Environmental, Health, and Safety Guidelines for Retail Petroleum Networks

Introduction

The Environmental, Health, and Safety (EHS) Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP)[1]. When one or more members of the World Bank Group are involved in a project, these EHS Guidelines are applied as required by their respective policies and standards. These industry sector EHS guidelines are designed to be used together with the **General EHS Guidelines** document, which provides guidance to users on common EHS issues potentially applicable to all industry sectors. For complex projects, use of multiple industry-sector guidelines may be necessary. A complete list of industry-sector guidelines can be found at: www.ifc.org/ifcext/enviro.nsf/Content/EnvironmentalGuidelines

The EHS Guidelines contain the performance levels and measures that are generally considered to be achievable in new facilities by existing technology at reasonable costs. Application of the EHS Guidelines to existing facilities may involve the establishment of site-specific targets, with an appropriate timetable for achieving them. The applicability of the EHS Guidelines should be tailored to the hazards and risks established for each project on the basis of the results of an environmental assessment in which site-specific variables, such as host country context, assimilative capacity of the environment, and other project factors, are taken into account. The applicability of specific technical recommendations should be based on the professional opinion of qualified and experienced persons. When host country regulations differ from the levels and measures presented in the EHS Guidelines, projects are expected to achieve whichever is more stringent. If less stringent levels or measures than those provided in these EHS Guidelines are appropriate, in view of specific project circumstances, a full and detailed justification for any proposed alternatives is needed as part of the site-specific environmental assessment. This justification should demonstrate that the choice for any alternate performance levels is protective of human health and the environment.

[1] Defined as the exercise of professional skill, diligence, prudence and foresight that would be reasonably expected from skilled and experienced professionals engaged in the same type of undertaking under the same or similar circumstances globally. The circumstances that skilled and experienced professionals may find when evaluating the range of pollution prevention and control techniques available to a project may include, but are not limited to, varying levels of environmental degradation and environmental assimilative capacity as well as varying levels of financial and technical feasibility.

Applicability

The EHS Guidelines for Retail Petroleum Networks include information relevant to retail petroleum networks primarily dedicated to the sale of petroleum-based automotive fuels, including Liquid Petroleum Gas (LPG) and Compressed Natural Gas (CNG), and which may provide limited vehicle repair and washing services. Guidance applicable to bulk storage and distribution of petroleum or petroleum-related products is presented in the EHS Guidelines for Crude Oil and Petroleum Product Terminals. This document is organized according to the following sections:

Section 1.0 — Industry-Specific Impacts and Management
Section 2.0 — Performance Indicators and Monitoring
Section 3.0 — References
Annex A — General Description of Industry Activities

1.0 Industry-Specific Impacts and Management

The following section provides a summary of EHS issues associated with retail petroleum facilities which occur during the operational and decommissioning phases, along with recommendations for their management.

1.1 Environment

Environmental issues in retail petroleum networks primarily include the following:

- Leaks and spills
- Wastewater
- Waste management
- Emissions to air

Leaks and Spills

Among the most significant environmental issues from retail petroleum sites is the accidental release of stored or handled fuels due to leaks from storage tanks, piping systems, and fittings under fuel dispensers. Releases may also result from surface spills and overfills during delivery and fueling. Tank and piping system failures may result from aging (e.g. corrosion of steel components) or from structural stress due to improper installation. The impacts from such releases depends on numerous factors including the amount of materials released, local geologic conditions, and proximity to environmental receptors such as subsurface utilities or building structures (in which organic vapor may accumulate) or water resources (e.g. groundwater wells or surface water reservoirs used for potable water purposes).

