SLOVENSKI STANDARD
SIST EN 489:2000

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Preinsulated bonded pipe systems for underground hot water networks - Joint assembly for steel service pipes, polyurethane thermal insulation and outer casing of polyethylene

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Werksmäßig gedämmte Verbundmantelrohrsysteme für erdverlegte Fernwärmenetze - Rohrverbindungen für Stahlmediumrohre mit Polyurethan-Wärmedämmung und Außenmantel aus Polyethylen

Systemes bloqués de tuyaux préisolés pour les réseaux enterrés d'eau chaude - Assemblage pré-isolé - Tube de service en acier, isolation thermique en polyuréthane, et tube de protection en polyéthylene

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Preinsulated bonded pipe systems for underground hot water networks - Joint assembly for steel service pipes, polyurethane thermal insulation and outer casing of polyethylene

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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.

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart,36 B-1050 Brussels

Contents

Foreword

This European Standard was prepared by CEN/TC 107/WG 4, "Joints", under the Technical Committee CEN/TC 107 "Prefabricated district heating pipe systems", the secretariat of which is held by the Danish Standards Association.

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of an identical text or by endorsement, at the latest by April 1995, and conflicting national standards shall be withdrawn at the latest by April 1995.

This specification is part of the series of standards for bonded systems using polyurethane foam thermal insulation applied by injection (pouring), to bond to a steel service pipe and a polyethylene casing pipe.

The other standards from TC 107 are:

EN 253:1994 - Pipes
EN 448:1994 - Fittings
EN 488:1994 - Valves

In compiling this document, WG 4 has made use of results of research carried out by system manufacturers, raw material suppliers, users, universities and research institutes.

In accordance with the Common CEN/CENELEC Rules the following countries are bound to implement this European Standard : Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

1 Scope

This standard specifies requirements for joints, made under field conditions, between adjacent preinsulated pipes and/or fittings in district heating networks.

The standard covers jointing of steel service pipes by means of fusion welding, the connecting of casing pipe ends with joint casings and the thermal insulation with poured rigid PUR-foam.

This standard specifies methods for type tests of complete joints and PUR-foam for joints under laboratory conditions. Field made T-branches, reducers, caps etc are excluded from this standard.

2 Normative references

EN 253:1993, Preinsulated bonded pipe systems for underground hot water networks – Pipe assembly of steel pipes, polyurethane thermal insulation and outer casing of high density polyethylene

EN 287-1:1992, Approval testing of welders – Fusion welding – Part 1: Steels

EN 288-1:1992, Specification and qualification of welding procedures for fusion welding – Part 1: General rules

EN 25817:1992, Arc-welded joints in steel materials – Guidance on quality levels for imperfections. (ISO 5817:1992)

ISO 1106-3:1984, Recommended practice for radiographic examination of fusion welded joints – Part 3: Fusion welded circumferential joints in steel pipes of up to 50 mm wall thickness

ISO 6520:1982, Classification of imperfections in metallic fusion welds, with explanations

ISO 6761:1981, Steel tubes – Preparation of ends of tubes and fittings for welding

ISO 7963:1985, Welds in steel – Calibration block No. 2 for ultrasonic examination of welds

INTERNATIONAL INSTITUTE OF WELDING (IIW)
Collection of reference radiographs of welds.

3 Definitions

3.1 Joint: The complete construction of the connection between adjacent pipes and/or fittings.

3.2 Joint casing: Is the part that connects the two pipe casing ends in a joint.

3.3 Steel weld: Is the connection between the service pipes in accordance with EN 25817.

4 Requirements

A joint construction in an underground hot water network shall meet the following requirements. The assumptions made to establish these requirements are given in Annex C.

4.1 General requirements

The joint shall be:

- watertight
- resistant to axial forces initiated by axial movements of the pipe in the ground
- resistant to radial forces and bending moments
- resistant to effects of temperature and temperature variations.

4.1.1 Construction of the joint

Each individual step in the construction of a joint shall follow the system supplier's installation instructions in order to ensure that the joint obtained is equivalent to the joint as previously type-tested.

