storage container capacity when determining the facility’s overall aggregate oil storage capacity.[1]

ASTs are most often considered an environmental risk regardless of whether they are used to store petroleum products, hazardous waste or other hazardous material. Therefore, they fall under the regulation and auspices of several regulatory agencies; the EPA being the foremost agency in many cases, especially regarding their SPCC regulations. There are many overlapping federal and state regulations for ASTs and similar containers; unfortunately, many of these requirements are found indirectly as pieces of regulations on other topics.

Originally published in 1973 under the authority of §311 of the Clean Water Act, the Oil Pollution Prevention Regulation, the EPA’s initial “oil spill rule” as it is commonly referred to, has had additional requirements and clarifications published until the amended final rule was published in July 2002. Currently, the EPA Oil Pollution Prevention and Response Regulation (40 CFR 112; “SPCC Oil Spill Rule”) sets forth requirements for the prevention of, preparedness for and response to oil discharges at specific non-transportation related facilities.

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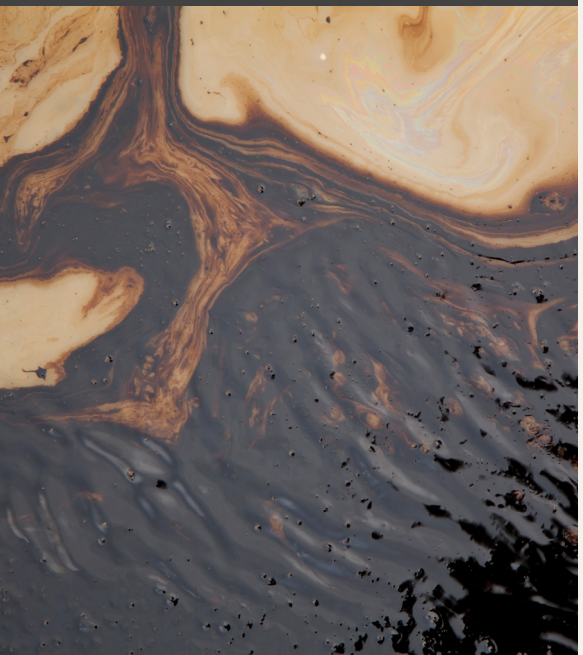

The goal of the SPCC regulation is to prevent oil from reaching navigable waters and adjoining shorelines and to contain discharges of oil. The regulation requires noted facilities to develop and implement SPCC plans and establishes procedures, methods and equipment requirements (Subparts A, B and C).

SPCC rules in regard to ASTs are complex and have many subdivisions and exceptions that apply to ASTs. Generally, the major titles are as follows:

- Subpart A – applicability, definitions and general requirements for all facilities and all types of oils[1, 2]
- Subpart B – requirements for petroleum oils and non-petroleum oils, except animal fats and oils and greases, and fish and marine mammal oils; and vegetable oils, including oils from seeds, nuts, fruits and kernels[1, 2]
- Subpart C – requirements for animal fats and oils and greases, and fish and marine mammal oils; and for vegetable oils, including oils from seeds, nuts, fruits and kernels[1,6]

On January 2, 1988, in Floreffe, Pennsylvania, a tank holding approximately 3.5 million gallons of diesel oil failed and collapsed. The spill dumped nearly one million gallons of oil into a sewer that eventually dumped the oil in the Monongahela River, which flowed into the Ohio River. Following the infamous event, also referred to as the Ashland oil spill, the EPA formed the SPCC task force to examine federal regulations governing oil spills from aboveground storage tanks.

Following the spill which affected the drinking water of one million people throughout Ohio, West Virginia and Pennsylvania and in response to the task force recommendations, the EPA proposed revisions to the Oil Pollution Prevention Regulation in the 1990s and finalized the amendments in 2002. The EPA has since amended the SPCC requirements of the Oil Pollution Prevention Regulation to extend compliance dates and clarify and/or tailor specific regulatory requirements.[3] Included in these are the 2010 updates.