Recommended leak and spill prevention and control strategies include:

Tanks and Piping - New Facilities and Upgrades

- Underground storage tanks (USTs) or aboveground storage tanks (ASTs), whether constructed of steel or fiberglass-reinforced plastic, should be designed and built according to recognized industry standards.[2]
- USTs and ASTs should have secondary containment systems to prevent the uncontrolled release of fuel. Secondary containment may consist of:
  - Double wall construction for USTs and the bottoms of ASTs, equipped with an interstitial monitoring devise connected to a continuous leak detection system
  - Use of vaults or membranes in single wall USTs
  - Use of secondary containment structures for ASTs as described in the **General EHS Guidelines**
  - Use of composite tanks
- Leak detection systems should be able to detect the presence of liquid or petroleum vapor within the interstitial space;[3,4]
- Use of corrosion protection in steel tanks and piping. Corrosion protection may consist of coating with a suitable dielectric material or by cathodic protection;[5]
- Tanks should be equipped with devices that prevent spills and overfills, such as overfill alarms, automatic shut-off devices and catch basins around fill pipes. Fill pipes on ASTs should be located within the tank's secondary containment structures;

[2] Examples include the American Society for Testing and Materials (ASTM) International, European Standards (EN), or Underwriter Laboratories Standards 1746 and 1316.

[3] Additional information on interstitial and other types of leak detection systems is provided by the Association for Petroleum and Explosive Administration and Institute of Petroleum (1999).

[4] Specific information on tank and pipework design and release detection requirements can be found in the United States Environmental Protection Agency (EPA) Code of Federal Regulation (CFR) 40 Subpart B 280.20 - 280.22 and Subpart D 280.40 - 280.45.

[5] The level of corrosion protection may also be established based on the corrosiveness of local soils.

- UST and AST piping, fittings, and connections should be designed and built according to recognized industry standards;[6]
  - Buried piping joints and fittings made of metal should be kept to a minimum and, when necessary, should be welded rather than threaded. The use of polyethylene piping and continuous, flexible composite piping from specially developed thermoplastic composites with no joints should be considered
  - Pressure piping systems should include secondary containment with plastic
  - AST related piping should be installed inside the AST secondary containment system
- Tank and piping installation procedures should be consistent with recognized industry standards and equipment manufacturer recommendations.[7] Installation procedures designed to reduce the likelihood of tank and piping structural failure include:
  - Proper care and handling of tank and piping materials prior to installation
  - Preparation of foundations with the use of backfill that support tank and piping securely and evenly to prevent movement, uneven settlement, or concentrated loading, especially for fiberglass-reinforced plastic USTs and flexible composite piping
  - Overlying concrete or pavement should be designed to handle dynamic loads to prevent stress on buried tank and piping
- ASTs should be located in a secure area, protected from potential collisions by vehicles, vandalism, and other hazards.

[6] Such as ASTM, EN, or other comparable international standards.
[7] Ibid.

Tanks and Piping - Existing Facilities

- Monitoring of UST and AST tanks and piping for leaks through the use of periodic tightness testing[8] combined with inventory reconciliation consisting of an analysis of daily inventory compared to delivered quantities and volumes dispensed;
- Prioritizing the upgrade of equipment and installation for existing facilities of a network according to local regulatory standards (which may require the upgrade or replacement of tanks and other infrastructure after they reach a certain age)[9] or according to the potential likelihood of a release and the potential severity of the consequences in the event of a release. Examples of risk-based criteria applicable to USTs include:
  - Evidence of system leaks such as loss of product from inventory or reports of gasoline / fuel vapors in underground utilities or nearby buildings
  - Age and type of construction of existing tank and piping infrastructure[10]
  - Soil characteristics that may contribute both to the corrosion of underground systems
  - Location in, or in close proximity to, underground mining areas
  - Proximity to environmental receptors such as underground infrastructure (e.g. underground public utilities such as sewers, tunnels / vaults for electric or telephone utilities, or building basements), private or public water supply wells, surface water reservoirs, aquatic habitats for critically endangered or

[8] Typical tightness testing frequency may range from annually to every three years. Tightness testing of tanks and piping should be conducted by qualified experts following nationally certified methodologies or, in their absence, methodologies certified by internationally recognized entities. It should be noted, however, that the results of certified tank tightness tests do not guarantee the absence of small leaks with potentially significant cumulative impacts.
[9] Some jurisdictions require replacement of tanks when they reach 15 years, for example Compañía de Tecnología de Saneamento Ambiental (CETESB), State of Sao Paulo, Brazil.
[10] The likelihood of leaks due to corrosion typically increases with the age of the tank and if a tank or piping is made of steel and has a single wall construction.

endangered species, or other potential points of human or ecological exposure to gasoline / fuel related contaminants

Fuel Dispensing Equipment

Dispensers should be securely mounted and be protected against damage from vehicles and include the following features:

- Suction systems should include a leak-proof drip tray beneath the dispenser;
- Pressure systems should be equipped with leak-proof sumps instead of, or in addition to, a drip tray beneath the dispenser;
- No-return or check valves, fitted within the dispenser housing, should be installed on each line of a suction system;
- Use of "breakaway" hose connections which provide emergency shutdown of flow should the fueling connection be broken through movement;
- Nozzles fitted with automatic shut off and attitude devices;
- Fuel dispensing areas should be paved and be equipped with drainage into an oil / water separator able to contain accidental spills which may be occur during vehicle fueling.

