BRITISH STANDARD

BS EN
14396:2004

Fixed ladders for manholes

The European Standard EN 14396:2004 has the status of a British Standard

ICS 97.145

National foreword

This British Standard is the official English language version of EN 14396:2004. EN 14396 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 14396 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*.

There are no national product standards that will be affected by the publication of this standard. However, when specifying ladders for manhole access and egress reference should be made to National Annex NB of BS EN 752-3. This national annex contains health and safety recommendations agreed with Health and Safety Executive regarding the use of ladders in manholes. These recommendations were used to determine the minimum sizes of access shafts and chambers advised in the annex and have also been incorporated in other British Standards, for example, to set the distance of the cover opening from the inside wall of precast concrete manholes.

The UK participation in its preparation was entrusted to Technical Committee B/505, Waste water 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.

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.

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This British Standard, was published under the authority of the Standards Policy and Strategy Committee on 21 January 2004

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EN 14396

January 2004

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English version

Fixed ladders for manholes

Echelles fixes pour raccords

Ortsfeste Steigleitern für Schächte

This European Standard was approved by CEN on 28 November 2003.

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 Central Secretariat 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 Central Secretariat has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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Contents

Foreword

This document (EN 14396:2004) 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 July 2004, and conflicting national standards shall be withdrawn at the latest by October 2005.

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.

Annexes A to F are normative.

This document includes a Bibliography.

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

1 Scope

This standard applies to permanently fixed ladders in manholes. It specifies the performance criteria for the mechanical stability and resistance providing protection against falling.

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

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 353-1, *Personal protective equipment against falls from a height - Part 1: Guided type fall arresters including a rigid anchor line*

EN 365, *Personal protective equipment against falls from a height — General requirements for instructions for use and for marking.*

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

ENV 10080, *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 and sections for general purposes.*

EN 10204, *Metallic products - Types of inspection documents.*

EN 13706, *Reinforced plastic composites — Specification for pultruded profiles (all parts).*

EN ISO 179-1:2000, *Plastics — Determination of Charpy impact properties — Part 1: Non- instrumented impact test (ISO 179-1:2000).*

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

EN ISO 4892-2:1999, *Plastics — Methods of exposure to laboratory light sources — Part 2: Xenon-arc sources (ISO 4892-2:1994).*

EN ISO 14125:1998, *Fibre-reinforced plastic composites — Determination of flexural properties (ISO 14125:1998).*

3 Terms, definitions and symbols

3.1 Terms and definitions

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

3.1.1
fixed ladder with two stringers
ladder, which is stationary and where the rungs are arranged between and attached to the stringers and the stringers carry the load

3.1.2
fixed ladder with one stringer
ladder, which is stationary and where the rungs are attached to both sides of the stringer and the stringer carries the load

3.1.3
fall arrest system
personal protective equipment against falls from a height comprising a full body harness and a connecting sub-system for fall arrest purposes

3.1.4
rest platform
platform located at or near a fixed ladder that enables the person climbing it to rest. It can comprise one or more units

3.1.5
handhold
hand grips provided at the top of the ladder or at the point of entry to the manhole

3.1.6
connector
mechanical device as insert or fishplate to join sections together

3.1.7
section
modules consisting of single or double stringers and rungs designed to join together to produce full height ladders

3.1.8
stringer
vertical structural element to support rungs

3.1.9
stay
element to support and distance a ladder from the manhole wall

3.1.10
rung
solid or tubular element fixed to the stringer(s) to provide a foot or handhold

3.1.11
tread
top surface of a rung to accommodate a foot or hand

3.2 Symbols

L climbing height of ladder

F design load for calculation of strength for fixing at anchor points

F_1 vertical load at rung

F_2 design load for calculation of the fixed ladder system

F_3 load for strength test of stringers (0,4 kN)

F_3' load for strength test of stringers multiplied by the safety factor

safety factor

4 Requirements

4.1 General

Fixed ladders shall conform to the requirements of this clause.

Fixed ladders shall be supplied with manufacturer's instructions for mounting and use. For the installation of the fixed ladders, national regulations shall be observed. Information on instructions for assembly and use shall be given by the manufacturer.

If fall arresters are used, EN 365 and regulations in the place of use shall be taken into account.

4.2 Materials

Materials shall be selected to suit the service conditions at the ladder site.

Materials used for fixed ladders shall be one of the following:

- steel conforming to EN 10025 or ENV 10080 and hot dip galvanised according to EN ISO 1461 with thickness according to Table 1;

Table 1 — Galvanising thickness

Thickness of steel components	Local coating (minimum)		Mean coating (minimum) [a]	
	g/m^2	m	g/m^2	m
6 mm	505	70	610	85
3 mm to < 6 mm	395	55	505	70
1,5 mm to < 3 mm	325	45	395	55
< 1,5 mm	250	35	325	45

[a] If the fitness for purpose is not affected, the thickness is not limited to a maximum value

- Glass reinforced plastics conforming to EN 13706 or equivalent and resistant against UV according to annex A;

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

  NOTE It is recommended that stainless steel of grade X6CrNiMoTi17-12-2 (material no. 1.4571) according to EN 10088-1 be used in sewage and drinking water systems and particular corrosive environments.

- Aluminium alloys, which have been selected in accordance with the manufacturing process and documented by an inspection document according to EN 10204.

Where materials likely to cause electrochemical corrosion are used together, care shall be taken to prevent corrosion, e.g. by ensuring that they are not in direct contact with each other.

For unprotected aluminium alloys consideration shall be made with the choice of ladder materials when prevention of spark generation resulting in explosions is required.

Manhole ladders, including all stays, shall be resistant to corrosion. Ladder materials and corrosion protection systems shall be selected according to the mechanical and chemical loading, as well as the thermal stresses to which each component will be subjected, taking into consideration expected operating conditions.

