BS EN 14678-3:2013

BSI Standards Publication

LPG equipment and accessories — Construction and performance of LPG equipment for automotive filling stations

Part 3: Refuelling installations at commercial and industrial premises

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National foreword

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The UK participation in its preparation was entrusted to Technical Committee PVE/19, LPG containers and their associated fittings.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Contents

Page

Foreword

This document (EN 14678-3:2013) has been prepared by Technical Committee CEN/TC 286 “Liquefied petroleum gas equipment and accessories”, the secretariat of which is held by NSAI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 2013, and conflicting national standards shall be withdrawn at the latest by June 2013.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

EN 14678 consists of the following parts:

— EN 14678-1, *LPG equipment and accessories — Construction and performance of LPG equipment for automotive filling stations — Part 1: Dispensers*;

— EN 14678-2, *LPG equipment and accessories — Construction and performance of LPG equipment for automotive filling stations — Part 2: Components other than dispensers, and installation requirements*;

— EN 14678-3, *LPG equipment and accessories — Construction and performance of LPG equipment for automotive filling stations — Part 3: Refuelling installations at private and industrial premises*.

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Introduction

This European Standard calls for the use of substances and procedures that may be injurious to health if adequate precautions are not taken. It refers only to technical suitability and does not absolve the user from legal obligations relating to health and safety at any stage.

Protection of the environment is a key political issue in Europe and elsewhere. Protection of the environment is taken in a very broad sense. What is meant is the total life cycle aspects of, e.g. a product on the environment, including expenditure of energy and during all phases from mining of raw materials, fabrication, packaging, distribution, use, scrapping, recycling of materials, etc.

NOTE Annex B indicates which clauses in this European Standard address environmental issues. Clauses addressing environmental issues are restricted to a general guidance. Limiting values can be specified in national laws.

It is recommended that companies using this European Standard develop an environmental management policy. For guidance see EN ISO 14021 [3], EN ISO 14024 [4] and EN ISO 14025 [5].

1 Scope

This European Standard covers the equipment and installation requirements for LPG refuelling installations, which are required to safely dispense LPG at commercial and industrial premises.

This European Standard does not cover public LPG filling stations.

This European Standard does not cover nautical LPG refuelling installations.

This European Standard does not cover on-site and off-site safety distances.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 549, *Rubber materials for seals and diaphragms for gas appliances and gas equipment*

EN 837-1, *Pressure gauges — Part 1: Bourdon tube pressure gauges — Dimensions, metrology, requirements and testing*

EN 1762, *Rubber hoses and hose assemblies for liquefied petroleum gas, LPG (liquid or gaseous phase), and natural gas up to 25 bar (2,5 MPa) — Specification*

EN 12542, *LPG equipment and accessories - Static welded steel cylindrical tanks, serially produced for the storage of Liquefied Petroleum Gas (LPG) having a volume not greater than 13 m³ — Design and manufacture*

EN 13445 (all parts), *Unfired pressure vessels*

EN 13463-1, *Non-electrical equipment for potentially explosive atmospheres — Part 1: Basic method and requirements*

EN 14570, *LPG equipment and accessories — Equipping of LPG tanks, overground and underground*

EN 14678-1, *LPG equipment and accessories — Construction and performance of LPG equipment for automotive filling stations — Part 1: Dispensers*

prEN 16125, *LPG equipment and accessories — Pipework systems and supports — LPG liquid phase and vapour pressure phase*

EN 50525-2-51, *Electric cables — Low voltage energy cables of rated voltages up to and including 450/750 V (U_0/U) — Part 2-51: Cables for general applications — Oil resistant control cables with thermoplastic PVC insulation*

EN 50525-2-21, *Electric cables — Low voltage energy cables of rated voltages up to and including 450/750 V (U_0/U) — Part 2-21: Cables for general applications — Flexible cables with crosslinked elastomeric insulation*

EN 60079-10-1, *Explosive atmospheres — Part 10-1: Classification of areas — Explosive gas atmospheres (IEC 60079-10-1)*

