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Plastics pipes and fittings — Decohesion test of polyethylene (PE) saddle fusion joints — Evaluation of ductility of fusion joint interface by tear test

Tubes et raccords en matières plastiques — Essai de décohésion des selles en polyéthylène (PE) assemblées par soudage — Évaluation de la ductilité de l'interface de soudage par essai d'arrachement

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Foreword

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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.

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ISO 13956 was prepared by Technical Committee ISO/TC 138, *Plastics pipes, fittings and valves for the transport of fluids*, Subcommittee SC 5, *General properties of pipes, fittings and valves of plastic materials and their accessories — Test methods and basic specifications*.

Plastics pipes and fittings — Decohesion test of polyethylene (PE) saddle fusion joints — Evaluation of ductility of fusion joint interface by tear test

1 Scope

This International Standard specifies a method for the evaluation of the ductility of the fusion joint interface of assemblies of polyethylene (PE) pipe and electrofusion or heated tool saddles, intended for the conveyance of fluids.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 11413, *Plastics pipes and fittings — Preparation of test piece assemblies between a polyethylene (PE) pipe and an electrofusion fitting*

3 Principle

A load is applied to the saddle of an assembly of an electrofusion or heated tool saddle fused on to a pipe.

The ductility of the fusion joint interface is characterized by the appearance of the failure in the fusion plane and by the determination of the percentage of decohesion.

4 Apparatus

4.1 General

The test apparatus shall comprise a tensile equipment type A1 or A2, as indicated in Figures 1 and 2 respectively, or a compressive equipment type B as indicated in Figure 3. For nominal outside pipe diameter $\geqslant$ 250 mm, equipment type C as indicated in Figure 4 may be used.

4.2 Tensile test equipment — Type A1 or A2

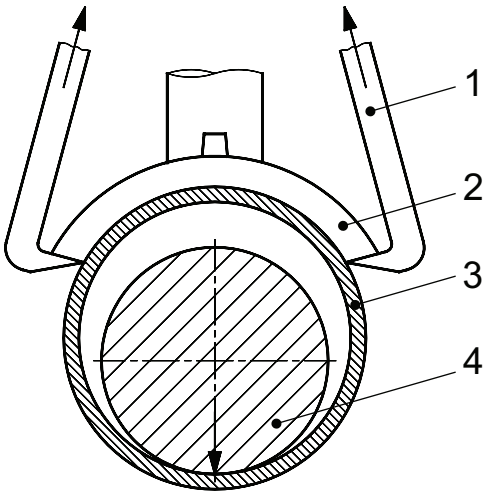
The tensile equipment shall include the following main parts.

4.2.1 Tensile testing machine, capable of maintaining a speed of (100 $\pm$ 10) mm/min, with sufficient force to separate the saddle from the pipe.

4.2.2 Loading pin, with an outside diameter of at least 1/2 of the nominal outside diameter of the pipe and allowing rotation.

4.2.3 Appropriate clamping device, to grip the saddle and allow separation from the pipe.

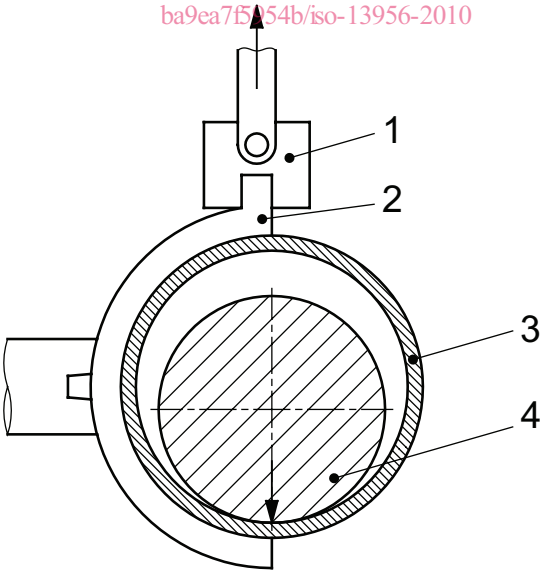
NOTE The type A1 clamping device allows symmetrical loading of the saddle from both sides (an example is shown in Figure 1). The type A2 clamping device grips the saddle only from one side (an example is shown in Figure 2).