4.3 Design requirements

4.3.1 Types

Fixed ladders for manholes shall be one of the following types:

Table 2 — Types of fixed ladders

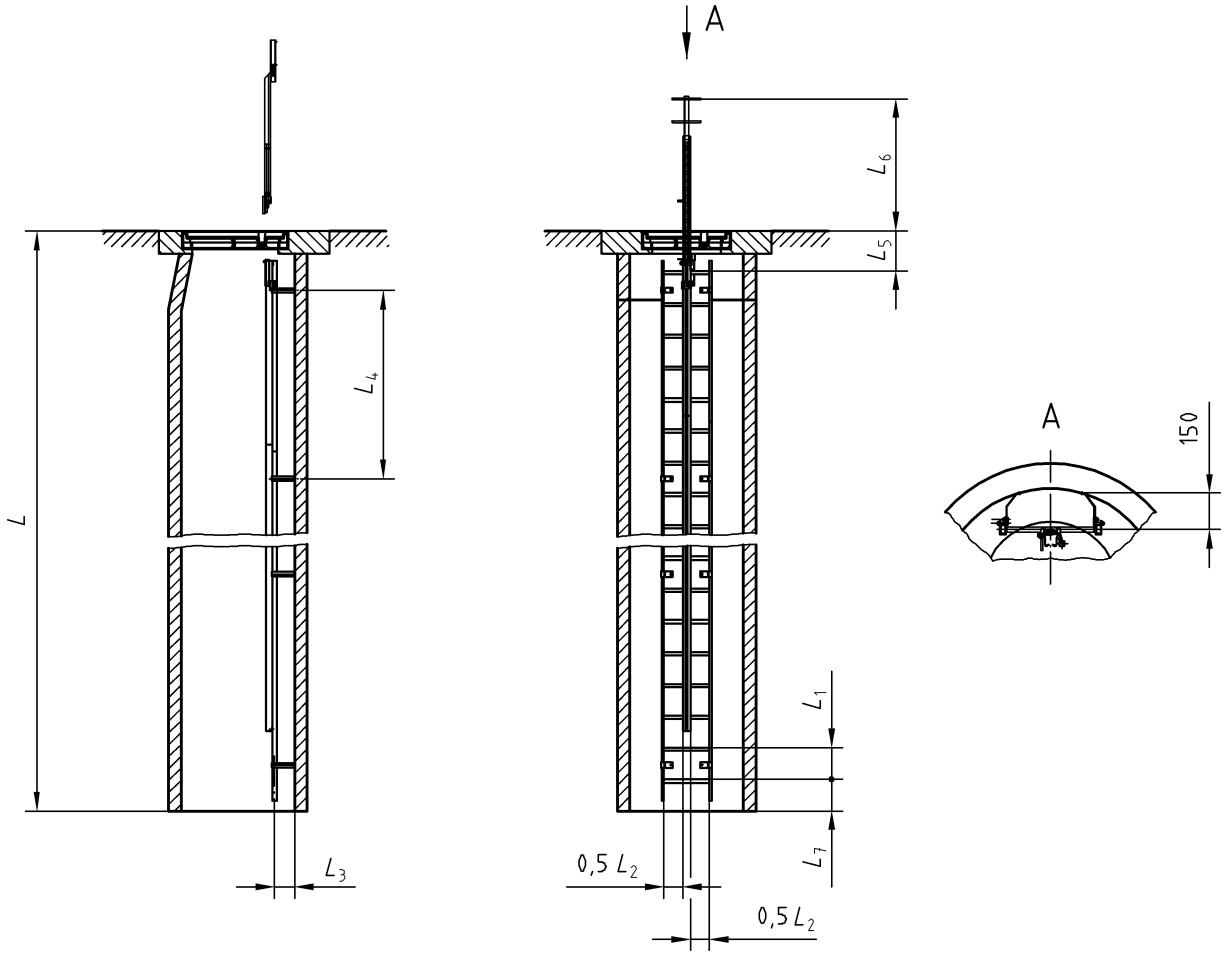
Type	Designation
A	Fixed ladder with movable top extensions
B	Fixed ladder with two stringers and fall arrester
C	Fixed ladder with one stringer and fall arrester
D	Fixed ladder with two stringers
E	Fixed ladder with one stringer

For ladders type A the movable top extension shall be tested according to the provisions in the place of use.

4.3.2 Dimensions

Ladder dimensions are to be taken from Table 3. Examples of ladder design are shown in Figure 1 and Figure 2. The figures are examples only and not intended to fix design. The given dimensions shall, however, be met.

