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Glass-reinforced thermosetting plastics (GRP) pipes and fittings — Test methods to prove the design of locked socket-and-spigot joints, including double-socket joints, with elastomeric seals

Tubes et raccords en plastiques thermodurcissables renforcés de verre (PRV) — Méthodes d'essai pour confirmer la conception des assemblages mâle-femelle verrouillés, y compris ceux à double emboîture, avec joints d'étanchéité en élastomère

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 7432 was prepared by Technical Committee ISO/TC 138, *Plastics pipes, fittings and valves for the transport of fluids*, Subcommittee SC 6, *Reinforced plastics pipes and fittings for all applications*.

Annex A forms a normative part of International Standard.

Introduction

In a pipework system, pipes and fittings of different nominal pressures and nominal stiffnesses may be used.

A joint may be made between pipes and/or fittings and should be designed such that its performance is equal to or better than the requirements for the pipeline, but not necessarily for the components being joined.

The requirements for the assembly of the joint are not included in this International Standard, but they should be in accordance with the manufacturer's recommendations.

The material-dependent parameters and/or performance requirements will be incorporated in the referring specification.

Glass-reinforced thermosetting plastics (GRP) pipes and fittings — Test methods to prove the design of locked socket-and-spigot joints, including double-socket joints, with elastomeric seals

1 Scope

This International Standard specifies methods of test for joints with a locked socket and spigot, including double-socket joints, and with elastomeric seals, for buried and non-buried glass-reinforced thermosetting plastics (GRP) piping systems. This standard is applicable only to the joint, and specifies methods of test to prove its design. It assumes that the joint will be exposed to the effects of hydrostatic end thrust.

The tests, detailed in 7.2 to 7.6, are applicable to locked socket-and-spigot joints intended to be used in buried or non-buried applications.

With the exception of the bending test (7.5), these tests are applicable to joints with pipes and fittings of all nominal sizes. The test detailed in 7.5 is applicable to joints with pipes and fittings up to and including DN 600. The tests are suitable for evaluating joints intended for applications in which liquids are conveyed at particular temperatures specified in the referring specification.

2 Principle

A joint is subjected to a specified internal pressure. The methods include prolonged static tests at elevated pressures and cyclic testing.

A method is included to test the joint for resistance to a pressure differential. This also simulates an external positive pressure.

NOTE 1 The only reason for testing the joint for resistance to a pressure differential is to ensure adequate safety against infiltration of pollutants through the joint into the fluid carried in the piping system. Under the test conditions used, pipes with low stiffness may require support to prevent buckling.

A series of tests under bending is also included.

At the end of each of the tests, the joint is inspected for signs of leakage and damage, and if either has occurred then the joint has failed.

If the joint is to be used in systems where the maximum operating temperature is higher than the value given in the referring specification, the test conditions can be modified accordingly.

NOTE 2 It is assumed that the following test parameters are set by the specification making reference to this standard:

a) the total effective length L of the assembled test piece (see 4.1);

b) the number of test pieces to be used (see 4.2);

c) if applicable, any conditioning other than as specified in clause 5;

d) the test temperature and permissible deviations from it (see clause 6);

e) the nominal pressure relevant to the joint under test (see 4.1 and clause 7 as well as the Introduction);

f) if applicable, any criteria indicative of damage to the joint components [see clause 7 and item h) in clause 8];

g) the force F_1 to be applied in the misalignment test (see 7.4);

h) the acceptable increase in pressure over 1 h for a pressure-differential test (see 7.2).

3 Apparatus

3.1 End-sealing devices, of a size and type appropriate to the joint under test.

The end-sealing devices shall be securely fixed to the pipes to transmit the end thrust loads to the pipes.

