

INVITATION TO COMMENT ON THE DRAFT PHILIPPINE NATIONAL STANDARD (DPNS) ON STORING AND HANDLING OF B5 IN RETAIL OUTLET

Notice is hereby given to all parties to comment on the Draft PNS on Storing and Handling of B5 in Retail Outlet.

All comments and suggestions must be received on or before April 18, 2011. Any proposed change to the draft must be supported with technical explanation/justification and e-mailed to facilities@doe.gov.ph Non receipt of your comments on the specified date shall be construed your concurrence to the draft PNS.

PNS/DOE FS 1-1:2004
ICS 75.200

Retail Outlet - Health, safety and environment

Foreword

This Philippine National Standard Retail Outlet – Health, safety and environment, PNS DOE FS 1-1:2004 was prepared by the Department of Energy’s Technical Committee on Petroleum Processes and Facilities - BPS/TC 68 Subcommittee 2, HSE requirements for retail outlet.

The development of this standard was initiated by the Department of Energy - Oil Industry Standards Monitoring Division through the Memorandum of Agreement (MOA) between DOE-OIMB and DTI-BPS.

This standard was prepared to complement Department Circular No. DC 2003-11-010 - Providing for the Rules and Regulations Governing the Business of Retailing Liquid Petroleum Products.

In the development of this standard the following standards were considered:

- API Recommended Practice 1615-1998: Installation of Underground Petroleum Storage System
- API Recommended Practice 2005, Service Station Safety (6th edition, 1996)
- NFPA 30-1996: Flammable and Combustible Liquids Code
- NFPA 30A-1996: Automotive and Marine Service Station Code

PNS/DOE FS 1 consists of the following parts under the general title Retail Outlet:

- Part 1: Health, safety and environment
- Part 2: Underground storage tank
- Part 3: Piping system
- Part 4: Dispensing pump

1 Scope

This section covers the facilities, clearances and distances therein intended for retail outlets *storing and handling up to B5 and applicable to all kind of locations either with mid-block lot, corner lot and passing-thru lot.*

2 Structure minimum distances

2.1 General

This section covers the facilities, clearances and distances therein intended for retail outlet applicable to all kind of lots from mid-block lot, corner lot and passing-thru lot.

3 Definitions

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

3.1 Station component/facilities

3.1.1 Forecourt Area

An area in the Retail Outlet wherein petroleum products are being dispensed. The components are as follows:

3.1.1.1 Canopy structure

A roof covering the dispensing area protecting all components included therein designed and constructed with good engineering practice. This definition excludes curb mounted pumps, pumps installed outside the canopy defined above.

3.1.1.2 Dispensing pump

The dispensing pump shall be installed in accordance with PNS/DOE FS 1-4:2004 – Retail outlet - Dispensing pump.

3.1.1.3 Pump island

A rectangular, tapered, fillet end, or a t-bone shape elevated platform used to elevate the dispensing devices from the finished floor line for protection, made of non-combustible material such as concrete or steel. Pump island shall be constructed to elevate and provide added security to the dispensing devices. Reference PNS/DOE FS 1-4:Dispensing Pump

3.1.1.4 Pump guard

The pump guard, or its equivalent, serving as safety barrier and can withstand vehicular impact for the dispensing devices shall be provided.

3.1.1.5 Cashier's booth

Cashier's booth may be provided for monetary transactions made within the forecourt area.

3.1.2 Building/Structure

3.1.2.1 Sales office

Although discretionary, this structure may also serve as a showcase area and/or transient office.

3.1.2.2 Toilet facilities

It shall be adequately provided for use by motorists.

3.1.2.3 Electrical/Mechanical room

This shall accommodate all electrical/mechanical components necessary for the retail outlet operation.

3.2 Minimum clearances

3.2.1 Minimum yard requirement

The yard requirements in Table I are for newly developed thoroughfares. For highly built-up urban areas with duly established lines and grades reflecting therein proposed road widening and elevation, the requirements in Table I may not be imposed and the building may abut on the front, side and rear property lines provided that the requirements on open space, window opening, artificial ventilation, if any, and firewalls are complied with. (Rule XVI – Light & Ventilation, National Building Code).

Table I - Yard for commercial building

Road right-of-way	Front	Side	Rear
30 meters & above	10m	3m	3m
25-29 meters	8m	3m	3m
20-24 meters	6m	3m	3m
10-19 meters	4m	2m	2m
Below 10 meters	2m	2m	2m

3.2.2 Setbacks

The vacant space left between the building and lot lines shall not be less than two (2) meters in width. A setback may be considered part of the open space, provided that it abuts a permanent public open space without any separation between them, which obstructs the free flow of light, and ventilation. Fences, if any, made of wrought or galvanized iron bars and the like with solid masonry zocalo, if any, not higher than one (1) meter shall be allowed. (Rule 3.3, National Building Code)

3.2.3 Ingress and egress

3.2.3.1 This section shall be provided to set the minimum length for the ingress and egress of the station to accommodate standard car and large vehicles as shown in Figure 1.

3.2.3.2 The minimum width of the ingress and egress for the retail outlet shall be seven (7) meters (23 ft), for each, based on the standard car and large vehicle turning radii.

3.2.3.3 Turning radius - This illustrates the configuration of vehicle dimensions and turning radius/dimensions relative to its surrounding. Figure 1 illustrates the turning radii and dimension of different type of vehicles.

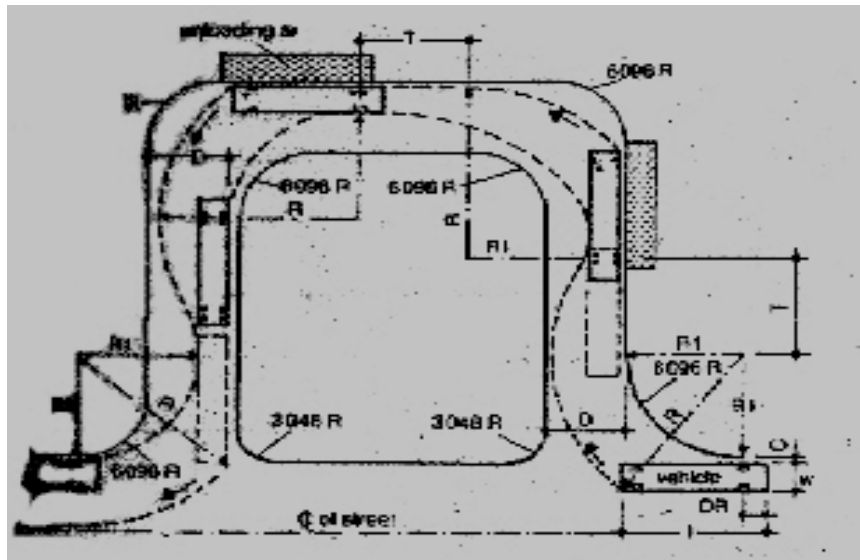


Figure 1 - Vehicular turning radius

VEHICLE	R	R1	T	D	C
Small car	5.05	3.28	3.70	3.06	0.15
Compact car	5.55	3.61	4.57	3.30	0.18
Standard car	5.63	3.84	4.57	3.40	0.20

Large car	7.01	3.84	4.57	3.66	0.23
Intercity Bus*	16.76	10.06	9.14	6.86	0.30
City bus	16.30	10.10	9.14	6.86	0.30
School bus	13.26	7.92	9.14	5.92	0.30
Ambulance	9.14	5.72	7.62	4.04	0.30
*Headroom =4.62m					

For trucks, trailers/articulated vehicles refer to vehicle manufacturer's manual

3.2.4 Pump island

3.2.4.1 The pump island shall be constructed in accordance to the required clearances between dispensing pump and any object (e.g. column post, cashier's booth and pump guards). The effective clearance between dispensing pump and any fixed object shall not be less than 0.2 m. The length of the pipe island shall have a minimum distance of 3.5m and its width shall have a minimum distance of 1.2m. Refer to figure 1, 2 and 3.

3.2.4.2 The center-to-center distance between pump islands shall not be less than 6.00 meters (20 ft).

3.2.5 Dispensing pump

3.2.5.1 Dispensing pump shall be installed at least 6.00 meters (20 ft) from any potential fixed source of ignition.

3.2.5.2 During maintenance of dispensing pump wherein handling of liquid petroleum products is involved, all vehicle traffic and unauthorized persons shall be prevented from coming within 6.00 meters (20 ft) radius from the said dispensing pump.

3.2.5.3 Hose length shall not exceed 5.50 meters (18 ft).

3.2.6 Underground storage tank (UGT)

3.2.6.1 The minimum clear distance between the edge of the underground storage tank (UGT) and property line or any adjoining structures shall not be less than 1.00 meter (3 ft).

3.2.6.2 Distances between tanks shall not be less than 0.45m.

3.2.6.3 Underground storage tank (UGT) opening shall have a minimum distance of at least 6.00 meters (20 ft) from the center of any pump island.

3.2.7 Canopy

3.2.7.1 Canopy is required to cover all filling positions with approximate 2.50 meters (8 ft) projection beyond the edge of dispensing pumps on both sides.

3.2.7.2 Height above filling area should have a minimum clear distance of 4.50 meters (15 ft) from the finished floor line to the canopy ceiling.

3.2.7.3 Distance between edges of the canopy and property line shall abide by the minimum yard requirement for commercial buildings. Refer to 3.3.1.

3.2.7.4 Curb mounted pumps, sometimes referred to as wall mounted pumps may be covered by a shed.

4 Electrical system

4.1 Electrical safety

Safety procedures and information applicable to electrical equipment and tools used in service stations compliant with Philippine Electrical Code and local regulations include, but are not limited to, the following:

- a. Institute a retail outlet electrical lockout/tagout program to educate (or train, if required by DOLE-BWC) employees to be aware that electrical power to all electrical tools, components, or fixtures undergoing repair must be disconnected, tagged or locked out at the circuit panel, or other control points before starting work (refer to Section 2.2).
- b. Assure that the installation and maintenance of all electrical and equipment are in accordance with Philippines Electrical Code and local regulations
- c. Legible mark or identify each electrical disconnect (circuit breaker, fuse, switch) to indicate its purpose, unless it is located so that the purpose is evident.
- d. Provide wall outlets and extension cords with a three-wire ground system maintained in good condition. Where use of extension cords is permitted, only use those, which are Listed, maintained in good condition, and free of splices. Do not use extension cords when fixed wiring is required by local code or regulation.
- e. Assure that all electrical tools, water coolers, ice machines, refrigerators and similar electrical equipment are properly grounded. Assure that portable electric hand tools used by employees which are not equipped with three wire systems and three prong ground plugs are either double insulated or ground fault protected.
- f. Inspect electrical cords to appliances and equipment periodically to assure soundness and the continued presence of the ground prong on all three-prong electric plugs.
- g. Provide and maintain sufficient access and working space around all electrical equipment to allow safe operation and maintenance.
- h. Do not locate conductors or electrical equipment in wet or damp locations, or in areas where exposure to excessive temperatures or other agents having a deteriorating effect can occur, without determining if the classification is suitable to the location.
- i. Assure all electrical circuits are protected by proper size circuit breakers. Since an over loaded circuit may be indicated by an intermittent tripping of a circuit breaker, determine the cause and initiate corrective action.
- j. Provide education and/or training for all employees in the basic fundamentals of electrical safety applicable to the retail outlet and their assigned work.

