BRITISH STANDARD

BS EN
13101:2002

Steps for underground man entry chambers — Requirements, marking, testing and evaluation of conformity

The European Standard EN 13101:2002 has the status of a British Standard

ICS 97.145

BSI
British Standards

National foreword

This British Standard is the official English language version of EN 13101:2002.

EN 13101 is a candidate "harmonized" European Standard and fully takes into account the requirements of the European Commission mandate M118 "Waste water engineering products", given under the EU Construction Products Directive (89/106/EEC), and intended to lead to CE marking. The date of applicability of EN 13101 as a harmonized European Standard, i.e. the date after which this standard may be used for CE marking purposes, is subject to an announcement in the *Official Journal of the European Communities*.

The Commission in consultation with Member States have agreed a transition period for the co-existence of harmonized European Standards and their corresponding national standard(s). It is intended that this period will comprise a period, usually nine months, after the date of availability of the European Standard, during which any required changes to national regulations are to be made, followed by a further period, usually of 12 months, for the implementation of CE marking. At the end of this co-existence period, the national standard(s) will be withdrawn.

EN 13101 is the subject of transitional arrangements agreed under the Commission mandate. In the UK, the corresponding national standards are:

— BS 1247-1:1990, *Specification for galvanized ferrous or stainless steel manhole steps*.

— BS 1247-2:1990, *Specification for plastics encapsulated manhole steps*.

— BS 1247-3:1991, *Specification for aluminium manhole steps*.

and based on this transition period of twenty-one months, BS 1247-1:1990, BS 1247-2:1990 and BS 1247-3:1991 would be withdrawn in June 2004.

NOTE This date is approximate. Users of this standard should contact BSI Customer Services for confirmation of withdrawal.

The UK participation in its preparation was entrusted to Technical Committee B/505, Wastewater engineering, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

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

This British Standard, having been prepared under the direction of the Building and Civil Engineering Sector Policy and Strategy Committee, was published under the authority of the Standards Policy and Strategy Committee on 14 November 2000

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Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the BSI Catalogue under the section entitled "International Standards Correspondence Index", or by using the "Search" facility of the *BSI Electronic Catalogue* or of British Standards Online.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, page i, a blank page, the EN title page, pages 2 to 35 and a back cover.

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 13101

October 2002

ICS 97.145

English version

Steps for underground man entry chambers - Requirements, marking, testing and evaluation of conformity

Echelons de trou d'homme - Prescriptions, marquage, essai, et évaluation de la conformité

Steigeisen für Steigeisengänge in Schächten - Anforderungen, Kennzeichnung, Prüfung und Beurteilung der Konformität

This European Standard was approved by CEN on 1 August 2002.

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. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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

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Foreword

This document (EN 13101:2002) has been prepared by Technical Committee CEN /TC 165, "Waste water engineering" the secretariat of which is held by DIN.

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 April 2003, and conflicting national standards shall be withdrawn at the latest by July 2004.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

In this European Standard the Annexes A to F and H are normative and the Annexes G and I are informative.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This standard specifies general requirements and testing methods for steps manufactured from cast iron, steel or aluminium, for use in manholes and other underground man entry chambers as a means of access.

This standard specifies performance criteria for mechanical stability and resistance providing protection against falling. Corresponding test methods and evaluation of conformity are included.

The steps specified in this European Standard are suitable for use in sewage, surface water and, subject to the requirements of national regulations, potable water environments.

Where steps are to be used in particular corrosive environments, e.g. industrial effluents, additional protection may be required.

This standard does not apply for steps moulded in prefabricated manholes of the same material.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 197-1, *Cement - Part 1: Composition, specifications and conformity criteria for common cements.*

EN 573-3:1994, *Aluminium and aluminium alloys - Chemical composition and form of wrought products - Part 3: Chemical composition.*

EN 1561, *Founding – Grey cast irons.*

EN 1562, *Founding - Malleable cast irons.*

EN 1563, *Founding - Spheroidal graphite cast irons.*

EN 2101, *Aerospace series; Chromic acid anodizing of aluminium and wrought aluminium alloys.*

EN 2284, *Aerospace series; Sulphuric acid anodizing of aluminium and wrought aluminium alloys.*

EN 10025, *Hot rolled products of non-alloy structural steels; - Technical delivery condition.*

ENV 10080:1995, *Steel for the reinforcement of concrete weldable ribbed reinforcing steel B 500 - Technical delivery conditions for bars, coils and welded fabric.*

EN 10088-1, *Stainless steels - Part 1: List of stainless steels.*

EN 10088-3, *Stainless steels - Part 3: Technical delivery conditions for semi-finished products, bars, rods, wire, sections and bright products of corrosion resisting steels for general and construction purposes .*

EN ISO 1461, *Hot dip galvanized coatings on fabricated iron and steel articles – Specifications. (ISO 1461:1999)*

ISO 1183, *Plastics; Methods for determining the density and relative density of non-cellular plastics*

ISO 3599, *Vernier callipers reading to 0,1 and 0,05 mm).*

ISO 3893:1977, *Concrete; Classification by compressive strength*.

3 Terms and definitions

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

3.1
step
component which is capable of being fixed into or attached to the wall of an underground man entry chamber or manhole to facilitate safe entry and exit

3.2
single step
step which is designed to support one foot or hand, and is intended to be installed in a staggered configuration with other such steps

3.3
double step
step which is designed to support two feet or two hands next to each other, and is intended to be installed in a single vertical alignment with other such steps

3.4
replaceable step
step designed to allow removal and replacement

3.5
tread
top surface of a step to accommodate a foot or hand

3.6
plastic encapsulation
polymeric material providing protection of a metal core

3.7
stand-off-distance
horizontal distance from the vertical face of the manhole or other chamber to the front of the step after fixing (see Figure 1)

3.8
upstand
raised part of a step designed to stop the foot slipping laterally off the edge of the step

4 Requirements

4.1 General

Steps shall conform to the requirements of this clause. Where a fixing system is supplied as part of the step, the system shall conform to the requirements of this standard.

Steps shall be installed in accordance with the manufacturer's instructions. For the installation of the steps, national regulations shall be observed.

4.2 Materials

4.2.1 Metals

Steps shall be manufactured from the following metals:

a) Aluminum alloys according to designation 6 060 or 6 106 of EN 573-3:1994.

b) cast Iron:

— malleable cast iron conforming to EN 1562;

— spheroidal graphite (ductile) cast iron conforming to EN 1563;

— flake graphite (grey) cast iron conforming to EN 1561.

c) Steel:

— steel conforming to EN 10025 or ENV 10080:1995;

— austenitic stainless steel conforming to EN 10088-1 or EN 10088-3, minimum grade X6CrNiTi18-10.

NOTE Grade X6CrNiMoTi17-12-2 or better should be used for particularly corrosive environments. Advice should be sought from the step manufacturer.

4.2.2 Plastics encapsulation

The material for encapsulating steps in plastics shall be polyethylene of minimum density 0,935 g/cm^3 (as tested in accordance with ISO 1183) or equivalent qualities of polypropylene copolymer.

NOTE If encapsulated steps are to be installed or stored where they will be subjected to prolonged exposure to direct sunlight, they should be protected from the degradation effects of ultraviolet light. This can be achieved by the use of suitable pigments and/or stabilizers. Advice should be sought from the step manufacturer.