Dimensions in millimetres



Key

L Climbing height

L_1 Distance between the top of adjacent rungs

L_2 Width of rung

L_3 Minimum stand off distance at any point

L_4 Maximum distance between two stays

L_5 Distance from ground level to the top of the first rung

L_6 Height of handhold

L_7 Distance from the bottom rung to the benching

Figure 1 — Ladder with two stringers, fall arrester and handhold

Table 3 — Dimensions for ladders

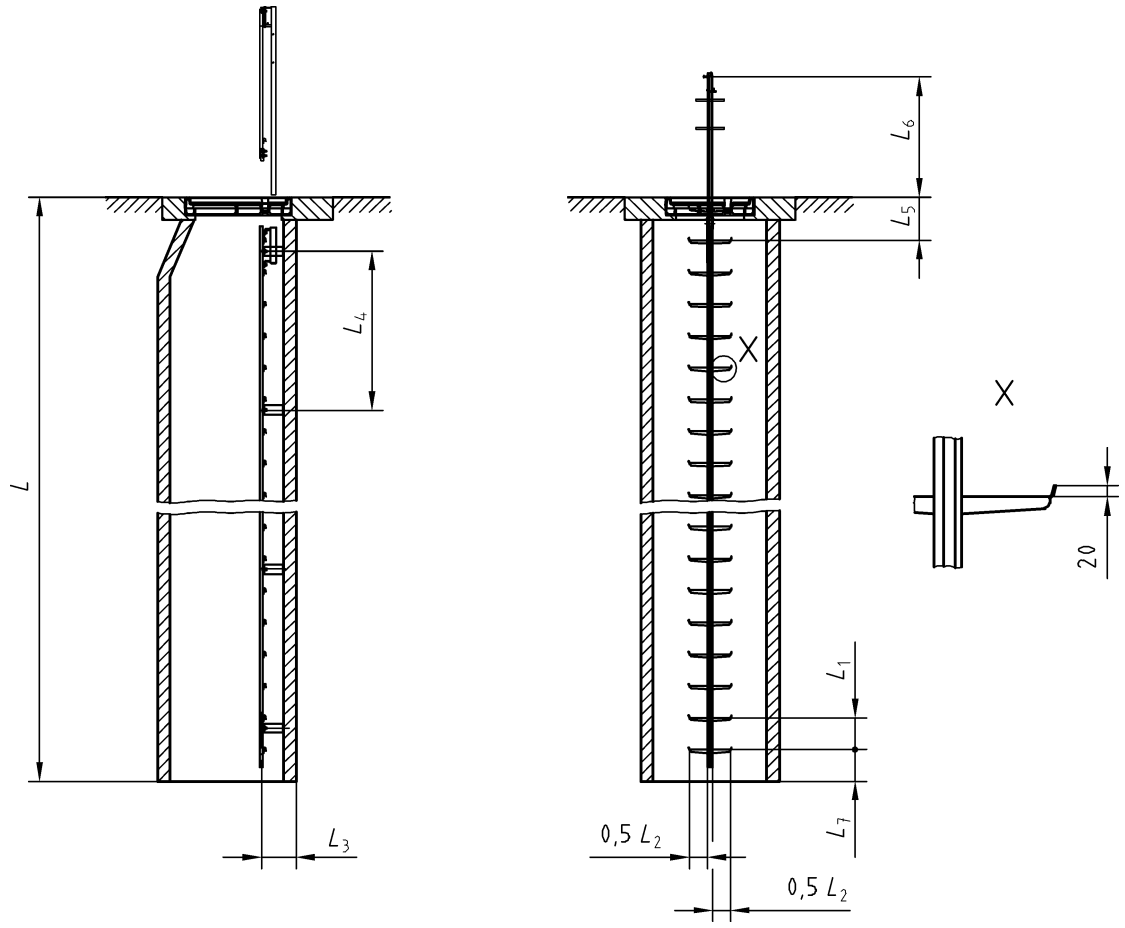
Dimensions in millimetres

Tolerance	L_1	L_2	L_3	L_4	L_5	L_6	L_7
min.	250	300	150	—	—	1000	
max.	300	—	—	[b]	L_1 [a]	—	L_1

[a] In special cases (e.g. where the manhole design so requires). For the installation national provisions valid in the place of use shall be taken into account.

[b] To be stated by the manufacturer (see clauses 5 and 6 and ZA.3), but not more than 3000 mm.

Dimensions in millimetres



Key

L Climbing height

L_1 Distance between the top of adjacent rungs

L_2 Width of rung

L_3 Minimum stand off distance at any point

L_4 Distance between two stays

L_5 Distance from ground level to the top of the first rung

L_6 Height of handhold

L_7 Distance from the bottom rung to the bottom of the shaft

Figure 2 — Ladder with one stringer

4.3.3 Surface conditions

Ladders according to this standard shall be free from visible defects, protrusions or sharp edges.

The surface of rungs shall conform to 4.3.6.

4.3.4 Threaded joints

Threaded joints shall be designed so that fasteners cannot work loose.

4.3.5 Welded joints

Welded joints shall be carried out by qualified personnel in accordance with the procedures specified in the relevant standards.

NOTE See also EN 288-1, EN 288-2, EN 288-3 and EN 288-4.

4.3.6 Rungs

Flat treads shall be at least 20 mm wide and be profiled to prevent slipping. Circular treads shall have at least a 20 mm diameter or the walking surface of the rung of polygonal or U-shaped rungs shall have a depth of at least 20 mm.

NOTE For ergonomic reasons (easy standing, better grip), 25 mm is recommended.

The cross-section of the rungs shall not have dimensions difficult to grasp by hand. The maximum diameter of a circular rung shall be 45 mm, for non circular cross sections the maximum circumferencial length shall be 140 mm.

The surface of the rung shall have a slip resistant walking surface. Special measures to prevent slipping may be necessary when the risk of slipping is increased due to environmental conditions (oil, ice, etc.).

The ends of the rungs of fixed ladders with one stringer shall be fitted with boots stop to prevent lateral slip off from the rungs. These boot stops shall have a height of at least 20 mm (see Figure 2).

4.3.7 Attachment to manhole

For ladders with two stringers each section shall have at least four stays and anchorage points.

The top stay(s) shall be located below the top rung, but not by more than 600 mm, while the bottom stay(s) shall be located below the second rung from the ladder bottom (see Figure 1 and Figure 2).

Dowels and plugs instead of nuts and bolts may be used to attach the ladder to the manhole only where their suitability in the country of use has been verified. They shall be selected according to the force at the anchorage point of the ladder, given by the manufacturer.

For ladders with one stringer the distances between consecutive anchorage points shall be similar.

4.4 Load bearing capacity

4.4.1 General

The stability of ladders and their stays shall be verified as follows:

¾ Vertical imposed load on rungs by testing

¾ Strength of stringers by testing or calculation

¾ Pull out force for anchorage by calculation

¾ Strength of stay and ladder by calculation

4.4.2 Vertical imposed load on rungs

The resistance of the rungs for F_1 shall be proved by applying the test load of 2,6 kN as shown in annex B.

After removing the test load, the maximum permanent deflection of the rungs shall be not more than 0,3 % of the rung's length and cracks and damage shall not be visible.

4.4.3 Ladder strength by testing or calculation

4.4.3.1 Analysis by calculation

Strengths are to be analysed on a worst-case basis for all ladder components according to annex F, unless otherwise specified in 4.4.3.2 to 4.4.4.

4.4.3.2 Analysis by testing

4.4.3.2.1 Stringers

When determining strengths experimentally according to annex C, the following safety factors shall be taken:

¾ = 1,75 for steel and aluminium,

¾ = 4 for GRP.

When testing ladders as shown in Figure C.1 they shall withstand a test load of $F_3' = F_3$, where F_3 is 0,4 kN.

The permanent deflection shall not exceed 0,3 % of the relevant length (0,5 L_4).