- k. *Injuries or accidents can occur from an unexpected release of energy when equipment which is undergoing repair or maintenance has not been properly locked out or tagged out of service. To comply with the Occupational Safety and Health Standard, a lockout/tagout program at each retail outlet to prevent the release of potentially hazardous energy while performing maintenance, repair and service work on equipment, machinery and systems.*

4.2 Lockout / Tagout

Injuries or accidents can occur from an unexpected release of energy when equipment which is undergoing repair or maintenance has not been properly locked out or tagged out of service. To comply with Occupational Safety and Health Standard, establish a lockout/tagout program at each retail outlet to prevent the release of potentially hazardous energy while performing maintenance, repair and service work on equipment, machinery and systems.

5 Operational requirement

5.1 Drainage and waste disposal

Flammable or combustible liquids spilled within the premises of service stations shall not be directly discharged into the public sewer and drainage system or natural waterways. Precautionary measures to contain such spill shall be adopted but not limited to grading driveways or intercepting canals with trench grating for containment leading to a catch basin with a capacity that can accommodate the contents of the largest compartment of the tank vehicle being dispensed.

Used or accumulated residues of flammable or combustible liquids from separator pits and/or other equally effective means shall not be dumped on the ground, into sewers, drainage ditches or storm drains, but shall be stored in tanks or tight drums outside of any building until removed from the premises.

Pits intended to contain subsurface pumps or fittings from submersible pumps shall not be longer than necessary to contain the intended equipment and to permit the free movement of hand tools operated from above grade.

Pits and covers shall be designed and constructed to withstand the external forces to which they may be subjected. Pits shall be protected against ignition of vapors by any of the following methods:

1. *Sealing the un-pierced cover with mastic or by bolting against a gasket in an approved manner.*
2. *Filling the pit with a noncombustible inert material.*

5.1.1 Waste handling and disposal

Properly store, label and discard waste materials according to applicable regulations, RA 6969 and company policies. Waste materials include, but are not limited to, used motor oil, spilled gasoline, and certain cleaning solvents. Advise all employees of the impact these wastes might have on the environment, as well as on physical health, safety and fire risks associated with their handling and disposal.

To avoid environmental contamination, do not sweep, wash or flush, oils, grease, radiator coolant, spilled fuel, etc. into floor drains, toilets, other drains, or into the street. Flooring at the filling station should have slight sloping leading to a floor drain and a collection sump to prevent large liquid spill from reaching the public drainage system.

5.1.2 Fuel spills and drainage

Assure all employees are aware of the regulations relative to reporting and cleaning up of petroleum product spills. Clean up spills in accordance with employer policy and applicable regulations. To avoid fires, clean up fuel spills under or around vehicles, or first push vehicles away from the spill, before starting the vehicles' engine. Do not allow other vehicles to enter or drive through spills until they are cleaned up.

Recovered spilled fuel may be recycled by returning it to the distribution terminal, refinery or recycle agency. If recovered fuel is not recycled, it must be removed by an approved hazardous waste collection agency or treated in an approved facility. Do not dispose of any petroleum product in drains, sinks, toilets, sumps, or sewer systems. Materials which have been used to clean up spills shall be properly disposed of according to national and local regulations.

5.1.3 Leak and Spills

Leak detection system should be installed and should be able to detect the presence of liquid or petroleum vapor underneath the underground storage tanks. Likewise, provisions shall be made to prevent the contamination of soil around the storage tank in case of leak. Leak shall be contained in order to be easily detected, i.e. construction of concrete pad and wall around the tank or High Density Polyethylene (HDPE) liner to cover the entire pit. (see sketch A)

Install devices that may prevent spills and overfills, such as overflow alarms, automatic shut-off devices and catch basins around fill pipes. The catch basin or secondary containment should be of non-permeable material that will be able to hold the entire underground storage tank (UGT) capacity. The UGT may be provided with additional ~~should have adequate~~ grounding by embedding ~~that is~~ at least 3.5 to 4 meters of metal rods. Grounding and bonding should be strictly observed during UGT filling to prevent generation of sparks due to static charge potential difference between the underground storage tank and the Gasoline/Diesel tanker truck.

Install or construct oil/water separator. Fuel dispensing areas should be equipped with drainage into an oil/water separator to contain accidental spills during vehicle fueling. Car

washing effluents should pass through the oil/water separator before discharging to the drainage system.

Assure all employees are aware of the regulations relative to reporting and cleaning up of petroleum product spills. Clean up spills in accordance with employer policy and applicable regulations. A chemical spill kit should be readily available and provided near the fuel pump and filling stations. Spill absorbing materials to be used should be sand or soil or any absorbing pads/pillows which is non-reactive or is made of inert material that is compatible to fuel products or its derivatives. The use of saw dust as absorbent materials should be discouraged since it may react to chemicals that will produce noxious fumes. To avoid fires, clean up fuel spills under or around vehicles, or first push vehicles away from the spill, before starting the vehicles' engine. Do not allow other vehicles to enter or drive through spills until they are cleaned up.

Recovered spilled fuel may be recycled by returning it to the distribution terminal, refinery or recycle agency. If recovered fuel is not recycled, it must be removed by an approved hazardous waste collection agency or treated in an approved facility. Do not dispose of any petroleum product in drains, sinks, toilets, sumps, or sewer systems. Materials which have been used to clean up spills shall be properly disposed of according to national and local regulations.

Facilities should develop a spill prevention and control plan, supported by necessary resources and training.

5.2 Fire safety and Prevention / Fire Fighting / Fire Control

5.2.1 Fire extinguishers and fixed protection systems

Assure that all fire protection systems are regularly inspected, tested and maintained by a qualified person, as required by local regulation. Keep records of protection system inspection and servicing. Maintain an MSDS on file for each of the extinguishing agents used. Educate and/or train employees upon hire and annually thereafter, so they know how to properly use the systems. Education and/or training must be documented and the records must be maintained on file. Employers may utilize extinguisher training provided by their fire extinguisher supplier or service contractor.

Fire Extinguishers

- a. Fire extinguishers are essential for proper response to certain emergency situation and are intended as a first line of defense to cope with fires of limited size.***
- b. Retail Outlets having an occupancy hazard subject to Class B or Class C fires, or both, shall have a standard complement of Class A fire extinguishers for building protection, plus additional Class B or Class C fire extinguishers, or both as required in NFPA 10.***

- c. *There shall be one (1) 20 lbs. ABC/Foam type fire extinguisher, provided to every 7.5 m. horizontal radius for every influence area, which shall refer to the dispenser pump, underground fill pipe opening and lubrication or service room.*
- d. *All portable fire extinguishers shall be operational and in good condition*
- e. *Locate fire extinguishers at identified/designated places so that they are readily accessible and immediately available in the event of fire*
- f. *There shall be one (1) fire extinguisher for every pump island for multiple pump islands retail outlet*
- g. *Do not block fire extinguishers with obstacles or hide from view*
- h. *Whenever an extinguisher has been used, or there is question whether it has been used, take it out of service and immediately replace it with an operational service unit*
- i. *Identify the used extinguisher as “out of service” and placed it in a designated location until maintenance and recharging is performed*
- j. *It is a good practice to visually inspect fire extinguisher daily to ensure they are in their designated places, and ready for use*
- k. *Provide for visual monthly inspections of fire extinguishers to detect any physical damage, corrosion and other impairments*
- l. *Provide for thorough annual maintenance check-up by qualified service personnel, including internal inspection of non stored pressure extinguishers*

5.2.2 Emergency exits

Retail Outlets with office/convenience store shall be provided with a safe egress in the event of a fire or similar emergency as provided in Section 10.2.5.2 of Implementing Rules and Regulation RA 9514 and it's a proper means of egress should consists of three separate and distinct parts: the way to the exit (exit access); the exit (door); and the direction and where to go after exiting.

5.2.3 Safety Precaution

The engine of all vehicles being fueled shall be shut-off during fueling or re-fueling. Smoking, use of electronic devices and open flames are strictly prohibited in areas where flammable or combustible liquids are dispensed. Signs of the above prohibitions shall be posted within the premises of the service station. A warning sign shall be conspicuously posted in the dispensing area indicating that it is unlawful and dangerous to dispense gasoline into unapproved containers. All vendors using open flames are also prohibited within the premises. Necessary repairs of the service station involving hotworks shall comply with the applicable provisions of Division 17 of the Implementing Rules and Regulation of RA 9514.

5.2.4 Housekeeping and storage of flammable and combustible liquids

Maintain all Retail Outlets in as clean a condition as the nature of the work allows. Good housekeeping and general appearance is important to safe operation.

- a. The safe and proper storage of flammable and combustible liquids in retail outlet is guided by the internationally accepted standards such as but not limited to the Uniform Fire Code; NFPA 30-1996, Flammable and Combustible Liquids Code; and NFPA 30A-1996, Automotive and Service Station Code; and regulated by Republic Act 9514 otherwise known as the Fire Code of the Philippines of 2008, Philippine Electrical Code, National Building Code, Occupational Safety and Health Standards.

5.2.5 Occupational Safety and Health Training

Managers/owners of retail outlets should undergo a basic occupational safety and health course (BOSH^C), being offered by various accredited training organizations of DOLE-BWC or by the DOLE-OSHC. Thereafter, they should also train their employees on the practices of safety and health before actual employment.

5.3 Attended retail outlet safety

5.3.1 Forecourt area of the retail outlet areas used for fueling motor vehicles, dispensing fuel or receiving flammable product, must be kept free of open flames and other ignition sources. National and local regulations require various types of signs to be posted in the area of the retail outlet used for fueling vehicles and/or other kinds of internal combustion engines. Employers and employees should follow all applicable regulations and enforce required restrictions.

5.3.2 The following signs shall be prominently displayed by the owner and/or operator of the retail outlet in strategic and appropriate locations within the premises of the said outlet for the awareness and information of the buying public and service station personnel:

- a Fixed Brand/Business name signage
- b Price display board with updated prices for each liquid petroleum product sold in the retail outlet
- c Octane rating stickers
- d Warning signs
 - i. Switch off cellular phones while filling
 - ii. Switch off engine while filling
 - iii. No smoking signs
- e Other safety signs as may be required by the regulating agencies

5.3.3 Emergency/incident response plan and procedures

It is important to plan for emergencies as even the safest service station could have an incident. Regulations require development of emergency/incident plans and procedures and employee training to implement the plans and assist in safe and orderly emergency evacuation, if

necessary. Elements to be considered in emergency plans, as a minimum, include: use of fire extinguishers, first aid, how and when to activate emergency shutdown switches and names of persons to contact for further emergency information.

5.3.4 Hazards communication

Retail Outlet Operator shall develop and maintain an up-to-date written hazard communication program for each Retail Outlet. As a minimum, the program should cover requirements for a Retail Outlet hazardous chemical lists, chemical inventory and storage, material safety data sheets, warning signs and labels, chemical hazard recognition and employee training. Assure that all applicable “hazardous chemicals” in the Retail Outlet to which employees may be exposed, are included in the program.

Communicate information concerning the hazards of these chemicals to employees by means of a comprehensive training program, and whenever a new hazardous chemical is introduced into their work area.

5.3.5 Employee and personnel protective clothing/equipment

Personal protective clothing/equipment should be appropriate for the work required. Employees working on machinery should not wear rings, wrist watches, identification bracelets or long chains, because there is a chance that the jewelry could contact with a machine's moving parts or electrical, causing a short circuit, shock, burn or other injuries.