4.3 Design requirements

4.3.1 Types

Steps shall be one of the following types:

— Type A : Circular tread without patterned surface, without upstand;

— Type B: Circular tread without patterned surface, with upstand;

— Type C: Any shape tread with patterned surface, without upstand;

— Type D: Any shape tread with patterned surface, with upstand.

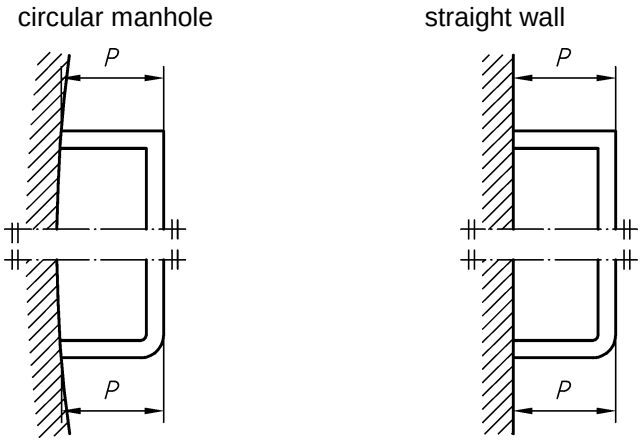
It is permissible for steps to incorporate a facility for attaching handrails or safety devices.

NOTE The purpose of the patterned surface is to provide some additional resistance to the foot slipping on the tread. Any design of the patterned surface, e.g. ribbing or chequering is at the step manufacturer's discretion.

4.3.2 Dimensions

4.3.2.1 General

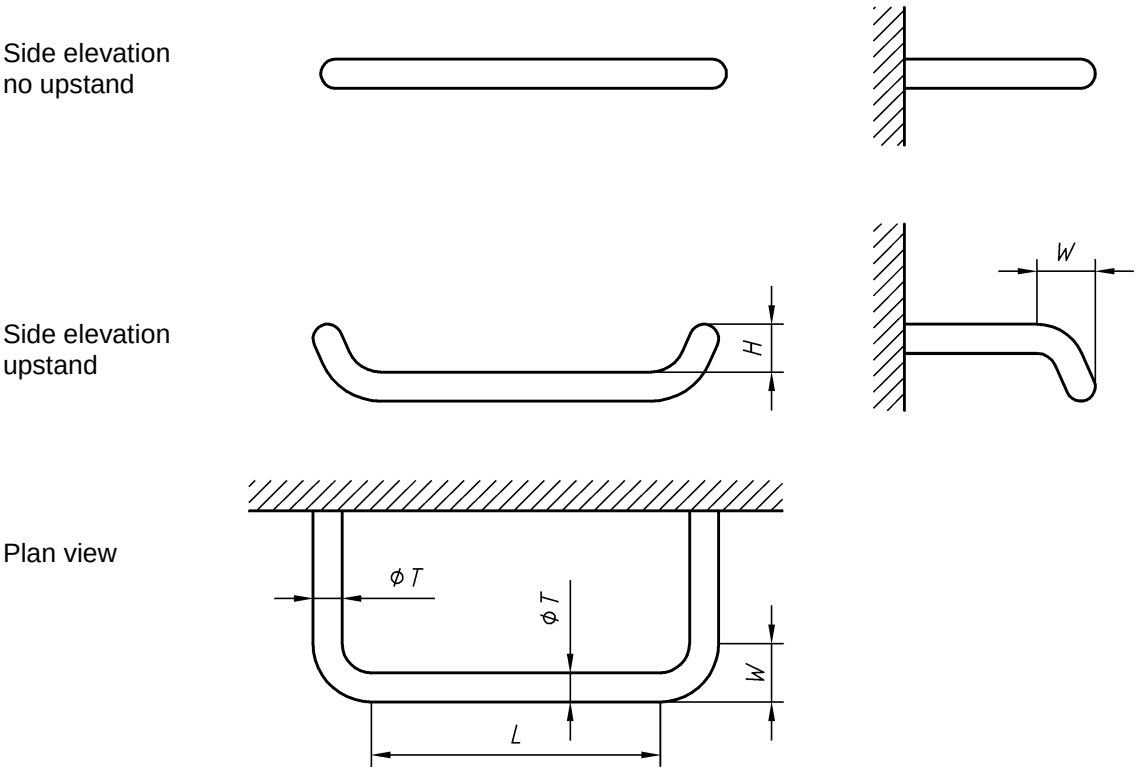
Steps shall conform to the relevant dimensions given in 4.3.2 (see Figure 1, Figure 2 and Figure 3) and to dimensions and tolerances declared by the producer and shall be measured to the nearest 0,1mm.



Key

P Stand-off-distance (see 4.2.2.2 e)

Figure 1 — Stand-off-distance



Key

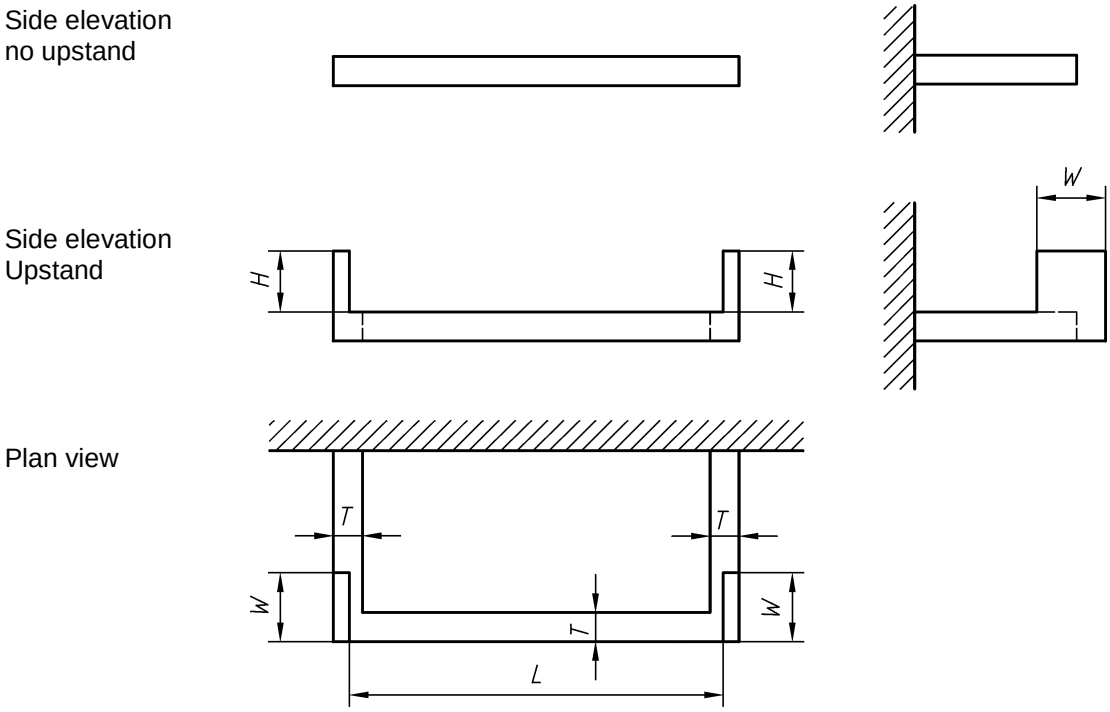
T Width of tread

H Height of upstand

W Length of upstand

L Length of tread

Figure 2 — Dimensions for double and single steps; Example for Circular tread



Key

T Width of tread

H Height of upstand

W Length of upstand

L Length of tread

Figure 3 — Dimensions for double and single steps; Example for Flat tread

4.3.2.2 Requirements

a) Cast iron steps shall have a minimum cross-sectional thickness of 5 mm, at any point;

b) Plastics encapsulation shall have a minimum thickness of plastics of 2,5 mm at any point;

c) The minimum width of tread (dimension T on Figure 2 and Figure 3) shall be 20 mm;

d) The minimum length of tread (dimension L on Figure 2 and Figure 3) shall be 145 mm for single steps and 250 mm for double steps;

e) The minimum stand-off-distance (dimension P on Figure 1) shall be 120 mm;

f) For single and double steps of type B and type D, the following shall apply:

