

Design, Construction, Operation, Maintenance, and Inspection of Terminal and Tank Facilities

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Introduction

This standard was developed to guide the management of terminals and tanks in a manner that protects the environment and the safety of workers and the public. This standard is intended for petroleum terminal and tank facilities associated with marketing, refining, pipeline, and other similar facilities. This standard may be used as a resource and management guide by those responsible for such facilities and by those working on their behalf. This standard is a compilation of industry knowledge, information, and management practices for all relevant aspects of terminal and tank operations aggregated into an overview document comprising best practices. In instances where greater detail or additional information may be helpful or needed, this standard references other API publications or similar industry guides and standards. It is intended to be consistent with, but is not a substitute for, any applicable federal, state, and local regulations.

The requirements of this standard represent minimum requirements applicable to all facilities within the scope of this document. Some provisions in this standard, as indicated by the use of the word shall, are mandatory and have to be followed to meet the intent of this standard. Some provisions are recommended, as denoted by the word should, but are not mandatory. These provisions will need to be considered based on site-specific factors. Still other provisions are optional, as denoted by the word may. Typically, these will be given where a range of good options exists.

To foster greater awareness and assist the industry in addressing environmental, health, and safety concerns, API has undertaken the development of this single document aggregating the various standards, specifications, and recommended practices on the design, construction, operation, inspection, and maintenance of petroleum terminals and tanks. API also has significant research underway to assist members in addressing issues of groundwater protection and remediation of soil contamination. This research includes the evaluation of improved leak detection technology and the evaluation of better methods to detect and remediate groundwater and soil contamination.

Design, Construction, Operation, Maintenance, and Inspection of Terminal and Tank Facilities

1 Scope and Purpose

1.1 Overview

This standard covers the design, construction, operation, inspection, and maintenance of petroleum terminal and tank facilities associated with marketing, refining, pipeline, and other similar activities as stipulated in 1.2 through 1.8. This standard covers site selection and spacing, pollution prevention and waste management, safe operation, fire prevention and protection, tanks, dikes and berms, mechanical systems, product transfer, corrosion protection, structures, utilities and yard, and removals and decommissioning.

The purpose of this standard is to consolidate a wide base of current industry experience, knowledge, information, and management practices into a cohesive standard comprising a range of best practices.

The values stated for this standard are in U.S. Customary units with the International System of Units (SI) provided in parentheses.

The petroleum industry is engaged in the manufacture, storage, transportation, blending, and distribution of crude oil and refined products. Individual terminal facilities and plants may perform one or more of these functions. These facilities represent diverse operations ranging from small distribution facilities (e.g. bulk plants and warehouses), to large storage and distribution facilities (e.g. pipeline and marine terminals and wholesale plants), to large integrated facilities (e.g. petroleum refineries and grease production, oil blending, and packaging plants). The specific application of this standard within those various types of operations is itemized in 1.2 through 1.8.

1.2 Petroleum Terminals

Petroleum terminals may include tank farms, loading and unloading areas, pipeline manifolds, storage areas, warehouses, docks, garages, product quality test rooms, and office buildings. Products may be received and distributed by pipeline, marine transport, rail, or truck. Bulk quantities of refined products are stored in aboveground tanks for distribution in smaller quantities to industrial customers, to commercial consumers, and to retail and wholesale marketing facilities. Petroleum terminals may also store petroleum products in consumer packaging, bulk containers, totes, and drums. See USCG 33 *CFR* Parts 154 and 156.

1.3 Pipeline Tankage Facilities

Pipeline tankage facilities consist of breakout tanks and tank farms used to receive and transport petroleum (crude oil and refined products) from pipelines and to provide surge relief from pipeline operations (see Office of Pipeline Safety regulation PHMSA 49 *CFR* Part 195).

1.4 Refinery Facilities

Provisions for loading and unloading areas, docks, blending and packaging facilities, warehouses, and some refinery tankage facilities are included in this standard. Refinery tankage covered by this standard does not include those aboveground tanks or groups of tanks as defined in 1.2 c) (e.g. process tanks).

Examples of covered refinery tankage include tanks that are used to accomplish the following.

- a) Receive incoming crude oil.
- b) Store intermediate products or components outside of the refinery process units.

- c) Store finished products for shipment by truck, marine transport, rail, or pipeline.

Examples of refinery tankage and other equipment specifically excluded are the following.

- a) Tanks and equipment integral to refinery process equipment.
- b) Refinery tanks and other equipment located within the battery limits of process units.
- c) Process equipment located outside the process unit battery limits.
- d) Tanks containing materials, such as additives, used in refinery processes or utility systems.

1.5 Bulk Plants

Although bulk plants typically handle smaller quantities of product, operations and facilities at these plants are similar to those at petroleum terminals. Bulk plants typically receive and distribute product by truck, although some are serviced by rail, marine transport, or pipeline. Bulk plants may also store an inventory of petroleum products in consumer packaging, bulk containers, totes, and drums.

1.6 Lubricant Blending and Packaging Facilities

Lubricant oil blending and packaging facilities blend refined base stock products with additives and then package the finished products in drums, pails, portable tanks, or consumer-size containers or ship to consumers in bulk. The additives and lubricant base stocks may be received and stored either in bulk or in containers. Lubricant blending and packaging facilities typically include warehouses, blending and packaging areas, quality control labs, base stock and additive storage areas, shipping and receiving areas, and office buildings.

1.7 Asphalt Plants

Asphalt plants receive asphalt from petroleum refineries and blend it with additives to produce paving, roofing, and industrial grade asphalt products. Asphalt facilities typically consist of a control product quality test room, a rail siding or marine dock, an aboveground tank farm, a warehouse, one or more unloading areas for raw materials and products, a manufacturing area, a package heating system, a truck scale, a loading rack, and an office.

1.8 Aviation Service Facilities

Aviation service facilities store light petroleum fuels in aboveground or underground storage tanks. Services provided may include the following: refueling, defueling, deicing, washing, maintenance, and repair of aircraft. Aircraft fuel may be loaded into refueling trucks that service the aircraft or dispensed directly into aircraft from a fixed dispenser system or hydrant system cart.

1.9 Nonapplicability and Retroactivity

This standard does not apply to the following installations.

- a) Those facilities or portions of facilities already covered by API 2510 and API 12R1.
- b) Retail facilities, such as service stations, garages, and automotive lubrication facilities.
- c) Refinery process equipment, refinery process tanks located within the battery limits of the process units, and gas processing equipment (see 1.4).
- d) Aboveground tanks and vessels less than 1320 gal (5000 L) in storage capacity.
- e) Tanks that are part of oil and gas production, natural gas processing plants, or offshore operations.

- f) Production, pipeline, and truck crude oil gathering facilities.

The design and construction provisions of this standard are intended for application at new facilities or installations. Application of the design and construction provisions of this standard to facilities, equipment, structures, or installations that are already in place, that are in the process of construction, or that are installed before the date of this publication should be evaluated when circumstances merit. Such an evaluation should consider the site-specific circumstances and details accounting for both the potential and tolerance for risk, existing conditions at the installation, and overall benefit of applying the required design and construction provisions.