5.3.6 Fueling Vehicles

Requirements for safely dispensing fuel into vehicles include, but are not limited to, the following:

- a Never fuel a vehicle while its engine is running. Shutting off the engine will reduce the possibility of accidental vehicle movement, spills and free vapor ignition. Never fuel a vehicle if the attendant, bystanders or occupants of the vehicle are smoking.
- b Insert the delivery hose nozzle firmly into the fill pipe of the vehicle. Maintain contact between the nozzle and the tank until the delivery has been completed. Do not stretch out the hose when there are small loop, in it as this can kink the hose and cause it to crack and break.
- c Never block open a nozzle with fuel caps, or other objects. Use only approved latches supplied by the nozzle manufacturer to hold open automatic nozzles.
- d Clean up small spills which may occur while fueling vehicles promptly.
- e All employees should know where the dispenser pump emergency power shut off is located and how to activate it, at all times.

- f Immediately after fueling has been completed, properly replace the hose nozzle on the dispenser, turn off the pump, and replace the cap on the fuel tank, or container.

5.3.7 Fueling Motor Tanks

Fuel tanks on motorcycles, motorbikes or similar small vehicles shall not be filled while the engine is running or when anyone is seated on the vehicle. The tank should be filled carefully at a slow rate to prevent spilling fuel, which could run, onto the hot engine and catch on fire. If the hose nozzle does not fit into the fuel tank opening, a spout type spill and/or container shall be first filled and then used for refueling the tank. A funnel should not be used because it can easily over fill, resulting in a fire.

5.3.8 Tank Vent or Breather Openings

*Underground storage tank vent **or** breather should be high enough and located in an isolated spot free from sources of heat, sparks and electrical wirings. No smoking and no parking signs should be posted within the vicinity to warn the public on the position of the vent. Vent openings should be provided with **fire arrester (what specific device?)** and weather cap to prevent over flowing of tank due to rain water infiltration. Breather should have label or should be color coded to determine which tank is for which vent, to provide easy guide for service personnel during tank maintenance.*

5.3.9 Confined Space Entry

Whenever maintenance/ repair or cleaning of underground storage tank is carried out on site, the internal atmosphere should be checked for adequacy of oxygen and presence of noxious gases and flammable vapors prior to the conduct of the said activities. Confined space entrants should have proper gear and appropriate personal protective equipment suited for the task at hand. The area should be continuously ventilated using explosion proof fans or blowers to dilute and purge out all contaminants present inside the tank. Continuous monitoring of oxygen, hydrogen sulfide, carbon monoxide, flammable vapor, and volatile organic compounds (VOC) should be conducted while the area is being occupied. The area should be evacuated whenever the internal atmosphere in the confined space registers an oxygen level below 19.5 (oxygen deprivation), LEL is above 10%, or the noxious gases is above the permissible exposure limit. Entry of service/maintenance personnel should not be allowed while the condition has not been rectified and the area still poses risk on workers health.

Retail Outlet - Underground storage tank

Foreword

This Philippine National Standard for Retail Outlet-Underground storage tank, PNS DOE FS 1-2:2004 was prepared by the Department of Energy's Technical Committee on Petroleum Processes and Facilities - BPS/TC 68 Subcommittee 1 Fuel Storage and Dispensing System.

The development of this standard was initiated by the Department of Energy - Oil Industry Standards Monitoring Division through the Memorandum of Agreement (MOA) between DOE-OIMB and DTI-BPS.

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- Part 1: Health, safety and environment
- Part 2: Underground storage tank
- Part 3: Piping system
- Part 4: Dispensing pump

Retail outlet - Underground storage tank

1 Scope

This standard specifies the requirements for the following:

1.1 *The tank for petroleum products used in Retail Outlet, refers to gasoline, diesel (up to B5), and kerosene tanks. It does not include tanks for lube oils, aviation fuels, chemicals, solvents, asphalt, waste oil, water etc.*

1.2 Tank design performance and construction.

1.3 The installation and location of tanks at retail outlet.

1.4 Operations, periodic maintenance and eventual disposal of the underground tank.

2 References

The titles of the standards publications referred to in this standard are listed on the inside back cover.

3 Definitions

For the purpose of this standard, the following definitions apply:

3.1

automatic tank gauging (ATG) system

an automatic gauging system used to measure the level of and provide information on petroleum product in an underground storage tank and/or to measure the rate of change in the level of petroleum product over a period of time

3.2

B5

refers to diesel fuel with 5% of Coco-methyl Ester (CME)

3.3

building structure

any structure built or constructed, an edifice or building of any kind or any piece of work artificially built up or composed of parts joint together in some definite manner.

3.4

corrosion protection

a means to lessen or prevent the deterioration of a material, usually a metal, from a reaction with its environment; or the use of a material known to be non-reactive to its anticipated environment; or the use of a material to isolate the metals from the environment

3.5

corrosion resistive material

a material that resists all forms of electrochemical corrosion

3.6

double wall tank

a form of secondary containment in which a storage tank is constructed with shells or walls with an interstice between to contain a release from the primary (that is, inner) tank

3.7

fiberglass reinforced plastic (FRP)

thermosetting resin laminate (material composed of several layers of fiberglass and resin) where the resin is a plastic substance used as a matrix for glass fibers

3.8

impermeable liner

a barrier material that impedes the migration of released product. This secondary liner/barrier beneath or partially surrounding the UGT system consists of artificially constructed material that is sufficiently thick and impermeable (at least 10^{-6} cm/sec for the regulated substance stored) to direct a release to the monitoring point and permit its detection

3.9

jacketed tank

a single wall steel primary tank with a fiberglass or high density polyethylene (HDPE) outer tank separated by a layer of mesh

3.10

leak

a release of product through a perforation, hole, crack, or other opening in any component of an underground storage tank system, including either primary or containment hardware

3.11

liquid petroleum products

refers to crude oil derived products limited to gasoline, diesel and kerosene only

3.12

Listed

equipment or material included in a list published by an organization that is acceptable. This organization is concerned with product evaluation that maintains periodic inspection of production of listed equipment or materials. This organization's listing equipment or material meets appropriate standards or has been tested and found suitable for use in a specified manner

3.13

monitoring

the periodic checking or testing of an underground storage tank system's equipment, detection devices, and monitoring or observation wells for evidence of released petroleum product or for verifying the integrity of the system

3.14

observation well

a cased in-ground well that (a) is in contact with groundwater and (b) is designed to assist in detecting releases of liquid product from an underground storage tank system

3.15

operational life

refers to the period that starts when the underground storage tank system is first placed underground and ends when the system is properly removed or abandoned

3.16

pre-installation tank test

a test for underground storage tank that is conducted before the tank's installation and the introduction of product

3.17

remote pumping system or submerged pumping system

a system in which one or more pumping units push petroleum product via a pressurized piping system, to one or more points away from the tank or tanks

3.18

retail outlet, also refer to liquid petroleum product retail outlet

a gasoline station, outlet, facility or business establishment which sells or dispenses liquid petroleum products directly to individual end user/s or the public

3.19

secondary containment

any system in which an outer or secondary container or impervious liner prevents petroleum product releases from the primary container from reaching the surrounding environment for a time sufficient to allow the released product's detection and control

3.20

siphon

piping that interconnects two or more underground tanks permitting the automatic transfer of liquid until equalization is accomplished

3.21

tank tightness test

a test of the liquid product handling portion of an underground storage system or a portion of the system

3.22

underground storage tank (UGT)

a container that has a capacity of more than 416 liters (110 gallons), is used to store petroleum products, and is buried completely underground

3.23

vault

a structure, usually constructed of concrete and containing no backfill material, to house or contain fuel storage tanks

3.24

visual inspection

an examination, with the naked eye, to detect the presence of petroleum product

4 Design Performance

4.1 Functional – The planning of an underground tank capacity requires consideration of immediate and future operational requirements for the site in order to: gain economic benefit from trucking operations, limit disruption on site during deliveries, limit possibility of having to replace tanks before their design life is reached, provide a reserve in case of supply disruption or meet peak demand, and absorb future sales growth.

4.2 Civil Works

4.2.1 Tank location

4.2.1.1 Tanks should be located to minimize the amount of maneuvering necessary for the tank truck making the product delivery to reach the fill openings. Wherever possible, deliveries should be accomplished without the need for the truck to move or travel in reverse.

4.2.1.2 Tanks should be located so that the tank truck making the product delivery will not be on public right-of-way, block motorists' views of roadway, nor impede the flow of vehicles or pedestrians.

4.2.1.3 Tank edge should not be less than 1 m (~3 ft) from the property line or any other building structure. If soil instability creates concern, qualified professional assistance is recommended (Refer also to section 4.2.2.3).

4.2.1.4 Underground tanks or tanks under building shall be so located with respect to existing building foundations and supports so that the load carried by the latter cannot be transmitted to the tanks.

4.2.2 Soil type

4.2.2.1 Because many site-specific factors related to soil conditions and drainage that affect the safety and operational life of any underground tank, it is necessary to conduct site analysis. Factors affecting may include but are not necessarily limited to soil stability, underground rock soil resistivity, acidity, moisture, sulfide content and presence or absence of contamination.

4.2.2.2 A site analysis should be made of soil stability and soil composition with respect to the type of underground tanks to be installed. Soil corrosivity need not be evaluated if the tanks to be installed are made of corrosion resistive materials, e.g., FRP, high density polyethylene (HDPE). For tank type, refer to Sections 5.2.2 and 5.2.3.

4.2.2.3 The design engineer must determine the slope stability of the soil such that the ability of the side wall of the excavation to remain stable and safe for workers throughout the period the tank is being installed. The amount of slope (or benching) required will determine the excavation dimensions.

4.2.3 Bedding and backfilling

4.2.3.1 Steel and Jacketed Tanks. Sand is generally used to bed and backfill around these tanks to provide even support along the length of the tank, to cushion against puncture by rock or hard materials, and to isolate the tank against chemical reaction from aggressive clay soils. Sand backfill shall be clean, non-plastic, chemically inert, and free from salt, shells, organic matter, balls of clay, lump of earth and corrosive material.

4.2.3.2 Fiberglass tanks. A clean, self-compacting, pea gravel (naturally rounded river gravel of nominal size 4.75 to 19mm) approved by tank manufacturer, should be used to bed and backfill around the fiberglass tank. Where a suitable source of pea gravel is not suitable, washed, crushed stone or gravel of nominal size 4.75 to 13.2mm may be used.

4.2.3.3 At sites where the nature of the ground is such that the sand or pea gravel may be washed away into the surrounding material or allow the tank or tank slab to settle, the backfill material shall be enclosed by a filter fabric to prevent migration. Filter fabrics are recommended for the following installations:

- i. where tidal conditions or frequent changes of water table level exist
- ii. in unstable soil type
- iii. in loose gravel soils

4.2.4 Anchorage

4.2.4.1 An underground tank can float if it is submerged in a high water table or as a result of flooding, even if the tank is partly or completely full of product. The product weight, the tank weight, the type of tank cover (backfill and paving) and height of around the tank all have an effect on whether a tank will float.

4.2.4.2 If a high water table exists or if flooding can be expected, tanks should be anchored.

4.2.5 Loading

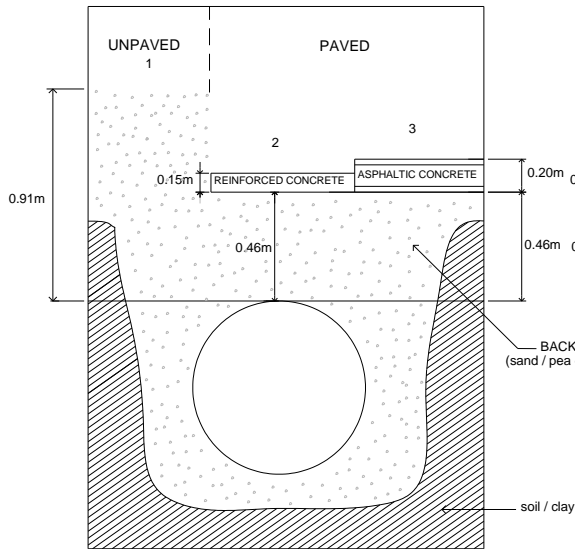
4.2.5.1 The cover over the tank will vary depending on the type of traffic over the tank and the possible tank float-out conditions.