Fuel Delivery Equipment

- Fill pipes should have suitable fittings to ensure a secure, leak-proof connection with the hoses from delivery trucks. Such fittings should have provision for a locking device that prevents unauthorized access;
- Where fill pipes are installed above ground, the height should be below the minimum height of the delivery tanker's bottom loading adaptor to ensure proper draining of the hose contents into the storage tank.

Spill and Leak Prevention and Control Planning

- ASTs should undergo periodic inspection for corrosion and structural integrity and be subject to regular maintenance and replacement of equipment (e.g. pipes, seals, connectors, and valves);[11]
- Bulk deliveries should be conducted by properly trained personnel according to pre-established formal procedures to prevent accidental releases and fire / explosion hazards. Procedures should include all aspects of the delivery or loading operation from arrival to departure, including wheel blocking to avoid vehicle movement, connection of grounding systems, verification of proper hose connection and disconnection, adherence to no-smoking and no-naked light policies for visiting drivers, among other considerations;
- Facilities should develop a formal spill prevention and control plan that addresses significant scenarios and magnitude of releases. The plan should be supported by the necessary resources and training. Spill response equipment should be conveniently available to address all types of spills, including small spills. Spill cleanup materials should be managed as discussed below;
- Facilities should also have a formal procedure developed by network operators and managers to respond to the discovery of leaks in ASTs or USTs, including means for confirming the presence of the release; investigating potential impacts to environmental media; and, based on the result of the assessment or on confirmation of the significance of the release, implementing corrective actions to repair or replace damaged or leaking equipment and address risks of the resulting impacts to soil and water

[11] Several methods exist for inspecting tanks. Visual inspection may reveal cracks and leaks in tanks. X-ray or ultrasonic analysis can be used to measure wall thickness and pinpoint crack locations. Hydrostatic testing may indicate leaks caused by pressure, while a combination of magnetic flux eddy current and ultrasonic analysis can be used to detect pitting. An example of good practice includes American Petroleum Institute (API) Standard 653 (1995).

resources. Service station staff should be trained in these procedures.

- Groundwater monitoring should be included as part of a spill / leak detection strategy. Groundwater monitoring should typically consist of at least three monitoring points to also establish the direction of groundwater flow.

Wastewater

The most significant source of liquid effluents include stormwater runoff from fuel delivery and dispensing areas and from automobile repair areas, as well as effluents from automobile washing activities.

Stormwater

In addition to the application of effective spill prevention and control, additional measures to minimize the generation of petroleum contaminated stormwater runoff in retail petroleum sites primarily include:

- Minimization of volume of stormwater generated from vehicle fueling stations and AST containment areas through installation of roofs or other types of covers;
- Implementation of secondary containment procedures that avoid accidental or intentional releases of contaminated containment fluids;
- Segregation of clean drainage and potentially contaminated drainage, treating the latter through oil / water separators. Oil water separators may include baffle type or coalescing plate type. They should be properly designed, operated, and maintained to achieve the desired water treatment results.

Further recommendations for the management of stormwater are discussed in the **General EHS Guidelines**.

Automobile Washing

Automatic vehicle washes, high pressure hand washes, and steam cleaners may produce large volumes of wastewater, possibly at high temperatures, which may contain cleaning agents, oil, and road dirt, sometimes in the form of stable emulsions. Due to these characteristics, automobile washing effluents should not be discharged through oil / water separation systems, instead applying the following additional considerations:

- Use of recycling systems (closed-loops) to reduce the volumes of water used and discharged;
- Passing stream through a silt trap prior to discharging into centralized wastewater collection systems;
- Containing used wash water in a sealed tank for off-site management by a qualified contractor.