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Aboveground storage tanks (ASTs)

In 1990, the Oil Pollution Act amended the Clean Water Act to require some oil storage facilities to prepare Facility Response Plans (FPRs), and on July 1, 1994, EPA finalized the revisions that directed facility owners or operators to prepare and submit plans for responding to a worst-case discharge of oil (Subpart D).[3]

– Subpart D – response requirements[4, 2]

Many types of facilities utilize ASTs such as private residences with home heating oil tanks, manufacturing facilities storing petroleum for equipment use, raw materials used during manufacturing, commercial fueling stations often times for motor carrier refueling or airline refueling and bulk storage facilities. Many of these uses may not invoke SPCC requirements or in some cases only invoke very specific SPCC requirements. Applicable AST regulations and required tank testing and maintenance activities vary based on the jurisdiction involved (i.e., EPA or state, city or local) and on the use, size of the facility, number of tanks and the capacity of the AST(s) under consideration.

It should be remembered that while EPA is solely responsible for ensuring that facilities comply with SPCC regulations, several states have established their own parallel tank AST regulations and programs like that of the SPCC program. These programs may differ from the EPA's program in type and extent of regulations and in their implementation (e.g., Florida, Minnesota, Missouri, New Jersey, New Mexico and Virginia have AST programs). Some state programs are more robust than others, and some state programs are stricter than the EPA requirements.

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Regulations and requirements

Several of the important federal and/or nationwide regulations as regards AST requirements include:

- SPCC rules (40 CFR 112, Oil Pollution Prevention)
- National Pollutant Discharge Elimination System (NPDES) (40 CFR 122)
- International Fire Code® (IFC) published by the International Code Council (where adopted)
- National Fire Protection Association (NFPA) 1, Fire Code (where adopted)
- NFPA 30, Flammable and Combustible Liquids Code (where adopted)
- NFPA 30A, Code for Motor Fuel Dispensing Facilities and Repair Garages (where adopted)
- US Coast Guard (USCG) requirements for transferring oil or hazardous materials in bulk (33 CFR 154)
- Occupational Health and Safety Act (OSHA) requirements for flammable and combustible liquids (29 CFR 1910.106 – Flammable Liquids)
- Requirement for hazardous waste containers (40 CFR 265, Subpart I) and tanks (40 CFR 265, Subpart J)
- Underwriters Laboratories (UL) 142, Standard for Safety for Steel Aboveground Tanks for Flammable and Combustible Liquids
- Laboratories UL 2085, Standard for Protected Aboveground Tanks for Flammable and Combustible Liquids
- International Fire Code (IFC) (where adopted)
- Steel Tank Institute (STI) standards (generally adopted and mandated)

It is important to remember that over 35 states have their own regulatory programs that impose additional, or more stringent, AST requirements than federal regulations alone.

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Issues for risk management to consider

For risk management purposes, the following issues should be considered:

- The Authority Having Jurisdiction, commonly known as AHJ, is responsible for the final AST approval.
- State hotline requirements for reporting spills can be more stringent than SPCC requirements.
- The inspection requirements of the SPCC rule are designed to detect oil leaks, spills or other potential integrity or structural issues before they can result in a discharge of oil to navigable waters of the US or adjoining shorelines.[5]
- Tank farms often have sub-standard piping, tanks and fuel dispensing systems.
- At some tank farms, spill containment dikes may be inadequate or non-existent.
- Regularly scheduled inspections, evaluations and testing of bulk oil storage containers by qualified personnel are critical parts of discharge prevention.[5]
- The type of inspection program and its scope will depend on site-specific condition and the application of good engineering practices, and this can be accomplished by following applicable industry standards.[5]
- Overfilling is the most frequent cause of oil spills from ASTs and is usually associated with human error.
- Overfill protection is the term used to describe devices that either shut off product flow, restrict product flow or alert the delivery operator with an alarm when the tank is close to being full. These devices are installed inside the tank and activate if the product in the AST reaches a certain level in the tank.
- Most other leaks from AST systems occur in the tank bottom, piping or connections as a result of faulty installation, poor preventive maintenance (PM) and/or lack of adequate protection from corrosion.
- Corrosion protection of AST tank bottoms and piping is critical over the life of a tank. A primary form of corrosion control has been the application of cathodic protection. Over time, these systems can fail or reach the end of their design lives. Note: The first cathodic protected tank in general use was introduced in 1969.

