BRITISH STANDARD

BS EN
13380:2001

General requirements for components used for renovation and repair of drain and sewer systems outside buildings

The European Standard EN 13380:2001 has the status of a British Standard

ICS 93.030

National foreword

This British Standard is the official English language version of EN 13380:2001.

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 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

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This British Standard, having been prepared under the direction of the Sector Committee for Building and Civil Engineering, was published under the authority of the Standards Committee and comes into effect on 15 July 2001

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English version

General requirements for components used for renovation and repair of drain and sewer systems outside buildings

Prescriptions générales pour les composants utilisés pour la rénovation et la réparation des branchements et des réseaux d'assainissement à l'extérieur des bâtiments

Allgemeine Anforderungen an Bauteile für Renovierung und Reparatur von Abwasserleitungen und -kanälen außerhalb von Gebäuden

This European Standard was approved by CEN on 23 March 2001.

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.

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

Management Centre: rue de Stassart, 36 B-1050 Brussels

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Contents

Foreword

This European Standard has been prepared by Technical Committee of 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 November 2001, and conflicting national standards shall be withdrawn at the latest by November 2001.

This European Standard provides the basis for the preparation or revision of product standards for components and materials used for renovation and repair of drain and sewer systems (see clause 1 "Scope").

The annexes A, B and C 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, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Introduction

This European Standard was derived from EN 476. As far as possible the same wording has been used.

1 Scope

This European Standard specifies general requirements and general test methods for:

— components such as pipes and fittings with their respective joints, manholes, inspection chambers; and

— materials such as mortar and chemicals all intended to be used for repair and renovation of drain and sewer systems.

These drain and sewer systems generally operate as gravity drainage systems where any pressure likely to occur is a maximum of 40 kPa and which are generally buried.

This European Standard provides the general basis for the preparation and revision of voluntary product standards. It is not applicable for evaluation of products.

It applies as a reference for drawing up a product specification, if there is no product standard available.

This European Standard includes quality control and optional certification requirements.

It applies to components those used in systems that convey in a satisfactory manner:

— domestic waste water;

— rainwater and surface water; and

— other waste waters (e.g. industrial waste water) that will not damage the components.

This European Standard applies to components of circular and other cross-sections.

This European Standard applies equally to components that are factory-made and to those manufactured on site, where applicable.

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 476, *General requirements for components used in discharge pipes, drains and sewers for gravity systems*

EN 752-1, *Drain and sewer systems outside buildings — Part 1: Generalities and definitions*

EN 752-5, *Drain and sewer systems outside buildings — Part 5: Rehabilitation*

EN 45011:1998, *General requirements for bodies operating product certification systems* (ISO/IEC Guide 65:1996)

EN 45012:1998, *General requirements for bodies operating assessment and certification/registration of quality systems* (ISO/IEC Guide 62:1996)

ISO 48:1994, *Rubber, vulcanized or thermoplastic — Determination of hardness* (hardness between 10 IRHD and 100 IRHD)

3 Terms, definitions, symbols and abbreviations

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

3.1
external diameter OD
mean external diameter of the pipe barrel at any cross-section. For pipes with external profiles on the barrels, the external diameter is the maximum diameter when viewed in cross-section.
[EN 476]

3.2
factory production control
surveillance mode in which a manufacturer performs its own surveillance on the result of its production according to a set of rules formally specified in quality assurance or quality management provision
[EN 476]

3.3
flexible pipe
pipe, the load carrying capacity of which is limited by diametral deformation under load to the ultimate design criteria without breaking or overstressing
[EN 476]

3.4
gravity system
system where flow is caused by the force of gravity and where the pipe normally operates partially full
[EN 476]

3.5
grouting
filling the gap, if any, between the existing pipe and a new liner

3.6
internal diameter ID
mean internal diameter of the pipe barrel at any cross-section
[EN 476]

3.7
joint
connection between the adjacent ends of two components including the means of sealing
[EN 476]