Other Effluents

Sanitary wastewater should be managed according to the recommendations provided in the **General EHS Guidelines** and depending on the site location and availability of public sewage collection and treatment.

Waste Management

The principal sources of waste may include waste lubricating oil, solvents for parts cleaning, oily rags from automobile repair operations, waste oil and oily solids from sediment traps and oil / water separators, contaminated spill cleanup materials, and contaminated soils and equipment from the replacement or decommissioning of tanks and piping. Recommended waste management practices are outlined below.

Automobile Repair and Site Maintenance

Waste lubricating oils and waste solvents should be stored in properly designed containers and specially designated areas as with other hazardous materials (see **General EHS Guidelines**).

They should be transported and recycled off-site by qualified personnel or contractors. Common off-site options may include recycling by refineries or as a fuel source in cement kilns. Operators may also work with other industries and relevant authorities to develop cooperative efforts for the collection of used oil into volumes that make recycling commercially viable. Rags containing fuels, oil, or solvents, as well as spill cleanup materials, should be managed as a hazardous waste as described in the **General EHS Guidelines**.

Site Upgrade and Decommissioning

Contaminated soils and water may be encountered around fuel dispensers, piping, and tanks during excavation for repairs, upgrades or decommissioning. Depending on the type and concentration of contaminants present, small quantities of soils or liquids may need to be managed as a hazardous waste as described in the **General EHS Guidelines**. Larger quantities of affected soils and other environmental media, including sediment and groundwater, may require management according to contaminated land guidance as provided in the **General EHS Guidelines**.

Retail petroleum networks should have formal procedures to address and manage the planned or unplanned discovery of site upgrade and decommissioning waste, as well as to address the discovery of more extensive evidence of environmental contamination.[12]

Removal operations of any USTs, ASTs, and connected piping should include the following procedures:

- Residual fuel should be removed from the tank and all associated pipes and managed as a hazardous waste;
- Before commencing tank removal operations the tanks should be inerted so as to remove the risk of explosion. Proven inerting methods include hydrophobic foam fill, nitrogen foam fill, nitrogen gas purging, water fill, dry ice, combustion of gas, and cleaning-degassing;
- All vent pipes and risers associated with the tank should be dismantled and / or capped-off and clearly labeled;
- Tank dismantling should be carried out off-site, if the facility is currently used to store fuel and there is not sufficient space to carry out the dismantling work safely;
- If tanks and piping are left in situ, recommended closure methods should include cleaning and removing contents, inerting, and filling with sand and cement slurry, hydrophobic foams, or foamed concrete.

Emissions to Air

The main sources of emissions to air include evaporative losses of volatile organic compounds (VOCs) of fuel product from storage, particularly during bulk deliveries, and during dispensing operations. General recommendations to prevent and control the emission of VOCs from storage and working losses which apply to most bulk fuel storage tanks, piping and pump systems, include the following:[13,14]

- Using white or other color paints with low heat absorption properties on exteriors of ASTs for lighter distillates such as gasoline to reduce heat absorption. Potential for visual impacts from reflection of light off tanks should be considered;
- Where vapor emissions may contribute or result in ambient air quality levels above health based standards, considering the installation of secondary emissions controls

[12] Host country regulations may require specific approaches to screening of soils during excavation as well as further assessment of contaminated media in retail petroleum sites (CETESB, State of Sao Paulo, Brazil).

[13] The applicability may depend on the type of product stored, the storage system, and the significance of potential impacts to ambient air quality.

[14] More detailed recommendations are provided in European Commission (EC): Integrated Pollution Prevention and Control Bureau: Reference Document on Best Available Techniques on Emissions from Storage (2005).

such as Stage 1(for unloading of fuel products from road tankers[15]) and Stage 2 (for filling of vehicles[16]) vapor recovery systems.

1.2 Occupational Health and Safety

The most significant occupational health and safety issues occur during the operational (mainly related to maintenance activities) and decommissioning phases of retail petroleum networks and primarily include the following:

- Chemical hazards
- Fire and explosions
- Confined spaces

Chemicals Hazards

Occupational exposures may be most likely related to dermal contact with fuels and inhalation of fuel vapors among fuel dispensing and tanker delivery workers, as well as workers involved in maintenance activities, especially those which involve potential contact with contaminated soils and the resulting vapors. Exposures should be prevented through the implementation of occupational health and safety management programs and measures described in the **General EHS Guidelines** applicable to hazardous materials management and chemical occupational health and safety hazards.

