International Standard 7658

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Pipework — Stripwound flexible metal hoses — Testing and verification of characteristics

Tuyauterie — Tuyaux métalliques flexibles agrafés — Essais et vérifications des caractéristiques

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Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 7658 was developed by Technical Committee ISO/TC 5, *Ferrous metal pipes and metallic fittings*, and was circulated to the member bodies in March 1983.

It has been approved by the member bodies of the following countries :

Australia	Germany, F. R.	Poland
Austria	India	Romania
Belgium	Italy	South Africa, Rep. of
Brazil	Korea, Rep. of	Sweden
China	Mexico	Switzerland
Czechoslovakia	Netherlands	United Kingdom
France	Norway	USA

No member body expressed disapproval of the document.

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Pipework — Stripwound flexible metal hoses — Testing and verification of characteristics

1 Scope and field of application

This International Standard specifies test methods necessary to check characteristics of stripwound flexible metal hoses as defined in the specific product standards for each hose type. It also specifies complementary tests, the results of which can be essential to special purpose users.

2 References

ISO 554, *Standard atmospheres for conditioning and/or testing — Specifications.*

ISO 7369, *Pipework — Flexible metal hoses — Vocabulary of general terms.*

ISO 7657, *Pipework — Stripwound flexible metal hoses — Specifications and temperature-related requirements for use.*

3 Test methods

3.1 Inside coiling diameter

3.1.1 Determination of coiling diameter value

The flexible metal hose is wound up until the coils touch and form a helix. The inside diameter of the helix is equal to the coiling diameter E.

For large diameters (especially for small lengths) a 1 000 mm ruler is applied to the spiral. The distance h is measured in the middle of the ruler (see figure 1); the coiling diameter E is calculated by the formula

$$E = \frac{250\,000}{h} + h$$

and the bending radius R by the formula

$$R = \frac{E + D}{2}$$

Dimensions in millimetres

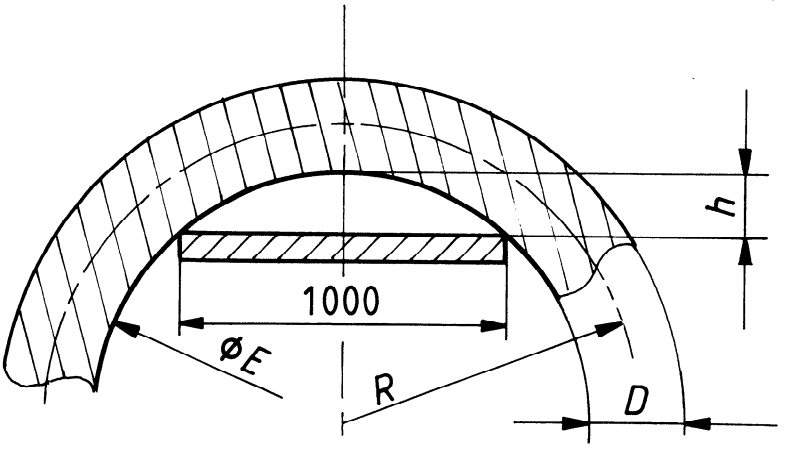

Figure 1 — Winding of a large diameter hose

3.1.2 Verification

The bending radius shall be less than or equal to the one shown in the table of characteristics of specific product standards.

3.2 Tensile strength

3.2.1 Determination of tensile strength value

The test-piece is fitted with a screwed or welded end fitting, with a free length between ends of 400 mm.

During a tensile test, a slowly increasing regular strain is applied to the test-piece. The load is applied progressively so that elongation takes place with a constant speed of 0,5 mm/s.

The maximum load withstood by the test-piece before rupture is considered to be the tensile strength value (see figure 2). Tensile strength is expressed in newtons.

3.2.2 Verification

The value of tensile strength shall be higher than or equal to the one shown in the table of characteristics of specific product standards.