Key

1 clamping device
2 PE saddle
3 PE pipe
4 loading pin

Figure 1 — Typical type A1 test arrangement



Key

1 clamping device, allowing rotation of the loading point
2 PE saddle
3 PE pipe
4 loading pin

Figure 2 — Typical type A2 test arrangement

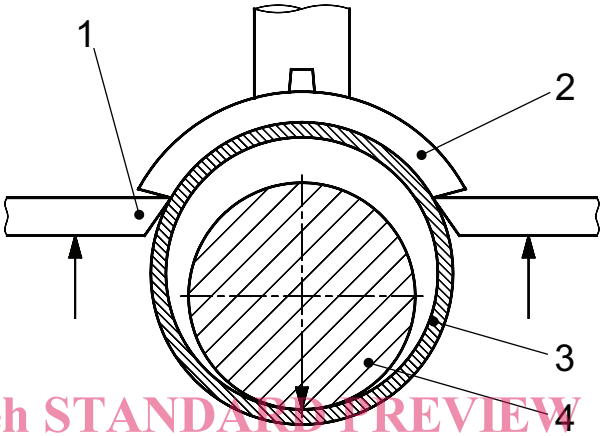
4.3 Compressive equipment — Type B

The compression equipment shall include the following main parts.

4.3.1 Compression testing machine, capable of maintaining a speed of (100 ± 10) mm/min, with sufficient force to separate the saddle from the pipe.

4.3.2 Loading pin, with an outside diameter of at least 1/2 of the nominal outside diameter of the pipe.

4.3.3 Appropriate clamping device, to grip or support the saddle and allow separation from the pipe (an example is shown in Figure 3).