The operation, inspection, and maintenance provisions in various sections of this standard shall apply to both new and existing facilities or installations.

1.10 Governmental Requirements and Reviews

References are made throughout this document to U.S. jurisdictional requirements. For facilities located outside of the United States, local national statutory regulations or other recognized international standard can be utilized.

Reviews should be conducted on a periodic basis to help ensure that the facility meets applicable federal, state, or local requirements. These reviews should include, but not be limited to, the following items.

- a) Spill Prevention Control and Countermeasure (SPCC) plans, U.S. EPA 40 *CFR* Part 112, and other environmental regulations.
- b) Occupational Safety and Health Act (OSHA) requirements.
- c) Tank or vessel inspection records, registration, or files.
- d) Discharge or remediation permits.
- e) Air and water permits [such as the Clean Air Act (CAA) and Clean Water Act (CWA) and their amendments].
- f) Oil Pollution Act of 1990 (OPA 90) regulations and contingency plans including Office of Pipeline Safety (PHMSA 49 *CFR* Part 194), U.S. EPA, and USCG response plans.
- g) State and local emergency plans [such as the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and Emergency Planning and Community Right-to-Know (EPCRA) requirements].
- h) PHMSA 49 *CFR* Part 195
- i) Superfund Amendments and Reauthorization Act (SARA) Title III requirements.
- j) USCG 33 *CFR* Parts 154 and 156.
- k) Local or state permits (fire protection, building, zoning, etc.), as applicable.
- l) Resource Conservation and Recovery Act (RCRA) requirements.

2 Normative References

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any addenda) applies.

API Manual of Petroleum Measurement Standards (MPMS) Chapter 2, Tank Calibration

API MPMS Chapter 3.1B, *Standard Practice for Level Measurement of Liquid Hydrocarbons in Stationary Tanks by Automatic Tank Gauging*

API MPMS Chapter 5, *Metering*

API MPMS Chapter 6, *Metering Assemblies*

API MPMS Chapter 19.1, *Evaporative Loss from Fixed-roof Tanks*

API MPMS Chapter 19.2, *Evaporative Loss from Floating-roof Tanks*

API Specification 5L, *Specification for Line Pipe*

API Specification 6FA, *Standard for Fire Test for Valves*

API Specification 12F, *Specification for Shop Welded Tanks for Storage of Production Liquids*

API Specification 12P, *Specification for Fiberglass Reinforced Plastic Tanks*

API Recommended Practice 12R1, *Recommended Practice for Setting, Maintenance, Inspection, Operation and Repair of Tanks in Production Service*

API Publication 306, *An Engineering Assessment of Volumetric Methods of Leak Detection in Aboveground Storage Tanks*

API Publication 307, *An Engineering Assessment of Acoustic Methods of Leak Detection in Aboveground Storage Tanks*

API Publication 315, *Assessment of Tankfield Dike Lining Materials and Methods*

API Publication 334, *A Guide to Leak Detection for Aboveground Storage Tanks*

API Publication 340, *Liquid Release Prevention and Detection Measures for Aboveground Storage Facilities*

API Publication 341, *A Survey of Diked-area Liner Use at Aboveground Storage Tank Facilities*

API Publication 351, *Overview of Soil Permeability Test Methods*

API Recommended Practice 500, *Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Division 1 and Division 2*

API Recommended Practice 520 (all parts), *Sizing, Selection, and Installation of Pressure-Relieving Devices*

API Recommended Practice 540, *Electrical Installations in Petroleum Processing Plants*

API 570, *Piping Inspection Code: In-service Inspection, Repair, and Alteration of Piping Systems*

API Recommended Practice 575, *Inspection of Existing Atmospheric and Low-pressure Storage Tanks*

API 579-1/ASME FFS-1, *Fitness-For-Service*

API Standard 607, *Fire Test for Quarter-turn Valves and Valves Equipped with Nonmetallic Seats*

API Standard 610, *Centrifugal Pumps for Petroleum, Petrochemical and Natural Gas Industries*

API Standard 620, *Design and Construction of Large, Welded, Low-pressure Storage Tanks*

API Standard 650, *Welded Tanks for Oil Storage*

API Recommended Practice 651, *Cathodic Protection of Aboveground Petroleum Storage Tanks*

API Recommended Practice 652, *Lining of Aboveground Petroleum Storage Tank Bottoms*

API Standard 653, *Tank Inspection, Repair, Alteration, and Reconstruction*

API Standard 674, *Positive Displacement Pumps—Reciprocating*

API Standard 675, *Positive Displacement Pumps—Controlled Volume for Petroleum, Chemical, and Gas Industry Services*

API Standard 676, *Positive Displacement Pumps—Rotary*

API Bulletin 939-E, *Identification, Repair, and Mitigation of Cracking of Steel Equipment in Fuel Ethanol Service*

API Recommended Practice 1004, *Bottom Loading and Vapor Recovery for MC-306 & DOT-406 Tank Motor Vehicles*

API Recommended Practice 1007, *Loading and Unloading of MC 306/DOT 406 Cargo Tank Motor Vehicles*

API Recommended Practice 1110, *Recommended Practice for the Pressure Testing of Steel Pipelines for the Transportation of Gas, Petroleum Gas, Hazardous Liquids, Highly Volatile Liquids, or Carbon Dioxide*

API Recommended Practice 1124, *Ship, Barge, and Terminal Hydrocarbon Vapor Collection Manifolds*

API Recommended Practice 1125, *Overfill Control Systems for Tank Barges*

API Recommended Practice 1604, *Closure of Underground Petroleum Storage Tanks*

API Recommended Practice 1615, *Installation of Underground Hazardous Substances or Petroleum Storage Systems*

API Recommended Practice 1626, *Storing and Handling Ethanol and Gasoline-Ethanol Blends at Distribution Terminals and Service Stations*

API Recommended Practice 1627, *Storage and Handling of Gasoline-Methanol/Cosolvent Blends at Distribution Terminals and Service Stations*

API Publication 1628, *A Guide to the Assessment and Remediation of Underground Petroleum Releases*

API Publication 1629, *Guide for Assessing and Remediating Petroleum Hydrocarbons in Soils*

API Recommended Practice 1631, *Interior Lining and Periodic Inspection of Underground Storage Tanks*

API Recommended Practice 1632, *Cathodic Protection of Underground Petroleum Storage Tanks and Piping Systems*

API Recommended Practice 1637, *System to Mark Equipment and Vehicles for Product Identification at Gasoline Dispensing Facilities and Distribution Terminals*

API Publication 1638, *Waste Management Practices for Petroleum Marketing Facilities*

API Recommended Practice 1639, *Owner/Operator's Guide to Operation and Maintenance of Vapor Recovery Systems at Gasoline Dispensing Facilities*

API Recommended Practice 1640, *Product Quality in Light Product Storage and Handling Operations*

API Standard 2000, *Venting Atmospheric and Low-pressure Storage Tanks*

API Recommended Practice 2003, *Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents*

API Recommended Practice 2009, *Safe Welding and Cutting Practices in Refineries, Gasoline Plants, and Petrochemicals Plants*