4.1.2 Competence of the welder and fitter

The welder shall have a valid certificate in accordance with according to EN 287 part 1.

Fitters dealing with the joint sealing and insulation work shall receive appropriate training relevant to the pipe system.

4.1.3 Expected life and long term temperature resistance

The requirements for expected life and long term temperature resistance shall be in accordance with 4.4.4 of EN 253:1993.

4.1.4 Service pipe weld

The steel service pipe weld shall:

- be tight when tested in accordance with clause A,5
- have mechanical properties equivalent to those of the service pipe.

4.1.5 Polyurethane rigid foam insulation (PUR)

The PUR-foam shall completely fill the joint.

The requirements for the rigid PUR-foam insulation shall be in accordance with 4.3.2, 4.3.3.1, 4.3.4 and 4.3.5 of EN 253:1993.

4.1.6 Joint casing

The joint casing shall be tight against external water pressure when tested in accordance with 5.1.5.

4.2 Type test requirements

4.2.1 Soil stress test

No water ingress shall be detected after the soil stress test in accordance with 5.1.

4.2.2 PUR properties

The PUR properties shall be in accordance with 4.3 and 4.4 EN 253:1993.

4.3 Installation instructions

Installation instructions, crucial for the quality of the installed joint and for acheiving the expected life, shall be a part of the manufacturer's documentation and shall be supplied together with the component parts.

The installation instructions shall, as a minimum, deal with the following topics.

4.3.1 Work environment

Proper procedures to obtain optimum work conditions on site shall be specified.

4.3.2 Cleaning

Proper procedures for the cleaning and drying shall be specified for:

- steel pipe surfaces
- insulation surfaces
- joint casing surfaces
- casing pipe surfaces.

The sentence "Any wet foam shall be removed from the pipe ends" shall be included in the instructions.

4.3.3 Leak detection system

When a leak detection system is installed proper procedures for connecting the leak detection system shall be specified. This specification shall, as a minimum, include:

- general handling instructions to avoid damaging the system

- procedures for positioning and connecting adjacent pipes to ensure the function of the system
- procedures and test methods to check the function of the leak detection system during construction.

4.3.4 Steel weld

Proper procedures for the steel weld shall be described. This description shall, as a minimum, include the parts "Welding process" and "Preparation for welding and lining up" in accordance with Annex A.

4.3.5 Joint casing

Proper handling and installation procedures for the joint casing shall be specified.

4.3.6 Foaming

Proper procedures for the foaming shall be described. The following paragraphs shall, as a minimum, be included:

- Surface temperatures should be between 15 °C and 45 °C. If other temperatures occur, precautions shall be taken.
- Temperature of PUR-components shall be kept between 15 °C and 25 °C.
- Precautions shall be taken to optimize venting of the joint and to prevent excessive foam losses.

5 Methods for type tests

5.1 Soil stress test

The soil stress test shall be carried out as follows.

5.1.1 Sand box

A box with minimum dimensions as shown in figure 1 shall be used. The box shall be provided with a rigid compression plate that covers the entire box.