3.8
nominal size DN
numerical designation of size of component, which is a convenient integer approximately equal to a manufacturing dimension in mm. This can apply to either the internal diameter (DN/ID) or the external diameter (DN/OD)
[EN 476]

3.9
pipe barrel
cylindrical part of the pipe with a uniform cross-section excluding socket and spigot
[EN 476]

3.10
proof load
specified test load which a component withstands where the related requirements of the product standard are met
[EN 476]

3.11
quality control system
organizational structure, responsibilities, procedures, processes and resources for implementing quality management
[EN 476]

3.12
rehabilitation
all measures for restoring or upgrading the performance of existing drain and sewer systems
[EN 752-1:1995]

3.13
renovation
work incorporating all or part of the original fabric of the drain or sewer by means of which its current performance is improved
[EN 752-5]

3.14
repair
rectification of local damage
[EN 752-5]

3.15
rigid pipe
pipe, the load carrying capacity of which is limited by breaking or overstressing, without significant deformation of its cross-section
[EN 476]

3.16
ring stiffness
resistance of a pipe to diametrical deflection in response to external loading applied along one diametric plane is given as follows:

$$S = \frac{EI}{D_{\mathrm{m}}^3}$$

where:

S is the ring stiffness of the pipe, in kN/m^2;

E is the modulus of elasticity in flexure in the circumferential direction, in kN/m^2;

I is the second moment of area of the pipe wall in the longitudinal direction, per unit length, in m to the fourth power per metre;

D_{m} is the diameter of the neutral axis of the pipe wall, in m.

3.17
semi-rigid pipe
pipe, the load carrying capacity of which is limited by diametral deformation or by breaking or overstressing
[EN 476]

3.18
specimen
selected component, or part of a component, or material, that is to be used for testing in laboratory or in situ

3.19
surface water
water drained from the surface of buildings, structures or the ground
[EN 476]

3.20
ultimate load
load that causes failure as defined in product standards
[EN 476]

4 Installation techniques

Product standards for components used for repair and renovation shall specify the technique(s) and the environmental conditions for which the component is applicable (“fitness for installation”).

Where grouting is needed it shall be specified on a case to case basis, considering the local conditions.

NOTE In annex A examples of rehabilitation techniques are given.

5 Product stages “M”-stage and “I”-stage

Product standards for components and materials used for repair and renovation shall specify the various properties of the components and materials in both stages with reference to an installation technique:

— “M”-stage: (as manufactured): related to a component before any subsequent site processing associated with a particular repair or renovation technique;

— “I”-stage: (as installed): related to a component or material in its final configuration after any site processing associated with a particular repair or renovation technique.

NOTE In annex B, examples of materials/components are given which “change” and “not change”, their characteristics from “M”-stage to “I”-stage.

6 General requirements

6.1 General

Product standards for components and materials shall specify the requirements for both "M"-stage and "I"-stage, where applicable.

Product standards may include specifications which are more stringent, but not less stringent than those in clause 6.

With reference to the safety requirements in force at the place of renovation/repair the designer should check whether or not the minimum dimensions of manholes and inspection chambers as given in EN 476 may be reduced by the renovation/repair process.

6.2 Dimensions

Components may have different nominal sizes than those specified in EN 476 in order to be installed into drains or sewers that are to be renovated or repaired.

Product standards shall specify both for "M"-stage and "I"-stage, where applicable:

— external diameters, wall thicknesses and limit deviations;

— internal diameters, wall thicknesses and limit deviations.

For components designed for renovation/repair of pipelines with non-circular (e.g. egg-shaped) cross-sections, the product standards shall specify the relevant geometrical characteristics, where applicable.

6.3 Geometry

The straightness of the components shall be within tolerances specified in product standards both for "M"-stage and "I"-stage, where applicable.

The angle between the planes of the end faces of the components and the relevant axis of the components shall be 90° with a limit deviation such that the function of the joints of the components shall not be impaired both for "M"-stage and "I"-stage, where applicable.