API Standard 2015, *Requirements for Safe Entry and Cleaning of Petroleum Storage Tanks*

API Recommended Practice 2021, *Management of Atmospheric Storage Tank Fires*

API Publication 2021A, *Interim Study—Prevention and Suppression of Fires in Large Aboveground Atmospheric Storage Tanks*

API Recommended Practice 2026, *Safe Access/Egress Involving Floating Roofs of Storage Tanks in Petroleum Service*

API Recommended Practice 2027, *Ignition Hazards Involved in Abrasive Blasting of Atmospheric Storage Tanks in Hydrocarbon Service*

API Recommended Practice 2030, *Application of Fixed Water Spray Systems for Fire Protection in the Petroleum and Petrochemical Industries*

API Publication 2202, *Dismantling and Disposing of Steel from Aboveground Leaded Gasoline Storage Tanks*

API Publication 2207, *Preparing Tank Bottoms for Hot Work*

API Recommended Practice 2219, *Safe Operation of Vacuum Trucks Handling Flammable and Combustible Liquids in Petroleum Service*

API Standard 2220, *Contractor Safety Performance Process*

API Standard 2350, *Overfill Protection for Storage Tanks in Petroleum Facilities*

API Standard 2510, *Design and Construction of Liquefied Petroleum Gas Installations (LPG)*

API Publication 2557, *Vapor Collection and Control Operations for Storage and Transfer Operations in the Petroleum Industry*

API Recommended Practice 2611, *Terminal Piping Inspection—Inspection of In-service Terminal Piping Systems*

API Publication 4602, *Minimization, Handling, Treatment, and Disposal of Petroleum Products Terminal Wastewaters*

API Publication 45881, *Development of Fugitive Emission Factors and Emission Profiles for Petroleum Marketing Terminals, Volume 1*

API, *Security Vulnerability Assessment Methodology for the Petroleum and Petrochemical Industries*

AAR Mechanical Division ¹, *Manual of Standards and Recommended Practices*

ABS ², *Rules for Building and Classing Steel Vessels*

AREMA ³, *Manual for Railway Engineering*

ASM International ⁴, *ASM Metals Handbook, Volume 13: Corrosion*

ASME B16.5 ⁵, *Pipe Flanges and Flanged Fittings—NPS 1/2 Through NPS 24 Metric/Inch Standard*

ASME B16.9, *Factory-Made Wrought Butt welding Fittings*

ASME B16.11, *Forged Fittings, Socket-Welding and Threaded*

ASME B16.20, *Metallic Gaskets for Pipe Flanges*

ASME B16.21, *Nonmetallic Flat Gaskets for Pipe Flanges*

ASME B16.28, *Wrought Steel Butt welding Short Radius Elbows and Returns*

ASME B16.47, *Large Diameter Steel Flanges—NPS 26 Through NPS 60 Metric/Inch Standard*

ASME B31.3, *Process Piping*

ASME B31.4, *Pipeline Transportation Systems for Liquids and Slurries*

ASME B31.5, *Refrigeration Piping and Heat Transfer Components*

ASME B73.1M, *Specification for Horizontal End Suction Centrifugal Pumps for Chemical Process*

ASTM A193 ⁶, *Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service*

ASTM A194/A194M, *Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure or High-Temperature Service*

ASTM A320/A320M, *Standard Specification for Alloy-Steel and Stainless Steel Bolting for Low-Temperature Service*

AWS D1.1 ⁷, *Structural Welding Code—Steel*

AWWA C110 ⁸, *Ductile-Iron and Gray-Iron Fittings*

AWWA C115, *Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges*

AWWA C150, *Thickness Design of Ductile-Iron Pipe*

AWWA C151, *Ductile-Iron Pipe, Centrifugally Cast*

¹ Association of American Railroads, 425 3rd Street SW, Washington, DC 20024, www.aar.org.

² American Bureau of Shipping, ABS Plaza, 16855 Northchase Drive, Houston, Texas 77060, www.eagle.org.

³ American Railway Engineering and Maintenance-of-Way Association, 4501 Forbes Boulevard, Suite 130, Lanham, Maryland 20706, www.arena.org.

⁴ ASM International, 9639 Kinsman Road, Materials Park, Ohio 44073-0002, www.asminternational.org.

⁵ ASME International, 2 Park Avenue, New York, New York 10016-5990, www.asme.org.

⁶ ASTM International, 100 Barr Harbor Drive, West Conshohocken, Pennsylvania 19428-2959, www.astm.org.

⁷ American Welding Society, 8669 NW 36 Street, #130, Miami, Florida 33166-6672, www.aws.org.

⁸ American Water Works Association, 6666 West Quincy Avenue, Denver, Colorado 80235, www.awwa.org.

AWWA C153, *Ductile-Iron Compact Fittings*

BOCA ⁹, *The BOCA National Building Code*

DOJ 28 CFR Part 36 ¹⁰, *Nondiscrimination On the Basis of Disability By Public Accommodations and In Commercial Facilities*

EI 1529 ¹¹, *Aviation Fuelling Hose and Hose Assemblies*

EI 1581, *Specification and Qualification Procedures for Aviation Jet Fuel Filter/Separators*

HSE ¹², "Vapor Cloud Formation: Experiments and Modelling," HSE Research Report RR908-2012

ICBO ¹³, *International Building Code*

ICBO, *International Fire Code*

ICBO, *Uniform Building Code*

ICBO, *Uniform Fire Code*

ICOS/OCIMF/IAPH ¹⁴, *International Safety Guide for Oil Tankers & Terminals (ISGOTT)*

ICOS/OCIMF/IAPH, *International Safety Guide for Inland Navigation Tank- barges and Terminals (ISGINTT)*

IES ¹⁵, *The Lighting Handbook*

ISA 84.00.01 ¹⁶ (all parts), *Functional Safety: Safety Instrumented Systems for the Process Industry Sector*

MSS SP-75 ¹⁷, *High-Strength, Wrought, Butt-Welding Fittings*

MSS SP-83, *Class 3000 Steel Pipe Unions, Socket Welding and Threaded*

NACE RP0169 ¹⁸, *Control of External Corrosion on Underground or Submerged Metallic Piping Systems*

NACE RP0193, *External Cathodic Protection of On-Grade Carbon Steel Storage Tank Bottoms*

NACE RP0285, *Corrosion Control of Underground Storage Tank Systems by Cathodic Protection*

NACE SP0200, *Standard Practice Steel-Cased Pipeline Practices*

⁹ Building Officials Code Administrators. In 2003, BOCA, ICBO, and SBCCI combined into the International Code Council (ICC), www.iccsafe.org.

¹⁰ U.S. Department of Justice, 950 Pennsylvania Avenue NW, Washington, DC 20530-0001, www.usdoj.gov.

¹¹ Energy Institute, 61 New Cavendish Street, London W1G 7AR, UK, www.energyinst.org.

¹² Health and Safety Executive, Redgrave Court, Merton Road, Bootle, Merseyside L20 7HS, UK, www.hse.gov.uk.

¹³ International Conference of Building Officials. In 2003, BOCA, ICBO, and SBCCI combined into the International Code Council (ICC), www.iccsafe.org.