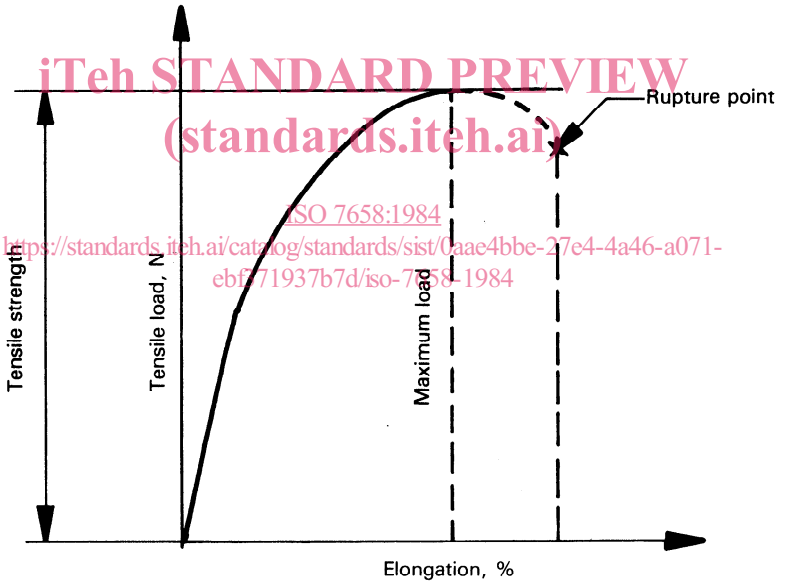

Figure 2 — Tensile strength diagram

3.3 Crush strength

3.3.1 Determination of crush strength value

The length of the test-piece shall be

a) 500 mm for external diameters of 100 mm and below;

b) 5 times the external diameter for external diameters above 100 mm, with a maximum of 1 000 mm.

The test-piece is placed horizontally and drawn taut (or drawn, without compressed set for rubber packing) in the compression test device, between two parallel steel plates with a length of 200 mm and a width equal to or greater than the hose diameter. The ends of the hose shall be at least 100 mm from the ends of the test plates. Load is gradually applied to compress the test piece at a continuous rate of 0,5 mm/s. The curve and/or deformation point shall then be recorded.

The value resulting in the permanent reduction of the inside diameter by 5 % is considered to be the crush strength (see figure 3). This resistance is expressed in newtons.

3.3.2 Verification

After applying the compression load for 1 min, in accordance with the properties table of specific product standards, the permanent reduction in the inside diameter shall not exceed 5 %.

In addition, the leak-proof flexible metal hoses shall satisfactorily pass the hydraulic pressure test in 3.5.

3.4 Maximum permissible working pressure of the hose assembly

The maximum permissible working pressure is checked according to the method to specify the hydraulic bursting pressure. (These two values are linked by definition.)

3.4.1 Determination of bursting pressure value

The test-piece is placed flat and unfixed at a standard temperature according to ISO 554; a constantly increased hydraulic pressure is applied until water-drops appear on the outside of the test-piece. The pressure reached at this moment is called the "bursting pressure"; it is expressed in bars.

3.4.2 Verification

The value obtained shall be at least equal to three times the maximum permissible working pressure shown in the characteristics table of specific product standards.

3.5 Hydraulic pressure test

The test is carried out at a pressure equal to one and a half times the maximum permissible working pressure, generally on a complete hose assembly. The hose assembly is examined to see that there is no visible leakage or deformation. The pressure shall be maintained for a minimum of 1 min, at ambient temperature; the hose assembly is placed on a horizontal surface and allowed freedom of movement.

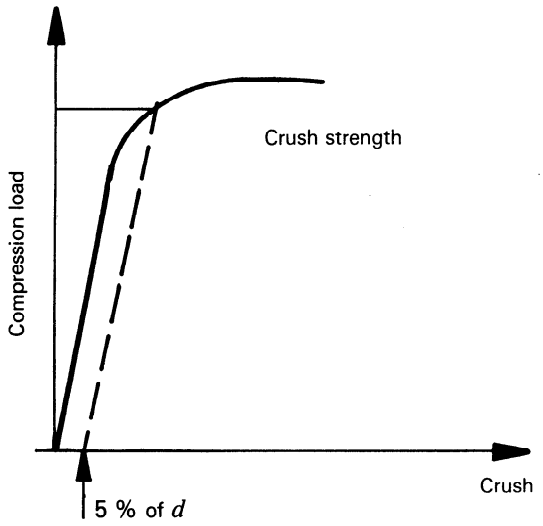

Figure 3 — Diagram of crush strength resistance

4 Complementary tests

These tests are optional, by agreement between user and manufacturer.