4.4.3.2.2 Strength test of ladders with one stringer

The strength test of ladders with one stringer shall be verified by torsion testing according to annex D, by fixing the ladder on 3 stays with at least one connector at the least favourable point and applying a pair of forces of 0,4 kN each, as illustrated in Figure D.1. These loads shall be applied vertically opposed at the least favourable point on each end of the rungs and at a distance of 4 L_1 (for L_1 see Table 3).

NOTE The least favourable point is where maximum deflection occurs.

Torsion is considered to be sufficient when rungs do not move at the tips by more than 20 mm in the direction of the applied force when loaded (see Figure D.1).

4.4.4 Pull out force for anchorage and strength of stay by calculation

4.4.4.1 General

For calculation the self weight of the ladder shall be included in the design.

If fall arrester systems are required according to regulations in the place of use of the ladders they shall conform to the strength requirements given in EN 353-1.

4.4.4.2 Anchor points

Fixed ladders for manholes shall support the loads specified in Table 4 without failure when calculated in accordance with annex E and annex F.

Table 4 —Design loads for calculation of fixed ladders and anchor points

Type	Calculation of strength for fixing at anchor points		Calculation of ladder design	
	F kN	according to	F_2 kN	according to
A , B and D (ladders with two stringers)	3	Figure E.1	1,5	Figure F.1
E and C (ladders with one stringer)	6	Figure E.2	1,5	Figure F.2

5 Marking

Fixed ladders in compliance with this standard shall be durable and legibly marked at the top with

- manufacturer's name or symbol,
- last two digits of the year of manufacture,
- type,
- maximum distance between two anchorage points.

The marking of fixed ladders with fall arrest systems shall conform to EN 365.

6 Instructions for installation and use

The manufacturer shall provide instructions containing all information necessary for the proper installation of the fixed ladder. This includes details of pull out force for anchorage and the intended use of the fixed ladder including:

- the type of attachment and
- the assembly of the fall arrester system, if applicable.

For handholds, rest platforms or ladders with fall arresters, instructions for installation and use shall meet the provisions in the place of use. If fall arrester systems are required, user instructions for ladders with fall arrester shall meet the requirements of EN 365.

The handhold should be designed to ensure that the fall arrester element can be connected and disconnected to the anchorage line from a safe position by the user.

7 Evaluation of conformity

7.1 General

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

- initial type testing,
- factory production control by the manufacturer, including product assessment.

7.2 Type testing (initial testing of the product)

Initial type testing shall be performed to demonstrate conformity to this standard (the term "test" here also covers assessment by calculation where the standard permits this for load bearing capacity). 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 fixed ladder or at the beginning of a new method of production (where this may affect the stated properties).

Fixed ladders shall be evaluated for conformity to all the requirements of clause 4 before production commences. Three complete specimens shall be tested.

For the purposes of testing, ladders may be grouped into families, where it is considered that the results for any characteristic(s) are the same for all products within the family.

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 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 5.

Table 5 — Factory production control for fixed ladders

Items to be inspected	Requirements	Frequency of inspection
Surface conditions	4.3.3	Each piece
Dimensions	4.3.2	3 pieces per production lot
Materials	4.2	Each consignment
Load bearing capacity	4.4	Only type test
Corrosion protection	4.2	3 pieces visibly per production lot, if relevant
Marking	5	Random sampling in series 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)

Ageing test of composite materials

A.1 Principle

In order to determine the utilisation characteristics of composite materials in the load-bearing elements of the structure of ladders and stepladders, tests shall be carried out according to a) or b):

a) two batches of 10 samples shall be subjected to the shock test according to EN ISO 179-1 without undergoing the ageing test for the first batch and after the ageing test according to EN ISO 4892-2 for the second batch;

b) two batches of 5 samples shall be subjected to the bending test according to EN ISO 14125 without undergoing the ageing test for the first batch and after the ageing test according to EN ISO 4892-2 for the second batch.

A.2 Preparation of the samples

The specimens for the ageing test shall be taken from the thinnest profile. The specimens shall be sampled according to the main fibre direction(s) into load-bearing elements of finish product.

A.3 Ageing test

One batch of specimens according to A.1a) and A.1b) shall be subjected to the ageing test according to the method of EN ISO 4892-2 under the following test conditions:

— the test duration shall be 500 h;

— the specimens shall be exposed to a xenon arc light source according to EN ISO 4892-2:1999, Table 1 (method A);

— the reference temperature chosen for the black standard is (65 3) °C;

— the relative humidity chosen is (65 5) %;

— the cycle shall be conducted without any dark period under continuous illumination for (102 0,5) min and a sprinkling period of (18 0,5) min.

For the determination of changes in properties after exposure, EN ISO 4892-2:1999, 7.4 is not applicable.

A.4 Shock test

The shock test shall be conducted on the two batches of 10 specimens of the first series (see A.3) according to EN ISO 179-1 under the following conditions:

— the shocks shall be administered perpendicular to the longitudinal direction of the fibres;

— the shocks shall be delivered according to EN ISO 179-1:2000 definitions 3.4 (flat wise impact (f), and 3.5 (normal impact (n)) and in compliance with EN ISO 179-1:2000, Figure 3 (fn) (diagram of designations describing the direction of impact).

A.5 Bending test

The bending test shall be carried out on the two batches of 5 samples of the second series (see A.3) according to EN ISO 14125 under the following conditions.

— The bending properties determination test shall be conducted in accordance with the 3 point loading method EN ISO 14125:1998 (method A – Class IV).

A.6 Acceptance criteria

Acceptance criteria before and after the ageing test are defined in the following Table A.1:

Table A.1 — Acceptance criteria

Test type	Standard	Acceptance criteria
Shock	EN ISO 179-1	20 %
Bending	EN ISO 14125	20 %

Annex B
(normative)

Vertical loading test of rungs

B.1 Apparatus

The apparatus shall consist of:

- a test block which will evenly distribute the load over a length of (100 2) mm,
- a device capable of applying a load of at least 25 % greater than the maximum load specified in 4.4.2, where the testing devices shall have an accuracy of 3 % of the load applied,
- a clamping device for holding the fixed ladder,
- a device suitable for measuring deflection, up to the nearest 0,05 mm.