— Single steps shall have an upstand of between 5 mm to 20 mm high (dimension H on Figure 2 and Figure 3) and at least 25 mm long (dimension W on Figure 2 and Figure 3) on each end of the tread to act as a boot stop;

— Double steps shall have an upstand of at least 20 mm high (dimension H on Figure 2 and Figure 3) when measured within 70 mm from the front of the step and between 25 mm to 100 mm long (dimension W on Figure 2 and Figure 3) on each end of the tread to act as a boot stop.

4.3.3 Limit of insertion of step

The limit to which the step should be inserted into the wall of a chamber shall be clearly indicated by a single change of section or additional information on the step, except when it is to be factory fixed into a precast concrete unit. When the limit of insertion is not indicated on the step, its manufacturer shall state in his technical literature the insertion length used in test method D.2.1 of this European Standard.

4.3.4 Surface condition

Steps shall be free from visible defects, protrusions or sharp edges.

4.3.5 Corrosion resistance

Steps shall be resistant to corrosion, which shall be achieved by the properties of the metal used in manufacture or by a surface treatment or by plastics encapsulation.

a) Steel steps;

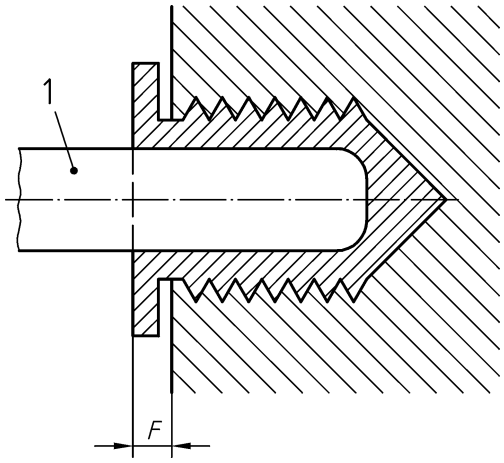
- Mild steel and non-austenitic stainless steel steps shall be protected from corrosion by hot dip galvanizing conforming to EN ISO 1461, or by plastics encapsulation;
- No surface protection is necessary for austenitic stainless steels;

b) Aluminium steps;

- Aluminium steps shall be supplied either with no additional protection (i.e. bare metal), or plastics encapsulated or anodised in accordance with EN 2101(chromic acid anodizing) or EN 2284 (sulphuric acid anodizing);
- Aluminium steps shall be provided with plastics fixing tails which totally encapsulate each end of the step and which protrude into the chamber a minimum of 20 mm (dimension F on Figure 4) from the vertical installation face;

c) Cast iron steps;

- Malleable cast iron and ductile (spheroidal graphite) cast iron steps shall be protected from corrosion by hot dip galvanizing conforming to EN ISO 1461, or by plastics encapsulation;
- No surface protection is required for grey cast (flake graphite) iron steps.



Key

1 Aluminium core

F Protrusion

Figure 4 — Plastics fixing tails

4.3.6 Twist

When tested in accordance with Annex A, the height of the front edge of the tread from the level surface shall not vary along its length by more than 3,0 mm for a single step or more than 5,0 mm for a double step.

4.3.7 Vertical loading

When tested in accordance with Annex B, the step (in all materials other tan grey cast iron (see 4.3.8)) shall support the initial load in accordance with Table 1, without visible cracking and the deflection under load shall not exceed that specified in Table 1. After removal of the load, the permanent deflection shall not exceed that specified in Table 1. The procedure shall be repeated using the ultimate load according to Table 1. Steps shall conform with the requirements of both initial and ultimate tests.

Class I and class II, shown in columns 5 and 6 of Table 1, for permanent deflection relate to steps of different designs and materials. Class II steps shall be capable of being replaced in accordance with manufacturer's instructions during maintenance. For the use of class I steps and class II steps, provisions in the country of use may be taken into account.

Table 1 —Requirements for vertical loading test

Characteristic	Test under initial load		Test under ultimate load		
	Single step	Double step	Single step	Double step	
				Class I	Class II
Load (in kN)	2,0	2,0	4,0	4,0	4,0
Deflection under load (in mm)	5,0	10,0	—	—	—
Permanent deflection (in mm)	1,0	2,0	5,0	10,0	50,0

4.3.8 Proof load — Non-ductile materials (Grey cast iron)

Grey cast iron steps shall withstand a load of 12 kN when tested in accordance with Annex C without visible cracking.

4.3.9 Resistance to pull-out

When tested in accordance with Annex D, steps shall resist a minimum force (F_2) of 5 kN.

All steps designed to be replaceable shall be additionally tested under method of preparation D.2.4 and shall be resistant to a minimum force (F_2) of 5 kN.

NOTE The requirements and test methods (in Annex D) relate to the step whilst within the factory and assessed for compliance under controlled conditions designed to reflect methods of installation in pre-cast units or on-site, but do not necessarily replicate them.

4.3.10 Resistance to impact

When tested in accordance with Annex E, steps shall absorb an impact from a striker of mass M of 20 kg dropped from a height of 1 m without fracture and shall conform to the requirements of 4.3.11 after impact, if relevant.

4.3.11 Integrity of plastics encapsulation

To demonstrate that the core material is protected from corrosion, plastics encapsulated steps shall show an electrical resistance of at least 1 MΩ when tested in accordance with Annex F.

NOTE The above test is carried out in an aqueous solution and gives a pass/fail for the product. A dry test is also given in Annex G which identifies the point of failure on the step. This test can be used by manufacturers in the quality control of steps.

4.3.12 Thickness of plastics encapsulation

The thickness of plastics shall be determined in accordance with Annex H and shall conform to the requirements in 4.3.2.2 b).

4.3.13 Integrity of galvanizing

When tested in accordance with EN ISO 1461, galvanized steps shall have a thickness of galvanizing in accordance with EN ISO 1461.

5 Testing

Steps according to this standard shall be tested in accordance with the testing schedule given in Table 2.

