
**Fire protection — Automatic sprinkler
systems —**

**Part 11:
Requirements and test methods for
pipe hangers**

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*Protection contre l'incendie — Systèmes d'extinction automatiques du
type sprinkler —*

*Partie 11: Exigences et méthodes d'essai relatives aux dispositifs de
fixation des conduites*

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 21, *Equipment for fire protection and fire fighting*, Subcommittee SC 5, *Fixed firefighting systems using water*.

This second edition cancels and replaces the first edition (ISO 6182-11:2003), which has been technically revised.

The main changes compared to the previous edition are as follows:

- The seismic requirements and testing have been removed from this document and will be addressed in a separate standard.

A list of all the parts in the ISO 6182 series, can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Fire protection — Automatic sprinkler systems —

Part 11:

Requirements and test methods for pipe hangers

1 Scope

This document specifies construction requirements, performance requirements, test methods and marking requirements for typical types of pipe hangers.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 1460, *Metallic coatings — Hot dip galvanized coatings on ferrous materials — Gravimetric determination of the mass per unit area*

ISO 2064, *Metallic and other inorganic coatings — Definitions and conventions concerning the measurement of thickness*

ISO 2178, *Non-magnetic coatings on magnetic substrates — Measurement of coating thickness — Magnetic method*

ISO 3575:2016, *Continuous hot-dip zinc-coated and zinc-iron alloy-coated carbon steel sheet of commercial and drawing qualities*

ISO 4998:2014, *Continuous hot-dip zinc-coated and zinc-iron alloy-coated carbon steel sheet of structural quality*

ASTM B568, *Standard test method for measurement of coating thickness by X-ray spectrometry*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1

band (loop) hanger

type of pipe hanger where the distance from the structure to the pipe is adjustable and usually utilizes a metallic strip looped around the pipe for support of a load

Note 1 to entry: See [Figure 1 j](#)).

3.1.1

adjustable swivel band (loop) hanger

type of pipe hanger that is intended to accommodate support of piping at various directions in the same plane

Note 1 to entry: See [Figure 1 e](#)).

3.2

bracket

cantilever-type pipe hanger that is attached directly to a vertical surface of the building structure

Note 1 to entry: See [Figure 1 l](#)).

3.3

building attachment component support fixing

pipe hanger component set into the wall, such as driven fastener, expansion anchor, undercut anchor, or cast-in insert, intended to support the pipe hanger

3.4

cast-in insert

type of building attachment component cast into the concrete at the time of pouring

Note 1 to entry: See [Figure 1 m](#)).

Note 2 to entry: Cast-in inserts can be channels, which take special threaded bolts, or internally threaded sockets, which accept conventional bolts or rods.

3.5

ceiling flange

type of building attachment component pipe hanger that is attached directly to an overhead surface of a building structure

Note 1 to entry: See [Figure 1 k](#)).

3.6

beam clamp

type of building attachment that is rigidly attached to both edges of the bottom flange of a structural member

Note 1 to entry: See [Figure 1 a](#)).

3.7

C-clamp

building attachment component that grips a flange by means of a jaw and setscrew combination

Note 1 to entry: See [Figure 1 q](#)).

3.8

riser clamp

pipe attachment component intended to support vertical piping (risers) at various levels

Note 1 to entry: See [Figure 1 b](#)).

3.9

top/bottom clamp

building attachment intended to rigidly grip one edge of a top or bottom flange of a steel structural member

Note 1 to entry: See [Figure 1 d](#)).

3.10**clevis hanger**

type of split-ring pipe-attachment component

Note 1 to entry: See [Figure 1 i](#)).

3.11**clip**

pipe-attachment component, usually a one piece and nonadjustable "U" shaped device that partially embraces a pipe intended to be attached directly to a building structure

Note 1 to entry: See [Figure 1 c](#)).

3.12**coupler****threaded rod coupling**

threaded element used to connect the building attachment component (support fixing) to the rod

Note 1 to entry: See [Figure 1 p](#)).

Note 2 to entry: Couplers can have male or female threads (usually female) and can be the same thread throughout or two different thread diameters to link fixings and rods of different sizes (increaser coupler).