Clamping blocks shall be shaped to the profile of the stringer.

B.2 Procedure

Clamp the section of the ladder firmly to leave the rung to be tested projecting freely. A datum from which to measure deflection shall be established:

- at the centre of the tread for fixed ladders with two stringers as shown in Figure B.1,
- at a distance of 50 mm from the lateral protective devices used to prevent slipping-off for fixed ladders with one stringer as shown in Figure B.2.

A preload of 200 N perpendicular to the top of the rungs is applied for 1 min. The position of the rung after removing the preload is the datum position for the test carried out with the test load.

The direction of the preload and of the test load of 2,6 kN is perpendicular to the top of the rungs. The preload and test load are evenly distributed on a length of 100 mm as shown in Figure B.1 and Figure B.2.

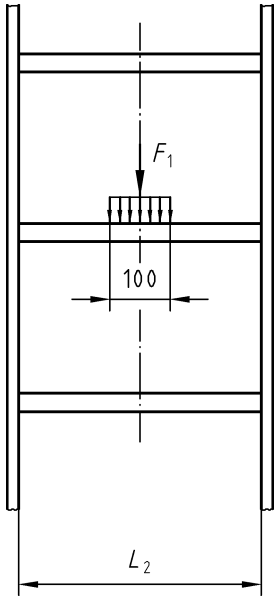
After removing the test load, the permanent deflection of the rungs shall be not more than 0,3 % related to the length of the rung (see Figure B.1 and Figure B.2). Cracks and damage shall not be visible. The point of measurement is at a distance of 50 mm from the lateral protective device provided at the end of the rung to prevent slipping-off; the direction of measuring to be in the line of application of the test load.

B.3 Test report

The report shall include the following information:

- identification of the test sample (manufacturer, batch, materials and size);
- a reference to this standard;
- method of fixing;
- the permanent deflection, cracks and damages;
- the date of the test.

Dimensions in millimetres



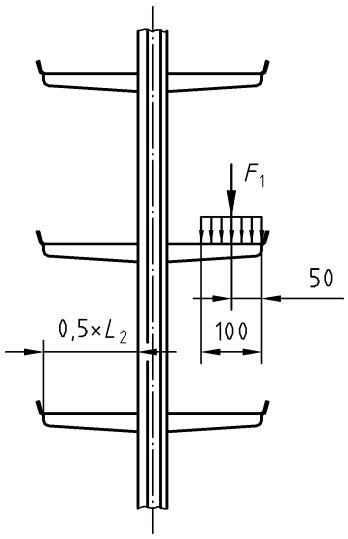
Key

F_1 Vertical load

L_2 Width of rung

Figure B.1 — Test for vertical loading of rungs on fixed ladders with two stringers

Dimensions in millimetres



Key

F_1 Vertical load

L_2 Width of rung

Figure B.2 — Test for vertical loading of rungs on fixed ladders with one stringer

Annex C
(normative)

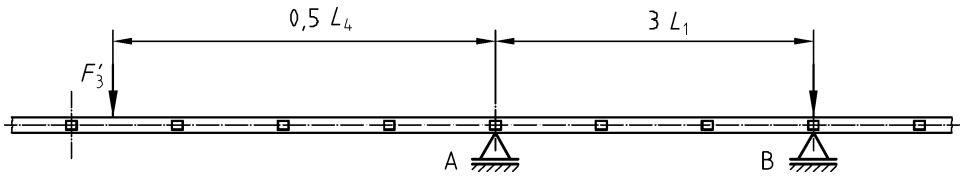
Strength test of stringers of fixed ladders with two stringers and fixed ladders with one stringer

C.1 Test equipment

The bending test of the stringers of fixed ladders with one or two stringers shall be carried out as shown in Figure C.1.

The bending of the stringers shall be measured with devices of an accuracy of 0,1 mm.

Dimensions in millimetres



Key

A Fixing point
B Fixing point
F_3' Vertical applied load
L_1 Distance between the top of adjacent rungs
L_4 Distance between two stays

Figure C.1 — Test method for the strength test of stringers of a fixed ladder with one or two stringers

C.2 Procedure

The load F_3 ' , as specified in 4.4.3.2, shall be vertically applied at a distance of 0,5 L_4 from the fixing point A. In the case of fixed ladders with two stringers, F_3' can be distributed evenly between the stringers. The load application time shall be at least one minute. After removal of the load, the permanent deflection shall be measured.

C.3 Test report

The report shall include the following information:

- identification of the test sample (manufacturer, batch, materials and size);
- a reference to this standard;
- method of fixing;
- the permanent deflection;
- the date of the test.

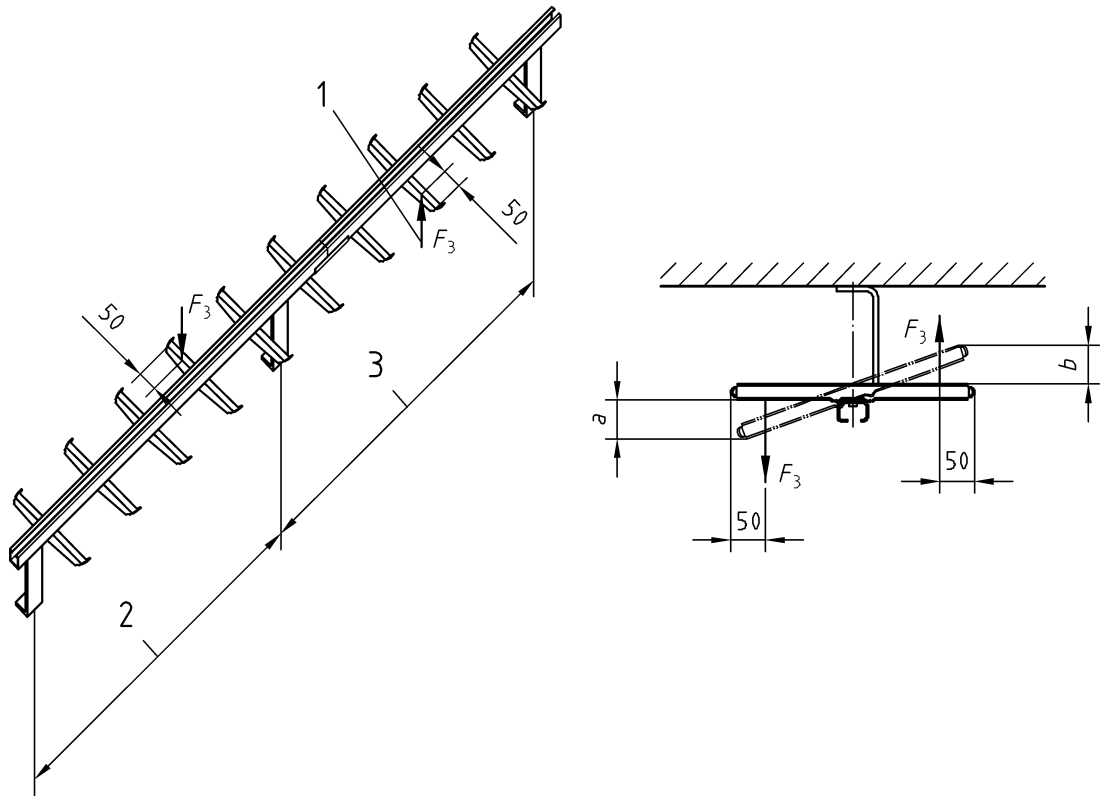
Annex D
(normative)