Fire and Explosions

Fire and explosion hazards at retail petroleum sites may result from the presence of combustible gases and liquids, oxygen, and ignition sources during unloading and dispensing activities, and / or leaks and spills of flammable products. Possible ignition sources include sparks associated with the buildup of static electricity[17], lightning, and open flames. Other sources of explosion hazards include tank cutting activities associated with maintenance and decommissioning. In addition to recommendations for hazardous materials and oil management, and emergency preparedness and response provided in the **General EHS Guidelines**, the following measures are specific to terminal facilities:

- Retail petroleum sites should be designed, constructed, and operated according to international standards[18] for the prevention and control of fire and explosion hazards;
- Implementing safety procedures for unloading of product from tanker trucks;
- Prevention of potential ignition sources such as:
  - Proper grounding to avoid static electricity buildup and lightning hazards (including formal procedures for the use and maintenance of grounding connections)
  - Use of intrinsically safe electrical installations and non-sparking tools
  - Implementation of permit systems and formal procedures for conducting any hot work during maintenance activities,[19] including proper tank cleaning and venting

[15] The control of vapor displaced from storage tanks during the unloading of a tanker is achieved by diverting vapor, present in the UST / AST, via a pipe / hose system back into the road tanker. As fuel flows out of the vehicle, the vapor is routed back to the vehicle compartment. The tanks should be fitted with pressure / vacuum (P/V) valves which maintain back pressure on the system.

[16] As vehicles are being filled, vapors are displaced by the fuel entering the vehicle tank and, at the same time, a similar vapor space is created in the UST / AST. Collection and return of vapor to storage tanks can be achieved through active (open) and passive (closed or balanced) systems. An active system uses a vapor pump to assist returning of vapor flow from the vehicle fuel tank to the storage tank. A passive or balance vapor recovery system does not include a vacuum pump. Instead, the pressure exerted by the displaced fuel vapors is used to drive the vapors back into the storage tank.

[17] Static electricity may be generated by liquids moving in contact with other materials, including pipes and fuel tanks during loading and unloading of product. In addition, water mist and steam generated during tank and equipment cleaning can be come electrically charged, in particular with the presence of chemical cleaning agents.

[18] An example of good practice includes the US National Fire Protection Association (NFPA) Code 30: Flammable and Combustible Liquids. Further guidance to minimize exposure to static electricity and lightening is available in API (2003).

[19] Control of ignition sources is especially relevant in areas of potential flammable vapor-air mixtures such as within vapor space of tanks, within vapor

- Providing clear signage for customers about the prohibition of smoking or use of electronic equipment (e.g. cellular phones)
- Prohibiting the placement of informal food vending (including some with the use of open flames) within a pre-established distance from fuel dispensing equipment
- Establishing procedures for the proper filling and management of LPG bottles

- Preparation of a formal fire response plan supported by the necessary resources and training, including training in the use fire suppression equipment and evacuation. Procedures may include coordination activities with local authorities or neighboring facilities. Further recommendations for emergency preparedness and response are addressed in the **General EHS Guidelines**;
- Facilities should be properly equipped with fire suppression equipment that meets internationally recognized technical specifications for the type and amount of flammable and combustible materials stored at the facility.[20] Examples of fire suppression equipment may include portable equipment such as fire extinguishers or fixed systems such as foam extinguishers placed above fuel dispensing areas.[21]

Confined Spaces

Confined space hazards, as in any other industry sector, are potentially fatal to workers. Confined spaces in retail petroleum sites may include storage tanks (during repairs and maintenance work), storage tank excavation areas (during underground utility repairs, tank replacements, and site decommissioning), some secondary containment areas, and stormwater / wastewater management infrastructure. Facilities should develop and implement confined space entry procedures as described in the **General EHS Guidelines**.