EN 60079-14 *Explosive atmospheres — Part 14: Electrical installations design, selection and erection (IEC 60079-14)*

EN 60947-3 *Low-voltage switchgear and control-gear — Part 3: Switches, disconnectors, switch-disconnectors and fuse-combination units (IEC 60947-3)*

3 Terms and definitions

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

3.1
liquefied petroleum gas
LPG
low pressure liquefied gas composed of one or more light hydrocarbons which are assigned to UN 1011, UN 1075, UN 1965, UN 1969 or UN 1978 only and which consists mainly of propane, propene, butane, butane isomers, butene with traces of other hydrocarbon gases

3.2
accessories
devices connected to the system whose main function is not for the storage or conveyance of LPG

Note 1 to entry: Safety and pressure accessories are defined in the PED.

3.3
dead man type shut-off device
manually operated non-latching device which immediately stops flow when released

3.4
excess flow valve
valve designed to close automatically, with a small residual flow, when the fluid flow passing through it exceeds a predetermined value, and to re-open when the pressure differential across the valve has been restored below a certain value

3.5
pressure relief valve
self-closing valve which automatically, without the assistance of any energy other than that of the vapour concerned, discharges vapour at a predetermined pressure, and operates with a pop action

3.6
hydrostatic relief valve
self-closing valve which automatically, without the assistance of any energy other than that of the fluid concerned, discharges fluid at a predetermined pressure

3.7
shut-off valve
valve to provide a leak-tight seal which is operated either manually, remotely or is self-closing

3.8
filling nozzle
mechanical system, fitted to the hose of the dispensing system, consisting of a filling nozzle body, operating mechanism, including sealing elements and a service gasket if required

3.9
contents gauge
device to indicate the liquid level or contents in a pressure vessel

3.10
pressure vessel
assembly of the pressure-retaining envelope (including the openings and their closures) and non-pressure-retaining parts attached directly to it

3.11
mounded vessel
pressure vessel above or partially underground of which the part above the ground is completely covered

3.12
underground vessel
vessel below the surrounding ground level and completely covered

3.13
overground vessel
pressure vessel above the surrounding ground level and not covered

3.14
submersible pump
pump which is completely or partially immersed in the liquid LPG

3.15
external pump
pump which is installed on the LPG delivery pipe-work

3.16
hazardous area
area in which an explosive atmosphere is or may be present, in a quantity such as to require special precautions for the construction and installation of equipment and use of apparatus

3.17
breakaway coupling
coupling which separates at a predetermined section when required and each separated section contains a self-closing shut-off valve, which seals automatically

Note 1 to entry: Also referred to as a safe break.

3.18
break point
weakened section in a pipe or fitting intended to break when excessive force is applied

3.19
installer
person or organisation who, by qualification, training, experience and resources assumes technical responsibility for the installation of an LPG filling station

4 Requirements

4.1 Environmental

4.1.1 The manufacturer shall endeavour to acquire materials and components from suppliers who have a declared environmental policy, see EN ISO 14021, EN ISO 14024 and EN ISO 14025.

4.1.2 Materials should be selected to optimise product durability and lifetime and consideration should be made to avoiding the selection of rare or hazardous materials.

4.1.3 Consideration should be made to use recycled or reused materials, and to the selection of materials which can then be subsequently recycled.

4.1.4 The installer shall endeavour to minimise use and wastage of material during all the installation process, with particular attention to welding and allied processes. Unavoidable waste/scrap material shall be recycled.

4.1.5 Noise levels from installation process shall be evaluated and measures put in place to minimise the impact upon the external environment.

4.2 General

4.2.1 The design of the installation shall take into account stresses resulting from internal and external loads such as pressure, thermal expansion, contraction, vibration and seismic activity.

4.2.2 The installer shall be provided with a drawing of the layout of the installation on which the hazardous areas are shown including their classification in accordance with EN 60079-10-1.