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Issues for risk management to consider

- OSHA 1910.106 (b)(2)(ii)(a) requires a minimum separation of three feet for flammable storage tanks.
- ASTs are generally and should be required to include secondary containment that provides temporary containment of discharged oil until the appropriate actions are taken to abate the source of the discharge and remove oil from areas where it has accumulated.
- ASTs and aboveground piping are also at risk of releases from physical damage such as vehicle collision; therefore, it is important to install, maintain, protect and operate piping properly, including the use of barriers.
- Double-walled tanks are always preferable.
- OSHA 1910.106 (b)(2)(ii)(a) requires a minimum separation of three feet for flammable storage tanks.
- Each AST must be tested for integrity on a regular schedule and whenever material repairs are made. The frequency and type of testing must consider container size and design such as floating roof, skid-mounted, elevated or partially buried.
- Regularly scheduled inspections, evaluations and testing of ASTs by qualified personnel are critical parts of preventing a release to the environment.
- A container integrity inspection and/or testing program may involve visual inspections (VT), or other non-destructive testing (NDE) may include hydrostatic testing, radiographic testing (RT), ultrasonic testing (UT) and acoustic emissions testing.
- Liquid level sensing devices must be regularly tested to ensure proper operation.
- A facility is required to implement an SPCC plan if it has a total aboveground oil storage capacity greater than 1,320 US gallons and there is a reasonable expectation of an oil discharge into or upon navigable waters of the US or adjoining shorelines.[4]
- Facility personnel must be trained on the plan and able to take appropriate response action if a spill occurs.[4]
- A gauge and alarm system designed to prevent releases to the environment from overfilling are required for ASTs. These systems alert the person filling the tank of a potential overfill problem and prevent releases from overfilling.

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Issues for risk management to consider

- Most states have adopted the International Code Council (ICC) IFC which is a model code that regulates minimum fire safety requirements for new and existing buildings, facilities, storage and processes and/or NFPA[4], Fire Code, as their state fire code. These standards have additional requirements for designing, installing and operating ASTs containing fuels and hazardous materials. The facility should check with and be aware of their local and state fire marshal to see what guidelines are in place.
- ASTs must be constructed so that secondary containment is provided for the entire capacity of the largest single container and enough excess volume for precipitation. Examples of secondary containment are dikes, berms, retaining walls, booms and sorbent materials, barriers and culverts/guttering.
- The AST and piping should be designed so that supports are in place to prevent sagging, minimize corrosion and allow for expansion and contraction. Inadequate system design may result in premature failure of piping or accelerated corrosion of the AST/piping.
- Warning signs should be posted, barriers erected and verbal warnings provided to alert traffic to ASTs and aboveground piping. ASTs and associated piping are at an increased risk of being struck by surface traffic. Carefully designed traffic patterns and clear warning signs can prevent tanks from damage caused by vehicle impact.
- Industry organizations have developed and published codes or standards designed to meet regulatory requirements and maintain best industry practices for ASTs. These organizations include the American Petroleum Institute (API), ASTM International (formerly American Society for Testing Materials), the STI and others.
- AST contents may not be compatible with material from which the AST is constructed. Incompatible materials may result in accelerated deterioration of the tank system. For example, hydrochloric acid will corrode metal tanks.
- Monthly checklists should be utilized to ensure that integrity inspections and maintenance activities are performed per federal and local requirements. Checklists should adhere to the facility's SPCC plan and be maintained on-site and off-site for record-keeping purposes.

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Useful definitions

Useful definitions

Breakout tank – a container used to relieve surges in an oil pipeline system or to receive and store oil transported by a pipeline for reinjection and continued transportation by pipeline.

Bulk storage container – any container used to store oil. These containers are used for purposes including, but not limited to, the storage of oil prior to use, while being used or prior to further distribution in commerce. Oil-filled electrical, operating or manufacturing equipment is not a bulk storage container.