1.3 Community Health and Safety

Community health and safety issues associated with the operation of retail petroleum sites are generally negligible for well designed and managed facilities. These may include potential public exposure to spills, fires, and explosions. Nevertheless, facilities should prepare a formal emergency preparedness and response plan that considers the role of communities and community infrastructure as appropriate in responding to emergency events. Additional information on the elements of emergency plans is provided in the **General EHS Guidelines.** The likelihood of community exposure to chemical hazards may be greater during road transport activities associated with fuel delivery. Risk management strategies associated with the transport of hazardous materials by road are presented in the **General EHS Guidelines** (refer specifically to the sections on "Hazardous Materials Management" and "Traffic Safety").

2.0 Performance Indicators and Monitoring

2.1 Environment

Emission and Effluent Guidelines

VOC emissions from retail petroleum facilities should be controlled through the application of techniques described in Section 1.1 if required by local regulations[22].

space of rail / truck tankers during loading / unloading, near vapor disposal / recovery systems, near discharge vents of atmospheric tanks, in proximity to a leak or spill.

[20] Such as the US National Fire Protection Association (NFPA) or other equivalent standards.

[21] API Standard 2610 (2005).

[22] For example, the European Community Directive 94/63 has adopted a target reduction of VOC total annual loss from loading into storage installations at retail petroleum facilities to be below a target reference value of 0.01 weight by weight percent of the throughput. This directive does not apply to facilities with throughput of less than 100 m^3/year.

Stormwater runoff should be treated through an oil / water separation system able to achieve an oil and grease concentration of 15 mg/l at the flow rate of the 1 in 10 year rainfall on the contributing area to the oil / water separator.

Environmental Monitoring

Environmental monitoring programs for this sector should be implemented to address all activities that have been identified to have potentially significant impacts on the environment, during normal operations and upset conditions. Environmental monitoring activities should be based on direct or indirect indicators of emissions, effluents, and resource use applicable to the particular project. Monitoring frequency should be sufficient to provide representative data for the parameter being monitored. Monitoring should be conducted by trained individuals following monitoring and record-keeping procedures and using properly calibrated and maintained equipment. Monitoring data should be analyzed and reviewed at regular intervals and compared with the operating standards so that any necessary corrective actions can be taken. Additional guidance on applicable sampling and analytical methods for emissions and effluents is provided in the **General EHS Guidelines**.

2.1 Occupational Health and Safety

Occupational Health and Safety Guidelines

Occupational health and safety performance should be evaluated against internationally published exposure guidelines, of which examples include the Threshold Limit Value (TLV®) occupational exposure guidelines and Biological Exposure Indices (BEIs®) published by American Conference of Governmental Industrial Hygienists (ACGIH),[23] the Pocket Guide to Chemical Hazards published by the United States National Institute for Occupational Health and Safety (NIOSH),[24] Permissible Exposure Limits (PELs) published by the Occupational Safety and Health Administration of the United States (OSHA),[25] Indicative Occupational Exposure Limit Values published by European Union member states,[26] or other similar sources.

Accident and Fatality Rates

Projects should try to reduce the number of accidents among project workers (whether directly employed or subcontracted) to a rate of zero, especially accidents that could result in lost work time, different levels of disability, or even fatalities. Facility rates may be benchmarked against the performance of facilities in this sector in developed countries through consultation with published sources (e.g. US Bureau of Labor Statistics and UK Health and Safety Executive)[27].

Occupational Health and Safety Monitoring

The working environment should be monitored for occupational hazards relevant to the specific project. Monitoring should be designed and implemented by accredited professionals[28] as part of an occupational health and safety monitoring program. Facilities should also maintain a record of occupational accidents and diseases and dangerous occurrences and accidents. Additional guidance on occupational health and safety monitoring programs is provided in the **General EHS Guidelines**.

[23] Available at: http://www.acgih.org/TLV/ and http://www.acgih.org/store/
[24] Available at: http://www.cdc.gov/niosh/npg/
[25] Available at: http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9992
[26] Available at: http://europe.osha.eu.int/good_practice/risks/ds/oel/
[27] Available at: http://www.bls.gov/iif/ and http://www.hse.gov.uk/statistics/index.htm
[28] Accredited professionals may include Certified Industrial Hygienists, Registered Occupational Hygienists, or Certified Safety Professionals or their equivalent.