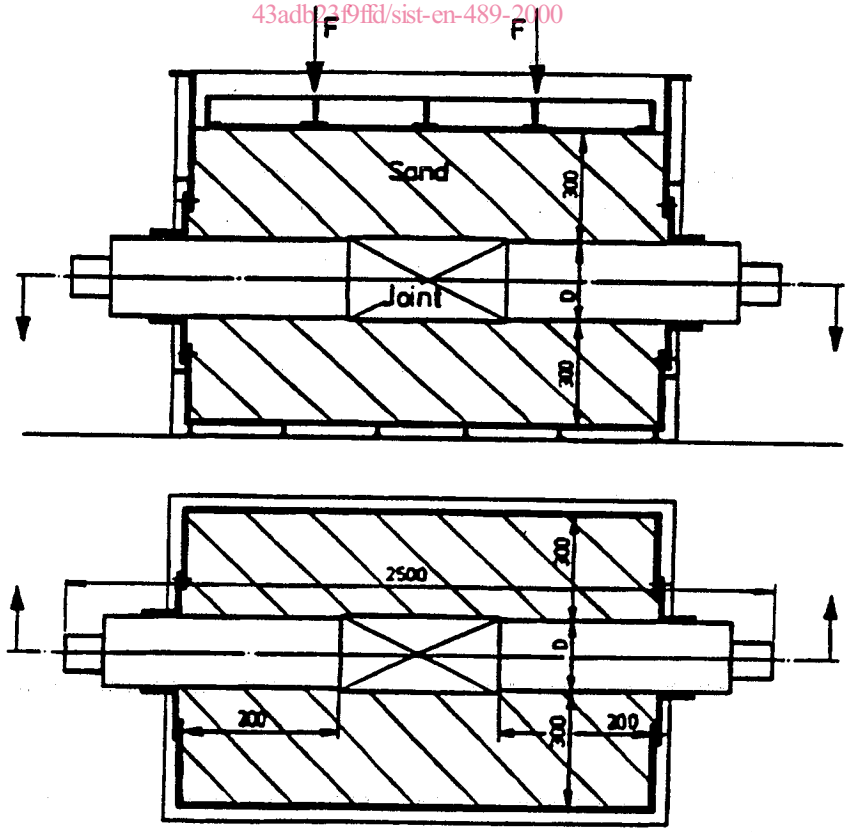

Figure 1: Minimum dimensions of sand box

5.1.2 Sand

Natural sand in air dried condition at room temperature with a grain distribution as shown in figure 2 shall be used.

5.1.3 Test specimens

Three test specimens of minimum length 2,5 m shall be used. Each test specimen shall comprise a joint made by welding together two prefabricated pipe ends.

Two test specimens shall be made of pipes with casing pipe diameter 160 mm and one specimen shall be made of pipe with casing pipe diameter 250 mm. The test can also be applied on other casing pipe diameters.

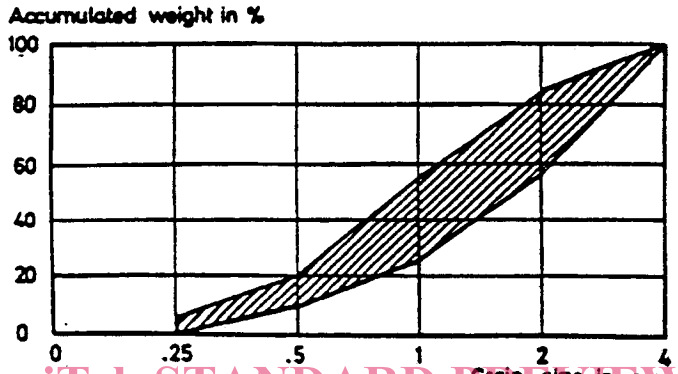

Figure 2: Standard sand quality

5.1.4 Sand box test

The following test parameters shall be used:

- service pipe temperature of 120 C maintained for 24 hours before the testing
- simulated sand overfill of 1 m (18 kN/m2)
- displacement of 75 mm
- forward speed of 10 mm/min
- backward speed of 50 mm/min
- 100 cycles, where a cycle is defined as one forward and one backward movement without pause.

5.1.5 Water impermeability test

Following the test in clause 5.1.4, each joint shall be immersed in a watertank at 30 C and pressurized externally with a constant pressure of 30 kPa for a period of 24 hours.

To facilitate assessment of water ingress, the liquid can be coloured.

5.2 PUR-foam

The type tests for polyurethane rigid foam for joints shall be carried out in accordance with 5.3 of EN 253:1993, with the following exceptions:

5.2.1 Test specimens

The test specimens shall comprise two joint casings having a diameter of at least 160 mm.

Only PE-joint casings shall be used to construct the joint test specimens.

If the joints are made on one pipe, the minimum space between the joints shall be 400 mm. (See figure 3)

5.2.2 Sampling

PUR test specimens shall only be taken from the foam after the sample has been stored at room temperature for at least 72 hours.