4.2.3 Only components suitable for the selected hazardous area shall be installed.

4.2.4 All handles, switches and controls required for operational and emergency purposes shall be easily accessible.

4.2.5 Remotely operated shut-off valves fitted to the liquid outlet of the storage vessel shall be of the normally closed type. Other remotely operated shut-off valves fitted in the system may be of the normally open position provided that safety is not compromised.

4.2.6 All equipment and components shall be installed according to the manufacturer's instructions and tested according to the procedures described in Clause 5 and Clause 6.

4.2.7 Dispensing equipment shall include a pump, a delivery hose complete with breakaway coupling, filling nozzle and operational dead man type shut-off device.

4.2.8 Pipework and equipment shall be:

— secured to prevent excessive movement of pipes;

— located to reduce the possibility of impact damage from vehicles or mobile equipment; and

— protected where necessary, e.g. with bollards or barriers.

4.3 Design pressure

The design pressure for the components subject to pressure, other than the pressure vessel and its pressure relief valve, shall be at least 2 500 kPa (25 bar).

4.4 Design temperature

The maximum design temperature shall be 40 °C.

The minimum design temperature shall be -20 °C.

For operating conditions outside the above range, different design temperature(s) shall be agreed with the manufacturer and suitably marked.

For some parts of Europe and certain applications, temperatures lower than -20 °C can be encountered and for these applications, the minimum design temperature shall be -40 °C.

4.5 Materials

4.5.1 All materials in contact with LPG shall be compatible with LPG in the liquid phase. Materials exposed to corrosive environments shall be corrosion resistant or protected against corrosion.

4.5.2 Non-conductive materials exposed to potentially explosive atmospheres, which are susceptible to electrostatic charge, shall comply with EN 13463-1.

NOTE Further information on electrostatics is given in CLC/TR 50404.

4.5.3 All elastomeric materials in contact with LPG shall be compatible with LPG and shall not distort, harden or adhere to other components to such an extent as to impair the function of those components. Rubber materials shall conform to the requirements of EN 549. For guidance on the selection of non-metallic materials see EN ISO 11114-2.

4.6 LPG storage

4.6.1 Design

Pressure vessels with a volume not greater than 13 m^3 shall be designed and manufactured to EN 12542 or the equivalent.

Pressure vessels with a volume greater than 13 m^3 shall comply with EN 13445 (all parts) or equivalent.

4.6.2 Installation

The pressure vessel shall be installed in a fixed position either overground, underground or mounded, in accordance with the instructions provided by the pressure vessel manufacturer. See Annex A for installation examples.

Adequate provisions shall be taken to avoid movement of the pressure vessel in respect to the surrounding ground.

4.6.3 Equipping

Pressure vessels with a volume not greater than 13 m^3 shall be equipped in accordance with EN 14570.

Larger vessels shall be equipped in accordance with national requirements.

The following pressure vessel connections are also required:

— vapour return when required by design of dispensing equipment;

— a means of safely emptying the pressure vessel;

— vapour balance for multiple pressure vessels in a group; and

— drain.

4.6.4 Mechanical protection

Adequate means shall be provided to protect the pressure vessel and ancillary components from mechanical damage.

EXAMPLE With bollards or barriers.

4.7 Pumping units

4.7.1 General

External or submersible pumps are permitted. See Annex A for installation examples.

Precautions shall be taken to ensure that the pump outlet pressure does not exceed the maximum design pressure of the installation.

NOTE This may be achieved by installing a suitable by-pass system.

4.7.2 Submersible pump

Where a submersible pump is used the pressure vessel design shall allow for removal of the submersible pump, in accordance with the pump manufacturers' instructions, with minimal loss of pressure vessel contents.

NOTE If no isolating barrel has been installed, the pressure vessel may have to be emptied before the pump can be replaced to minimise the losses.

4.7.3 External pump

4.7.3.1 External pumps shall comply with the requirements of with EN 13463-1.

4.7.3.2 External pumps shall be securely fixed.

4.8 Pipework systems and supports

Pipework systems and supports shall comply with the requirements of prEN 16125.