Table 2 — Testing schedule

Material	Characteristic							
	Twist	Vertical loading	Proof Load grey cast iron	Pull Out	Impact	Plastics Integrity	Thickness of plastics	Galvanising Integrity
	Test method according to Annex or other Standards							
	A	B	C	D	E	F or G	H	EN ISO 1461
	Requirements according to clause							
	4.3.6	4.3.7	4.3.8	4.3.9	4.3.10	4.3.11	4.3.12	4.3.13
Steel: Mild and Non- austenitic	a	a	—	a	—	—	—	a
Steel: Stainless	a	a	—	a	—	—	—	—
Aluminium	a	a	—	a	—	—	—	—
Ductile cast iron	a	a	—	a	—	—	—	a
Malleable cast iron	a	a	—	a	—	—	—	a
Grey cast iron	a	—	a	a	—	—	—	—
Plastics encapsulated	a	a	—	a	a	a	a	—

[a] Test required

6 Marking and designation

6.1 Marking

When the steps meet all requirements of this standard, they shall be legibly and durably marked, as delivered, with the following identification in a manner which is visible after installation:

a) Number of this European Standard (EN 13101),

b) Manufacturer’s identification;

c) Material code as given in Table 3. In case of plastics encapsulated steps the material code as given in Table 3 shall be indicated for the core material;

d) Type (see 4.3.1) and class I or class II (see 4.3.7).

Marking is permitted on the fixing tail, provided that it is visible after installation.

Table 3 — Material code

Material	Solid	Tubular
Mild steel	MSS	MST
Stainless steel	SSS	SST
Aluminium	ALS	ALT
Ductile cast iron	DIS	
Grey cast iron	GIS	
Malleable cast iron	MIS	

When steps are installed by the manhole producer before delivery and the manhole producer ensures information equivalent to a) to d), the marking may be placed on the packaging only.

6.2 Designation

Steps shall be designated by quoting:

a) the number and date of this European Standard;

b) type and class of step;

c) length and type of tail where applicable;

d) materials.

7 Evaluation of conformity

7.1 General

The compliance of steps for underground man entry chambers with the requirements of this standard and with the stated values (including classes) shall be demonstrated by:

— initial type testing;

— factory production control by the manufacturer, including product assessment.

The control by a third party is recommended. If third party control is carried out this should be done in accordance with Annex I.

NOTE The actual practice of third party control in the different countries may be maintained as long as the third party control in this standard retains its recommendatory character.

7.2 Type testing (initial testing of the product)

Initial type testing shall be performed to demonstrate conformity to this standard. Tests previously performed in accordance with the provisions of this standard (same product, same characteristic(s), same (or more demanding) test method, same sampling procedure, etc.) may be taken into account. In addition, initial type testing shall be

performed at the beginning of the production of a new type of manhole steps or at the beginning of a new method of production (where this may affect the stated properties).

Three complete specimens of steps for underground man entry chambers shall be tested in accordance with clause 5, and each shall comply with all the requirements of the clauses 4 before production commences.

Full reports of these tests shall be retained by the manufacturer and shall be available to a third party (if applicable) for examination.

7.3 Factory production control (FPC)

7.3.1 General

The manufacturer shall establish, document and maintain an FPC system to ensure that the products placed on the market conform with the stated performance characteristics. The FPC system shall consist of procedures, regular inspections and tests and/or assessments and the use of the results to control raw and other incoming materials or components, equipment, the production process and the product.

An FPC system conforming with the requirements of the relevant Part(s) or EN ISO 9001, and made specific to the requirements of this standard, is considered to satisfy the above requirements.

The results of inspections, tests or assessments requiring action shall be recorded, as shall any action taken.

7.3.2 Equipment

All weighing, measuring and testing equipment shall be calibrated and regularly inspected according to documented procedures, frequencies and criteria.

7.3.3 Raw materials and components

The specifications of all incoming raw materials and components shall be documented, and shall conform to the inspection scheme for ensuring their conformity.

7.3.4 Product testing and evaluation

The manufacturer shall establish procedures to ensure that the stated values of all of the characteristics are maintained. The characteristics, and the means of control, shall conform to Table 4.

Table 4 — Factory production control for manhole steps

Items to be inspected	Requirements	Test method	Frequency of inspection
Appearance	4.3.4	Visual inspection	Each piece
Dimensions	4.3.	Measurement	At start of manufacture, and each5 pieces per production lot [a]
Materials	4.1	Manufacturer's certification of compliance	Each consignment
Composition of cast iron	Manufacturer's instructions	Analysis	Each treatment or each furnace or each ladle
Twist	4.3.	Annex A	At start of production and each 5 pieces per production lot [a]
Vertical loading and classification	4.3.	Annex B	At start of production and each 5 pieces per 3 production lots [a]
Proof load	4.3.8	Annex C	At start of production and each 3 pieces per production lot [a]
Resistance to pull-out	4.3.9	Annex D or relevant dimensions validated by the type test shall be checked	At start of production and each 3 pieces per production lot [a]
Impact	4.3.10	Annex E	At start of production and each 5 pieces per production lot [a]
Plastics integrity	4.3.11	Annex F or G	At start of production and each 5 pieces per production lot [a]
Thickness of plastics	4.3.12	Annex H	At start of production and each 5 pieces per production lot [a]
Galvanising integrity	4.3.13	ISO 1461EN ISO 1461	At start of production and each 5 pieces per production lot [a]
Marking	6.1	visual	Random sampling in series production

[a] The size of a production lot consists of ≤ 1000 specimens with a maximum of two production days

NOTE When the production of a design of steps is interrupted during more than three month, the tests have to be performed at restart of production.

7.3.5 Non conforming products

If during the factory production control non-conforming products are detected, the manufacturer's quality control shall stop the production related to the failure(s).

All non-conforming products shall be segregated and excluded from delivery, and instructions given for further handling, storage and marking.

Only after thorough investigation, due correction of the failure(s) and final control shall the person, responsible for quality agree to the recommencement of production.

Annex A
(normative)

Twist test

A.1 Apparatus

The apparatus shall consist of:

— a flat and level surface;

— a device suitable for measuring the gap, with an accuracy of ± 0,1mm, between the front edge of the supported step and the level surface;

— three props of equal height.

A.2 Procedure

Support the step in three places, as shown in Figure A.1. Measure the gap between the front edge of the tread and the level surface in a minimum of 3 places along the length of its tread.

A.3 Test report

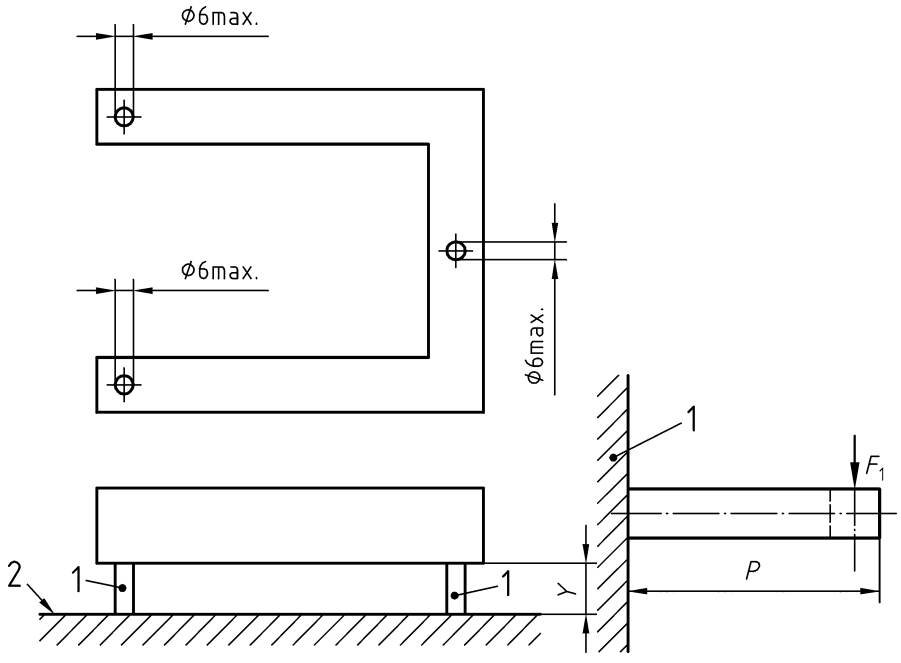
The report shall include the following information:

— identification of test sample (manufacturer, batch, materials and size);

— measurements of gap;

— the date of the test.