3.2 Supports

3.2.1 Straps or cradles, for use as follows:

a) a support R (item 6 in Figure 2) positioned at least 500 mm from the spigot end of the pipe at the point of balance to provide support during testing with misalignment (see 7.4);

b) a strap or cradle (100 ± 5) mm wide (item 7 in Figure 2) supporting at least a 120° arc of the socket, as required for misalignment testing (see 7.4);

c) a strap or cradle (100 ± 5) mm wide supporting a 180° arc of the pipe barrel, positioned adjacent to the end of the joint being tested (item 5 in Figure 2) and through which the force F_1 necessary for misalignment testing (see 7.4) can be applied;

d) supports of sufficient width to carry the pipe components of the test piece (item 3 in Figure 2) and designed in such a way that they allow misalignment to occur.

The straps or cradles shall not have a detrimental effect on the test piece, e.g. by applying point loads.

3.2.2 Special supports, if necessary to prevent buckling of the pipe barrel during misalignment (see 7.4) or pressure-differential (7.2) testing. Such supports shall be positioned in such a way that they do not affect the force F_1 applied to the joint or the joint's response to such a load.

3.3 Source of hydrostatic pressure, to meet the needs of the test.

3.4 Means of measuring the gauge pressure at the top of the pipe to an accuracy within ± 1 % and of checking conformity to the specified pressures (see 7.2.4, 7.2.6, 7.3.2, 7.4.4, 7.4.7, 7.4.10, 7.5.4, 7.5.5 and 7.6.1).

3.5 Vacuum pump or equivalent, capable of producing the required negative gauge pressure (see 7.2).

3.6 Means of applying and measuring the required misalignment and bending forces F_1 and F_2 (see 7.4 and 7.5) to an accuracy within ± 5 %.

4 Test pieces

4.1 Assembly and test arrangement

The test piece shall comprise an assembly of two pieces of pipe of the correct size and pressure class, as specified in the referring specification, between which is located the joint to be tested.

For the tests detailed in 7.2, 7.3 and 7.6, the arrangement shall be as shown in Figure 1. For the test detailed in 7.4, the arrangement shall be as shown in Figure 2. For the test detailed in 7.5, the arrangement shall be as shown in Figure 3. For the test in 7.5, see annex A for details on determining the maximum deflection Δ (see Figure 3) at mid-span and the magnitude of the bending force F_2. In the test in 7.5, the length L shall be not greater than 8 m. In all these arrangements, a joint of the same size and design shall be used. The same test piece may be used for more than one test procedure providing it is undamaged and of sufficient size to enable the test conditions to be achieved.

The total effective length L of the assembly shall be not less than that specified in the referring specification and shall allow, if required, the joint under test to be located in the middle of the test arrangement.

The joint shall be assembled in accordance with the manufacturer's recommendations and the requirements of the referring specification.

4.2 Number of test pieces

The number of test pieces shall be as specified in the referring specification.

5 Conditioning

For any interval between assembly of the test pieces in accordance with clause 4 and conditioning performed in accordance with the following paragraph, store the test pieces at temperatures which do not exceed the test temperature (see clause 6).

Unless otherwise specified in the referring specification, following assembly condition the test pieces at the test temperature (see clause 6) for at least 24 h prior to testing.

6 Test temperature

Conduct the following procedure at the temperature specified in the referring specification.

7 Procedure

7.1 General

Subject a test piece (see clause 4) to the applicable tests in 7.2 to 7.6 (see Table 1 for a summary).

NOTE Each reference to hydrostatic pressure specifies a positive internal gauge pressure (i.e. relative to atmospheric pressure), and the nominal pressure is that relevant to the joint under test.

If a test is interrupted, record the details in the test report and repeat the particular test before carrying on to the next, if applicable. Failure of the end-sealing devices or the pipe shall not constitute failure of the joint but, if the test conditions are invalidated thereby, repeat the particular test after replacing the failed component.

7.2 Leaktightness when subjected to a pressure differential

7.2.1 Assemble the test piece as shown in Figure 1, using supports (see 3.2) if appropriate.

7.2.2 Fix the end-sealing devices to the pipes.

7.2.3 Condition the test piece in accordance with clause 5.

7.2.4 Connect to the vacuum pump (3.5).