4.9 Delivery hose

The delivery hose shall be in accordance with EN 1762.

Provisions shall be made to secure LPG filling nozzle and delivery hose to prevent damage when not in use.

4.10 Dead man type shut-off device

The refuelling operation shall only be allowed to start and be maintained by activation of the dead man type shut-off device located at the dispensing point. The de-activation of this device shall immediately stop the flow of LPG.

Electrical push button dead man type shut off devices shall comply with EN 60947-3.

4.11 Valves and pressure indication

4.11.1 Shut-off valves

A shut-off valve shall be provided to stop the flow of LPG in the event of an emergency to completely isolate the delivery and dispensing pipework from the storage vessel.

Hand wheels and handles of valves which are designated to be closed in case of an emergency shall be easily accessible and shall be coloured red or clearly labelled.

4.11.2 Hydrostatic relief valves

Where liquid LPG may be trapped between two closed valves a hydrostatic relief valve, with a maximum set pressure which is not greater than the design pressure, shall be installed.

Hydrostatic relief valves shall discharge to a ventilated safe area.

The location and positioning of hydrostatic relief valves shall be such that:

— discharging liquid will not impinge on pressure vessels or other parts of the installation; and

— obstruction by debris (e.g. caused by installation in the lower section of the pipe-work) will not compromise its operation.

Hydrostatic relief valves shall be provided with protective caps to prevent ingress of water or any pollution (i.e. rain cap) and shall indicate the opening of the valve itself.

4.11.3 Pressure indication

Means shall be provided to indicate the system pressure downstream of the pump. Where a pressure gauge is installed it shall be in accordance with EN 837-1.

4.12 Breakaway coupling

The device, mounted in its normal operating position, shall part and close both ends. Unless justified by a risk assessment, it shall be installed in such a position that no moments are applied. It shall be tested in accordance with the operational tests in EN 14678-1.

If a breakaway coupling is designed to be anchored to the ground, the anchorage shall be able to withstand a force of 750 N.

4.13 Electrical installation

4.13.1 General

4.13.1.1 All components shall have the same earth potential except for components which are cathodically protected.

4.13.1.2 Electrical and electronic components shall be suitable for both the hazardous area and environmental conditions in which they are installed.

4.13.1.3 The means of introduction of cables or ducts with their individual glands, bushings etc., into an enclosure shall ensure that the degree of protection is not reduced.

4.13.1.4 To minimise the risk of electrostatic discharge during road tanker deliveries, an effective earthing point shall be provided near the filling point of the storage vessel.

Considerations should be given to the positioning and location of electrical enclosures to ensure adequate protection from potential impingement of LPG in the liquid phase.

4.13.2 Electrical cables

4.13.2.1 Electrical cables used in hazardous areas shall comply with: either:

a) EN 60079-14 and EN 50525-2-51; or

b) EN 60079-14 and EN 50525-2-21.

4.13.2.2 Where cables are placed in a tube, pipe or duct provision shall be made to ensure that LPG cannot flow along the conduit to another area where the mixture can be ignited.

4.13.2.3 Seals and sealants used for closing conduits shall be impermeable to LPG in liquid or vapour phase.

5 Testing of the installation

Where the pressure vessel has been supplied with the accessories pre-assembled and upon completion of the installation, tightness tests shall be carried out on the pipework in accordance with the requirements of prEN 16125.

When accessories are fitted to the pressure vessel on-site, such an installation shall be tested in accordance with the pressure vessel relevant standard.

Test fluids should be disposed of in an environmentally friendly manner.

6 Commissioning

Following satisfactory completion of all testing procedures, the installation shall be commissioned and leak tested by the installer to verify that all systems are operational.

The tests and checks performed for commissioning shall be documented and recorded.