¹⁴ International Chamber of Shipping, 38 St Mary Axe, London EC3A 8BH, UK, www.ics-shipping.org; Oil Companies International Marine Forum, 29 Queen Anne's Gate, London SW1H 9BU, UK, www.ocimf.org; International Association of Ports and Harbors, 7th Floor, South Tower New Pier Takeshiba, 1-16-1 Kaigan, Minato-ku, Tokyo 105-0022, Japan, www.iaphworldports.org.

¹⁵ Illuminating Engineering Society, 120 Wall Street, 17th Floor, New York, New York 10005, www.iesna.org.

¹⁶ International Society of Automation, 67 T.W. Alexander Drive, Research Triangle Park, North Carolina 27709, www.isa.org.

¹⁷ Manufacturers Standardization Society of the Valve and Fittings Industry, 127 Park Street NE, Vienna, Virginia 22180-4602, www.mss-hq.com.

¹⁸ NACE International, 1440 South Creek Drive, Houston, Texas 77084, www.nace.org.

NFPA 1¹⁹, *Fire Code*

NFPA 10, *Standard for Portable Fire Extinguishers*

NFPA 11, *Standard for Low-, Medium-, and High-Expansion Foam*

NFPA 15, *Standard for Water Spray Fixed Systems for Fire Protection*

NFPA 16, *Standard for the Installation of Foam-Water Sprinkler and Foam-Water Spray Systems*

NFPA 17, *Standard for Dry Chemical Extinguishing Systems*

NFPA 20, *Standard for the Installation of Stationary Pumps for Fire Protection*

NFPA 22, *Standard for Water Tanks for Private Fire Protection*

NFPA 24, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances*

NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*

NFPA 30, *Flammable and Combustible Liquids Code*

NFPA 30A, *Code for Motor Fuel Dispensing Facilities and Repair Garages*

NFPA 69, *Standard on Explosion Prevention Systems*

NFPA 70, *National Electrical Code*

NFPA 70E, *Standard for Electrical Safety in the Workplace*

NFPA 77, *Recommended Practice on Static Electricity*

NFPA 101, *Life Safety Code*

NFPA 111, *Standard on Stored Electrical Energy Emergency and Standby Power Systems*

NFPA 403, *Standard for Aircraft Rescue and Fire-Fighting Services at Airports*

NFPA 407, *Standard for Aircraft Fuel Servicing*

NFPA 415, *Standard on Airport Terminal Buildings, Fueling Ramp Drainage, and Loading Walkways*

NFPA 496, *Standard for Purged and Pressurized Enclosures for Electrical Equipment*

NFPA 497, *Recommended Practice for the Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas*

NFPA 600, *Standard on Facility Fire Brigades*

NFPA 780, *Standard for the Installation of Lightning Protection Systems*

NFPA 5000, *Building Construction and Safety Code*

OCIMF, *Design and Construction Specification for Marine Loading Arms*

¹⁹ National Fire Protection Association, 1 Batterymarch Park, Quincy, Massachusetts 02169, www.nfpa.org

OSHA 29 CFR Part 1910.36 ²⁰, *Design and Construction Requirements for Exit Routes*

OSHA 29 CFR Part 1910.66, *Powered Platforms for Building Maintenance*

OSHA 29 CFR Part 1910.119, *Process Safety Management of Highly Hazardous Chemicals*

OSHA 29 CFR Part 1910.120, *Hazardous Waste Operations and Emergency Response*

OSHA 29 CFR Part 1910.134, *Respiratory Protection*

OSHA 29 CFR Part 1910.146, *Permit-Required Confined Spaces*

OSHA 29 CFR Part 1910.147, *The Control of Hazardous Energy (Lockout/Tagout)*

OSHA 29 CFR Part 1910.156, *Fire Brigades*

OSHA 29 CFR Part 1910.157, *Portable Fire Extinguishers*

OSHA 29 CFR Part 1910, Subpart D, *Walking-Working Surfaces*

OSHA 29 CFR Part 1910, Subpart L, *Fire Protection*

OSHA 29 CFR Part 1910, Subpart S, *Electrical*

OSHA 29 CFR Part 1926, Subpart M, *Fall Protection*

OSHA 29 CFR Part 1926.56, *Illumination*

OSHA 29 CFR Part 1926.62, *Lead*

OSHA 29 CFR Part 1926.64, *Process Safety Management of Highly Hazardous Chemicals*

PHMSA 49 CFR Part 194 ²¹, *Response Plans for Onshore Oil Pipelines*

PHMSA 49 CFR Part 195, *Transportation of Hazardous Liquids by Pipeline*

SBCCI ²², *Standard Building Code*

SSPC SP-1 ²³, *Solvent Cleaning*

SSPC SP-2, *Hand Tool Cleaning*

SSPC SP-3, *Power Tool Cleaning*

SSPC SP-5/NACE No. 1, *White Metal Blast Cleaning*

SSPC SP-6/NACE No. 3, *Commercial Blast Cleaning*

SSPC SP-7/NACE No. 4, *Brush-Off Blast Cleaning*

²⁰ U.S. Department of Labor, Occupational Safety and Health Administration, 200 Constitution Avenue NW, Washington, DC 20210. OSHA Regulations are posted on, and can be downloaded from: www.osha.gov.

²¹ Pipeline and Hazardous Material Safety Administration, 1200 New Jersey Avenue SE, Washington, DC 20590, www.phmsa.dot.gov.

²² Southern Building Code Congress International. In 2003, BOCA, ICBO, and SBCCI combined into the International Code Council (ICC), www.iccsafe.org.

²³ The Society for Protective Coatings, 800 Trumbull Drive, Pittsburgh, Pennsylvania 15205, www.sspc.org.

SSPC SP-10/NACE No. 2, *Near-White Metal Blast Cleaning*

SSPC, *Steel Structures Painting Manual, Volume 1: Good Painting Practice*

SSPC, *Steel Structures Painting Manual, Volume 2: Systems and Specifications*

STI SP001 ²⁴, *Standard for the Inspection of Aboveground Storage Tanks*

STI SP031, *Standard for Repair of Shop Fabricated Aboveground Tanks*

UL 142 ²⁵, *Standard for Steel Aboveground Tanks for Flammable and Combustible Liquids*

USCG 33 CFR Part 26 ²⁶, *Vessel Bridge-to-Bridge Radiotelephone Regulations*

USCG 33 CFR Part 126, *Handling of Dangerous Cargo at Waterfront Facilities*

USCG 33 CFR Part 154, *Facilities Transferring Oil or Hazardous Material in Bulk*

USCG 33 CFR Part 155, *Oil or Hazardous Material Pollution Prevention Regulations for Vessels*

USCG 33 CFR Part 156, *Oil and Hazardous Material Transfer Operations*

USCG 46 CFR Part 39, *Vapor Control Systems*

U.S. EPA 40 CFR Part 51 ²⁷, *Requirements for Preparation, Adoption, and Submittal of Implementation Plans*