3.0 References and Additional Sources

American Society for Testing and Materials (ASTM). E 1430-91. Guide for Using Release Detection Devices with Underground Storage Tanks. West Conshohocken, PA: ASTM International.

ASTM. E 1526. Standard Practice for Evaluating the Performance of Release Detection Systems for Underground Storage Tanks. West Conshohocken, PA: ASTM International.

American Petroleum Institute (API). 2003. Recommended Practice. Protection Against Ignitions Arising out of Static, Lightning, and Stray Currents. Washington, DC: API.

API. 2002. Standard 620: Design and Construction of Large, Welded, Low-pressure Storage Tanks. Washington, DC: API.

API. 2001. Publication 1612: Guidance Document for the Discharge of Petroleum Distribution Terminal Effluents to Publicly Owned Treatment Works (1996). Washington, DC: API.

API. 1998. Standard 650: Welded Steel Tanks for Oil Storage. Washington, DC: API.

API. 1995. Standard 653: Tank Inspection, Repair, Alteration, and Reconstruction. Washington, DC: API.

API. 1994. Standard 2015: Safe Entry and Cleaning Petroleum Storage Tanks: Planning and Managing Tank Entry from Decommissioning Through Recommissioning. Washington, DC: API.

Association for Petroleum and Explosive Administration and Institute of Petroleum. 1999. Guidance for the Design, Construction, Modification and Maintenance of Petrol Filling Stations. Colchester, UK: Portland Press Ltd.

Compañía de Tecnología de Saneamento Ambiental (CETESB). Decisao de Directoria No. 010-2006-C, January 26, 2006. "Procedimentos para o Licenciamento de Postos e Sistemas Retalhistas de Combustivies e da outras providencias." State of Sao Paulo, Brazil: CETESB.

Environmental Protection Authority (EPA) Victoria. 2003. Guidelines on the Design, Installation, and Management Requirements for Underground Petroleum Storage Systems (UPSS). Victoria, Australia: EPA. Available at http://www.epa.vic.gov.au/land/upss.asp

EPA Victoria. 2003. Environmental Risk Management at Retail Fuel Outlets. Victoria, Australia: EPA. Available at http://www.epa.vic.gov.au/envaudit/publications.asp

European Commission. 1994. European Parliament and Council Directive 94/63/EC of 20 December 1994 on the control of volatile organic compound (VOC) emissions resulting from the storage of petrol and its distribution from terminals to service stations. Available at http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31994L0063:EN:HTML

European Commission. 2002. EN 13352:2002. Specification for the performance of automatic tank contents gauges.

European Commission. 2003. EN 13160-1:2003. Leak detection systems. Part 1. General principles.

European Commission. 2003. EN 13160-2:2003. Leak detection systems. Part 2 Pressure and vacuum systems.

European Commission. 2003. EN 13160-3:2003. Leak detection systems. Part 3 Liquid systems for tanks.

European Commission. 2003. EN 13160-4:2003. Leak detection systems. Part 4 Liquid and/or vapour sensor systems for use in leakage containments or interstitial spaces.

European Commission. 2003. EN 13160-5:2003. Leak detection systems. Part 5 Tank gauge leak detection systems.

European Commission. 2003. EN 13160-6:2003. Leak detection systems. Part 6 Sensors in monitoring wells.

European Commission. 2003. EN 13160-7:2003. Leak detection systems. Part 7 General requirements and test methods for interstitial spaces, leak protecting lining and leak protecting jackets.

European Commission. 2005. European Standard (EN) 12285-2:2005. Workshop fabricated steel tanks - Part 2: Horizontal cylindrical single skin and double skin tanks for the aboveground storage of flammable and non-flammable water polluting liquids. Available at http://ec.europa.eu/enterprise/newapproach/nando/index.cfm?fuseaction=cpd.hs

European Commission. 2006. Integrated Pollution Prevention and Control (IPPC). Reference Document on Best Available Techniques (BAT) on Emissions from Storage. Available at http://eippcb.jrc.es/pages/FActivities.htm

Institute of Petroleum. 2002. Guidelines for Soil, Groundwater, and Surface Water Protection and Vapour Emission Control at Petrol Filling Stations. London: Institute of Petroleum. Available at http://www.energyinst.org.uk/content/files/file366.pdf