Dimensions in millimetres



Key

1 Props
2 Level surface
Y Gap

Figure A.1 — Test for twist

Annex B
(normative)

Vertical loading test

B.1 Apparatus

The apparatus shall consist of:

— a test block faced with hard rubber or other resilient material which will evenly distribute the load over a length of 90 mm ± 2 mm;

— a device capable of applying a load of at least 25 % greater than the maximum load specified in Table 1. Testing devices shall have an error limit of ± 3 % of the load applied,

— a clamping device for holding the tails of the step,

— a device suitable for measuring deflection, with an error limit of ± 0,05 mm.

Clamping blocks shall be shaped to the profile of the tail of the step. Alternatively, the step may be fitted in accordance with the manufacturer's instructions in a suitably restrained concrete block, brick section or steel section.

B.2 Procedure

Clamp the test sample firmly so as to leave the design projection acting as a cantilever. Establish a datum at the centre of the tread from which to measure deflection. Apply the load centrally and normally to the tread as shown in Figure B.1 at a rate of 1 kN/min to 3 kN/min. Note the deflection at each 0,5 kN increment up to the test load. Hold at the test load for one minute. Remove the load and note the residual deflection.

B.3 Test report

The report shall include the following information:

— identification of the test sample (manufacturer, batch, materials and size);

— method of fixing (clamped or fitted in accordance with manufacturer's instructions);

— initial deflection and subsequent deflection at each 0,5 kN increment of load;

— the residual deflection;

— the date of the test.

Key

1 Chamber wall

F_1 Vertical load

P Stand-off-distance

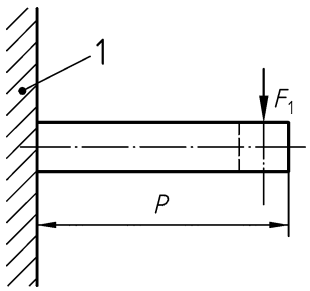


Figure B.1 — Test for vertical loading

Annex C
(normative)

Proof load test for grey cast iron steps

C.1 Apparatus

The apparatus shall consist of:

— a test block faced with hard rubber or other resilient material which will evenly distribute the load over a length of 90 mm ± 2 mm;

— a device capable of applying a load of at least 25 % greater than the maximum load specified in 4.3.8. Testing devices shall have an error limit of ± 3 % of the load applied;

— a clamping device for holding the tails of the step.

Clamping blocks shall be shaped to the profile of the tail of the step. Alternatively, the step may be fitted in accordance with the manufacturer's instructions in a suitably restrained concrete block, brick section or steel section.

C.2 Procedure

Place the test sample in the test machine with the step iron positioned as in use (i.e. horizontally). Apply the load vertically at the centre of the step tread. The force shall be steadily increased at a rate of 1 kN/s to 3 kN/s until the proof load is attained.

C.3 Test report

The report shall include the following information:

— identification of the test sample (manufacturer, batch, materials and size);

— method of fixing;

— whether the step fractured;

— the date of the test.

Annex D
(normative)

Pull out/anchorage test

D.1 Apparatus

The apparatus shall consist of:

— a test block faced with hard rubber or other resilient material which will evenly distribute the load over a length of 90 mm ± 2 mm,

— a hydraulic or mechanical equipment capable of exerting a force in excess of 20 kN and with a means of measuring the load. Testing devices shall have an error limit of ± 3 % of the load applied.

— a concrete mould capable of producing concrete blocks either 100 mm (width) x 200 mm (length) x 250 mm (height) or 100 mm (width) x 400 mm (length) x 500 mm (height).

D.2 Preparation

D.2.1 Method 1 - For steps designed to be factory fixed into pre-cast concrete

The step shall be casted into a concrete block and allow to cure for at least 10 days before testing. The block for a single step shall be a minimum of 100 mm (width) x 200 mm (length) x 250 mm (height). The block for a double step shall be a minimum of 100 mm (width) x 400 mm (length) x 500 mm (height). The concrete block shall be made to class C 35/40 of ISO 3893 using cement EN 197-1 – CEM I 32,5 N.

D.2.2 Method 2 - For steps designed to be fixed into masonry or concrete during construction

The step shall be build into a vertical masonry wall with minimum dimensions of 1 m x 1 m x 225 mm.

D.2.3 Method 3 - For steps designed to be fixed after construction

The concrete block shall be casted or the masonry wall constructed with the dimensions in D.2.1 or D.2.2, as appropriate. The step shall be assembled in accordance with the manufacturer's recommendations.

D.2.4 Method 4 - For steps designed to be replaced

The original step (which had been inserted in accordance with method 1, method 2 or method 3) shall be removed and replaced with a step in accordance with manufacturer's instructions.

D.3 Procedure

The force according to 4.3.9 shall be applied at the centre of the front tread of step as shown in Figure D.1. Apply the specified force in a maximum elapsed time of 60 s, without shock, and sustain the load for 1 min.

D.4 Test report

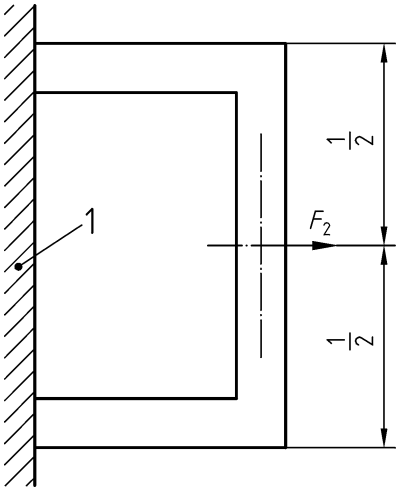
The report shall include the following information:

— identification of the test sample (manufacturer, batch, materials and size);

— the method of fixing and length of insertion;

— the maximum load sustained or the load at failure;

— the date of the test.



Key

1 Test wall

F_2 Pullout force

Figure D.1 — Test for pull-out

Annex E
(normative)

Impact test

E.1 Apparatus

The apparatus shall consist of:

— a vertical tube with a bore of 102 mm to 104 mm, at least 1,2 m long and with a means of indicating a minimum release height of 1m above the step,

— a steel striker 99 mm to 101 mm diameter with a hemispherical nose of 30 mm radius. The length of the striker shall be such as to ensure a mass of 20 kg ± 0,2 kg,

— an impact rig. A typical rig is shown in Figure E.1.

— a clamping device for holding the tails of the step (a typical apparatus is shown in Figure E.1).