A range of components and constituent lengths may be specified in product standards both for "M"-stage and "I"-stage, where applicable.

Limit deviations on component lengths shall be specified in product standards, even if the lengths themselves are not specified both for "M"-stage and "I"-stage.

6.4 Smoothness of bore, appearance and soundness

As defined in EN 476, product standards for components and materials shall specify the acceptable imperfections in "I"-stage.

Possible imperfections, caused by the conditions of the renovated components, shall not be deemed as failure of the components.

6.5 Watertightness

Components and materials in "I"-stage shall withstand without leakage an internal hydrostatic pressure test.

Components and materials in "I"-stage shall satisfy a pressure test from 0 kPa rising to 50 kPa when intended for renovation and repair of pipes, manholes, fittings and joints.

Components and materials in "I" stage intended for renovation and repair of inspection chamber assemblies designed to be used at depths less than or equal to 2,0 m shall be tested by an internal hydrostatic pressure equal to the pressure of water when totally filled.

Shafts of inspection chamber assemblies designed to be used at depths greater than 2,0 m shall be tested as manholes.

NOTE This hydrostatic pressure test is not intended to replace a commissioning test after installations (see EN 1610).

6.6 Temperature

Components and materials in "I"-stage at an ambient temperature of 10 °C, shall be suitable for a continuous water discharge temperature of 45 °C in the case of DNs less than or equal to 200, or of 35 °C for DNs over 200.

Where appropriate, temperature resistance tests shall be specified in product standards.

6.7 Corrosion resistance

Components and materials in "I"-stage shall be resistant to corrosion by domestic waste water, surface water and the effects of soil and ground water.

Product standards shall specify test methods to demonstrate corrosion resistance on a specimen, where appropriate.

6.8 Abrasion resistance

Components and materials in "I"-stage shall be resistant to the abrasive effects of hard particles in domestic waste and surface water. Where appropriate, abrasion resistance tests shall be specified in product standards.

6.9 Load bearing capacity and stiffness

Components in "M"-stage and "I"-stage, depending on material characteristic, shall be classified according to their characteristic structural behaviour ("flexible", "rigid" or "semi-rigid").

Where appropriate, product standards shall state:

- minimum crushing strengths (kN/m);
- or minimum stiffness values (kN/m^2);
- or both requirements;
- and any other relevant information.

Strength or stiffness classes, if more than one, shall be separated by at least 20 % of the next lower value.

NOTE The behaviour of the components in "M"-stage and "I"-stage may depend on:

— the material, particularly its ability to either deform and/or crack and/or rupture at failure under load;

— the geometry, diameter, shape and wall thickness;

— the mechanical characteristics of existing pipelines and of the surrounding materials.

6.10 Dimensional stability

For flexible and semi-rigid components in "I"-stage, the practical admissible deformation and shrinking dimensions shall be stated in product standards by giving both short-term and long-term values.

A test for buckling shall be stated in product standards, where appropriate.

6.11 Long-term behaviour

Where appropriate, long term behaviour of components and materials in "I"-stage and a test method shall be specified in product standards.

6.12 Durability

Product standards shall give details of which characteristics are subject to durability requirements.

6.13 Sealing elements

Product standards shall either specify the sealing elements or require specification from the pipe manufacturer. Where appropriate, a test method shall be specified.

NOTE Sealing elements should be supplied by the pipe manufacturer.

6.14 Fitness for installation

6.14.1 Resistance to installation forces

In addition to the requirements given in subclauses 6.2 to 6.13, product standards shall specify, related to the installation technique, the resistance to the following installation forces, where applicable:

- pulling forces;
- pushing forces;
- torsion forces;
- bending forces.

6.14.2 Additional requirements

In addition to the requirements given in 6.14.1, product standards of components shall specify the appropriate additional requirements for the related installation technique, where applicable.

Product standards for materials such as mortar, sprayed resin, etc. for renovation/repair shall give detailed requirements regarding the conditions of installation.

