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Thermoplastic and flexible metal pipework for underground installation at petrol filling stations

Thermoplastische und flexible metallene Rohrleitungen für erdverlegte Installationen für Tankstelle

Tuyauteries enterrées thermoplastiques et en métaux flexibles pour stations-service

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Thermoplastic and flexible metal pipework for underground installation at petrol filling stations

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Thermoplastische und flexible metallene Rohrleitungen für erdverlegte Installationen für Tankstelle

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 393.

If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Contents

Foreword

This document (prEN 14125:2011) has been prepared by Technical Committee CEN/TC 393 “Equipment for storage tanks and for filling stations”, the secretariat of which is held by DIN.

This document is currently submitted to the CEN enquiry.

This document will supersede EN 14125:2004 and EN 14125:2004/A1:2006.

According to edition 2004 and amendment edition 2006 the following fundamental changes are given:

— new definitions included;

— new types of secondary containment included;

— multilayer pipes included;

— requirements for static electricity revised;

— new test fuels added;

— test procedures revised;

— A-deviation for the Netherlands added.

Introduction

The purpose of this document is to ensure the suitability of underground pipework for conveying liquid fuels and their vapours at petrol filling stations.

NOTE Pipework should have a designated means of connector specified by the manufacturer or supplier.

Pipework for underground installation at petrol filling stations generally has a diameter less than 100 mm and is therefore outside the scope of the Pressure Equipment Directive (PED) 97/23/EC. Pipework with an internal diameter greater than or equal 100 mm could be within the scope of the PED.

1 Scope

This document specifies requirements for underground pipework systems used to transfer liquid fuels and their vapours at petrol filling stations. Minimum performance requirements covering fitness for purpose, safety and environmental protection are given.

This document applies to pipework made from thermoplastics, which may include some degree of reinforcement, and to flexible metal pipework. It does not apply to fibre reinforced thermosets, commonly referred to as glass fibre reinforced plastic (GRP), nor to rigid metals.

This document applies to:

— delivery pipes from tanks to dispensers, including positive pressure, vacuum suction and siphon modes;

— fill pipes from road tankers to tanks;

— vapour recovery and vent pipework;

— pipework for Secondary Containment;

— connectors.

It does not apply to pipework for use with liquefied petroleum gas.

2 Normative references

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

EN 1555-1, *Plastics piping systems for the supply of gaseous fuels — Polyethylene (PE) — Part 1: General*

EN 1555-2, *Plastics piping systems for the supply of gaseous fuels — Polyethylene (PE) — Part 2: Pipes*

EN 1555-3, *Plastics piping systems for the supply of gaseous fuels — Polyethylene (PE) — Part 3: Fittings*

EN 1555-4, *Plastics piping systems for the supply of gaseous fuels — Polyethylene (PE) — Part 4: Valves*

EN 1555-5, *Plastics piping systems for the supply of gaseous fuels — Polyethylene (PE) — Part 5: Fitness for purpose of the system*

EN 12201-1, *Plastics piping systems for water supply, and for drainage and sewerage under pressure — Polyethylene (PE) — Part 1: General*

EN 12201-2, *Plastics piping systems for water supply, and for drainage and sewerage under pressure — Polyethylene (PE) — Part 2: Pipes*

EN 12201-3, *Plastics piping systems for water supply, and for drainage and sewerage under pressure — Polyethylene (PE) — Part 3: Fittings*

EN 12201-4, *Plastics piping systems for water supply — Polyethylene (PE) — Part 4: Valves*

EN 12201-5, *Plastics piping systems for water supply, and for drainage and sewerage under pressure — Polyethylene (PE) — Part 5: Fitness for purpose of the system*

EN 12294, *Plastics piping systems — Systems for hot and cold water — Test method for leaktightness under vacuum*

EN 12295, *Plastics piping systems — Thermoplastics pipes and associated fittings for hot and cold water — Test method for resistance of joints to pressure cycling*

EN 13463-1:2001, *Non-electrical equipment for potentially explosive atmospheres — Part 1: Basic method and requirements*

EN 600243-2, *Electrical strength of insulating materials — Test methods — Part 2: Additional requirements for tests using direct voltage*

EN ISO 1167-1, *Thermoplastics pipes, fittings and assemblies for the conveyance of fluids — Determination of the resistance to internal pressure — Part 1: General method (ISO 1167-1:2006)*

EN ISO 1167-2, *Thermoplastics pipes, fittings and assemblies for the conveyance of fluids — Determination of the resistance to internal pressure — Part 2: Preparation of pipe test pieces (ISO 1167-2:2006)*

prEN ISO 1167-3, *Thermoplastics pipes, fittings and assemblies for the conveyance of fluids — Determination of the resistance to internal pressure — Part 3: Preparation of components (ISO/DIS 1167-3:2005)*

prEN ISO 1167-4, *Thermoplastics pipes, fittings and assemblies for the conveyance of fluids — Determination of the resistance to internal pressure — Part 4: Preparation of assemblies (ISO/DIS 1167-4:2006)*