E.2 Procedure

The procedure shall be as follows:

— Prior to the test, the step shall be held at 20 °C ± 3 °C for a minimum of 4 h;.

— the test sample shall be clamped firmly;

— the clamp shall be located so that the step faces vertically upwards;

— drop the striker from a height of 1 m onto the centre of the step.

Clamping blocks shall be shaped to the profile of the tail of the step. Alternatively, the step may be fitted in accordance with the manufacturer's instructions in a suitably restrained concrete block, brick section or steel section.

E.3 Test report

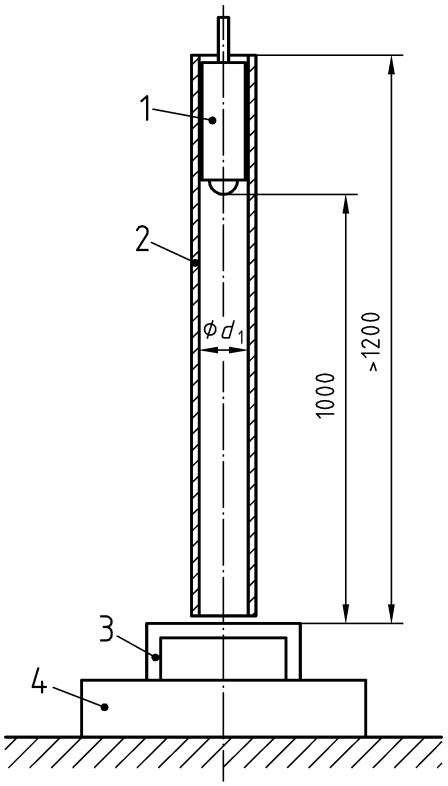
The report shall include the following information:

— identification of the test sample (manufacturer, batch, materials and size);

— the visual assessment of condition of sample after testing;

— the date of the test.

Dimensions in millimetres



Key

1 Striker 20 kg mass

2 Internal bore

3 Step

4 Block

d_1 102 mm ≤ d_1 ≤ 104 mm

d_2 99 mm ≤ d_2 ≤ 101 mm

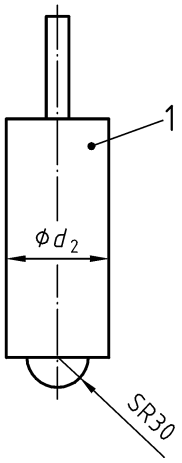


Figure E.1 — Typical impact rig and striker

Annex F
(normative)

Method of test for integrity of plastics encapsulation

F.1 Apparatus

The apparatus shall consist of a insulation resistance meter or equivalent instrument capable of measuring insulation resistance with a range of 0 MΩ to 200 MΩ having a nominal open circuit voltage of 500 V direct current (DC).

F.2 Procedure

The procedure shall be as follows:

— The plastics encapsulation shall be drilled to expose the metal reinforcement on a convenient face at the mid-point of the cross member of the step;

— A water solution shall be prepared containing sodium chloride at a concentration of 3 % (by mass) and a wetting agent (e.g. liquid detergent, as a volume fraction of 0,25 %);

— Half of the step shall be immersed in the test solution to within 10 mm of the exposed metal for a minimum of 30 min. A typical arrangement is shown in Figure F.1;

— One electrode shall be connected from the insulation resistance meter to the exposed metal and immerse the other electrode from the meter in the test solution. Record the reading on the meter;

— The step shall be removed from the solution and wipe off any solution from the surface of the step. The other half of the step shall be immersed to within 10 mm of the exposed metal for a minimum of 30 min and repeat the measurement.

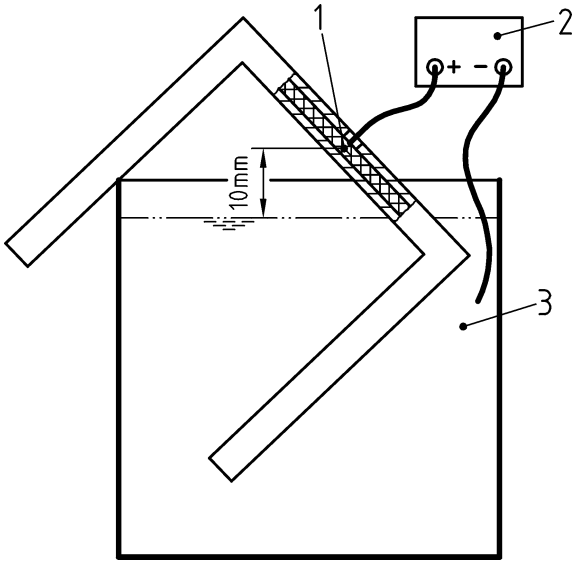
F.3 Test report

The report shall include the following information:

— identification of the test sample (manufacturer, batch, materials and size);

— the two meter readings for each step;

— the date of the test.



Key

1 Metal reinforcement

2 Insulation resistance meter

3 Test solution

NOTE The figure is an example only. The bare metal connection point should be chosen to fully evaluation the encapsulation.

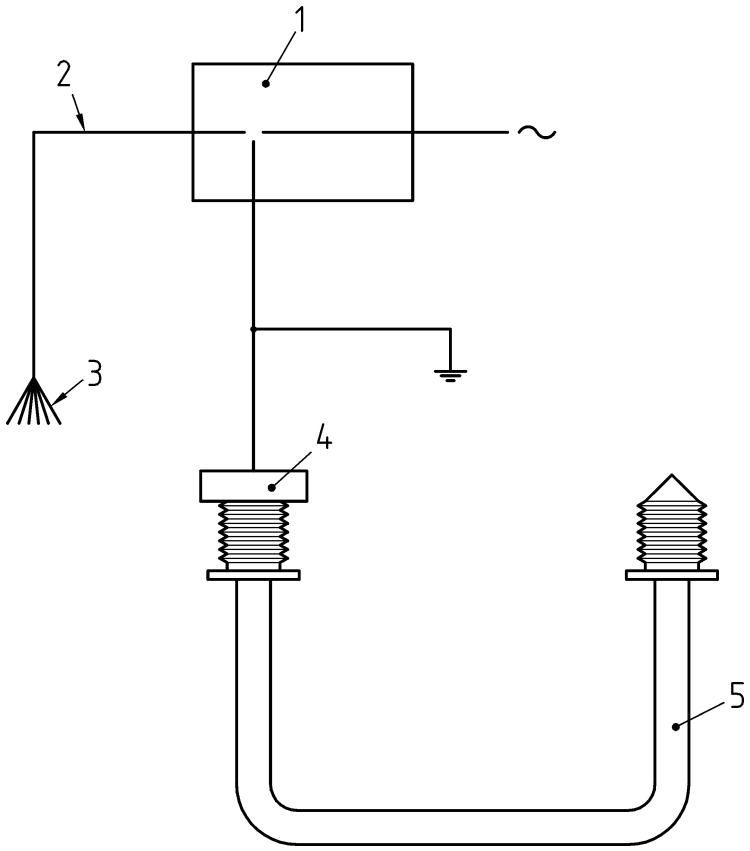
Figure F.1 — Typical arrangement for testing integrity of plastic encapsulation and sleeving

Annex G
(Normative)

Method of test for integrity of plastics encapsulation (dry conditions)

G.1 Apparatus

G.1.1 Pore detector



Key

1	Direct current control box
2	Low voltage control cable
3	Test brush
4	Bare metal connection point
5	Step

Figure G.1 — Schematic diagram of pore detector

NOTE The figure is an example only. The bare metal connection point should be chosen to fully evaluation the encapsulation.