Strength test of the stringer for fixed ladders with one stringer

D.1 Test procedure

The fixed ladder respectively ladder section with more than 4 rungs shall be tested by applying two forces according to Figure D.1. If a ladder section has only two stays, the load shall be applied at the most unfavourable point.

Dimensions in millimetres



Key

(a+b) 20 mm

1 Line of application and measuring point

2 Distance of two consecutive fixing points (stays)

3 Distances between four consecutive rungs

a,b Elongation of rung

F_3 Test load (each 0,4 kN)

Figure D.1 — Strength test of a fixed ladder with one stringer

The direction of both test loads F_3 of 0,4 kN is perpendicular to the face of the fixed ladder and applied 50 mm from the upstand of the rung. The length of the fixed ladder is at least two distances between consecutive anchor points and shall include at least one connector if the ladder is made from sections. The fixed ladders shall be mounted at the anchor points on the ground.

The distance between the test loads corresponds to four distances between the rungs of the fixed ladder. The test loads are applied to the rungs considered as the most unfavourable.

The deflection of the fixed ladder shall not exceed 20 mm under the application of the test loads. The deflection shall be measured at 50 mm from the upstand of the rung. The direction of measuring shall be in the line of application of the test loads.

D.2 Test report

The report shall include the following information:

- identification of the test sample (manufacturer, batch, materials and size);
- a reference to this standard;
- method of fixing;
- the deflection under load;
- the date of the test.

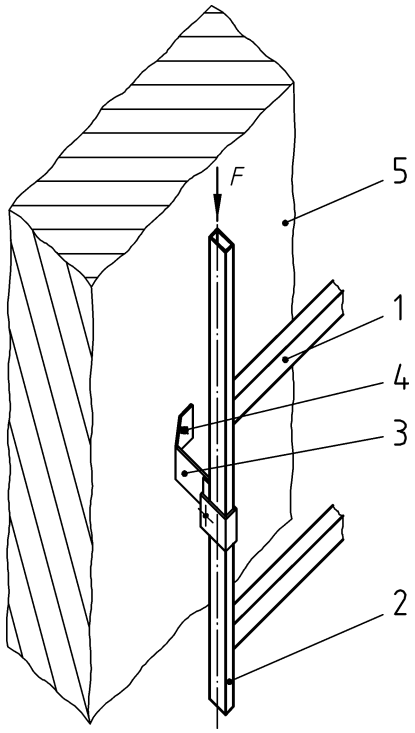
Annex E
(normative)

Calculation of strength of anchor points

E.1 Fixed ladders with two stringers without fall arrester

The strength of the anchor points of fixed ladders with two stringers shall be calculated in accordance with provisions in the place of use, taking into account a force of 3 kN for each stringer, directed along the centre line of each stringer (see Figure E.1).

At each stringer, no more than four anchor points shall be taken into account by which the forces will be transmitted to fixed parts of the surroundings.



Key

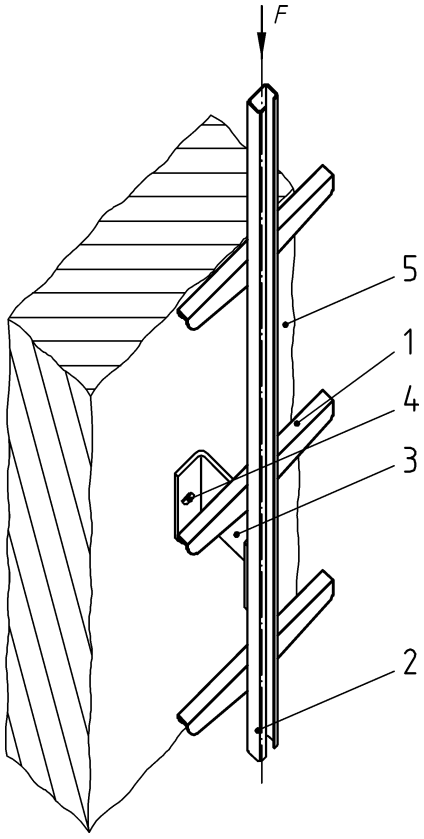
1 Rung
2 Stringer
3 Stay
4 Anchor point
5 Fixed part (e.g. wall)
F Vertical load

Figure E.1 — Arrangement for assessment of anchor points and connections of fixed ladders with two stringers

E.2 Fixed ladders with one stringer

The strength of the anchor points of fixed ladders shall be calculated in accordance with provisions in the place of use taking into account a force of 6 kN, directed along the centre line of the stringer (see Figure E.2).

At the stringer, no more than four anchor points shall be taken into account by which the forces will be transmitted to fixed parts of the surroundings.