4.1 Hose pliancy

The degree of pliancy is determined by measuring the bending moment required to bend the hose to its bending radius R (see figure 4).

A suitable length of hose shall be fixed at one end and bent to 45° minimum on a frame of which the radius r corresponds to half the bending diameter of the hose D.

The value $F \cdot a$, in newton-metres, is considered to be the bending moment. The leverage a is measured perpendicular to the direction of the force up to the point of contact between the hose and frame.

4.2 Tightness test pressure

The test-piece is tested, under water and flat, at a standard temperature according to ISO 554 with a regular slowly increasing air pressure until the limit of tightness is reached, as indicated by the appearance of air bubbles. This pressure is expressed in bars.

5 Corrosion resistance

The resistance to corrosion of flexible metal hoses made of protected unalloyed steel (carbon steel) depends on the protection quality; the minimum characteristics are defined in ISO 7657.

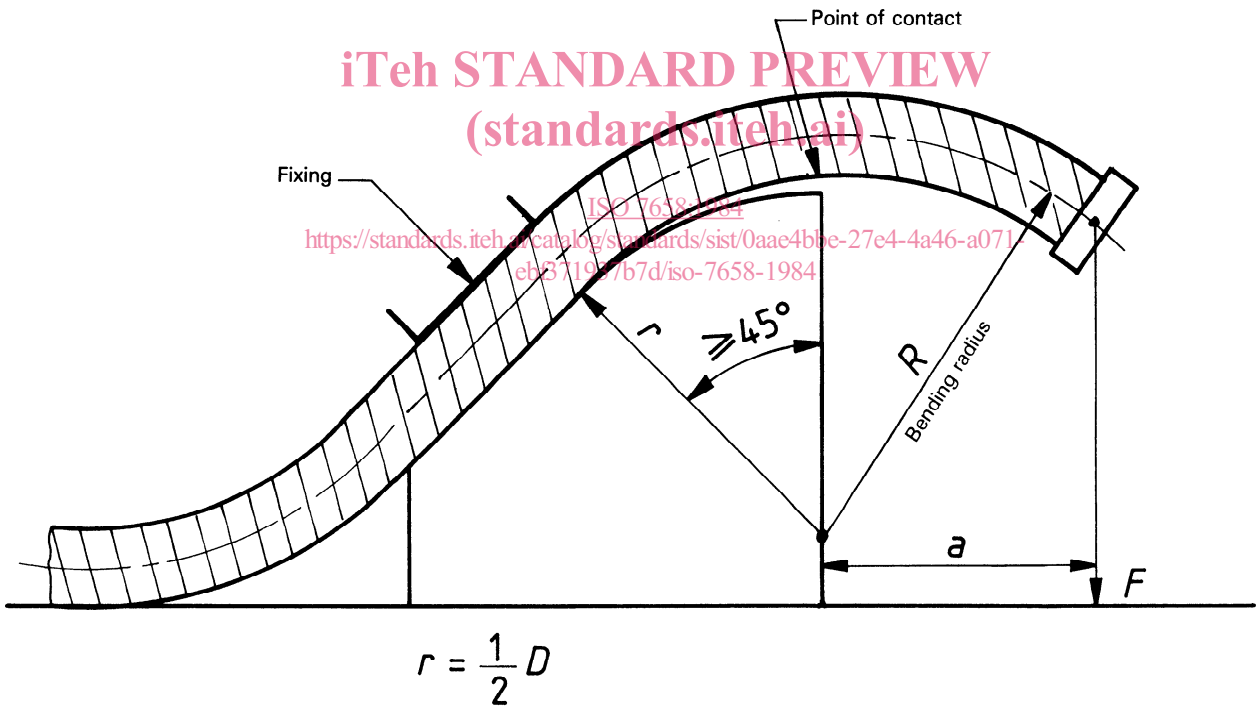

Figure 4 — Degree of pliancy

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