U.S. EPA 40 CFR Part 52, *Approval and Promulgation of Implementation Plans*

U.S. EPA 40 CFR Part 60, *Standards of Performance for New Stationary Sources*

U.S. EPA 40 CFR Part 61, *National Emission Standards for Hazardous Air Pollutants*

U.S. EPA 40 CFR Part 63, *National Emission Standards for Hazardous Air Pollutants for Source Categories*

U.S. EPA 40 CFR Part 112, *Oil Pollution Prevention*

U.S. EPA 40 CFR Part 112, Appendix A "Memorandum of Understanding Between the Secretary of Transportation and the Administrator of the Environmental Protection Agency"

U.S. EPA 40 CFR Part 122, *EPA Administered Permit Programs: The National Pollutant Discharge Elimination System*

U.S. EPA 40 CFR Part 123, *State Program Requirements*

U.S. EPA 40 CFR Part 125, *Criteria and Standards for the National Pollutant Discharge Elimination System*

U.S. EPA 40 CFR Part 262, *Standards Applicable to Generators of Hazardous Waste*

U.S. EPA 40 CFR Part 264, *Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities*

²⁴ Steel Tank Institute, 944 Donata Ct, Lake Zurich, Illinois 60047, steeltank.com.

²⁵ Underwriters Laboratories, 333 Pfingsten Road, Northbrook, Illinois 60062, www.ul.com.

²⁶ U.S. Coast Guard Marine Safety Center (part of DOT), 2100 Second Street SW, Washington, DC 20593, www.uscg.mil. Available from the U.S. Government Printing Office, www.gpo.gov.

²⁷ Environmental Protection Agency, Ariel Rios Building, 1200 Pennsylvania Avenue NW, Washington, DC 20004. EPA Regulations are posted on, and can be downloaded from, the EPA website: www.epa.gov.

U.S. EPA 40 CFR Part 265, *Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities*

U.S. EPA 40 CFR Part 280, *Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks (UST)*

U.S. EPA 40 CFR Part 311, *Worker Protection*

U.S. EPA 40 CFR Part 403, *General Pretreatment Regulations for Existing and New Sources of Pollution*

3 Terms and Definitions

For the purposes of this standard, the following terms and definitions apply.

3.1

aboveground storage tank

AST

Atmospheric or low-pressure aboveground storage containers of various sizes and capacities. ASTs can:

- be vertical or horizontal;
- be cylindrical or rectangular;
- be closed-top, open-top, or covered open-top;
- be steel, fiberglass, poly, or other material;
- be shop fabricated or field erected; and
- have their entire bottom supported uniformly on the ground, completely on saddles, or on other supports.

3.2

berm

The area around the tank, inside the dike, normally used to contain spills and to provide access to the tank and surrounding equipment.

NOTE Also known as a "bund."

3.3

combustible liquid

A liquid having a flash point at or above 100 °F (37.8 °C).

NOTE See NFPA 30 for discussion of combustible liquid classification.

3.4

external floating-roof tank

An aboveground tank with a floating roof, which has no fixed roof and has an open top.

3.5

facility

Any building, structure, installation, equipment, pipeline, or other physical feature used in petroleum refining, storage, transportation, and distribution.

NOTE The boundaries of a facility may 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 the types of activity at the site.

3.6**fixed-roof tank**

An aboveground tank with no internal floating roof (IFR) that is covered by either a steel roof or an aluminum dome.

3.7**flammable liquid**

A liquid having a flash point below 100 °F (37.8 °C) and having a vapor pressure not exceeding 40 psi (absolute) (2069 mm Hg) at 100 °F (37.8 °C).

NOTE This is also classified as Class I liquid (see NFPA 30 for additional definitions and subclassifications).

3.8**installations**

Tanks, pumps, compressors, accessories, controls, piping, and all other associated equipment required for the receipt, transfer, storage, blending, packaging, and shipment of petroleum products.

3.9**internal floating-roof tank****IFR tank**

An aboveground fixed-roof tank with a floating roof inside the tank.

3.10**petroleum**

Any crude oil, petroleum liquid, or gaseous complex combination of hydrocarbons and related derivatives (natural or manmade) that may be processed from crude oil for fractions, including the following: natural gas, gasoline, naphtha, kerosene, fuel and lubricating oils, paraffin wax, additives, asphalt, and various derivative products.

NOTE U.S. EPA 40 *CFR* Part 60, Subpart Kb defines “petroleum” as crude oil removed from the earth and the oils derived from the tar sands, shale, and coal, while “petroleum liquids” is defined as any finished or intermediate product manufactured in a petroleum refinery.

3.11**petroleum contact wastewater****PCW**

Water-containing product, such as condensate from underground and aboveground petroleum storage tanks; water bottoms or drawdown water removed from a petroleum storage tank, petroleum tank filler sump, and dispenser sump water; or recovered product or water in contact with product that does not contain hazardous constituents other than petroleum.

3.12**process tank**

An aboveground or underground tank that forms a part of a refining process through which there is a steady, variable, recurring, or intermittent flow of materials during the operation of the process.

NOTE This definition excludes tanks used for the storage of products or raw materials before their introduction into the refining process or for the storage of finished products or byproducts from the refining process.

3.13**release prevention barrier****RPB**

The second lined bottom of double steel bottom tanks, synthetic materials, clay liners, and all other barriers or combination of barriers placed in the bottom of or under an AST that have these functions:

- a) preventing the escape of contaminated material and
- b) containing or channeling released material for leak detection.

NOTE See nonmandatory Annex I of API 650.

3.14

underground tank

A buried container that has a capacity of more than 110 gal (416 L) and is used to store petroleum, additives or other products for later use.

4 Site Selection and Spacing Requirements

4.1 Overview

This section covers the site selection and spacing requirements for the design and construction of new terminal facilities.

4.2 Site Selection

Site selection criteria should be established that minimize the potential risk to property adjacent to the terminal facility and the risk presented to the terminal facility by an incident on the adjacent property. The following factors should be considered when selecting a site for a new terminal facility.

- a) Proximity to public ways.
- b) Proximity to waterways, other surface waters, and wetland protection.
- c) Proximity and risk (to and from) adjacent facilities.
- d) Types and quantities of products to be stored.
- e) Proximity and risk to populated areas.
- f) Present and predicted development or rezoning of adjacent properties and the terminal property.
- g) Topography of the site including elevation, slope, and drainage.
- h) Assessment of site environmental conditions including soil and groundwater conditions, such as depth of the water table and type of aquifer. Refer to API 1628 for information on assessment technology.
- i) Availability of off-site emergency services and access for emergency response.
- j) Location and availability of required utilities including the following: electricity, sewers, potable water, firewater, steam, air, and natural gas.
- k) Requirements for receipt and shipment of products including the following: over-the-road, rail, marine, and pipeline facilities.
- l) Codes, permits, license requirements, and regulations applicable to construction, operation, and environmental requirements, including the following: zoning requirements; building permits and codes; operating permits; fire marshal permits; and air, water, and waste discharge permits.
- m) Proximity to existing supply and distribution facilities.
- n) Existence of threatened and endangered species.
- o) Possible cultural resources located in the site selection.