Key

1 clamping device
2 PE saddle
3 PE pipe
4 loading pin

Figure 3 — Typical type B compression mode test arrangement

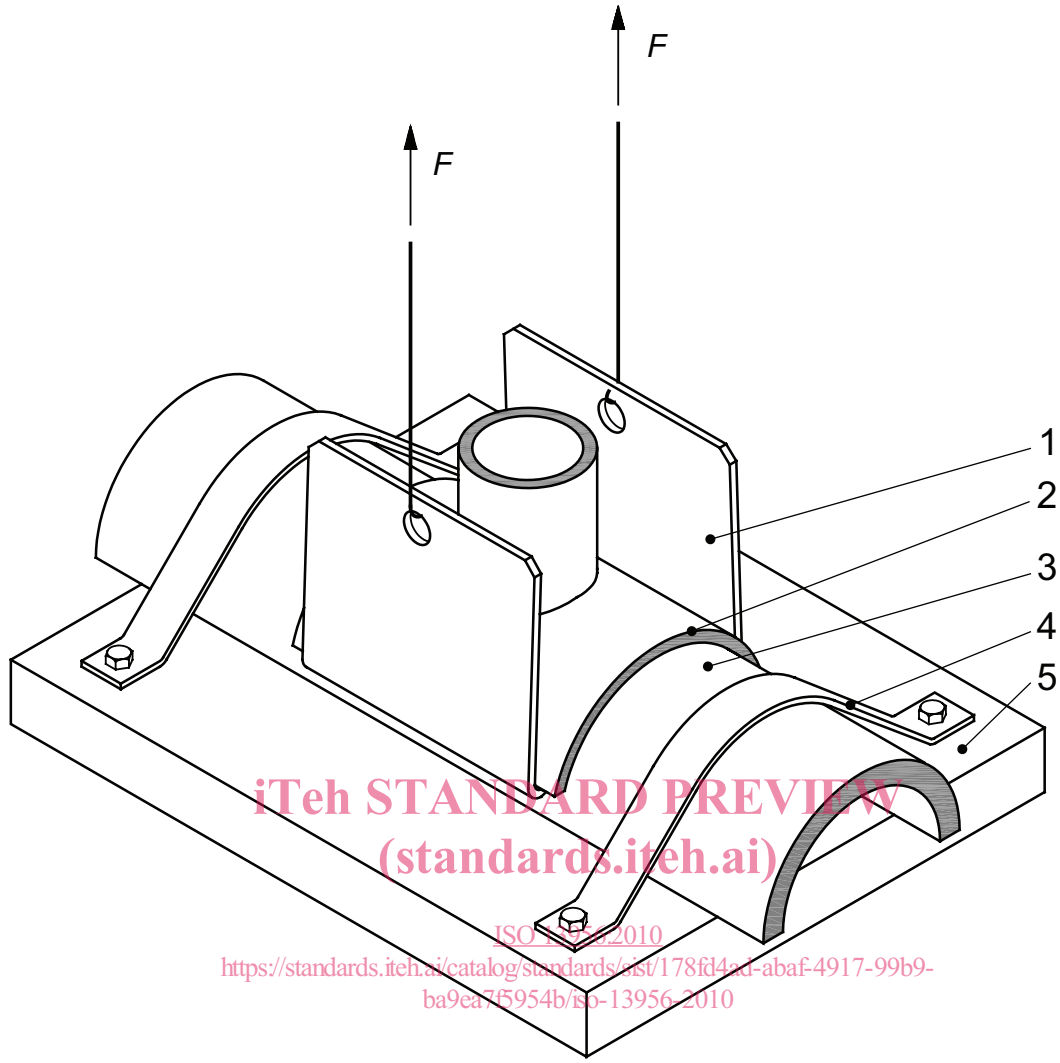
4.4 Equipment — Type C

The equipment shall include the following main parts.

4.4.1 Tensile testing machine, capable of maintaining a speed of (100 ± 10) mm/min, with sufficient force to separate the saddle from the pipe.

4.4.2 Appropriate clamping device, to grip or support the saddle and allow separation from the pipe (an example is shown in Figure 4).

4.4.3 Appropriate supporting frame with fixtures, to fix the pipe, next to the saddle, to the supporting frame (an example is shown in Figure 4).



Key

1 clamping device
2 PE saddle
3 PE pipe
4 fixture
5 supporting frame

F decohesion force

Figure 4 —Typical type C test arrangement

5 Sampling

5.1 Preparation of test pieces

5.1.1 Pipes and components shall be jointed according to the manufacturer's instructions and under conditions given in the product standard. For PE assemblies, the conditions given in ISO 11413 for electrofusion shall be taken into account.

5.1.2 Unless otherwise specified, the main pipe shall not be perforated.

5.1.3 The free pipe length on both sides of the saddle shall be minimum $0{,}1d_n$ (d_n being the nominal outside pipe diameter). For type C test mode, the free pipe length on both sides of the saddle shall be such that it extends out of the fixtures.

5.1.4 For type C test mode, the pipe shall be cut along the pipe axis, as indicated in Figure 4.

5.1.5 All screws, bolts and other fixing accessories (such as under-clamp, if any) shall be removed.

5.1.6 For practical reasons, the branch outlet of the saddle may be removed. To facilitate decohesion at the fusion interface, the removal of parts that are not involved in the fusion joint is allowed.

NOTE The pipe wall thickness can influence the magnitude of applied decohesion force.

5.2 Number of test pieces

Unless otherwise specified in the referring standard, the number of test pieces shall be three.

6 Conditioning

The testing shall be carried out at least 24 h after completion of jointing.

Condition the test piece at an ambient temperature of (23 ± 2) °C for at least 6 h before carrying out the procedure given in Clause 7.

7 Procedure

Carry out the following procedure at an ambient test temperature of (23 ± 2) °C.

a) For type A1, A2 and B test mode, insert the loading pin inside the pipe; for type C test mode, fix the pipe directly next to the saddle to the supporting frame.

b) Position the test piece and the clamping device such that the saddle is separated from the pipe at a speed of (100 ± 10) mm/min.

NOTE 1 An example of the test assembly, using a tensile test, is given in Figure 1 for type A1 test mode and in Figure 2 for type A2 test mode. An example of the test assembly, using a compression test, is given in Figure 3. An example of type C test assembly is given in Figure 4.

c) Continue the loading until complete separation or rupture of one of the parts of the test piece occurs.

If the test piece slips out of the clamps, the test may be continued by repositioning the clamps. For type A2 test mode, repositioning the clamping device on the other side of the saddle is allowed. In case separation cannot be achieved, testing may be carried out at a lower speed of (25 ± 5) mm/min, for instance.

d) Inspect the test piece and record the location of the rupture (e.g. in the pipe or the saddle, between the wires or the fusion interface), the type of rupture, and whether or not a brittle fracture surface is observed. Typical ruptures are characterized in Figures 5 and 6.

NOTE 2 It is common practice that, when no separation takes place in the fusion interface (e.g. rupture in the pipe or in the saddle), the test result is considered as 0 % brittle decohesion regarding e), f), g) and h). In this case, an alternative test arrangement of this International Standard (see Figure 1, 2, 3 or 4) can be applied or, for instance, the strip-bend test according to ISO 21751.

e) Measure and record the maximum brittle fracture length in radial direction of the fusion zone, l, and the overall length of the fusion zone at the same location, y.