EN ISO 4892-2, *Plastics — Methods of exposure to laboratory light sources — Part 2: Xenon-arc sources (ISO 4892-2:1994)*

EN ISO 11306, *Corrosion of metals and alloys — Guidelines for exposing and evaluating metals and alloys in surface sea water (ISO 11306:1998)*

EN ISO 16871, *Plastics piping and ducting systems — Plastics pipes and fittings — Method for exposure to direct (natural) weathering (ISO 16871:2003)*

CLC/TR 50404/Corrigendum, *Electrostatics — Code of practice for the avoidance of hazards due to static electricity*

ISO 8510-1, *Adhesives — Peel test for a flexible-bonded-to-rigid test specimen assembly — Part 1: 90 degree peel*

ISO 8510-2, *Adhesives — Peel test for a flexible-bonded-to-rigid test specimen assembly — Part 2: 180 degree peel*

ISO 11339, *Adhesives — T-peel test for flexible-to-flexible bonded assemblies*

ISO 11922-1, *Thermoplastics pipes for the conveyance of fluids — Dimensions and tolerances — Part 1: Metric series*

3 Terms and definitions

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

3.1
pipework system
pipes and connectors used to convey or retain liquid fuels and their vapours

3.2
connector
coupler, elbow, reducer, tee or cap, or flange or other component supplied to connect one pipe to another or pipework to equipment

3.3
flexible pipe
pipe that can be bent by hand to any radius above a set minimum without any change in performance

3.4
primary delivery pipework
pipework designed to convey liquid fuels by positive pressure or vacuum suction

3.5
fill pipework
pipework designed to convey liquid fuels from a delivery tanker to an underground storage tank by gravity discharge

3.6
multilayer pipe
pipe where more than one identified layer is present

3.7
vent pipework
pipework designed to convey vapour from a storage tank to the atmosphere

3.8
vapour recovery pipework
pipework designed to convey vapour (or condensate) to or from a storage tank

3.9
liquid fuel
commercially available petrol and diesel fuel comprising biofuels and biofuels blends

3.10
full secondary containment
system in which the outer secondary is separated continuously from the primary by an interstitial space consisting of an annulus between the primary and the secondary pipes and fittings over the whole length of the system, designed so as to prevent leakage of fuel from the primary system entering the environment

3.11
partial secondary containment
system in which the outer secondary is not separated fully from the primary by an interstitial space having a 360° annulus, designed so as to prevent leakage of fuel from the primary system entering the environment

3.12
design pressure (P_d)
maximum effective pressure of the fluid in the piping system, expressed in bar, which is allowed in continuous use

4 Classes and dimensions

4.1 Classes of pipework

Pipes for underground fuel distribution shall conform to one of the following two classes:

Class 1 — Double wall pipework capable of containing and facilitating the detection of leakage from a primary delivery pipe.

Class 2 — Single wall pipework.

The primary pipe of Class 1, and pipes of Class 2, shall conform to one of Types A or B. The secondary pipe of Class 1 shall conform to one of Types C1 or C2.

Type A. Plastic systems.

Pipes shall be principally made of thermoplastic polymers, with some metal or fibre reinforcement optional.

Type B. Flexible metal systems.

Pipes shall comprise a fluid tight primary pipe made of a metal.

Type C. Secondary containment.

Type S. Secondary Containment system with continuous 360° separation between the Primary Containment and Secondary Containment.

Type I: Integral Primary/Secondary system without continuous 360° separation between the Primary Containment and Secondary Containment.

Type C1: A pipe system designed to contain any leakage from the primary pipe. The system is at atmospheric pressure.

Type C2: A pipe system designed to contain any leakage from the primary pipe. The system is designed to conform to the performance criteria of Class I leak detection systems in accordance with EN 13160-1, EN 13160-2 and EN 13160-7.

4.2 Connectors

All pipework shall include connectors to provide leak-tight attachment to other systems, terminations, branches and changes of direction.

4.3 Dimensional tolerances

The external diameter and wall thickness shall be stated by the manufacturer. For plastic pipework the tolerance on the external diameter shall be in accordance with ISO 11922-1, Grade B, and the tolerance on the out-of-roundness shall be in accordance with ISO 11922-1, Grade N.

5 Physical properties

5.1 Pressure

5.1.1 General

Operating and test pressures shall be in accordance with Table 1 according to the application.

All pressures in Table 1 are gauge pressures.