4.3 Spacing Requirements

4.3.1 General

4.3.1.1 The spacing provisions presented in this section are intended to minimize the fire hazard (see 7.2) and the exposure risk to adjacent tanks, equipment, and important buildings if a fire or other incident were to occur. The specific spacing distances necessary for safe operations require identification of the hazards involved (see 6.2).

4.3.1.2 Site-specific reviews of the potential risks should be used to estimate setback distances needed to limit the exposure to or from adjacent facilities. Sources of information on this subject may be found in NFPA 30 or other locally recognized requirements, such as ICBO's *Uniform Fire Code* or ICBO's *International Fire Code*.

4.3.2 Spacing of ASTs

4.3.2.1 The provisions for the location of ASTs with respect to property lines, public ways, and important buildings on the same property are listed in NFPA 30 or other locally recognized requirements, such as ICBO's *Uniform Fire Code* or ICBO's *International Fire Code*. The type of floating roof used in an AST may affect spacing requirements. For example, pan roofs, which do not contain closed compartments for buoyancy, are subject to flooding or sloshing during earthquakes or the application of fire-fighting foam/water solutions. In addition, without bracing of the rim provided by the pontoon top plate, the design of the rim to resist buckling shall be evaluated. Tanks with pan roofs are considered fixed-roof tanks with no IFR for the purpose of siting requirements in NFPA 30.

4.3.2.2 The requirements for spacing (shell-to-shell) between any two adjacent ASTs are listed in NFPA 30 or other locally recognized requirements, such as ICBO's *Uniform Fire Code* or ICBO's *International Fire Code*. The type of floating roof used in an AST may affect spacing requirements.

4.3.2.3 The impact on spacing requirements by the use of dikes, berms, and drainage swales shall be considered during the initial layout (see Section 9).

4.3.3 Spacing of Tank Truck Loading Racks

Tank truck loading racks for flammable and combustible liquids should be located near the terminal access way and should be oriented to provide a one-way traffic pattern for entrance and exit with clear and direct access to the terminal exit. The requirements for the spacing or location of truck loading racks from aboveground tanks, warehouses, and other facility buildings or adjoining property lines are listed in NFPA 30 or other locally recognized requirements, such as ICBO's *Uniform Fire Code* or ICBO's *International Fire Code*. Refer to 11.3 for additional requirements. Two-way drives may be provided to accommodate trucks with manifolds on both sides; however, these locations require larger paved areas.

4.3.4 Spacing of Rail Tank Car Loading Racks

Rail tank car loading racks for flammable and combustible liquids should be located to avoid road blockage when spotting rail cars. This precaution will help ensure the passage of fire trucks or other emergency vehicles. The requirements for rail facility design are found in AREMA's *Manual for Railway Engineering*, Volumes 1 and 2, and AAR Mechanical Division's *Manual of Standards and Recommended Practices*. Other requirements by local railroads or as stipulated in ICBO's *Uniform Fire Code*, ICBO's *International Fire Code*, or other locally adopted and applicable fire code may apply. Refer to 11.4 for rail tank car loading and unloading requirements.

4.3.5 Spacing of Marine Facilities

The requirements for the spacing and location of marine facilities handling flammable and combustible liquids are listed in NFPA 30, USCG 33 CFR Part 154, or other locally recognized requirements, such as ICBO's *Uniform Fire Code* or ICBO's *International Fire Code*. Refer to 11.5 for marine loading and unloading requirements.

4.3.6 Spacing of Vapor-control Equipment

Combustion vapor-control units are a potential ignition source. Some terminals may use fuel source tanks [e.g. liquid petroleum gas (LPG) tanks] in conjunction with combustion vapor-control units. Electrical classification in areas where such ignition source equipment is to be located shall be in accordance with NFPA 70, NFPA 496, NFPA 497A, API 500, or other applicable local requirements. See 7.2.1 and 11.7 for additional requirements.

4.3.7 Spacing of Pumps and Other Miscellaneous Equipment

The requirements for the spacing of pumps for the handling of flammable and combustible liquids and other miscellaneous equipment, such as diesel generators and internal combustion engines, are found in NFPA 30 or other locally recognized equivalent requirements, such as ICBO's *Uniform Fire Code*. Refer to 9.2.8 and 10.5 for additional pump requirements.

If pumps are located within containment areas, sound risk management principles should be used to mitigate the risks of locating the pump inside the secondary containment area. Risk reduction measures include heat sensors to provide early warning of a seal fire and automated isolation valves among other measures. Refer to NFPA 30 for guidance.

NOTE API 500 should also be consulted when locating new pumps for the electric motor portion of the pump or electrical instrumentation.

4.3.8 Spacing of Buildings

Location of buildings and spacing between buildings should be based on the type of construction, the intended use, and the applicable NFPA fire codes. Other locally recognized requirements, such as ICC's *International Fire Code*, NFPA 5000 *Building Code*, ICBO's *Uniform Fire Code*, *The BOCA National Building Code*, ICBO's *Uniform Building Code*, SBCCI's *Standard Building Code*, or applicable state, municipal or locally adopted building code should also be consulted. Refer to 13.1 for structure requirements.

4.3.9 Spacing of Electrical Equipment

Spacing and location of electrical equipment should consider the requirements of the area's electrical classification. Recommendations for determining the electrical area classification are given in NFPA 30; NFPA 497; Articles 110, Article 513, and Article 515 of NFPA 70; API 500; or other applicable state and local requirements. Refer to 13.2.2 for electrical utility requirements.

4.3.10 Alternatives to Spacing Requirements

If the layouts at some sites are such that the recommended spacing requirements may not be met, consideration should be given using sound risk management and engineering practices to increase the fire preventive aspects of design, such as improved drainage, equipment isolation, increased fire suppression equipment, or an alternative, such as locating equipment in pressurized enclosures. Examples of such applications would be enclosures for motor control centers, diesel generators, or vapor-control units. Further information on this subject may be found in NFPA 496.

5 Pollution Prevention and Waste Management

5.1 Applicability

5.1.1 General

This section addresses the methods of pollution prevention and waste management practices in the design, maintenance, and operation of petroleum terminal and tank facilities.

5.1.2 Regulatory Requirements

Federal, state, and local regulations continue to increase pollution prevention and waste minimization requirements for petroleum terminal and tank facilities. Regulatory requirements involve use of the following.

- a) Placement of limits on air emissions, water discharges, waste generation, waste handling, and waste disposal.
- b) Collection of fees for emissions, discharges, and waste disposal.
- c) Identification, recordkeeping, and reporting requirements for sources and amounts of air emissions, water discharges, waste generation, waste handling, and waste disposal. Refer to 1.3 and Section 2 for referenced environmental regulations and governmental requirements.

Use of a waste management hierarchy provides a practical means of pollution prevention. Cost savings may accrue from reduction of waste generated and reduced levels of treatment or disposal.

5.2 Waste Management Hierarchy

5.2.1 General

A waste management hierarchy serves as a guide to pollution prevention activities. The waste management practices described in this section should be considered in the design, operation, and maintenance of facilities.