United Kingdom (UK) Department for Environmental, Food and Rural Affairs (DEFRA). 2002. Groundwater Protection Code: Petrol Stations and Other Fuels Dispensing Facilities Involving Underground Storage Tanks. London: DEFRA. Available at http://www.defra.gov.uk/environment/water/ground/petrol/index.htm

UK Environment Agencies (Environment Agency for England and Wales, Scottish Environment Protection Agency and the Environment and Heritage Service in Northern Ireland). Construction and Operation of Fuelling Stations: PPG7. Bristol, Stirling and Belfast, UK. Available at http://www.ehsni.gov.uk/pubs/publications/PPG07.pdf

UK Environment Agencies. Installation, Decommissioning, and Removal of Underground Storage Tanks: PPG27. Bristol, Stirling and Belfast, UK. Available at http://www.ehsni.gov.uk/pubs/publications/PPG27.pdf

UK Secretary of State, Welsh Assembly Government and Scottish Ministers. 2004. Draft Process Guidance Note PG1/14 Petrol Filling Station. Version 1.0. London: DEFRA. Available at http://www.defra.gov.uk/corporate/consult/pgnotes-petrol/pg1-14.pdf

Underwriters Laboratories (UL) 1316 Glass-fiber-Reinforced Plastic Underground Storage Tanks for Petroleum Products.

UL 1746, External Corrosion Protection Systems for Steel Underground Storage Tanks

United States (US) Environmental Protection Agency (EPA). Code of Federal Regulations (CFR). Regulations and Standards Related to Underground Storage Tanks. Washington, DC: US EPA. Available at http://www.epa.gov/OUST/fedlaws/cfr.htm

US EPA. 1990. Standard Test Procedures for Evaluating Various Leak Detection Methods. (EPA/530/UST-90/004 - EPA/530/UST-90/010). Washington, DC: US EPA. Available at http://www.epa.gov/OUST/pubs/protocol.htm

US EPA. 2005. Operating and Maintaining Underground Storage Tank Systems: Practical Help and Checklists. (EPA 510-B-00-008). Washington, DC: US EPA. Available at http://www.epa.gov/swerust1/pubs/ommanual.htm

US National Fire Protection Association (NFPA). 2003. NFPA 30 - Flammable and Combustible Liquids Code. Available at http://www.nfpa.org/assets/files/PDF/CodesStandards/TIAErrataFI/FI30-2003.pdf

Annex A: General Description of Industry Sector Activities

A retail fuel station is a facility where gasoline and other automotive fuels are sold. In addition, these facilities may provide maintenance and minor automobile repair services and / or be equipped with car wash operations. A facility typically consists of the following:

- Underground storage tanks (USTs) / aboveground storage tanks (ASTs) area;
- A pump island, where gasoline and other fuel dispensers are located;
- Associated facilities such as car washes, automotive workshops, convenience store, and / or other retail units

The majority of retail petroleum stations are small with some facilities operating 24 hours. They are often located in or near urban settings or along major transport routes. The industry trend in developed countries is to decommission any auto services associated with retail petroleum facilities (e.g. vehicle maintenance, carwash) while providing or adding other services (e.g. convenience stores, retail units, and drive-through services). Retail petroleum networks tend to operate on a local or regional market.

The main products used by the retail petroleum industry are gasoline and diesel, although other fuels such as alcohols or liquefied petroleum gas (LPG) may also be provided. Storage tanks are most commonly installed underground and are generally cylindrical with a single or double skin design, usually installed horizontally. Tanks typically used in retail petroleum facilities are made of the following materials:

- Steel
- Fiberglass reinforced plastic (GRP)
- A combination of steel and plastic or GRP

The piping system consists of pipes for delivery, vacuum suction and transfer, filling, vapor, vent, and all associated valves, fittings, connections, and couplings. Fuel transfer from storage tank to the dispensers can be either by means of a suction system, a pressure system, or a combination of both. Materials commonly used for pipework systems include:

- Steel
- GRP
- Polyethylene
- Composites including a combination of plastics or metals

Ancillary equipments include siphons, tank filling point / delivery hose connections, valves, pipework connection chambers, venting system, and overfill prevention devices.