Bunkered tank – a container constructed or placed in the ground by cutting the earth and recovering the container in a manner that breaks the surrounding natural grade, or that lies above grade, and is covered with earth, sand, gravel, asphalt or other material. A bunkered tank is considered an aboveground storage container for purposes of this part.

Complex – a facility possessing a combination of transportation-related and non-transportation-related components that is subject to the jurisdiction of more than one federal agency under section 311(j) of the Clean Water Act (CWA).

Discharge – includes, but is not limited to, any spilling, leaking, pumping, pouring, emitting, emptying or dumping of oil but excludes discharges in compliance with a permit under Section 402 of the CWA; discharges resulting from circumstances identified, reviewed and made a part of the public record with respect to a permit issued or modified under Section 402 of the CWA, and subject to a condition in such permit; or continuous or anticipated intermittent discharges from a point source, identified in a permit or permit application under section 402 of the CWA, that are caused by events occurring within the scope of relevant operating or treatment systems. For purposes of this part, the term ”discharge” shall not include any discharge of oil that is authorized by a permit issued under Section 13 of the River and Harbor Act of 1899 (33 USC 407).

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Useful definitions

Facility – any mobile or fixed, onshore or offshore building, property, parcel, lease, structure, installation, equipment, pipe or pipeline (other than a vessel or a public vessel) used in oil well drilling operations, oil production, oil refining, oil storage, oil gathering, oil processing, oil transfer, oil distribution and oil waste treatment, or in which oil is used. The boundaries of a facility depend on several site-specific factors, including but not limited to, the ownership or operation of buildings, structures and equipment on the same site and types of activity at the site. Contiguous or non-contiguous buildings, properties, parcels, leases, structures, installations, pipes or pipelines under the ownership or operation of the same person may be considered separate facilities.

Non-petroleum oil – an oil of any kind that is not petroleum-based, including but not limited to fats, oils and greases of animal, fish or marine mammal origin; and vegetable oils, including oils from seeds, nuts, fruits and kernels.

Offshore facility – any facility of any kind (other than a vessel or public vessel) located in, on or under any of the navigable waters of the United States, and any facility of any kind that is subject to the jurisdiction of the United States and is located in, on or under any other waters.

Oil – oil of any kind or in any form, including, but not limited to fats, oils or greases of animal, fish or marine mammal origin; vegetable oils, including oils from seeds, nuts, fruits or kernels; and, other oils and greases, including petroleum, fuel oil, sludge, synthetic oils, mineral oils, oil refuse or oil mixed with wastes other than dredged spoil.

Oil-filled operational equipment – equipment that includes an oil storage container (or multiple containers) in which the oil is present solely to support the function of the apparatus or the device. Oil-filled operational equipment is not considered a bulk storage container and does not include oil-filled manufacturing equipment (flow-through process).

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Useful definitions

Additional potentially related OSHA tank requirements include:[5]
1910.106(b)(1)(i)(a) – Tanks shall be built of steel except as provided in paragraphs (b)(1)(i)(b) through (e) of 1910.106.

1910.106(b)(1)(i)(b) – Tanks may be built of materials other than steel for installation underground or if required by the properties of the liquid stored. Tanks located above ground or inside buildings shall be of noncombustible construction.

1910.106(b)(1)(i)(c) – Tanks built of materials other than steel shall be designed to specifications embodying principles recognized as good engineering design for the material used.

1910.106(b)(1)(i)(d) – Unlined concrete tanks may be used for storing flammable liquids having a gravity of 40 deg. API or heavier. Concrete tanks with special lining may be used for other services provided the design is in accordance with sound engineering practice.