G.2 Procedure

The core metal should be exposed by removing the plastics encapsulation at one end of the step. Connect the apparatus as shown in Figure G.1. Set the testing apparatus to 25 kV testing voltage. Move the testing brush in contact with the encapsulation across the whole surface of the step.

G.3 Test report

The report should include the following information:

a) identification of the test sample (manufacturer, batch, materials and size);

b) the presence of sparks (i.e. pass/ failure of the step);

c) the date of the test.

Annex H
(normative)

Method of test for thickness of plastics encapsulation

H.1 Apparatus

Vernier calliper conforming to ISO 3599.

H.2 Procedure

Cut the step vertically at the five points shown in Figure H.1. Measure the thickness of the plastics using the vernier calliper to an error limit of ± 0,05 mm. Record the minimum thickness at any point to an error limit of ± 0,1 mm.

H.3 Test report

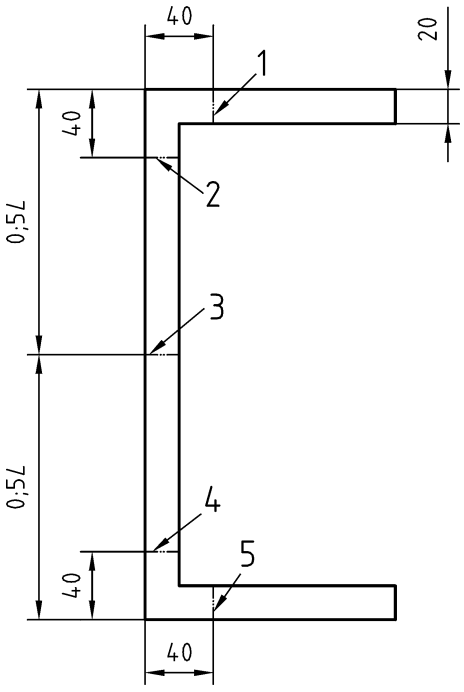
The report shall include the following information:

— identification of the test sample (manufacturer, batch, materials and size);

— the thickness of the plastic at each measuring point;

— the date of the test.

Dimensions in millimetres



Key

1 Cut 1

2 Cut 2

3 Cut 3

4 Cut 4

5 Cut 5

Figure H.1 — Determination of thickness of plastics encapsulation

Annex I
(informative)

Evaluation of conformity by third party

I.1 General

The purpose of the third party control is to assess the ability of the manufacturer to manufacture products which continuously meet the requirements of this standard and to give independent certification to these products.

I.2 Procedure of the third party control

Third party control consists of:

— approval of type testing; general evaluation of the production and testing facilities as well as suitability of staff for continuous and orderly manufacture;

— controlling and approval of the system and of the results of the factory production control;

— independent testing of finished products, covering at least the aspects listed in Table I.1.

Table I.1 — Third party control on manhole steps

Items to be inspected	Requirements	Test method	Test frequency
Appearance	4.3.4	Visual inspection	3 specimen of each design of step
Dimensions	4.3.2	Measurement	
Materials	4.1	Manufacturer's certification of compliance	
Composition of cast iron	Manufacturer's instructions	Analysis	
Twist	4.3.6	Annex A	
Vertical loading and classification	4.3.7	Annex B	
Proof load	4.3.8	Annex C	
Resistance to pull-out	4.3.9	Annex D or relevant dimensions validated by the type test shall be checked	
Impact	4.3.10	Annex E	
Plastics integrity	4.3.11	Annex F or G	
Thickness of plastics	4.3.12	Annex H	
Galvanising integrity	4.3.13	EN ISO 1461	
Marking	6.1	visual	

The inspection visits of the third party are carried out without previous announcement at regular intervals two times a year. The assessment is satisfactory if all requirements of Table I.1 are met for each test sample.

The inspection may be reduced after two years without failures to once a year, provided that the independent certification body has made sure that the manufacturer's quality control system is adequate, that the controls have been continuously carried out in a proper and effective way and that its results are in compliance with the

requirements of this standard. This reduced inspection frequency is valid as long as no non-conforming products are detected.

I.3 Report by the third party

The results of the inspection visits are given in a written report. The manufacturer signs this report and retains a copy of it. If no agreement can be reached between the inspector and the manufacturer on the content of the report, the manufacturer signs the report and states his reservations thereon.

The report contains at least the following items:.

- name and/or mark of the manufacturer;
- name and location of the production plant;
- title and number of this standard;
- description and manufacturer's reference numbers of products tested;
- results of the inspection in terms of:
  - staff;
  - production and testing facilities;
  - conformity of the products;
  - factory production control;
  - document control;
  - control, handling and disposal of non-conforming products;
  - calibration and control of measuring equipment;
  - handling complaints concerning non-conformity of products;
- signature of the manufacturer's representative, place and date;
- the inspector's signature.

Within four weeks after the inspection, an official report will be sent to the manufacturer by the third party.

Annex ZA
(informative)

Clauses of this European Standard addressing essential requirements or other provisions of EU Directives

ZA.1 Scope and relevant characteristics

This European standard has been prepared under the mandate M 118 "Wastewater engineering products" given to CEN by the European Commission and the European Free Trade Association.

The clauses of this European standard shown in this Annex meet the requirements of the mandate given under the EU Construction Products Directive (89/106/EEC).

Compliance with these clauses confers a presumption of fitness of the manhole steps covered by this annex for the intended uses indicated herein; reference shall be made to the information accompanying the CE-marking.

WARNING — Other requirements and other EU Directives, not affecting the fitness for intended use, may be applicable to the manhole steps falling within the scope of this standard.

NOTE In addition to any specific clauses relating to dangerous substances contained in this Standard, there may be other requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the EU Construction Products Directive, these requirements need also to be complied with, when and where they apply. An informative database of European and national provisions on dangerous substances is available at the Construction web site on EUROPA (CREATE, accessed through *http://europa.eu.int*

This Annex has the same scope as clause 1 of this standard. It establishes the conditions for the CE marking of manhole steps intended for the uses indicated in Table ZA.1 and shows the relevant clauses applicable.

Table ZA.1 - Relevant clauses for steps for manholes

Product:	Steps for manholes and other underground man entry chambers
Intended use:	As a means of access in manholes and other man entry chambers to facilitate safe entry and exit.

Essential Characteristics	Requirement clauses in this European Standard	Levels and/or classes	Notes
Width of tread	4.3.2.2 c)	None	Test according to clause 5. Minimum size is expressed in mm (dimension T)
Stand-off-distance	4.3.2.2 e)	None	Test according to clause 5. Minimum size is expressed in mm (dimension P)
Vertical loading	4.3.7	None	Test according to clause 5. Vertical loading is expressed in kN with corresponding values of initial and permanent deflections in mm
Pull-out/ anchorage	4.3.9	None	Test according to clause 5. Pull-out loading is expressed in kN
Proof load (Grey cast iron)	4.3.8	None	Test according to clause 5. No visible crack
Impact (where applicable)	4.3.10	None	Test according to clause 5. Impact resistance is demonstrated by the ability of the step to withstand a mass (in kg) dropped from a height (in m)
Twist	4.3.6	None	Test according to clause 5. Twist is demonstrated by the variability of the front edge of the tread from a flat surface.
Durability	4.1 and 4.3.5 and 4.3.2.2 b) where applicable	None	Test according to clause 5 for the relevant requirement.