7 Signage

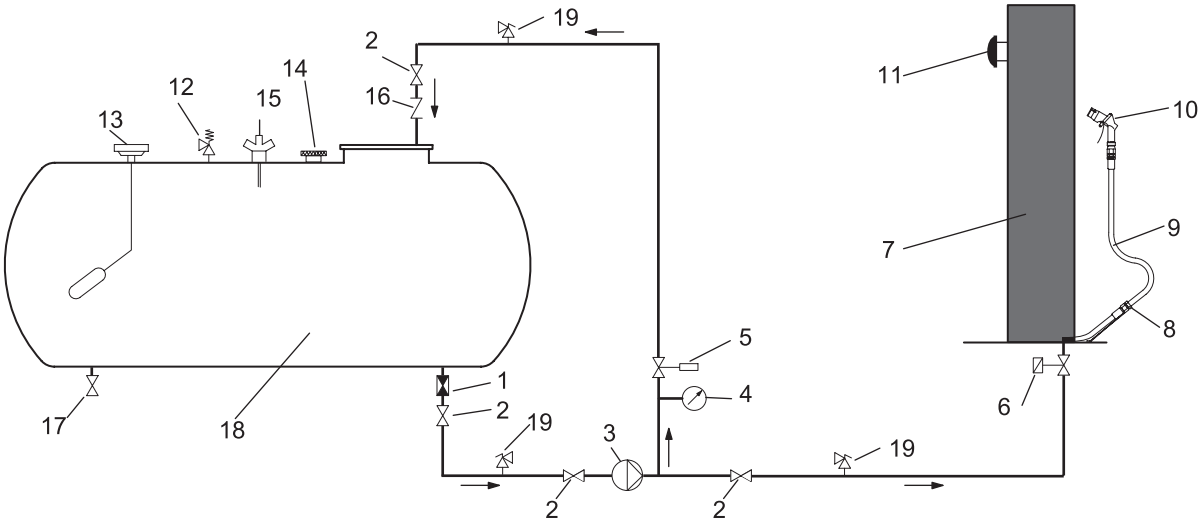
7.1 All the emergency valves/equipment shall be clearly marked and identified. All signage shall be clearly understandable, weather resistant and durable.

7.2 Markings, signs and written warnings shall be readily understandable and unambiguous. Readily understandable signs (pictograms) shall be used in preference to written warnings where possible.

7.3 Operational filling and dispensing instructions shall be provided at the refuelling point.

Annex A
(informative)