4.2.5.2 In areas that are subject or are likely subject to traffic (see Figure 1), the cover shall consist of one of the following options:

- i. a minimum of 0.91m (36 inches) of well-tampered backfill
- ii. a minimum of 0.46m (18 inches) of well tampered backfill, plus at least 0.15m (6 inches) of reinforced concrete
- iii. a minimum of 0.46m (18 inches) well-tampered backfill, plus at least 0.20m (8 inches) of asphaltic concrete

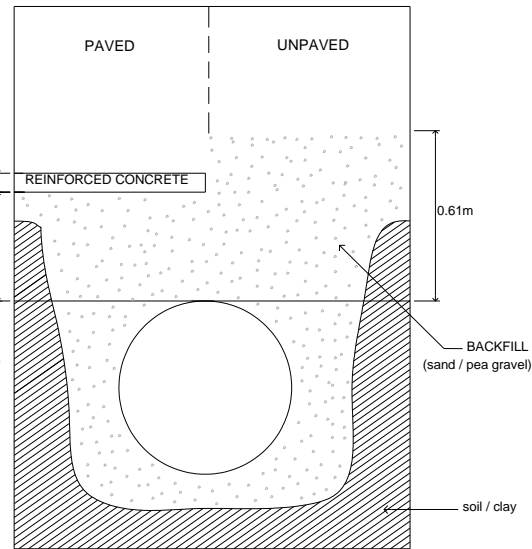
4.2.5.3 In areas that are not subject to traffic (see Figure 2), the cover shall consist of a minimum of 0.61m (24 inches) of backfill, or a minimum of 0.30m (12 inches) of backfill plus at least 0.10m (4 inches) of reinforced concrete.

Figure 1
AREA SUBJECT TO TRAFFIC



* In areas that are subject or likely subject to traffic the cover should consist of one of the ff. options
 1. A minimum of 0.91m of well-tampered backfill
 2. A minimum of 0.46m of well-tampered backfill plus at least 0.15m of reinforced concrete.
 3. A minimum of 0.20m backfill, plus at least 0.20m of asphaltic concrete.

Figure 2
AREA NOT SUBJECT TO TRAFFIC



* In areas that are not subject to traffic, the cover should consist of 0.61m of backfill, or a minimum of 0.30m of backfill plus at least 0.10m of reinforced concrete.

4.3 Mechanical

4.3.1 Tank fittings

4.3.1.1 Prior to purchasing of tank fittings, thought should be given to the number and size of tank openings needed. The tank manufacturer's specifications and drawings must be checked to determine the types, sizes and capacities that are available. The minimum tank fittings to be considered on tank fabrications are the following: Stick line, Fill line, Vent line, Suction pump/ Discharge line and Manway. Some of the optional tank openings that may be considered by the owners are as follows: Automatic Tank gauging, Siphon connection, and, tank interstice for double wall tanks.

4.3.1.2 Connections for all tank openings shall be liquid tight *preferably through the use of snap-on type fill caps.*

4.3.1.3 Tank openings, fill pipes, fill caps and fill tubes should be normally 0.13m (4 in.) in diameter. Submersible pumps designed with the capacity to meet the normal layout and operation requirements of retail outlets are built with 0.10m (4-inch) tank openings. If greater capacity is needed, larger pumps and tank openings may be required.

4.3.1.4 Fill and discharge lines shall enter tanks only through the top. Fill lines shall be sloped towards the tank. Underground tanks for petroleum products having a capacity of

more than 3785L (1000 gal) shall be equipped with a tight fill device connecting the fill hose to the tank.

4.3.1.5 Fill pipes that enter at the top of tanks shall terminate not higher than 15 cm (6 in.) at the bottom of the tank. Fill pipes shall be installed or arranged so that vibration is minimized.

4.3.1.6 Filling and emptying for petroleum products that are made and terminated shall be located outside of buildings at a location free from any source of ignition and not less than 3m (10 ft) away from any building opening. Such connections shall be closed and liquid tight when not in use and shall be properly identified.

4.3.2 Driveway manholes. The product being handled and the size of the tank should be marked on the fill assembly or manhole cover. The product can be identified by using a color code or by stamping or otherwise applying the product name to the fixed portion of the fill assembly or both means. The manway cover should be designed to carry maximum vehicular loading.

4.3.3 Sump

4.3.3.1 A sump is a liquid tight enclosure installed to contain product inadvertently released from the tank system.

4.3.3.2 The sump system shall be provided for all tank openings intended for product conveyance.

4.4 Corrosion Protection

4.4.1 Corrosion Protection. (Also refer to Section 4.2.2) Tanks and their fittings shall be protected by either:

4.4.1.1 A properly engineered, installed, and maintained corrosion protection system in accordance with recognized standards of design, such as:

- i. American Petroleum Institute Publication 1632-1996, Cathodic Protection of Underground Petroleum Storage Tanks and Piping Systems;
- ii. Underwriters Laboratories, Standard for Galvanic Corrosion Protection Systems for Steel Underground Tanks for Flammable and Combustible Liquids;
- iii. Steel Tank Institute Standard, Specification and Manual for External Corrosion Protection of Underground Steel Storage Tanks;
- iv. National Association of Corrosion Engineers Standard, Control of External Corrosion of Underground or Submerged Metallic Piping Systems
- v. National Association of Corrosion Engineers Standard, Control of External Corrosion on Metallic Buried
- vi. Underwriters Laboratories, Standard for External Corrosion Protection Systems for Steel Underground Storage Tanks

4.4.1.2 Approved or listed corrosion-resistant materials or systems, which can include special alloys, fiberglass reinforced plastic, fiberglass reinforced plastic coatings or bitumenous-based or asphaltic coatings.

4.4.2 Selection of the type of protection to be employed shall be based upon the corrosion history of the area and the judgment of a qualified engineer.

4.5 Controls/Instrumentation

4.5.1 Dip stick

4.5.1.1 A calibrated dip stick generally made of T-section aluminum, and of sufficient length (shall reach tank bottom but able to determine final surface level), shall be supplied with the host tank.

4.5.1.2 Or any other measuring device made of non-sparking material may be used.

4.5.2 Leak Detection

4.5.2.1 Monitoring wells detect the presence of petroleum products on the groundwater and located within the perimeter of the retail outlet (API 1615-1996 8.6.1).

The well casings should be at least 0.10m (4 in.) in diameter with maximum of 0.5mm (0.020-inch) graduated slots at every 0.33m (12 in) rise along alternating axis.

4.5.2.2 Double wall tank requires a means of detecting leaks in the interstitial space between the two tank shells. Four methods are commonly used:

- i Electrical. A water/hydrocarbon sensitive probe is positioned at the base of the tank at the time of manufacture. This probe sets off an alarm should it detect product out of the primary tank, or water into the secondary tank.
- ii Mechanical. A 50mm diameter drop tube is installed at the time of manufacture, running from the top to the bottom of the tank and into the interstitial space. A float switch fixed to the inside of the tube can trigger a warning light and indicate product or water in the interstitial space.
- iii Vacuum test. A negative 35kPA vacuum test, held for 30 minutes, is used to detect a leak in the interstitial space.
- iv Volume change. The interstitial space is filled with a fluid such as tri-ethylene glycol (steel tanks) or brine (fiberglass). A leak in either the inner or outer skin causes a volume change detected by a level indicator located at the top of the tank. This system is installed at the time of manufacture.

4.5.2.3 Water may enter into the primary tank from loose tank top fittings. Usually water is detected by periodically wiping water-finding paste into the bottom of the tank dip stick. A change of color will indicate the depth of water present.

4.5.2.4 If leak is evident, rectification must be conducted to qualify on OOSI requirement for underground storage tank.

5 Tank Construction

5.1 Materials (NFPA 30)

5.1.1 Tanks shall be designed and built in accordance with recognized good engineering standards, as provided under any of the following:

- i API Standard 650-1993: Welded Steel for Oil Storage
- ii API Standard 653-1991: Tank inspection, Repair, Alteration and Reconstruction
- iii ASTM D4021-1994: Specifications for Glass Fiber-Reinforced Polyester Underground Petroleum Tanks
- iv UL 58-1993: Steel Underground Tanks for Flammable and Combustible Liquids
- v UL 1316-1993: Glass Fiber Reinforced Plastic Underground Storage Tanks for Petroleum Products

The material of tank construction shall be compatible with the liquid to be stored. In case of doubt about the properties of the liquid to be stored, the supplier or producer of the liquid shall be consulted regarding the appropriateness of the material.

5.2 Fabrication

5.2.1 Tanks shall be permitted to be of any shape or type consistent with sound engineering practice.

5.2.2 Steel Tanks - Tanks shall be constructed from rolled carbon steel plate, welded together to meet the requirements of UL 58-1993 standard. The outer surface shall have all external sharp corners, burrs and weld pinnacles removed, then be abrasive blast-cleaned to SA 2.5 or equivalent. The entire external surface of the tank shall be painted with a primer then coated with an approved bitumen/asphalt-based coating at 10 mils dft.

5.2.3 Jacketed Tanks

5.2.3.1 The primary steel tank shall meet the requirements of UL 58-1993 standard. Flanged ends are preferred. The outer surface of the primary steel tank shall have all external sharp corners, burrs and weld pinnacles removed. It is not required to further treat or coat the steel surface prior to addition of the secondary tank.

5.2.3.2 The tank shall be clad with a stand-off mesh to create the interstitial space.

5.2.3.3 The outer shell (secondary tank) can be constructed either:

- i In accordance with UL1746-1993, high density polyethylene (HDPE)
- ii In accordance with UL 1316-1993, fiberglass

5.2.4 Fiberglass - Tanks shall be constructed of fiberglass reinforced polyester resin in accordance with UL 1316-1993 by a manufacturer authorized to use the UL fabrication label.

6 Installation

6.1 Any earth excavating procedure presents safety hazards related to the presence of unstable soils, water, released product and moving equipment. The results of any soil analysis or hydro-geological survey should be available prior to excavating activities. Special

attention should be given to sloping or shoring the sides of the excavation to make them stable.

6.2 Excavations for steel and FRP tanks should be deep enough to provide for a back fill of at least 0.30m (12 in.) below the bottom of the tank (or as recommended by the manufacturers), with or without a hold-down pad. The burial depth of the tank depends on the manufacturer's recommendations, tank diameter, local regulations, the type of finished surface to be applied, soil conditions, topography, the vertical distance needed to provide the required slope for vapor and product lines, the minimum depth of cover for the piping, and suction lifts.

6.3 Steel and FRP should be placed on a bed of suitable backfill that has been graded, leveled and to the depth specified in 6.2. Approximately 30 cm (12 in.) of backfill, or the amount recommended by the tank manufacturer, should be installed between the hold-down pad and tank bottom. An underground tank should never be installed directly on hold-down pad/anchorage, compacted earth or any hard surface. Care should be taken when the tank is lowered into the excavation to prevent damage.

6.4 Suitable backfill should be placed carefully along the bottom quadrant of the tank to prevent movement and to ensure proper tank support.

6.5 It is occasionally necessary to install more than one storage tank for a given product. Such tanks may be interconnected by means of a siphon connection, which permits the equalization of the product level in the connected tanks. Interconnected tanks should have the same top elevation to avoid operational and/or regulatory/spills problems.