Key

1 Rung
2 Stringer
3 Stay
4 Anchor point
5 Fixed part (e.g. wall)
F Vertical load

Figure E.2 — Arrangement for assessment of anchor points and connections of fixed ladders with one stringer

Annex F
(normative)

Calculation of the fixed ladder

The strength of the fixed ladder shall be calculated in accordance with provisions in the place of use taking into account the systems shown in Figure F.1 (fixed ladder with two stringers) and Figure F.2 (fixed ladders with one stringer).

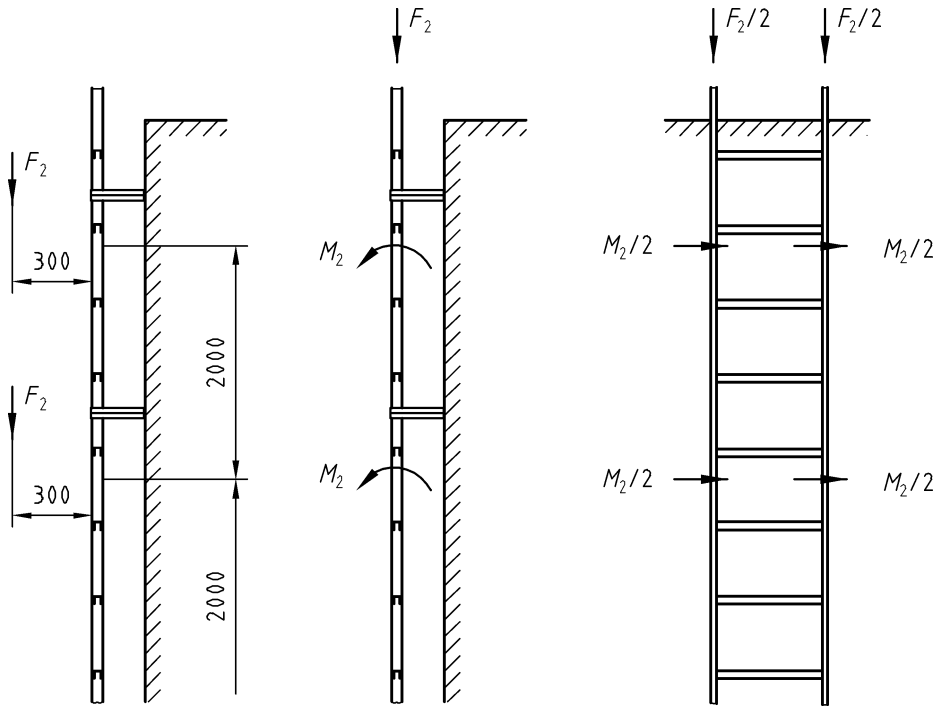
The design load F_2 represents the vertical load exerted on the stringer at intervals of 2 m along a line of action that is parallel to the centre axis of the stringer and at a distance of 300 mm from the fixed ladder.

The fixed ladder shall support the load.

Alternatively, F_2 may be substituted in calculations by the moment M_2 (see Figure F.1 and Figure F.2), where

$$M_2 = F_2 \text{ x } 300 \text{ mm}.$$

Dimensions in millimetres



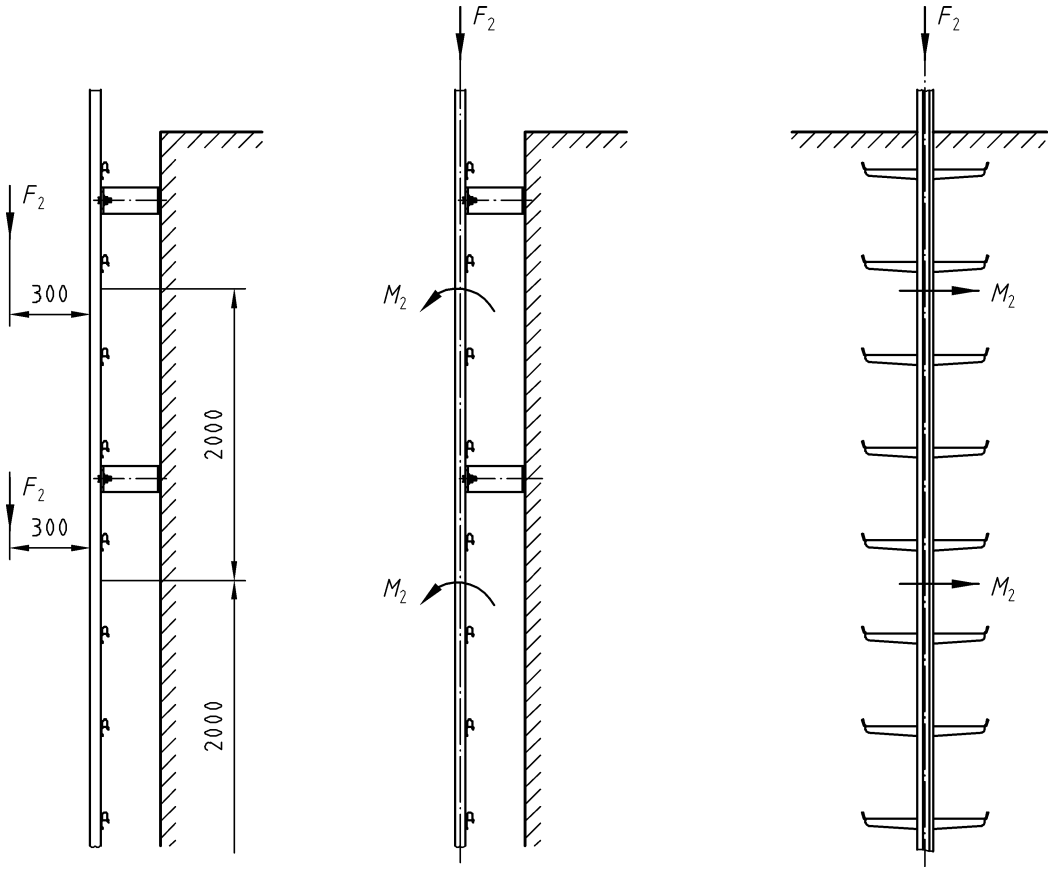
Key

F_2 Vertical load on the stringer

M_2 Bending moment

Figure F.1 — Load F_2 and bending moment M_2 on fixed ladder with two stringers

Dimensions in millimetres



Key

F_2 Vertical load on the stringer

M_2 Bending moment

Figure F.2 — Test for vertical loading of rungs on fixed ladders with one stringer

Annex ZA
(informative)

Clauses of this European Standard addressing the provisions of the EU Construction Products Directive

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 fixed ladders 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 may be applicable to the product(s) falling within the scope of this standard.