Table 1 — Operating and test pressures for pipework

Application	Operating pressure bar	Test vacuum bar	Lower test pressure bar	Higher test pressure bar
Primary delivery pipework: positive pressure	+3,5	—	+5,0 ± 0,1	+30,0 ± 1,0
Primary delivery pipework: vacuum suction including siphons	-0,6	-0,9 ± 0,05	+5,0 ± 0,1	
Vents and vapour recovery pipework	1,0	-0,9 ± 0,05	+5,0 ± 0,1	
Fill pipework	1,0	—	+5,0 ± 0,1	
Secondary Containment Type C1	+0,5	—	+1,0 ± 0,02	+5,0 ± 0,1

Secondary Containment Type C2	-0,5 to +4,5	-0,6 ± 0,05	+5,0 ± 0,1	+10 ± 0,2

5.1.2 Hydrostatic pressure

This requirement applies to all pipes and connectors.

When tested in accordance with 7.2.1.1, all pipes and connectors, sampled in accordance with 7.1.2 and connected together as one or more assemblies, shall:

— withstand the lower test pressure in Table 1 for no less than 5 min with no signs of leakage.

When tested in accordance with 7.2.1.2, all pipes and connectors, sampled in accordance with 7.1.2 and connected together as one or more assemblies, shall:

— withstand the lower test pressure in Table 1 for no less than 5 min with no signs of leakage;

— withstand the higher test pressure in Table 1 for no less than 1 min with no signs of leakage.

5.1.3 Vacuum

This requirement applies to all pipes and connectors intended for vacuum suction, including siphons, vent and vapour recovery and Secondary Containment, Type C2.

When tested in accordance with 7.2.2, all pipes and connectors, sampled in accordance with 7.1.2, shall:

— withstand the vacuum specified in Table 1 for no less than 30 min. The loss of vacuum shall not exceed 0,05 bar and there shall be no signs of collapse.

5.1.4 Cyclic pressure

This requirement applies to pipes and connectors for all applications except Secondary Containment.

When tested in accordance with 7.2.3, a sample of pipes and connectors selected in accordance with 7.1.1 and 7.1.2 shall withstand the test conditions without leakage.

5.2 Estimated working life

Design plans shall be available for all pipework which demonstrate that the pipework is designed to have an estimated working life of at least 30 years.

NOTE The pressure design of polymeric pipes where only one layer contributes to the pressure rating of the pipe will be designed through a regression curve generated in accordance with EN ISO 9080. In the case of a polymeric multilayer pipe construction, where more than one layers contribute to the pressure rating of the pipe, the stress base design can be measured (procedure II) or calculated (procedure I) as defined in ISO 17456.

When tested in accordance with EN ISO 1167 parts 1 to 4, pipes, fittings and assemblies shall not leak under the following test conditions:

a) a 1 h hydrostatic pressure test, at (20 ± 2) °C, at 1,5 times the design pressure P_d, or at 9 bar for primary pipe and 3 bar for Secondary Containment Type C2 piping , whichever is the greater.

b) a 1 000 h hydrostatic pressure test, at (80 ± 2) °C, at 0,8 times the design pressure P_d, or at 5 bar for primary piping and 2,6 bar for Secondary Containment Type C2 piping, whichever is the greater.

5.3 Temperature

There shall be two temperature classes:

Class T1: Underground pipework shall be fully operational between –40 °C and +50 °C.

Class T2: Underground pipework shall be fully operational between –20 °C and +50 °C, but suitable for transport and storage at –40 °C and +50 °C.

Pipework that passes the tests in 7.2.1.1, 7.2.5.3, 7.2.6 and 7.2.7.3 at the appropriate temperature shall be deemed to conform this requirement.

5.4 Mechanical tests

5.4.1 Crush test

This requirement applies to all pipes and connectors.

When tested in accordance with 7.2.4, a sample of pipes and connectors selected in accordance with 7.1.1 and 7.1.2 shall:

— recover to not less than 90 % of their original diameter within 5 min of the load being removed;

— show no visible sign of leakage or cracking;

— when tested in accordance with 7.1.3 show no signs of leakage and, where vacuum testing is specified, show no signs of collapse.

5.4.2 Bend radius test

This requirement applies to all pipes and straight connectors.

When tested in accordance with 7.2.5, a sample of pipes and straight connectors selected in accordance with 7.1.1 and 7.1.2 shall:

— show no visible sign of leakage or cracking;

— when tested in accordance with 7.1.3 show no signs of leakage and, where vacuum testing is specified, show no signs of collapse.

The sample of pipes chosen in accordance with 7.1.1 shall include that pipe diameter for which the bending strain is greatest. The bending strain is equal to $d/2R$, where d is the outer diameter of the pipe and R the bending radius specified by the manufacturer.

5.4.3 Impact test

This requirement applies to all pipes and connectors.

When tested in accordance with 7.2.6, a sample of pipes and connectors selected in accordance with 7.1.1 and 7.1.2 shall:

— show no visible sign of leakage or cracking; in Type B pipes there shall be no through-thickness damage to any protective coating;

— when tested in accordance with 7.1.3 show no signs of leakage and, where vacuum testing is specified, show no signs of collapse.