6.6 Tanks can be secured against flotation in several ways. The following are some of the most recent methods used:

6.6.1 Placing a concrete slab under the tanks, with 0.15m to 0.30m (6-12 in.), cushion of proper backfill between the bottom of the tank and the slab, and anchoring the tank to the slab.

6.6.2 Burying concrete deadmen/sinkers on either side of the tank, and anchoring the tank thereto.

6.6.3 Burying the tank deeper than normal 2.13 m (not exceeding UL limit of 7 feet). This method may result in access problems for tank top hardware.

6.7 When anchor straps are used, the straps shall be installed in accordance with manufacturer's instruction since special straps, special installation requirements or special strap locations may be required to protect the tanks or their coatings from damage or to protect the integrity of the corrosion protection system.

6.8 Secondary containments for tanks can be provided by the use of double wall tanks. The type of secondary containment used depends on the site conditions and economic factors.

Secondary containment is recommended for new installations where the sole-source aquifer requires protection, presence of public potable water well within 100-m radius from the site.

6.9 Vaulting a common wall

6.9.1 There shall be no openings in the vault enclosure except those necessary for access to inspection, filling, emptying and venting of the tank.

6.9.2 The walls and floor of a concrete vault shall be constructed of reinforced concrete at least 0.15 m (6 in.) thick. The top shall be constructed of noncombustible material. The top, floor of the vault and the tank foundation shall be designed to withstand the anticipated loading including soil and hydrostatic loading. Tanks and support shall be structurally designed for this application.

6.9.3 The vault shall be substantially liquid tight and there shall be no backfill around the area.

6.9.4 Each vault and its tank shall be suitably anchored to withstand uplifting by groundwater or flooding.

6.10 Ballasting

6.10.1 Underground tanks can be ballasted if necessary with product after the tanks are installed and backfill has been placed around the tank. It is recommended that the height of the ballast in the tank shall not exceed the level of backfill around the tank. However, at no time during the backfilling process should the height of the ballast in the tank exceed 0.30m (1 ft.) above the level of backfill around the tank.

6.10.2 Water may be used as an alternative ballast, however, submersible pumps should not be installed until after the water ballast is removed. Disposal of water ballast should be in accordance to appropriate regulations.

6.10.3 When product is used as ballast, care is required in handling, controlling inventories, and safeguarding against fire, accidents, and thefts. All caps and pumps should be kept locked when the system is unattended.

6.11 Observation Well

6.11.1 At least one observation well, located at the low side of the tank, shall be installed for each tank. The bottom of the well should be at least 0.33m (12 in.) below the tank bottom.

6.11.2 The soil between tanks and the observation wells must be permeable, such as gravels, coarse to medium sands, and coarse silts.

6.11.3 The slotted portion of the well casing and the gravel pack around the well must be installed to prevent migration of natural fine soil into a coarse backfill or into a well.

6.11.4 The observation wells shall be sealed from the top of the filter pack. This is normally 0.15m (6 in.) below the finished grade.

6.11.5 Observation wells should be clearly marked and secured to avoid unauthorized access and tampering.

6.12 Once the tank pipe work, electrical wiring, submersible pumps and manhole risers are installed, backfilling is completed to the underside of the tank slab level. The tank slab is specified in section 6.6.1.

7 Site testing and commissioning

7.1 Pre-installation inspection and testing

7.1.1 Upon delivery at the installation site and just prior to installation, tanks should be carefully inspected to ensure that they comply with the applicable specifications and to detect any evidence of damage to coatings, materials or structure. Another careful visual inspection should be conducted just prior to installation.

7.1.2 Before a tank is installed, the inside vertical diameter should be measured and permanently recorded for comparison with post installation measurements and for future reference. The inside vertical diameter of the tank can be measured from the top of the bung (or opening) in three locations (that is, the middle and both ends of the tank). The deflection (difference between pre-installation and post-installation measurements) must not exceed the tank manufacturer's recommendations.

7.2 Testing of single wall tanks

7.2.1 All factory installed bungs (plugs) are removed from the tank, and a pipe thread sealant certified for petroleum service or for the fuel to be stored is applied. The bungs are then replaced and tightened to ensure that no air or water is released during testing. Any temporary bungs or dust covers should be replaced with solid bungs.

7.2.2 Prior to pressurization, the external surface of the tank should be inspected for defects. A hydrostatic or air pressure (for new tanks only) applicable for tank is applied (according to the manufacturer's recommended procedures) to raise the internal tank pressure to a level recommended for this test by the manufacturer, usually not less than 3 psi but not more than 5 psi with at least 30 minutes holding time. A pressure gauge with a maximum range of 10-15 psi with graduations of no more than ¼ psi increments should be used to confirm proper pressurization.

7.2.3 When the internal pressure is achieved, the pressure source shall be disconnected from the tank, all seams, bungs, and manholes shall be uniformly coated and recoated as necessary with a soap solution. Leaks are detected by the presence of bubbles identified by a visual inspection.

7.2.4 If bubbles are observed around fittings, the fittings should be checked for tightness and repaired as necessary. If leaks are detected in seams or the shell, the supplier/manufacturer should be notified.

7.2.5 After tank installation, similar hydrostatic or air pressure test procedure shall be conducted to determine tank integrity.

7.2.6 For used tanks, Out of Service Inspection (OOSI) procedure shall be conducted prior to integrity test.

7.3 Testing of double wall tanks

7.3.1 Double wall tanks provide a form of secondary containment and it contain an internal cavity (that is, the space between the inner and outer tank walls) called an interstice. This space may also be referred to as interstitial space, an annulus, or an annular space. The interstice is a feature that provides for containment and detection of releases and is not meant to provide permanent storage of product. The primary containment vessel is referred to as the inner tank, and the exterior of the tank as the outer tank.

7.3.2 Both the inner and outer shells of a double wall tank should be tested prior to installation. It is extremely important that the manufacturer will determine the exact test methods and protocols for their product.

Warning: Pressurization of the interstice directly from an outside air source is dangerous and should be strictly prohibited. Never enter the inner tank while the interstice is under pressure. Remember to stay away from the tank ends while the tank is under pressure.

8 Quality Assurance

8.1 Tank manufacturers/suppliers must submit details of quality assurance programs in place, the standard to which tank complies, and the results of any factory testing done on the tank duly signed by a manufacturer's/supplier's authorized professional mechanical engineer.

8.2 All composite, fiberglass, jacketed, and fiberglass tanks must be subject to a 35,000 volt holiday detector test to ensure that no flaws are present in the finished tank outer shell.

9 Responsibilities of owner and vendor

9.1 Inventory reconciliation. Regular routine reconciliation of quantities of product sales, receipt and stock-on-hand must be kept, with monthly reviews of cumulative variances. Reconciliation should be made daily on a busy retail outlet site, and no less frequently on any other site.

9.2 Water draw-off. Tanks should be checked at least weekly for the presence of water. This may not necessarily be due to tank leakage. Water can enter the tank through loose tank top fittings, or sometimes can be entrapped in the product being delivered. Water should be removed as soon as possible using an air driven suction/diaphragm pump and hose generally inserted down the dip point, and the cause of water ingress investigated.

9.3 Leak monitoring. Where observation wells or monitoring are installed, these should be routinely checked for signs of product release. The presence of product in wells may not necessarily mean a leaking tank – it may have originated from surface spills – but it will indicate a problem that exists which needs to be rectified.

10 Removal and disposal of used storage systems

10.1 Product should be pumped out of the UGTs to be removed and the tanks in these systems should be made vapor and liquid free or inerted before excavation is initiated. (API Recommended Practice 1604-1987 describes vapor freeing and inerting procedure). In some situations, product in adjacent tanks should also be removed or reduced to prevent any possible release that might result from damage to these tanks.

10.2 Care should be taken when existing equipment and backfill are removed so that other existing tanks are not damaged or undermined. Removing and replacing backfill around existing piping and tanks can cause stresses that may damage coatings and/or the UGTs and piping system.

10.3 If the existing tanks that is left intact and the new equipment will be installed are both steel, consideration must be given to eliminate the electrochemical corrosion effect that the existing tanks might have on the new equipment.

10.4 When an existing UGT is partially or totally removed, contaminated backfill may be encountered. Backfill can be contaminated by minor spills and drips during previous operations of the facility or by minor spills and drips during removal of equipment. Contaminated backfill may be a fire and environmental hazard. Refer to RA 6969 and its Implementing Rules and Regulations, for the proper method of waste disposal.

10.5 Spills and drips should be contained to prevent contamination during removal.

10.6 API Recommended Practice 1604-1987 and DENR Administrative Order 29, Implementing Rules and Regulations of RA 6969, suggests appropriate disposal methods for petroleum product storage and handling equipment.

References

PNS/DOE FS 1-2: 2004

The following standards contain provisions, which through reference in this text form part of this national standard. At the time of publication of this Philippine National Standard, the editions indicated were considered valid.

- API Recommended Practice 1615-1996: Installation of Underground Petroleum Storage System
- API Recommended Practice 1632-1996: Cathodic Protection of Underground Petroleum Storage Tanks and Piping System
- API Recommended Practice 1604-1987: Closure of Underground Petroleum Storage Tanks
- API Recommended Practice 1631-1987: Interior lining of Underground Storage Tanks
- API Standard 650-1993: Welded Steel for Oil Storage
- API Standard 653-1991: Tank inspection, Repair, Alteration and Reconstruction
- ASTM C33-1994: Specification for Concrete Aggregates
- ASTM D4021-1994: Specifications for Glass Fiber-Reinforced Polyester Underground Petroleum Tanks
- ASTM G57-1994: Method for Field Measurement of soil resistivity using Wenner Four-Electrode Method
- NFPA 30-1996: Flammable and Combustible Liquids Code
- NFPA 30A-1996: Automotive and Marine Service Station Code
- NFPA 70-1996: National Electrical Code
- NFPA 329-1992: Recommended Practice for Handling Underground Leakage of Flammable and Combustible Liquids
- PEI Recommended Practice 100-1990: Recommended Practice for Installation of Underground Liquid Storage System
- PEI Recommended Practice 300-1994: Vapor Recovery Instructions
- UL 58-1993: Steel Underground Tanks for Flammable and Combustible Liquids
- UL 1316-1993: Glass Fiber Reinforced Plastic Underground Storage Tanks for Petroleum Products
- UL 1746-1993: External Corrosion Protective Systems for Steel Underground Storage Tanks
- DENR Administrative Order 29, Implementing Rules and Regulations for Toxic Substances and Hazardous and Nuclear Waste Control Act of 1990

Retail Outlet - Piping system

Foreword

This Philippine National Standard Retail outlet – Piping system, PNS DOE FS 1- 3:2004 - was prepared by the Department of Energy’s Technical Committee on Petroleum Processes and Facilities - BPS/TC 68 Subcommittee 1 Fuel Storage and Dispensing System.

The development of this standard was initiated by the Department of Energy - Oil Industry Standards Monitoring Division through the Memorandum of Agreement (MOA) between DOE-OIMB and DTI-BPS.

This standard was prepared to complement Department Circular No. DC 2003-11-010 - Providing for the Rules and Regulations Governing the Business of Retailing Liquid Petroleum Products.

In the development of this standard the following references were considered:

- API Recommended Practice 1615-1996: Installation of Underground Petroleum Storage System
- NFPA 30-1996: Flammable and Combustible Liquids Code
- NFPA 30A-1996: Automotive and Marine Service Station Code

PNS/DOE FS 1 consists of the following parts under the general title Retail Outlet:

- Part 1: Health, safety and environment
- Part 2: Underground storage tank
- Part 3: Piping system
- Part 4: Dispensing pump

Retail outlet - Piping system

1 Scope

1.1 These recommended guides and procedures are applicable to sites where underground piping system for petroleum products will be use.