NOTE 1 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.

NOTE 2 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/comm/enterprise/construction/internal/dangsub/dangmain.htm)*

This annex has the same scope as clause 1 of this standard. It establishes the conditions for the CE marking of fixed ladders intended for the uses indicated in the relevant clauses applicable (see Table ZA.1).

Table ZA.1 - Relevant clauses for fixed ladders for manholes

Product:	Fixed ladders for manholes and other underground man entry chambers		
Intended use: and exit.	As a means of access in manholes and other man entry chambers to facilitate safe entry		
Essential Characteristics	Requirement clauses in this and other European Standard(s)	Levels and/or classes	Notes
Design requirements (width of tread, stand off distance, etc.)	4.3	None	—
Load bearing capacity	4.4	None	Ladders meeting the requirements of 4.4.2 are considered to have satisfactory impact resistance.
Durability	4.2	None	—

ZA.2 Procedure for attestation of conformity of fixed ladders for manholes

ZA.2.1 System of attestation of conformity

The system of attestation of conformity of fixed ladders indicated in Table ZA.1 as given in Annex III of the mandate M118 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
Fixed ladders	to be used as a means of access in manholes and other man entry chambers to facilitate safe entry and exit	¾	4
System 4: See Directive 89/106/EEC (CPD) Annex III.2.(ii), Third possibility.			

Table ZA.3 — Assignment of evaluation of conformity tasks for Fixed ladders 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:

- ¾ name and address of the manufacturer, or his authorised representative established in the EEA, and place of production;
- ¾ description of the product (type, identification, use,...), and a copy of the information accompanying the CE marking;
- ¾ provisions to which the product conforms (i.e. Annex ZA of this EN);
- ¾ particular conditions applicable to the use of the product (e.g. provisions for use under certain conditions);
- ¾ 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

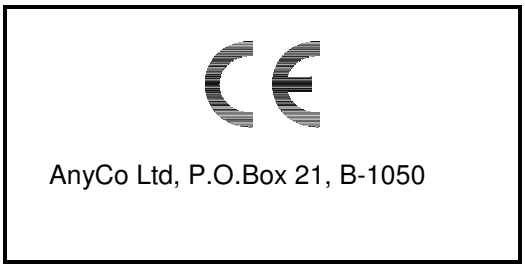
The manufacturer or his authorised representative established within the EEA is responsible for the affixing of the CE marking. The CE marking symbol to affix shall be in accordance with Directive 93/68/EC and shall be shown on the fixed ladder. The following information on the product and its essential characteristics shall accompany the CE marking symbol on the product:

- ¾ name or identifying mark of the manufacturer;
- ¾ last two digits of the year of affixing the CE marking.

The CE marking symbol, and the following information, shall also appear on the packaging or accompanying commercial document:

- ¾ name or identifying mark of the manufacturer;
- ¾ last two digits of the year of affixing the CE marking;
- ¾ number of this standard;
- ¾ intended use and description of the component (generic name, material, reinforcement materials, installation instructions);
- ¾ climbing height (see Figure 1) L in millimeters;
- ¾ length between two vertical anchorage lines (L_4) in millimeters;
- ¾ width of rung (L_2) in millimetres;
- ¾ stand-off distance (L_3) in millimetres;
- ¾ load bearing capacity.

Figures ZA.1 to ZA.3 give examples of the information to be given on the product, packaging and/or commercial documents.



CE conformity marking, consisting of the

"CE"-symbol given in Directive 93/68/EEC.

Name or identifying mark and registered address of the producer

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

CE	*CE conformity marking, consisting of the* *"CE"-symbol given in Directive 93/68/EEC.*
AnyCo Ltd, P.O.Box 21, B-1050 **03**	*Name or identifying mark and registered address of the producer* *Last two digits of the year in which the marking was affixed*
EN 14396 **Fixed ladder with two stringers** for underground man entry chamber **Type D** **Stainless Steel** **Max. climbing height**: 3000 mm **Max. stay pitch**: 1250 mm **Width of rung:** 300 mm **Stand-off distance:** 150 mm **Anchorage strength:** 5 kN **Max. vertical load:** 6 kN	*No. of European standard* *intended use* *Description of product* *Information on regulated characteristics*

Figure ZA.2 - Example CE marking on accompanying documents for fixed ladders with two stringers

CE	*CE conformity marking, consisting of the* *"CE"-symbol given in Directive 93/68/EEC.*
AnyCo Ltd, P.O.Box 21, B-1050 **03**	*Name or identifying mark and registered address of the producer* *Last two digits of the year in which the marking was affixed*
EN 14396 **fixed ladder with one stringer** for underground man entry chamber	*No. of European standard* *intended use*
Type E **Hot dip galvanised steel**	*Description of product*
Max. climbing height: 3000 mm **Max. stay pitch**: 1250 mm **Width of rung:** 150 mm **Stand-off distance:** 150 mm **Anchorage strength:** 5 kN **Max. vertical load:** 6 kN	*Information on regulated characteristics*

Figure ZA.3 — Example CE marking on accompanying documents for fixed ladders with one stringer

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 288-1, *Specification and qualification of welding procedures for metallic materials — Part 1: General rules for fusion welding.*

EN 288-2, *Specification and approval of welding procedures for metallic materials - Part 2: welding procedure specification for arc welding*.

EN 288-3, *Specification and approval of welding procedures for metallic materials - Part 3: welding procedure tests for the arc welding of steels.*

EN 288-4*, Specification and approval of welding procedures for metallic materials — Part 4: Welding procedure tests for the arc welding of aluminium and its alloys*.

EN ISO 9001, *Quality management systems — Requirements (ISO 9001:2000).*

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