Useful abbreviations encountered when discussing ASTs include:
ASTSWMO – Association of State and Territorial Solid Waste Management Officials
CWA – Clean Water Act
EPA – Environmental Protection Agency
ESA – Expedited Settlement Agreement
FRP – Facility Response Plan
GIS – geographic information system
GPRA – Government Performance and Results Act
ICIS – Integrated Compliance Information System
NRC – National Response Center
OECA – Office of Enforcement and Compliance Assurance
OEM – Office of Emergency Management
OMB – Office of Management and Budget
OSCARS – On-scene coordinators area response system
SPCC – Spill Prevention, Control, and Countermeasure

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Risk management questions

For risk management purposes, the following questions should be asked:

- Does the facility have aboveground storage capacity of more than 1,320 gallons?
- Are all tanks clearly identified by metal name plate attached permanently to the vessel or tank?
- Has there been a formal documented review to ascertain whether SPCC rules are mandated for the tank(s) under consideration, and is the review available?
- Is an SPCC plan in place?
- Are facility personnel trained to implement the SPCC plan? Failure to have an SPCC plan in place or inability to implement the plan if a spill occurs could result in costly fines and/or very significant impacts to the environment.
- Has the facility verified with their local and state fire marshal to confirm that local requirements for AST design, installation and operation or maintenance are met? Failure to adhere to local requirements may result in violations, fines and increased likelihood of spills.
- Does the facility have a secondary containment system in place that can hold the volume of the largest tank positioned within the system leaving adequate room for rainfall?
- What type of secondary containment system is in place? Failure to have a secondary containment system in place could result in a release to the environment if tank failure occurs.
- Is the AST equipped with a gauge and alarm system that operate independently of one another? These systems reduce overflow risk by providing redundant measurements of the liquid level and triggering an alarm in the event one system fails.
- Is the facility or part of the facility (e.g., complex) considered non-transportation-related?

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Risk management questions

- Are the facility's ASTs designed with structural support to prevent sagging, minimize corrosion and allow for expansion and contraction? Failure to provide adequate structural support may result in accelerated tank failure and a release to the environment.
- Are the locations of ASTs and piping clearly marked with warning signs or protected barriers? ASTs are at an increased risk for damage by surface traffic; significant impact could cause tank failure.
- Does the facility's maintenance plan utilize standards and codes published by recognized industry organizations? Utilizing standards and codes developed by recognized industry organizations will facilitate compliance with regulations and reduce the risk of spills at the facility.
- Are the tank contents and tank construction materials compatible? Slow or catastrophic releases to the environment may occur if tanks fail due to incompatible materials.
- Does the facility use checklists to demonstrate that integrity inspections and other maintenance activities are performed in compliance with federal and local requirements? Checklists can be a helpful tool in identifying potential problems with tanks that could result in a release to the environment.
- Is the facility engaged in drilling, producing, gathering, storing, processing, refining, transferring, distributing, using or consuming oil?
- Could the facility reasonably be expected to discharge oil in quantities that may be harmful into navigable waters or adjoining shorelines?
- Is the total aggregate capacity of aboveground oil storage containers greater than 1,320 gallons of oil? (Do not include containers less than 55 gallons, permanently closed containers, motive power containers or storage containers used exclusively for wastewater treatment).
- Is the facility certified by a professional engineer (PE), self-certified or does it deviate from the requirements of the standards and utilize the equivalency provision of 112.7(a)(2)?

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Sources

[1] US EPA, Referenced February 8, 2021, “Aboveground Storage Tanks“, epa.gov > ”Aboveground Storage Tanks”

[2] 40 CFR Part 112 – US EPA, 112. Electronic Code of Federal Regulations (eCFR), Title 40 > Chapter 1 > Subchapter D > Part 112 (current as of February 10, 2021). Oil Pollution Prevention. ecfr.gov > cgi-bin > text-idx.

[3] US EPA, Accessed February 8, 2021, “Overview of the Spill Prevention, Control, and…“, epa.gov > overview-spillprevention-control-and…

[4] 40 CFR Part 112 – US EPA, 112.5 Amendment of Spill Prevention, Control, and Countermeasure Plan by owners or operators. 112.6 [Reserved]. 112.7 General requirements for Spill Prevention..., epa.gov > sites > production > files > documents

[5] US EPA, Referenced February 8, 2021, August 2013, “Spill Prevention, Control and Countermeasure Plan (SPCC) Program Bulk Storage Container Inspection Fact Sheet“, epa.gov > ”Spill Prevention, Control and Countermeasure Plan (SPCC) Program Bulk Storage Container Inspection Fact Sheet”

[6] OSHA 1910 Subpart H, Hazardous Materials, 106 – Flammable Liquids, osha.gov

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