1.2 These recommendations do not relieve the owner, designer and installer from any or all damages resulting from the failure of the underground petroleum piping system. Due prudence and care must be practiced in the use of this underground system.

1.3 This document covers the medium in which petroleum product shall be conveyed from the point where the product is received on its way to its storage tank, from the storage tank to the final point of connection at the dispensing pump, and tank ventilation.

1.4 These guides are applicable for use with the following petroleum products; gasoline, kerosene and diesel only.

1.5 Above ground piping for petroleum products are not covered by these guidelines.

2 References

The following standard contains provisions, which, through reference in this text form part of this national standard. At the time of publication of this standard, the editions indicated were valid:

- API Recommended Practice 1632-1996: Cathodic Protection of Underground Petroleum Storage Tanks and Piping System
- UL 1746-1993: External Corrosion Protective Systems for Steel Underground Storage Tanks

3 Definition

For the purpose of this standard, the following definitions apply

3.1 certified

any equipment or material tested for use by any recognized international or local organization/laboratory for use with petroleum product.

3.2 corrosion protection

a means to lessen or prevent the deterioration of a material, usually a metal, from a reaction with its environment; or the use of a material known to be non-reactive to its anticipated environment; or the use of a material to isolate the metals from the environment

3.3

dip pipe

is a pipe which allows for the volume measurement of the product inside the underground storage tank

3.4

double wall pipe

is a form of secondary containment in which a pipe is constructed with shells or walls with an interstice between to contain a release from the primary (that is, inner) pipe

3.5

fiberglass reinforced plastic (FRP)

thermosetting resin laminate (material composed of several layers of fiberglass and resin) where the resin is a plastic substance used as a matrix for glass fibers

3.6

fill pipe

is a pipe used to introduce product into the underground storage tanks, direct or remote fill

3.7

jacketed pipe

is a single wall steel primary pipe with a fiberglass or high density polyethylene (HDPE) outer pipe

3.8

leak

a release of product through a perforation, hole, crack, or other opening in any component of a piping system, including either primary or containment hardware

3.9

liquid petroleum products

refers to crude oil derived product limited to gasoline, diesel and kerosene only

3.10

remote pumping system or submerged pumping system

a system in which one or more pumping units push petroleum product via a pressurized piping system, to one or more points away from the tank or tanks

3.11

siphon

a piping that interconnects two or more underground tanks permitting the automatic transfer of liquid until equalization is accomplished

3.12

spill containers

are liquid tight containers intended to contain and hold product spillage

3.13

spill container manhole

is a removable access cover on top of spill containers/sumps intended for inspection and maintenance works

3.14

steel pipes

these may be galvanized iron or black iron pipes

3.15

underground storage tank (UGT)

a container that has a capacity of more than 416 liters (110 gallons) used to store liquid petroleum products, and is buried completely underground

4 Design

4.1 Materials

The following kinds of underground piping systems available for use:

4.1.1 Fiberglass-reinforced plastics (FRP) – These are pipes made out of layers of fiberglass and resins. Any FRP pipe used in underground petroleum installation should be listed for products to be conveyed. It is important that manufacturer’s installation instructions are followed.

4.1.2 Coated steel piping – These are Schedule 40 min., steel pipe, protected against external corrosion, either through corrosion protection or other approved means. Couplings and fitting shall be made out of malleable iron and rated to handle at least 150 psi. Thread sealants certified for petroleum service should be used for all fittings. Use NPT threads.

4.1.3 Flexible piping – These are pipes characterized by non-corrosive materials, flexibility and no inaccessible joints. The piping may either be direct burial (single wall or double wall) or replaceable through an outer shell. Flexible pipe used in underground petroleum installations should be Certified for products to be conveyed. It is important that manufacturer’s installation instructions are followed.

4.2 For the above ground portion of the vent line, uncoated steel pipes can be used. In no instance shall the uncoated pipe of the vent line be used underground.

4.3 Corrosion Protection – All metallic underground piping should be protected from corrosion induced by the surrounding earth material around the pipe. The corrosion protection options for the piping can either be of the following:

4.3.1 Properly engineered, installed and maintained corrosion protection system in accordance with standards design of:

- i American Petroleum Institute Publication 1632-1996, *Cathodic Protection of Underground Storage Tanks and Piping Systems*;

- ii Underwriters Laboratory of Canada ULC-S603.1M, *Standard for Galvanic Corrosion Protection Systems for Steel Underground Tanks for Flammable and Combustible Liquids*;
- iii Steel Tank Institute Standard no. sti-P3, *Specification and Manual for External Corrosion Protection of Underground Steel Storage Tanks*;
- iv National Association of Corrosion Engineers Standard RP-01-69, *Recommended Practice, Control of External Corrosion of Underground or Submerged Metallic Piping Systems*;
- v National Association of Corrosion Engineers Standard RP-02-85, *Recommended Practice, Control of Corrosion on Metallic Buried, or submerged Liquid Storage Systems*; and,
- vi Underwriters Laboratories Inc., *Standard for External Corrosion Protection Systems for Steel Underground Storage Tanks*, UL 1746-1993, Part 1.

4.3.2 Approved or Certified corrosion-resistant materials or system, which include alloys, fiberglass-reinforced plastics, or fiberglass-reinforced plastic coatings.

5 Location and climatic conditions

5.1 In locations where existing structures, i.e. hospitals, schools, residential and commercial, are in the vicinity; consideration on the prevailing wind direction must be taken in locating the height and/or the vent lines of the station to minimize inconvenience to nearby establishments.

5.2 If the proposed location contains a high ground water table, material and installation methodology must be reviewed to avoid the entrance of water into the underground storage system and the mixing of petroleum product with the ground water. Liquid and vapor tightness of the pipeline system must be ensured.

5.3 Because many site-specific factors related to soil conditions and drainage affect the safety and operational life of any piping system, it is necessary to conduct site analysis. Factors may include but are not necessarily limited to soil stability, underground rock soil resistivity, acidity, moisture, sulfide content and presence or absence of any contamination.

5.4 A site analysis should be made of soil stability and soil composition with respect to the type of piping system to be installed. Soil corrosivity need not be evaluated if the pipes to be installed are made of corrosion resistive materials, e.g., FRP, high-density polyethylene (HDPE) and coated steel pipe. For pipe type, refer to 4.1.

6 Design Performance

6.1 Underground piping from tanks to dispensers should be sized to accommodate dispensing requirements. In determining size, consideration must be given to the length of runs, flow rates, the number and size of pumps, and the number of dispensers to be served. Refer to pump and piping manufacturer's recommendation for guidance.

6.2 All pipes must be made liquid tight. Pipe sealants certified for petroleum service should be used for fittings.

6.3 For suction type pumping system, underground product lines should have a uniform slope of not less than 1% down towards the tank.

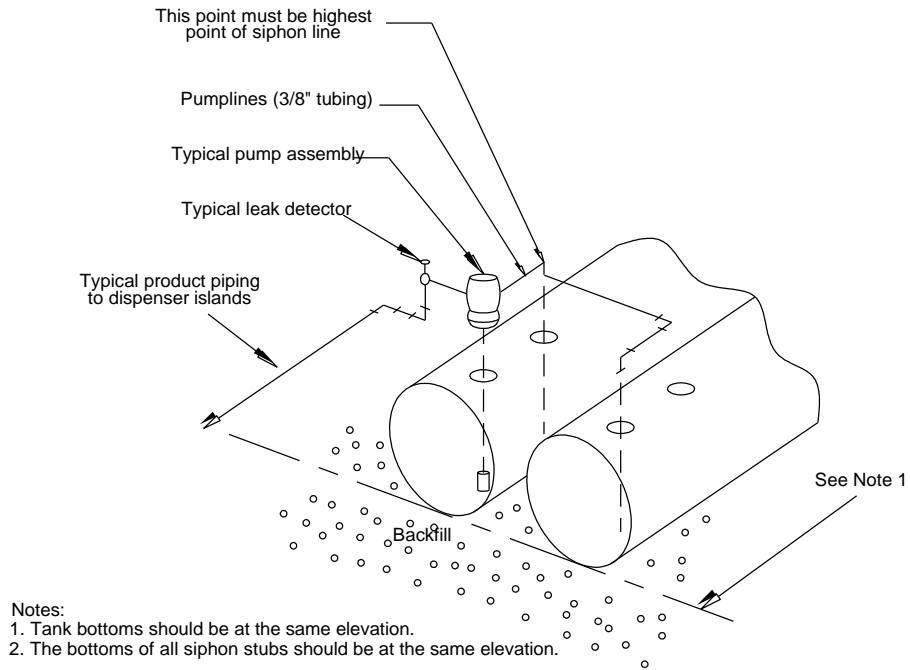


Figure 1 – Siphon pipe installation for remote pumping system

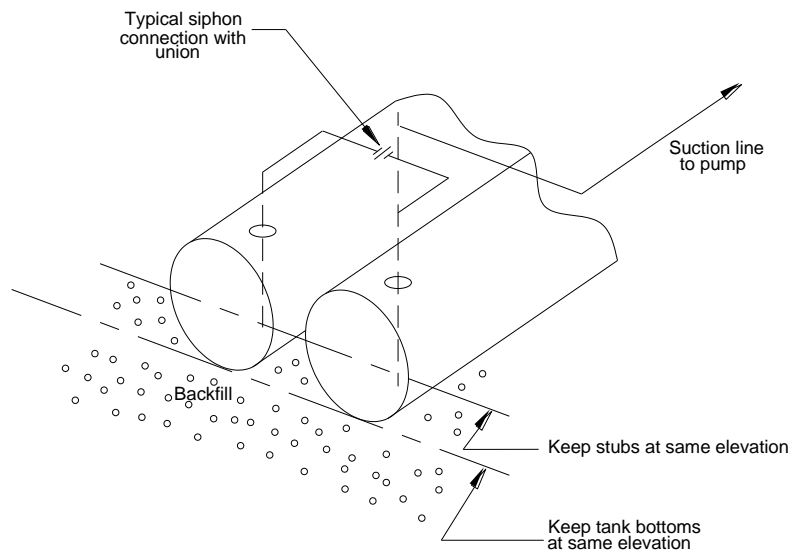


Figure 2 – Siphon pipe installation for suction type pump

6.4 Product lines (FRP and steel) should be buried with a minimum of 450mm (18 in.) from top of pipe to the unpaved finish grade level, 300mm (12 in.) for steel and 360mm (14 in.) for FRP from top of pipe to the concrete paved finish grade level. The pipe manufacturer's instructions should be followed.