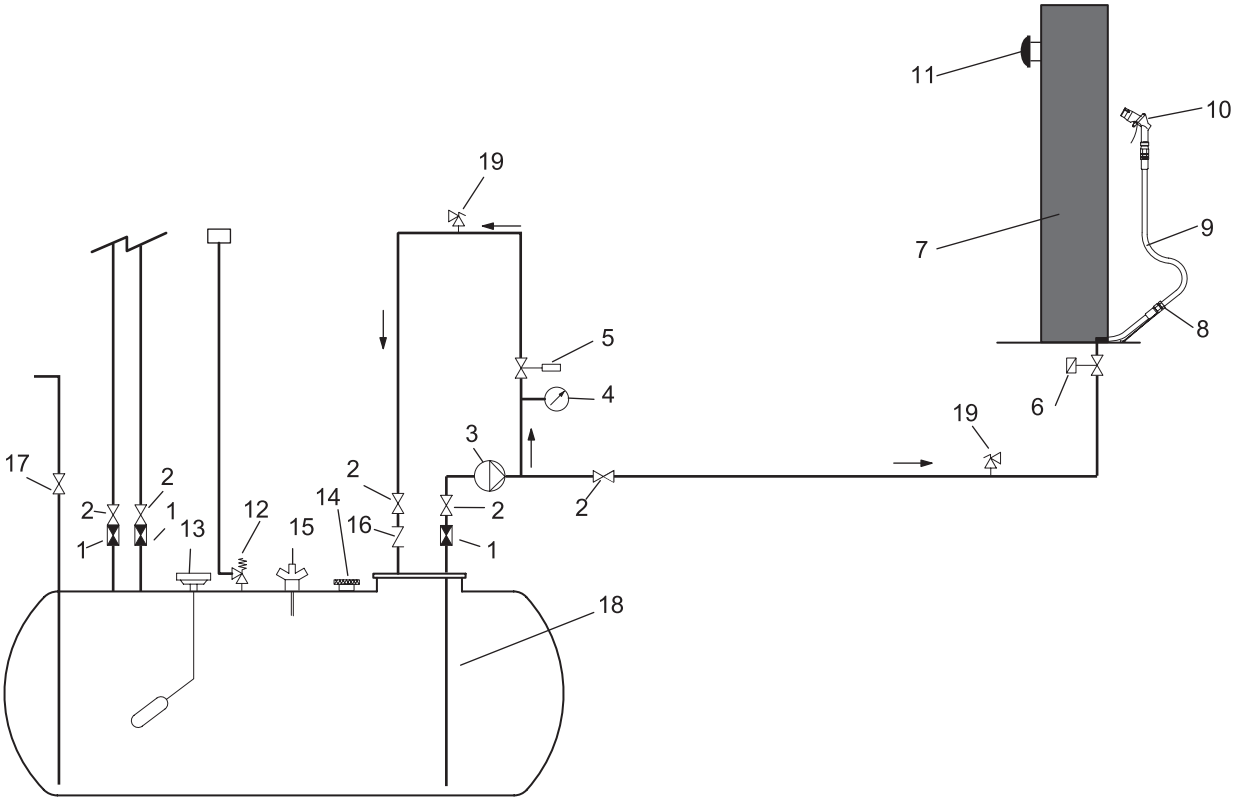
Explanatory drawings



Key

1 excess flow valve
2 shut-off valve
3 external pump
4 pressure gauge
5 by-pass valve
6 solenoid valve or equivalent cut-off device
7 dispensing point
8 break-away coupling
9 delivery hose
10 filling nozzle
11 dead man button
12* hydrostatic relief valve or pressure relief valve
13 contents gauge
14 filling point
15 max filling level indicator
16 non-return valve
17 drainage valve
18 overground vessel
19 hydrostatic relief valve or over pressure protection

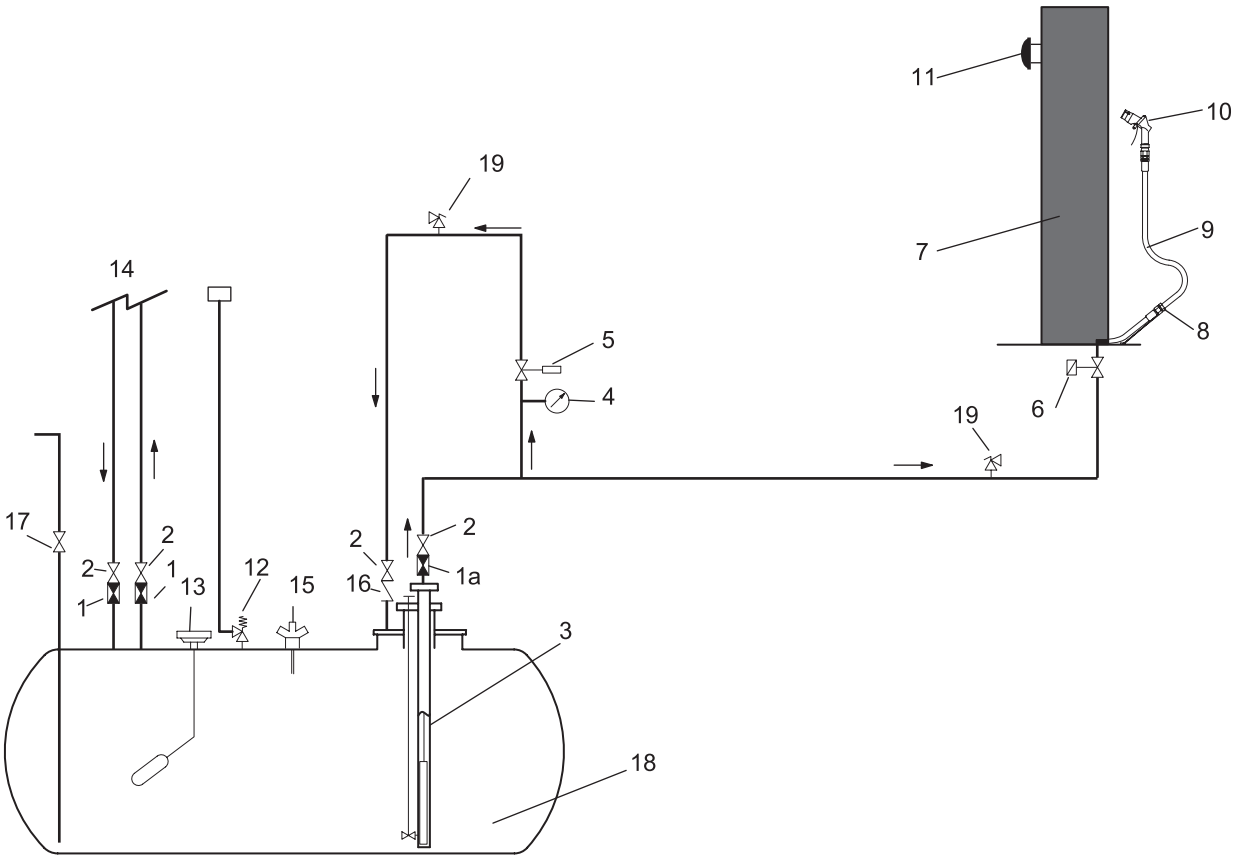
Figure A.1 — Example of above ground pressure vessel installation