7 Specimen for testing

Product standards shall specify for each requirement the type of specimen to be used with which to show conformity with.

When the specimen in "I"-stage is to be made in the laboratory, the product standard shall also specify the simulation of site conditions, where applicable.

When the specimen in "I"-stage is to be made from a renovated/repaired drain or sewer, the product standard shall also specify how to select a representative part of it.

In annex C, examples for requirements and types of specimen are given.

8 General test methods

8.1 General

Details of test methods shall be stated in product standards.

Product standards for components and materials shall specify the test methods to show compliance with the requirements for both "M"-stage and "I"-stage, where applicable.

8.2 Measurement of diameters and wall thicknesses

8.2.1 Mean internal diameter of barrels

Where measurement of internal diameter is a requirement of the product standard, it shall be carried out adjacent to the ends of the component. At least two measurements shall be taken adjacent to each end and the mean internal diameters calculated. The measurements shall be taken at approximately equal angular spacing.

8.2.2 Mean external diameter of barrels

Where measurement of external diameter is a requirement of the product standard, it shall be carried out adjacent to the ends of the component in a similar manner to that in 8.2.1, or by calculation from the circumference adjacent to the ends of the component.

8.2.3 Wall thickness of barrels

Where measurement of wall thickness is a requirement of the product standard, it shall be carried out adjacent to the ends of the component. Thickness shall be measured adjacent to each end at a minimum of four points, taken at approximately equal angular spacing. Alternatively minimum and maximum values shall be determined adjacent to each end.

8.3 Measurement of deviation from geometry

8.3.1 Straightness of the components

Where measurement of deviation from straightness is a requirement of the product standard, the method of measurement shall be stated. Deviation shall be measured at the centre point of a line of length not less than two thirds of barrel length.

8.3.2 Squareness of the ends of the components

Where measurement of deviation from squareness is a requirement of the product standard, the method of measurement shall be stated.

8.4 Testing of smoothness of bore, appearance and soundness

Product standards shall specify test methods to demonstrate the compliance with the requirements of the smoothness of bore, appearance and soundness in "I"- stage, where appropriate.

8.5 Watertightness test

The watertightness test shall be carried out on a specimen at ambient temperature, under hydrostatic pressure as stated in 6.5.

The specimen shall be clamped into a suitable testing apparatus, where appropriate. It shall be filled with water and completely vented. It may be preconditioned with water prior to testing.

The test method, the test period, the water addition to maintain the test pressure, and, where applicable, the angular deflection shall be stated in product standards.

8.6 Crushing and stiffness test

8.6.1 Crushing test

If a product standard requires a crushing pipe test, it shall be carried out on a test machine having:

a) a load recording facility;

b) stiff loading beam, the lower face of which is an elastomeric bearing strip of thickness from 10 mm to 40 mm and hardness between 45 IRHD and 65 IRHD, in accordance with ISO 48.

The maximum width of the bearing strip shall be:

— DN $\leq$ 400: 50 mm

— 400 < DN $\leq$ 1 200: 0,12 mm x DN, expressed in mm

— DN > 1 200: 150 mm

c) a lower beam(s), on which is located a V shaped support, which is either covered with, or has two bearing strips of, elastomeric material, having the same thickness and hardness as that on the loading beam. Where the angle (β) of opening of the V is 170° or more, the crushing load shall be as recorded. Where the opening is less than 170°, a reduction factor shall be applied to the recorded strength as given in Table 1.

Table 1 — Reduction factors for V shaped support

Angle	150 ° $\leq \beta <$ 160°	160 ° $\leq \beta <$ 170°	$\beta \geq$170°
Reduction factor	0,98	0,99	1,00

The test consists of subjecting a specimen to the action of a uniformly distributed load. To achieve uniform distribution, bearers may, for instance, be divided into sections.

The test load shall be applied symmetrically over the entire loading length. The position of the load may be adjusted to maintain horizontal stability.

During application of at least the final third of the specified load, the rate of increase of load shall be constant and this period of loading shall be at least 30 seconds.