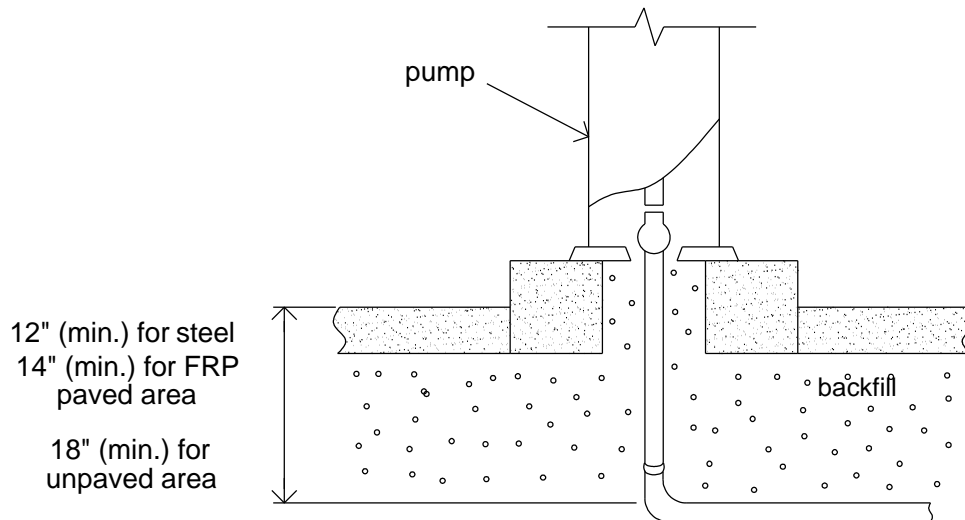


Figure 3 – Product Line Piping System

6.5 Traps and sags should be avoided in all piping.

6.6 It is occasionally necessary to install more than one storage tank for a given product. Such tanks may be interconnected by means of a siphon connection. Care must be taken to ensure that all joints in the siphon manifold are tight. Although not recommended, if it is necessary to connect tanks of different diameters at a new installation by means of siphons, both the tops of the tanks and the end of the suction stub piping in each tank should be at the same elevation. Remote pumps are available with siphon attachment that can be connected to a siphon manifold. This permits one pump to draw the contents from two or more interconnected tanks (see Figure 1). The pump manufacturer's installation should be followed. Siphon piping should be of the same diameter or smaller than the lines of the dispensers. Siphon piping need not have secondary containment since it will drain back to tanks if any leak occurs. Some jurisdictions prohibit siphoned tanks or may have other installation requirements.

6.7 Breakage of underground piping FRP and steel piping and vent lines, as well as loosening of steel piping can be minimized by use of Certified flexible joints. Flexible joints should be installed at points wherever differential movement may create a problem, including where piping connects with underground tanks and where the piping ends at the pump islands and vent riser.

6.8 In steel piping, flexible joints can be either swing joints or manufactured flexible connectors. A swing joint is made up of elbows and close nipples. A single swing joint consists of one elbow, one close nipple and one elbow. Changes of direction, as described in 6.7, shall be made up of double swing joints (two swing joints in different planes) or in lieu of double swing joints, commercially manufactured flexible connectors as described in 6.9 may be used. In locations where frequent movements are expected, certified flexible connector is highly recommended.

6.9 Certified flexible connectors are available in various sizes and lengths. They are also available in non-metallic materials that do not require corrosion protection. (Authorities having jurisdiction may require some non-metallic flexible connectors to be totally buried in backfill.) If metallic materials are used, any approved corrosion protection may be necessary. If double wall pipe is required, secondary containment boots are available to cover the flexible connectors.

6.10 A carefully planned, clearly detailed layout should be prepared for each installation. If the layout is properly planned, the pipe run will be minimized, operation will be more efficient, and maintenance will be easier.

6.10.1 For remote pumping system, piping should be in a single trench between the tank area and the island area. Piping across tanks should be minimized, and the trenches should run in straight lines with 45 or 90 degrees bend as necessary.

6.10.2 However for the direct or suction pump system, pipe to be installed across the top of installed underground storage tank shall be minimized. The total pipe run shall then be minimized.

6.10.3 Portion of vent lines between the tank area and the building or other structure to which the aboveground segment of the vent lines are attached should also be installed in a single trench.

6.10.4 If the location of the pipe runs is changed from that shown on the installation drawings, the actual location should be noted on as-built drawings.

6.11 The vent piping for all tanks should be adequately sized. This is necessary to prevent excessive pressure build-up while tank is being filled and to prevent vapor or liquid from blowing back at the fill opening when unloading hose is connected. The maximum fill rate can be limited by the diameter of the vent line. Vents that are 50 mm (2 in.) in diameter (for a maximum length of 45 m) should be adequate for flow rates incurred using 100 mm (4 in.) delivery equipment.

6.12 Horizontal portion of vent piping should be at least 450 mm (18 in.) below grade in unpaved areas and a minimum of 300 mm (12 in.) in paved areas and should slope uniformly down towards the tank. The piping should slope no less than 1% and laid to avoid sags and traps in the line in which liquid can collect.

6.13 Vertical portion of vents should be installed with a vertical support or can be attached to a building. Vents should be located to prevent flammable vapors from entering confined areas or building air-conditioning and/or ventilation intakes, or from reaching potential ignition sources. Vent outlets may be provided with pressure-vacuum (PV) valve and must

discharge upward; and the discharge point must be no less than 3.65 m (12 ft.) above the adjacent finished ground level or, if the vent is attached to a building, no less than 0.9m (3 ft.) above the roof at the point of attachment and at least 1.5 m (5 ft.) from any building opening. Where required by local ordinances or special conditions, rain shields or other special devices may be required.

6.14 Installed fill pipe and dip pipe, equipped with cover, must remain liquid-tight and vapor-tight when not in use.

6.15 Spills, drips and overfills that occur during transfer operations from the delivery truck to the underground tank must be prevented or contained. Refer to Part I – Underground Storage Tank, Section 4.3.3.

6.16 To contain small spills around the tank fills, spill container manholes must be installed. Containment manholes can be purchased or fabricated with a drain that routes any spilled product back into the underground tank. Other methods of fluid removal are also available, i.e. use of hand pumps, siphon and /or bail.

6.17 Pipe connections to tanks and dispenser must be done inside a liquid tight spill container. Proper seals shall be used to ensure that the spill container remains liquid tight through the pipe sleeves or interface. Pipes having connections, threaded or not, to various fittings should be contained inside liquid tight vaults with opening for regular maintenance inspection.

7 Construction and installation

7.1 To prevent damage to coatings and structures, pipelines should be handled with care during transit, storage and installation. These items should not be dropped, rolled, dragged or handled with equipment or devices that might impose damage or excessive stress.

7.2 Upon delivery at the installation site and just prior to installation, piping should be carefully inspected to ensure that they comply with applicable specifications and to detect any evidence of damage to coating, materials, or structure. Any method of acceptable testing recommended and approved by the manufacturer should be conducted at the time of delivery. Another careful inspection should be conducted just prior to installation. Refer to clause 8 for the test method.

7.3 When possible, damaged coating should be repaired at the installation site with manufacturer-supplied materials and in accordance with the manufacturer's instruction. If this is not possible or significant damage such as denting, puncturing, or cracking has occurred, the manufacturer should be employed to repair the equipment or coating and to rectify or replace as required.

7.4 Piping systems shall be substantially supported against physical damage and excessive stresses arising from settlement, vibration, expansion or contraction. The installation of non-metallic pipes shall be in accordance with the manufacturer's instruction.

7.5 Piping within the same trench shall be separated as follows:

7.5.1 Two pipe diameters between steel pipes;

7.5.2 Two pipe diameters between fiberglass-reinforced plastic lines; and

7.6 Two or more levels of pipes within the same trench shall be separated by a minimum 150 mm (6 in.) of well-compacted backfill of sand/fine aggregates.

7.7 Prior to backfilling, piping should be isolated from the tanks and subjected to a pipe leak/tightness test. Refer to 8.1.

7.8 The pipe trench should be bedded with at least 150 mm (6 in.) thick well compacted backfill material or as recommended by the manufacturer.

7.9 The backfill material must be free of debris and any organic material that might adversely affect the compactness or damage the pipe. Use of river washed sand is recommended as backfill material.

8 Pipeline commissioning

8.1 The piping should be tested as follows:

8.1.1 The product piping to be tested is isolated and pressurized to 150 percent of the maximum operating pressure of the system (or a minimum of 50 pounds per square inch gauge; maximum as recommended by component manufacturer) for at least 30 minutes and not more than 1 hour.

8.1.2 All piping surfaces including valves, fittings, joints and other accessories are wetted with soap and inspected for bubbles.

8.1.3 Leaking pipes or joints, as indicated by bubbles, are to be repaired or replaced, and the piping retested as necessary.

8.1.4 If double wall pipe is used, the inner wall shall be tested for tightness before closing the outer pipe. The outer pipe must be tested at a pressure of 5 pounds per square inch gauge maximum before backfilling. Care should be taken to prevent over pressurization of the interstice. It is important that the manufacturer's instruction be followed.

8.2 It is recommended that the following additional test be done prior to use of the piping after installation:

8.2.1 Apply a bubble test, as described in clause 8.1 above, once the piping has been connected to the tank and dispenser. Tighten, repair or replace defective fitting connecting the pipe to the tanks and dispensers.

8.2.2 Repeat pipe pressure test on the product, vent and receiving line after the lines have been backfilled. This will allow the installer to detect if the piping has been damaged after the backfilling of the pipes has been done.

8.3 Once the product piping has been used to transport product, leak or tightness test should not be conducted with the use of compressed air.

Retail outlet – Dispensing pumps

Foreword

This Philippine National Standard Retail Outlet - Dispensing pumps PNS DOE FS 1-4:2004 was prepared by the Department of Energy's Technical Committee on Petroleum Processes and Facilities - BPS/TC 68 Subcommittee 1 Fuel Storage and Dispensing System.

The development of this standard was initiated by the Department of Energy - Oil Industry Standards Monitoring Division through the Memorandum of Agreement (MOA) between DOE-OIMB and DTI-BPS.

This standard was prepared to complement Department Circular No. DC 2003-11-010 - Providing for the Rules and Regulations Governing the Business of Retailing Liquid Petroleum Products.

In the development of this standard the following standards were considered:

- NFPA 30-1996: Flammable and Combustible Liquids Code
- NFPA 30A-1996: Automotive and Marine Service Station Code

PNS/DOE FS 1 consists of the following parts under the general title Retail outlet:

- Part 1: Health, safety and environment
- Part 2: Underground storage tank
- Part 3: Piping system
- Part 4: Dispensing pump

Dispensing pumps

1 Scope

1.1. This standard shall include the design, installation and commissioning of self contained dispensing pumps (suction pump) and dispenser (pressurized pump), and the connection of product supply pipework, hoses and nozzles, electrical wiring and communication cables.

1.2. Operation, periodic maintenance, decommissioning and eventual disposal of the aboveground dispensing pumps and dispensers.

1.3. Requalification of reconditioned pumps.

2 Definitions

For the purpose of this standard, the following definitions apply.

2.1**approved**

acceptable to the authority having jurisdiction

2.2**authority having jurisdiction**

an organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation or a procedure

2.3**dispensing device**

is an equipment used to deliver petroleum products such as gasoline, diesel and kerosene; installed in a forecourt/curb area within the retail outlet. A dispensing device can either be a self-contained or with a remote/submersible pump.

2.4**liquid petroleum products**

refers to crude oil derived products limited to gasoline, diesel and kerosene

2.5**Listed**

equipment, materials, or services included in a list published by an organization that is acceptable to the authority having jurisdiction and concerned with evaluation of products or services, that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services, and whose listing states that either the equipment, material, or service meets appropriate designated standards or has been tested and found suitable for a specified purpose

2.6

retail outlet

a gasoline station outlet, facility or business establishments which sells or dispenses liquid petroleum products directly to individual end user/s or the public

2.7

self-contained dispensing device

an equipment incorporating a single housing with electric motor, pumping unit, computer/metering unit with complete accessories used to deliver petroleum products thru suction

2.8

submersible pump

a pump that is located inside a storage tank and positioned near the bottom of the tank, below the liquid level, used in conjunction with a dispenser

3 Design

3.1 General requirements

Dispensing devices installed in a retail outlet shall be located as follows:

3.1.1 Six (6) meters or more from the property lines;

3.1.2 Six (6) meters or more from buildings, other than canopies, having combustible exterior wall surfaces or buildings having noncombustible exterior wall surfaces that are not a part of a one-hour fire-resistive assembly;

3.1.3 Not less than one (1) meter from buildings with non-combustible wall surfaces and a part of a one-hour fire-resistive assembly;

3.1.4 Such that all parts of the vehicle being served will be on the premises of the retail outlet;

3.1.5 Such that the nozzle, when the hose is fully extended, will not reach within 1.5 m (5 ft) of any building openings.