The requirement on a certain characteristic is not applicable in those Member States (MSs) where there are no regulatory requirements on that characteristic for the intended use of the product. In this case, manufacturers placing their products on the market of these MSs are not obliged to determine nor declare the performance of their products with regard to this characteristic and the option “No performance determined” (NPD) in the information accompanying the CE marking (see clause ZA.3) may be used. The NPD option may not be used, however, where the characteristic is subject to a threshold level.

ZA.2 Procedure for attestation of conformity of steps for manholes

ZA.2.1 System of attestation of conformity

The system of attestation of conformity of manhole steps indicated in Table ZA.1, in accordance with the Decision of the Commission 97/476/EG of 1997-06-27 as given in Annex III of the mandate for "Waste water engineering products", is shown in Table ZA.2 for the indicated intended use and relevant level(s) or class(es):

Table ZA.2 — System of attestation of conformity

Product(s)	Intended use	Level(s) or class(es)	Attestation of conformity system
Manhole Steps	to be used as a means of access in manholes and other man entry chambers to facilitate safe entry and exit	—	4 [a]
[a] System 4: See Directive 89/106/EEC (CPD) Annex III.2.(ii), Third possibility.			

Table ZA.3 — Assignment of evaluation of conformity tasks for Steps for manholes under system 4

Tasks		Content of the task	Evaluation of conformity clauses to apply
Tasks for the manufacturer	Factory production control (F.P.C)	Parameters related to applicable characteristics of Table ZA.1	7.3
	Initial type testing	Applicable characteristics of Table ZA.1.	7.2

ZA.2.2 Declaration of conformity

When compliance with this Annex is achieved, the manufacturer or his agent established in the EEA shall prepare and retain a declaration of conformity (EC Declaration of conformity), which authorises the affixing of the CE marking. This declaration shall include:

— name and address of the manufacturer, or his authorised representative established in the EEA, and place of production;

— description of the product (type, identification, use, ...), and a copy of the information accompanying the CE marking;

— provisions to which the product conforms (e.g. Annex ZA of this European Standard);

— particular conditions applicable to the use of the product (e.g. provisions for use under certain conditions, etc.);

— name of, and position held by, the person empowered to sign the declaration on behalf of the manufacturer or of his authorised representative.

The above mentioned declaration shall be presented in the official language or languages of the Member State in which the product is to be used

ZA.3 CE marking and labelling

The manufacturer or his authorised representative established within the EEA is responsible for the affixing of the CE marking. The CE marking symbol to affix shall be in accordance with Directive 93/68/EC and shall be shown on the step for manholes (or when not possible it may be on the accompanying label, the packaging or on the accompanying commercial documents e.g. a delivery note).

The following information shall accompany the CE marking symbol on the product:

— name or identifying mark of the manufacturer;

When steps are installed by the manhole producer before delivery and the manhole producer ensures information on the manufacturers identification, the CE marking may be placed on the packaging only.

The CE marking symbol shall be shown on the accompanying commercial documents, together with the following information and characteristics:

— name or identifying mark of the manufacturer;

— last two digits of the year in which the CE marking was affixed;

— number of this standard;

— intended use and description of the component (generic name, Type (see 4.3.1) material, reinforcement materials, installation instructions);

— width of tread in millimetres;

— stand-off distance;

— vertical loading – vertical load in kilonewtons with corresponding values of initial and permanent deflections, in millimetres (for ductile materials);

— proof load in kilonewtons (for non-ductile materials/grey cast iron);

— resistance to pull-out in kilonewtons

— impact resistance - mass (in kg) dropped from a height (in metres) (if applicable);

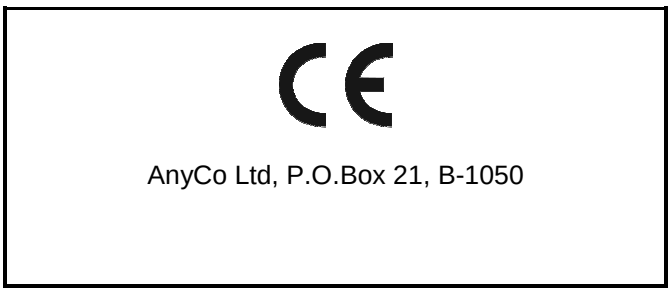
— twist - variability of the front edge of the tread from a flat surface in millimetres;

— durability as expressed in Table ZA.1;

— "No performance determined" for characteristics where this is relevant.

The “No performance determined” (NPD) option shall not be used where the characteristic is subject to a threshold level. Otherwise, the NPD option may be used when and where the characteristic, for a given intended use, is not subject to regulatory requirements.

Figure ZA.1 gives an example of the information to be given on the product.



CE conformity marking, consisting of the “CE”-symbol given in Directive 93/68/EEC.

Name of Manufacturer

Figure ZA. 1 — Example for CE marking on the product

Figures ZA.2 and ZA.3 give examples of the information to be given on the accompanying commercial documents.

CE	*CE conformity marking, consisting of the "CE"-symbol given in Directive 93/68/EEC.*
AnyCo Ltd, P.O.Box 21, B-1050 01	*Name or identifying mark and registered address of the producer* *Last two digits of the year in which the CE marking was affixed*
EN 13101 Step for manholes **Single step Type D grey cast iron** L=145 mm; T=20mm; H=20mm; W=30mm P=120 mm **Proof load:** ≥ 12 kN **Pull-out/ anchorage**: Minimum force 5kN **Twist:** ≤ 3 mm along front of step	*No. of European standard and intended use* *Description of product* *Information on regulated characteristics*

Figure ZA.2 — Example for CE marking on accompanying documents for single steps

CE	*CE conformity marking, consisting of the* *"CE"-symbol given in Directive 93/68/EEC.*
AnyCo Ltd, P.O.Box 21, B-1050 01	*Name or identifying mark and registered address of the producer* *Last two digits of the year in which the CE-marking was affixed*
EN 13101 Step for manholes **Double steel step Type A** **plastics encapsulated steel** **L=250 mm T=20 mm** **P=120 mm** **Vertical loading:** — deflection ≤ 10 mm under 2 kN vertical load, with permanent deflection ≤ 2 mm; — permanent deflection ≤ 10 mm under 4 kN, class I **Pull-out/ anchorage:** Minimum force 5kN **Impact:** Mass of 20 kg dropped from a height of 1m **Twist:** ≤ 5 mm along front of step	*No. of European standard intended use* *Description of product* *Information on regulated characteristics*

Figure ZA.3 — Example CE marking on accompanying documents for double steel steps

NOTE 1 In addition to any specific information relating to dangerous substances shown above, the product should also be accompanied, when and where required and in the appropriate form, by documentation listing any other legislation on dangerous substances for which compliance is claimed, together with any information required by that legislation.

NOTE 2 European legislation without national derogations need not be mentioned.

Bibliography

EN ISO 9001, *Quality management systems - Requirement. (ISO 9001:2000)*

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