Where the cross-section of the specimen does not allow the test method to be used, the product standard shall state an appropriate test method to obtain a comparable strength assessment.

8.6.2 Stiffness test

If a product standard requires a stiffness test, it shall be carried out on a test machine, having load and deformation recording facilities. The product standard shall state whether the bearer and the beam shall be flat steel plates (with no bearing faces or strips) or as described in 8.6.1.

The determination of ring stiffness and creep value shall be specified in each product standard.

8.7 Tests for fitness for installation

8.7.1 Test for installation forces resistance

Product standards shall specify, where applicable, test methods for:

— pulling forces;

— pushing forces;

— torsion forces;

— bending forces;

occurring during the installation of components taking into consideration:

– all possible internal and external influences when components are inserted by pulling and/or pushing and/or winding through the existing pipeline.

8.7.2 Test for additional requirements

Product standards shall specify, where applicable, test methods to compliance with additional requirements for the related installation technique.

9 Quality control

Product standards shall specify sampling and testing regimes including factory production control in “M”-stage.

Product standards shall define how quality control shall be carried out.

Product standards shall require the manufacturer to establish and maintain an effective documented quality control system. Systems based on EN ISO 9002 or EN ISO 9001 should be considered to comply with this requirement.

Product standards may provide third party product certification in an informative way. Where this is the case, product standards shall define how it shall be carried out. The third party body should comply with the requirements of EN 45011 and/or EN 45012 or equivalent specifications.

The product standard shall also define the site installation control when the site installation may influence the “I”-stage.

10 Marking

Product standards shall specify the marking requirements.

Each component or material or, where this is not possible, each package of components or materials, shall be marked indelibly and in a clearly visible manner and identification of the component or material shall be made in such a way that no doubt is possible.

Marking shall include at least the following information:

— EN number (product standard number);

— identification of manufacturer and site of production;

— identification of date or period of manufacture;

— identification of Third Party Certification Body; where applicable;

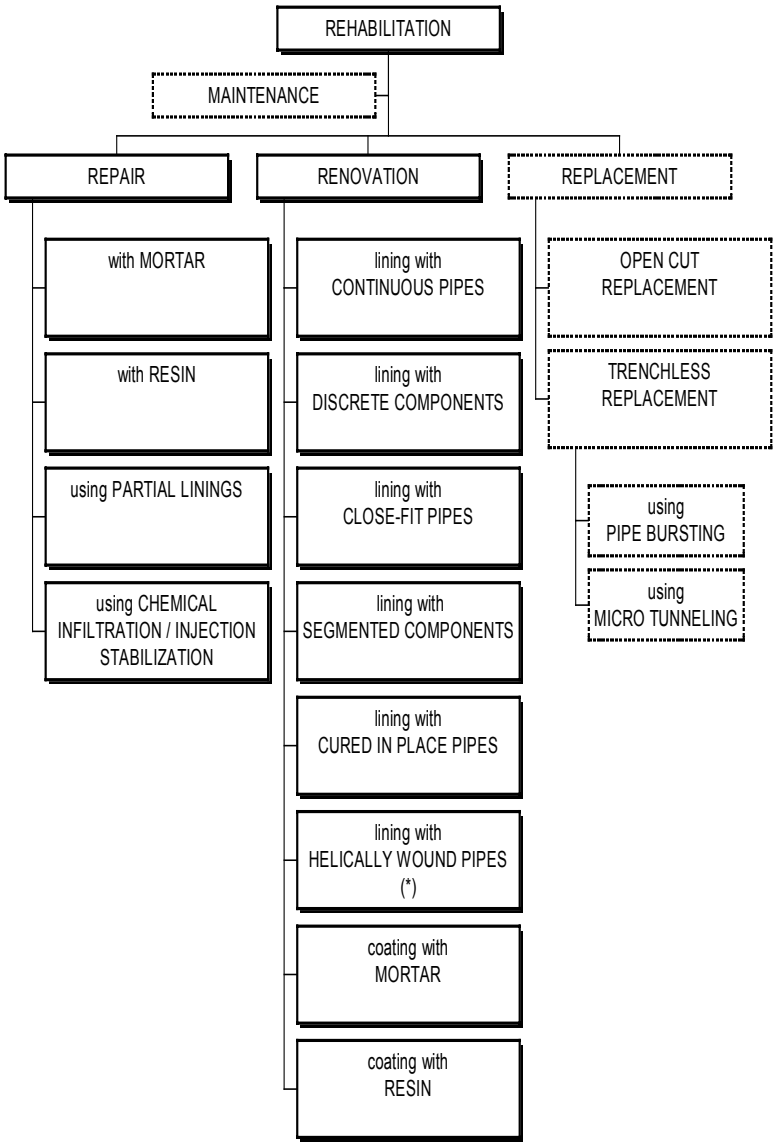
— identification of classes, where applicable;