The four categories within the hierarchy are prioritized in order of general acceptance: Source Reduction/Waste Elimination, Recycling/Reuse, Treatment, and Disposal. The following sections briefly describe each of the four categories and provide examples, where appropriate.

5.2.2 Source Reduction/Waste Elimination

Changes in facility design, operation, and maintenance that reduce, avoid, prevent, or eliminate waste generation are regarded as source reduction/waste elimination. Source reduction/waste elimination refers to a variety of activities that prevent (waste elimination) or decrease (source reduction) the amount of waste created or the toxicity of waste generated. Source reduction and waste elimination activities include, but are not necessarily limited to, the following items.

- a) Equipment or technology modifications.
- b) Procedure and operations modifications.
- c) Substitution of materials.
- d) Improved housekeeping, training, and inventory control.

Before initiation of significant facility operation modifications, a management of change review may be required (refer to 6.6). Additionally, the proposed modifications may be subject to regulatory review including permit modifications or new permits.

5.2.3 Recycling/Reuse

Resource recovery and other similar practices may be implemented to beneficially reclaim, recycle, reuse, or reprocess materials from a facility.

5.2.4 Treatment

Any physical, chemical, biological, or thermal process that reduces the volume or toxicity of waste is regarded as treatment.

5.2.5 Disposal

Controlled discharges of waste into air, water, or onto land may constitute disposal. Solid, liquid, and some gaseous waste disposal shall be handled at properly permitted disposal facilities as per federal, state, and local environmental guidelines. Refer to U.S. EPA 40 *CFR* Parts 60, 61, 63, 122, 123, 264, and 265 and other appropriate federal, state, and local requirements.

5.3 Pollution Prevention

5.3.1 General

Pollution prevention is a multi-faceted concept designed to reduce or eliminate pollutant discharges to air, water, or land. Pollution prevention includes changes in practices, source reduction, beneficial use, and environmentally sound recycling. It should be recognized that pollution prevention is typically far more effective than emergency response, remediation, or mitigation of initiating events. The aim of pollution prevention programs is to prevent equipment failures and minimize the generation of waste products, as well as minimize inventory loss to the air, water, and land. It is the responsibility of management to enact appropriate pollution prevention strategies that are protective of human health (see Section 6) and the environment, as appropriate. Factors to recognize during the development of pollution prevention programs include facility design, operating procedures (see 6.3), maintenance (see 11.15), training (see 6.7), recordkeeping, and inventory control (see 11.12). Pollution prevention should be implemented through source reduction or elimination, recycling, or re-use. Additionally, the implementation of pre-start-up safety and operational inspections (see 6.8) may assist in determining the effectiveness of pollution prevention programs. The benefits of effective pollution prevention programs may include the following.

- a) Reduced potential exposure to workers and community.
- b) Lower cost of waste disposal and treatment.
- c) Reduced risk to the environment.
- d) Reduced or simplified regulatory reporting and recordkeeping.
- e) Lower material and operating costs.
- f) Reduced long-term liabilities.
- g) Improved image and public relations.
- h) Reduced need for prescriptive regulations.

5.3.2 Air

5.3.2.1 General

Emissions to the atmosphere of volatile organic compounds (VOCs) and toxic or hazardous air pollutants (HAP) are subject to regulations promulgated in the CAA and its amendments and the regulations of state and local agencies. Federal, state, and local air regulations applicable to bulk gasoline and petroleum terminal and tank facilities are included in U.S. EPA 40 *CFR* Part 60, Subparts K, Ka, Kb, and XX. These regulations apply to all new, modified, or reconstructed facilities as defined within the CAA. Facilities that are major HAP emission sources are regulated under the Gasoline Distribution Industry Maximum Achievable Control Technology

(MACT) that is part of the National Emissions Standards for Hazardous Air Pollutants (NESHAP) of U.S. EPA 40 *CFR* Parts 61 and 63. Individual State Implementation Plans (SIPs) are authorized per U.S. EPA 40 *CFR* Parts 51 and 52 for implementation of stricter state and local rules for areas that have not attained the federal standards for air quality. The control of air emissions at facilities is listed in 5.3.2.2 through 5.3.2.6. Specific methods used to control emissions will be dependent upon site-specific conditions including the applicable regulatory requirements.

5.3.2.2 Loading Operations

Air emission control requirements for regulated product transfer operations include vapor collection and processing systems, as specified by various federal, state, and local requirements. Refer to 11.3.4 and 11.7 for additional information on loading operations and vapor control.

5.3.2.3 Product Storage—Aboveground Tanks

Air emissions of VOCs from aboveground tanks may be controlled by using an external floating roof with primary and secondary seals, an IFR with seals, a closed-vent vapor collection and control system, or other methods. See 5.3.2.5, 5.4.2, and 8.1.3.3 for additional information on AST vapor emissions.

5.3.2.4 Product Storage—Underground Tanks

Air emissions of VOCs from underground tanks, such as vapors emitted during filling, are generally regulated by SIPs and local regulations.

5.3.2.5 Fugitive Emissions

Methods for controlling or reducing fugitive vapor emissions from vents, pumps, tank mixers, valves, flanges, and other connecting points should be considered in the design, operation, and maintenance of facilities. Refer to API 45881 for development of fugitive emission factors and emission profiles for petroleum (marketing) terminals. Refer to equipment specifications, monitoring records, maintenance logs, and other sources, such as the air permit, to determine whether leak-loss or low-leak (i.e. low-emission) pumps or valves are required.

5.3.2.6 Asbestos, Lead, and Other Regulated Airborne Contaminants

Air emissions of dust as a result of removal of asbestos insulation or lead-based paint or the use of other regulated toxic materials shall be controlled in accordance with federal, state, and local requirements (see 6.4 and 12.2.6.2).

5.3.3 Water

5.3.3.1 General

Pollution prevention may be accomplished by reducing the sources and volume of PCW and the concentrations and toxicity of petroleum compounds in the PCW. These reductions are addressed in 5.3.3.2 and 5.3.3.3.

API 4602 provides a range of options for wastewater management and treatment at petroleum (marketing) terminals.

5.3.3.2 Petroleum Contact Water

Effective spill-containment design and operating procedures reduce the volume of petroleum contact water that shall be treated and discharged or disposed. For example, storm water may be segregated from sources of contamination to prevent petroleum contact, thereby reducing the volume of wastewater that shall be managed. Refer to 8.1.8, 11.3.2, 11.3.3, 11.4.2, 11.4.3, 11.14, 13.3.4, and 13.3.5 for operating procedures and design considerations for wastewater management. Refer to API 4602 for design considerations at petroleum (marketing) terminals. SPCC plan requirements (U.S. EPA 40 *CFR* Part 112) for regulated facilities provide additional guidance. For facilities with marine docks, refer to USCG 33 *CFR* Parts 126, 154, 155, and 156 and U.S. EPA 40 *CFR* Part 311, which regulate transfer of petroleum products across navigable waterways. Refer also to 8.1.7 regarding tank water draw-off.