3.2 Requirements for dispensing devices

3.2.1 Liquid petroleum products shall be transferred from tanks by means of fixed pumps designed and equipped to allow control of the flow and prevent leakage or accidental discharge.

3.2.2 Dispensing devices for liquid petroleum products shall be Listed.

3.2.3 Existing Listed or labeled dispensing devices shall be permitted to be modified provided that the modifications made are "Listed by Report" by an approved testing laboratory or as otherwise approved by the authority having jurisdiction. Modification proposals shall contain a description of the component parts used in the modification and the

recommended methods of installation on specific dispensing devices. Modification proposals shall be made available to the authority having jurisdiction upon request.

3.2.4 A control shall be provided that will permit the pump to operate only when a dispensing nozzle is removed from its bracket or normal position with respect to the dispensing device and the switch on this dispensing device is manually activated. This control shall also stop the pump when all nozzles have been returned to their brackets or to their normal non-dispensing position.

3.2.5 Dispensing devices shall be mounted on a concrete island or shall otherwise be protected against collision damage by an acceptable means. Dispensing devices shall be securely bolted in place. Dispensing devices shall be installed in accordance with the manufacturers' instructions.

3.2.6 Dispensing devices used to dispense kerosene to portable containers shall be located at least 6 m (20 ft) from any dispensing devices for motor fuels.

3.2.7 When maintenance to dispensing devices is necessary and such maintenance is capable of causing accidental release or ignition of liquid, the following precautions shall be taken before such maintenance is begun:

3.2.7.1 Only persons knowledgeable in performing the required maintenance shall be permitted.

3.2.7.2 All electrical power to the dispensing devices, to the pump serving the dispensing devices and to all associated control circuits shall be shut off at the main electrical panel board.

3.2.7.3 The isolation valve at the remote/submersible pumps shall be closed.

3.2.7.4 All vehicular traffic and unauthorized persons shall be prevented from coming within 6 m (20 ft) of the dispensing device.

3.2.8 Motor vehicle traffic patterns at retail outlet shall be designed to inhibit movement of vehicles that are not being fueled from passing through the dispensing area.

3.2.9 Where liquid is supplied to the dispensing device under pressure, a Listed, rigidly anchored emergency shutoff valve, incorporating a fusible link or other thermally actuated device, designed to close automatically in the event of severe impact or fire exposure shall be installed in the supply line at the base of each individual island-type dispenser. The emergency shutoff valve shall be installed in accordance with the manufacturers' instructions.

3.2.10 The automatic-closing feature of this valve shall be tested at the time of installation and at least once a year thereafter by manually tripping the hold-open linkage. Records of such tests shall be kept at the premises or shall be made available for inspection by the authority having jurisdiction.

3.2.11 Pumps shall be anchored and protected against physical damage.

3.2.12 Sumps, liquid tight, for subsurface pumps or piping manifolds of submersible pumps shall withstand the external pressures to which they can be subjected without damage to the pump, tank, or piping. The sump shall be adequate in size for inspection and maintenance and shall be provided with a fitted liquid tight cover.

3.2.13 Product filters inside the dispensing device shall at all times be present and maintained regularly for proper operation as recommended by the manufacturer.

3.3 Additional requirements for remote/submersible pumps

This section shall apply to systems for dispensing liquid petroleum products where the liquids are transferred from storage to individual or multiple dispensing devices by pumps located other than at the dispensing devices.

3.3.1 Pumps shall be Listed and shall be designed or equipped so that no part of the system will be subjected above its allowable working pressure.

3.3.2 Each pump shall have installed on the discharge side a Listed leak detection device that will provide an audible or visible indication if the piping or a dispenser is leaking. Each leak-detecting device shall be checked and tested at least annually according to the manufacturers' specifications to ensure proper installation and sealing operation.

3.4 Requirement for delivery nozzles

3.4.1 A Listed, automatic-closing-type hose nozzle valve, with or without latch-open device, shall be provided on island-type dispensing devices used to dispense Liquid Petroleum Products.

3.4.2 If a hose nozzle valve is provided with a latch-open device other than the one recommended by the valve manufacturer, the latch-open device shall be an integral part of the valve assembly and such valve/latch-open device combination shall meet all applicable requirements of Section 19A of UL 842-1997, Standard for Valves for Flammable Fluids.

3.4.3 Delivery nozzles shall be provided with anti-slip or locking mechanism e.g. spring or notch design to prevent the nozzle from slipping out of the vehicle fuel tank opening while dispensing.

3.5 Requirements for dispensing hose

3.5.1 Listed hose assemblies shall be used to dispense fuel. Hose length including breakaway coupling at retail outlet dispensing pump shall not exceed 5.5 m (18 ft).

3.5.2 A Listed emergency breakaway device designed to retain liquid on both sides of the breakaway point shall be installed on each hose dispensing liquid petroleum products. Such devices shall be installed and maintained in accordance with the manufacturers' instructions.

3.5.3 Where hose are attached to a hose-retrieving mechanism, the Listed emergency breakaway device shall be installed after the nozzle or as recommended by the manufacturer.

3.6 Emergency electrical disconnects

Fuel dispensing systems shall be provided with one or more clearly identified emergency shutoff devices or electrical disconnects. Such devices or disconnects shall be installed in accessible locations not less than 6 m (20 ft) from the fuel dispensing devices that it serve. Emergency shutoff devices or electrical disconnects shall disconnect power to all dispensing devices; to all remote pumps serving the dispensing devices; to all associated power, control, and signal circuits; and to all other electrical equipment in the hazardous (classified) locations surrounding the fuel dispensing devices. When more than one emergency shutoff device or electrical disconnect is provided, all devices shall be interconnected. The devices or disconnects shall be readily accessible to the attendant at all times.

4 Installation

4.1 Electrical wiring and electrical utilization equipment shall be of a type specified by and shall be installed in accordance with Philippine Electrical Code (PEC). Electrical wiring and electrical utilization equipment shall be approved for the locations in which they are installed.

4.2 Installation in Classified Locations

Table 1 for Electrical Equipment Classification shall be used to delineate and classify areas for the purpose of installing electrical wiring and electrical utilization equipment. (See Figure 1)

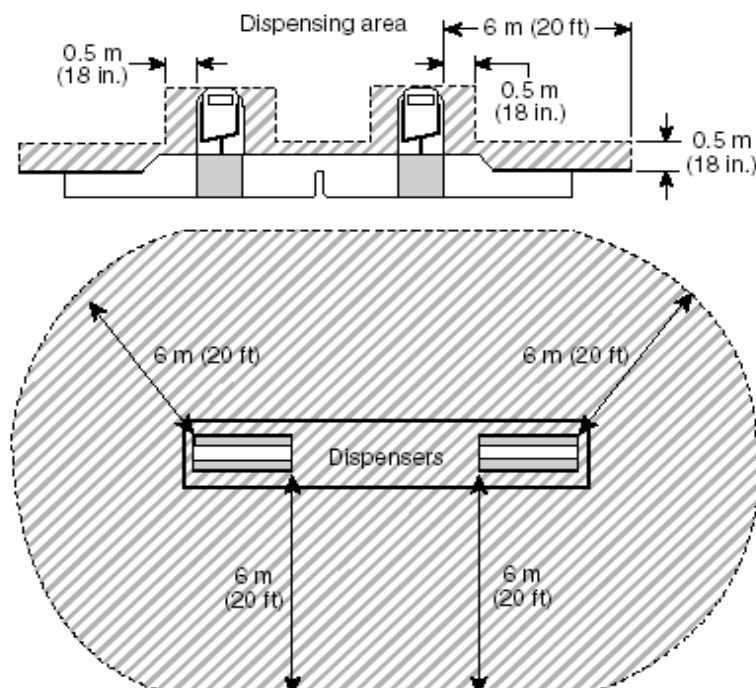


Figure 1. Classified Areas Adjacent to Dispensers as detailed in the Table 1 for Electrical Equipment Classified Areas

All electrical wiring and electrical utilization equipment that are integral with the dispensing hose or dispensing nozzle shall be approved for use in liquid petroleum products classified locations.

Where liquid petroleum products are stored, handled, or dispensed, electrical wiring and electrical utilization equipment shall be designed and installed in accordance with the requirements as set forth in Philippine Electric Code (PEC).

Emergency Electrical disconnects shall be installed at the locations required by Section 3.6.

(Table 1:Electrical equipment classified areas – Retail Outlet)

Location	Extent of Classified Area
Dispensing device Pits Dispenser	Any pit or box below grade level, any part of which is within classified area Within 46 cm (18in.) horizontally in all directions extending to grade from the dispenser enclosure or that Portion of the dispenser enclosure containing liquid handling components
Outdoor	Up to 46 cm (18 in.) above grade level within 6 m (20 ft) horizontally of any edge of enclosure
Remote pump – outdoor	Any pit or box below grade level if any part is within a horizontal distance of 3 m (10 ft) from any edge of pump Within 3 ft of any fill or dispensing point, extending in all Directions
Vent Underground tank fill opening Vent discharging upward	Within 1.5 m (5 ft) of open end of vent extending in all Directions Any pit or box below grade level, any part of which is within a classified area Within 3 ft of open end of vent, extending in all directions

5 Quality assurance

For used dispensing pumps, consider its physical appearance and must be certified fit for use by a Petroleum Equipment Institute (PEI) / Original Engine/Equipment Manufacturers (OEM) accredited pump re-conditioner company.

The reconditioning program shall provide verifiable evidence that materials, design, fabrication, inspection and testing of pumps supplied, conform to applicable standards and to the requirements of the manufacturer.

Results of new rating shall be reflected on the specification plate of reconditioned pumps, shall include, but not limited to the following: new rating of parts, date, name of reconditioning company.

Notwithstanding the above certification, all dispensing pumps, brand new or reconditioned must be properly calibrated and sealed by the appropriate government agency.

6 Responsibilities of owner and vendor

This clause shall apply to those requirements that relate to the operation of Retail Outlet.

6.1 Inventory Control.

Accurate daily inventory records shall be maintained and reconciled for all liquid fuel storage tanks for indication of possible leakage from tanks or piping. The records shall be kept on the premises or shall be made available to the authority having jurisdiction for inspection upon demand. The records shall include, as a minimum and by product, daily reconciliation between sales, used receipts, and inventory on hand. If there is more than one storage system serving an individual pump or dispensing device for any product, the reconciliation shall be maintained separately for each system.

6.2 Housekeeping.

The dispensing area shall be kept free of debris, and any other material that is not necessary to the proper operation of the Retail Outlet.

7 Disposal

API Recommended Practice and DENR Administrative Order 29-1990, Implementing Rules and Regulation of RA 6969, suggested appropriate disposal methods for petroleum product dispensing equipment shall apply.

8 References

API Standard 653-1991: Tank inspection, Repair, Alteration and Reconstruction

NFPA 30-1996: Flammable and Combustible Liquids Code

NFPA 30A-1996: Automotive and Marine Service Station code

Philippine Electrical Code

Fire Code of the Philippines

UL 842-1997: Valves for Flammable Fluids