— identification of use, where applicable.

ANNEX A
(informative)

The following chart gives examples of rehabilitation techniques for pipelines.

This chart is based on ISO TR 11295*, Techniques for rehabilitation of pipeline systems by use of plastics pipes and fittings*, extended by additional techniques.



Dealt with this standard

Not dealt with this standard

(*) in prEN 13566-1: helically equals spirally

ANNEX B
(informative)

Examples of components and materials used for repair and renovation which do “change” and which do “not change”, respectively, their properties from “M”-stage to “I”-stage:

Examples of components and materials which do “change”:

— mortar materials;

— plastics components (some thermoplastics, some thermosettings);

— resin materials.

Examples of components and materials which do “not change”:

— clay components;

— concrete components;

— fibre cement components;

— metallic components;

— plastic components (some thermoplastics, some thermosettings).

ANNEX C
(informative)

Examples for requirements to be tested regarding the system of renovation/ repair techniques ("M"-stage and/or "I"-stage)

Table C.1 — Requirements and tests to be carried out

	Renovation technique [1]				Repair technique [2]
Requirement according clause 6	**Lining with continuous pipes**	**Lining with close-fit pipes**	**Lining with cured-in-place pipes**	**Coating with resin**	**Using mortar**
	Test in stage	*Test in stage*	*Test in stage*	*Test in stage*	*Test in stage*
6.2 Dimensions	M	M+I	M+I	I	I
6.3 Geometry	M	M	none	none	none
6.4 Smoothness of bore, appearance and soundness	M	I	I	I	I
6.5 Watertightness	M	M	I	I	I
6.6 Temperature	M	M	I	I	I
6.7 Corrosion resistance	M	M	I	I	I
6.8 Abrasion resistance	M	M	I	I	I
6.9 Load bearing capacity and stiffness	M	M	I	none	none
6.10 Dimensional stability	M	I	I	none	none
6.11 Long-term behaviour	M	M	I	I	I
6.12 Durability	M	M	I	I	I
6.13 Sealing elements	none	none	none	none	none
6.14.1 Resistance to installation forces:					
— resistance to pulling forces	M	M	M	none	none
— resistance to pushing forces	none	none	none	none	none
— resistance to torsion forces	none	none	none	none	none
— resistance to bending forces	M	M	none	none	none
6.14.2 Additional requirements	M + I	M + I	I	I	I

[1] Specimen can be produced on site as a representative part of a renovated drain or sewer, or in a laboratory to simulate site conditions.

[2] Specimen can be produced on site as a representative part of a repair drain or sewer.

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prEN 13689:1999, *Guidance on the classification and design of plastics piping systems used for renovation*

ISO TR 11295, *Techniques for rehabilitation of pipeline systems by use of plastics pipes and fittings*

EN ISO 9001:1994, *Quality systems — Model for quality assurance in design/development, production, installation and servicing* (ISO 9001:1994)

EN ISO 9002:1994, *Quality systems — Model for quality assurance in production, installation and servicing* (ISO 9002:1994)

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