5.3.3.3 Wastewater Management

Wastewater may require treatment to reduce pollutants before discharge, under a National Pollutant Discharge Elimination System (NPDES) permit issued under federal regulations U.S. EPA 40 *CFR* Parts 122 and 125 or state permits [State Pollutant Discharge Elimination System (SPDES)] issued under the authority of U.S. EPA 40 *CFR* Part 123. Some wastewater discharge permits for petroleum terminals may impose discharge limits on specific compounds and impose toxic monitoring or limits on toxic parameters for wastewater discharge. Wastewater facilities may also be subject to RCRA requirements for treatment, disposal, and storage facilities (TSDFs) under U.S. EPA 40 *CFR* Parts 264 and 265.

Discharge to a publicly-owned treatment works (POTW) may require pretreatment or other conditions to achieve POTW permit standards before discharge. Refer to U.S. EPA 40 *CFR* Part 403 for additional information on discharges to POTWs.

Additional opportunities for reduction of wastewater pollutants may become evident upon further evaluation of the discharge. Furthermore, toxicity-based permits may require further reduction of wastewater constituents through pre-treatment or post-treatment.

5.3.3.4 Facility Design

Additional facility design guidance is provided for petroleum terminals in API 4602. This API publication addresses tank farm drainage, tank bottom water, ballast water, storm water, process and containment water, wastewater, and test water (refer also to 9.2, 10.3.7, and 13.3). Where appropriate, wastewater treatment may include one or more of the following:

- a) gravity separator,
- b) carbon,
- c) air stripping,
- d) biological treatment,
- e) UV/oxidation,
- f) dissolved air floatation, and/or
- g) other technologies.

5.3.4 Solid Waste Management

5.3.4.1 General

Solid waste reduction or elimination may be accomplished through facility design, product substitution, maintenance, and operation.

5.3.4.2 Waste Minimization Certification

All hazardous waste manifests require certification that a program is in place to reduce the volume or toxicity of waste generated to the degree economically practical (per U.S. EPA 40 *CFR* Parts 262, 264, and 265). Implementation of pollution prevention designs, maintenance, and operating practices will support this certification.

5.3.4.3 Facility Operation

Facility operation guidance to minimize solid waste in petroleum (marketing) terminals is suggested in API 1638. Additionally, the stipulations of API 2610 for dikes and berms (see Section 9), corrosion control (see Section 12), release prevention (see 8.1.3.1), and proper handling of recovered petroleum product support waste reduction.

5.4 Waste Management Practices

5.4.1 General

After consideration of pollution prevention practices, each facility should develop waste management practices that serve to minimize the amount of waste generated on-site from normal routine facility operation and maintenance. Waste management may be subject to the RCRA requirements of federal, state, and local regulations. API 1638 provides guidance and additional information for waste management in support of pollution prevention for petroleum terminals. The waste streams addressed in this standard are grouped into the following four categories.

- a) Waste produced by handling and storage facilities.
- b) Waste produced by waste treatment facilities.
- c) Vehicular waste.
- d) Miscellaneous waste.

Waste management options for wastes identified within each of the above-listed categories are covered in API 1638.

Refer to 5.4.2 through 5.4.4 for suggested waste management practices that are applicable for the facilities covered in this standard.

5.4.2 Product Storage

5.4.2.1 General

Source reduction opportunities exist in the design, modification, maintenance, and operation of tanks. Examples of source reduction opportunities are described in 5.4.2.2 and 5.4.2.3. Refer also to 8.1.3.

5.4.2.2 IFR Tanks

The use of an IFR (i.e. the fixed-roof component may be a steel or aluminum geodesic dome) will minimize possible damage to the floating roof as a result of snow, ice, or water accumulation on the floating roof. Fixed roofs over floating roofs may reduce air emissions depending on the base conditions, such as the type and condition of the floating roof and seals (see 8.1.3.3). Fixed roofs may also minimize the amount of petroleum contact water generated from precipitation.

5.4.2.3 Tank Cleaning

Improved procedures may reduce the volume of solid waste generated during tank cleaning operations. Procedures include the following.

- a) Extracting recoverable product for re-use prior to the start of tank cleaning and vapor (gas) freeing.
- b) Use of high-pressure/low-volume water wash methods.
- c) In situ sludge reduction/reclamation systems or procedures.
- d) Recycling of wash water or recycling of other cleaning materials.
- e) Extraction of liquids from the products of tank cleaning operations before disposal of solids.

Tank design features, such as sloped bottom design and tank bottom coatings, may reduce the amount of cleaning required, as well as the sludge volume generated. Refer to API 2015 for further tank cleaning information and requirements.

5.4.3 Wastewater Management

5.4.3.1 General

The design, maintenance, and operation of wastewater collection and treatment systems offer opportunities for waste minimization. Several options for wastewater management are given in 5.4.3.2 through 5.4.3.4. Additional considerations for petroleum terminals are presented in API 1638 and API 4602. Refer also to 8.1.7, 8.1.8, 11.3.2, 11.3.3, 11.4.2, 11.4.3, and 13.3.

5.4.3.2 Hydrostatic Test Water

Cleaning tanks before performing hydrostatic tests may reduce the generation of contaminated wastewater. When disposal of the test water is necessary, its handling should be reviewed with the authorities having jurisdiction before placement of test water in the tank. Unnecessary hydrostatic testing should be avoided as it may produce large volumes of potentially contaminated water that may have to be treated or disposed. Specific exemptions for hydrostatic testing for in-service tanks are given in API 653.

5.4.3.3 Spill Containment

Properly designed spill-containment systems at product transfer and storage areas will minimize the volume of storm water that becomes commingled with contaminants within the containment system. A properly designed spill-containment system should enclose the minimum area required for containment. Refer to 7.4.4 for consideration for fire protection water/water foam run-off.

5.4.3.4 Oil/Water Separators

The installation of sand/grit traps or protective mud sumps at the separator inlet or at source points, such as catch basins or manholes, will reduce the volume of petroleum contact sediments generated in the separator.

5.4.4 Storm Water

Facility designs that segregate uncontaminated storm water from petroleum contact water through the use of curbing, hard-piped systems, and other methods will provide source reduction (see 5.3.3.2 and 13.3.4).

6 Safe Operations of Terminals and Tanks

6.1 General

Safe operation of facilities is not only primarily a management responsibility, but the responsibility of all employees, as well as contractors working at the site. Management programs shall be established to ensure conformance with applicable safety and operational standards, compliance with applicable regulations, and the use of appropriate work practices and procedures.

This section covers the elements most often used in the safe operations of terminals and tanks and provides guidance to assist this effort, including but not limited to hazard identification, operating procedures, safe work practices, emergency response and control, management of change, training, pre-start-up safety and operational inspections, incident investigation, and contractor safety.

The API documents *Security Guidelines for the Petroleum Industry* and *Security Vulnerability Assessment Methodology for the Petroleum and Petrochemical Industries* provide information to help facilities evaluate and respond appropriately to their potential and real security threats.

6.2 Hazard Identification

Programs shall be in effect and information on safety hazards shall be available to facilitate communication with employees, contractors, subcontractors, on-site vendors, emergency response personnel, and visitors. The information provided should be consistent with federal, state, and local hazard communication, right-to-know requirements and include provisions for ready access to safety data sheets (SDSs).