Key

1 excess flow valve
2 shut-off valve
3 external pump
4 pressure gauge
5 by-pass valve
6 solenoid valve or equivalent cut-off device
7 dispensing point
8 hose breakaway
9 delivery hose
10 filling nozzle
11 dead-man button
12* hydrostatic relief valve or pressure relief valve
13 contents gauge
14 filling point
15 max filling level indicator
16 non-return valve
17 drainage valve
18 underground vessel
19 hydrostatic relief valve or over pressure protection

Figure A.2 — Example of under ground pressure vessel installation with external pump



Key

1 excess flow valve
2 shut-off valve
3 submersible pump
4 pressure gauge
5 by-pass valve
6 solenoid valve or equivalent cut-off device
7 dispensing point
8 hose break-away
9 delivery hose
10 filling nozzle
11 dead-man button
12* hydrostatic relief valve / pressure relief valve
13 level gauge
14 filling point
15 max filling level indicator
16 non-return valve
17 drainage valve
18 underground vessel
19 hydrostatic relief valve or over pressure protection

Figure A.3 — Example of underground pressure vessel installation with submersible pump

Annex B
(informative)

Environmental checklist

Environmental Aspect	Stages of the life cycle										All stages
	Acquisition		Production		Use			End-of-Life			
	Raw materials and energy	Pre-manufactured materials and components	Production	Packaging	Use	Maintenance and repair	Use of additional products	Reuse / Material and Energy Recovery	Incineration without energy recovery	Deposition	Transportation
Inputs											
Materials	4.1	4.1	4.1					4.1		4.1	
Water											
Energy											
Land											
Outputs											
Emissions to air						4.7.2 4.11.2 5					
Discharges to water						5					
Discharges to soil						5					
Waste			4.1							4.1	
Noise, vibration, radiation, heat losses			4.1								
Other relevant aspects											
Risk to the environment from accidents or unintended use		Intro									
Customer information					5.2						
Comments:											

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[3] EN ISO 14021, *Environmental labels and declarations — Self-declared environmental claims (Type II environmental labelling) (ISO 14021)*

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[5] EN ISO 14025, *Environmental labels and declarations — Type III environmental declarations. Principles and procedures (ISO 14025)*

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