3.13**driven fastener**

type of building attachment component driven into solid concrete or structural steelwork by means of a special tool, usually powder actuated, and can have female or, usually, male thread linked to the rod by means of a coupler

3.14**expansion anchor**

type of building attachment component set into the concrete ceiling or wall of the building structure in self-drilled or pre-drilled cylindrical holes

Note 1 to entry: See [Figure 1 n](#)) and [Figure 1 o](#)).

Note 2 to entry: Ceiling fixings are usually "deformation-controlled" internally threaded socket anchors, which are expanded by driving an expander plug to the base of the shell or by driving the shell over the expander plug.

Note 3 to entry: Fixings for walls can be socket anchors or can be "torque-controlled" anchors, either through-bolts (where an expander clip is expanded by the tightening of the bolt) or sleeve anchors (where the sleeve is expanded by the tightening of the bolt).

3.15**pipe hanger**

assembly of components used singly or in combination with other assemblies for supporting gravity loads of a piping system

Note 1 to entry: A pipe hanger can comprise a building attachment component (support fixing), coupler, rod or equivalent and pipe attachment component as shown in [Figure 2](#), or a simple bracket and building attachment component (support fixing) as indicated in [Figure 3](#).

3.16**non-heat sensitive material**

material whose measured tensile strength at $(540 \pm 10) ^\circ\text{C}$ is at least 90 % of the value measured at $(20 \pm 5) ^\circ\text{C}$

3.17**pipe attachment component**

pipe hanger component that is attached directly to the pipe

Note 1 to entry: See [Figures 2](#) and [3](#).

3.18

retaining strap

building attachment component, usually made from steel strip, intended for use in combination with a beam clamp, C-clamp or a top/bottom clamp to hold the clamp in place on the beam

Note 1 to entry: See [Figure 1 q](#)).

3.19

solid ring

pipe hanger that completely encircles a pipe without a positive gripping action that has to be slipped onto the end of the pipe and cannot be opened in any way for attachment to the pipe after the piping is fabricated

Note 1 to entry: See [Figure 1 f](#)).

3.19.1

split ring

pipe hanger that completely encircles a pipe without a positive gripping action that can be opened in some way to allow it to be installed on the pipe after the pipeline is fabricated

Note 1 to entry: See [Figure 1 g](#)).

3.19.2

swivel ring

solid or split ring pipe hanger, equipped with a top swivel allowing the pipe hanger to be connected to a rod after it has been installed onto the pipe

Note 1 to entry: See [Figure 1 f](#)).

3.20

undercut anchor

type of building attachment component installed in a concrete ceiling or wall of the building structure in self-drilled or pre-drilled undercut holes

Note 1 to entry: The setting of the anchor, usually by hammering a sleeve over an outwardly tapered element, forces the sleeve out into the undercut shape forming a mechanical interlock with the base material. These anchors are intended for tension zones of concrete, i.e. cracked concrete.

3.21

welded studs

type of building attachment, usually fabricated from threaded material equal to the rod size that is intended to be welded to the steel building structure

4 Product consistency

It shall be the responsibility of the manufacturer to implement a quality control programme to ensure that production continuously meets the requirements of this document in the same manner as the originally tested samples.

5 Materials and rod sizes

5.1 Materials

Pipe hangers and their components shall be made of ferrous or other non-heat-sensitive materials.

5.2 Rod sizes

5.2.1 Pipe hangers and their components shall be provided with rod sizes in accordance with [Table 1](#) unless otherwise stated in [5.2.2](#).

5.2.2 Pipe hanger rod sizes designated in [Table 1](#) are the nominal diameters associated with machined threads. The diameter of a rod provided with a rolled thread shall be not less than the root diameter of the thread.

5.2.3 Some pipe hanger assemblies, such as powder-driven (pyrotechnic) fasteners and 6-mm and 8-mm size expansion shells require the use of an increaser coupling to attach to nominal 10-mm size rod. The increaser couplings provided by the manufacturer shall have sufficient strength to support the test loads applicable to the maximum permitted pipe size.

5.3 Ceiling flanges

Ceiling flanges for pipe sizes up to DN 50 shall have at least two supporting screw holes. For pipe sizes of up to DN 200, no less than three supporting screw holes shall be provided.

6 Material thickness

6.1 Uncoated material thickness

6.1.1 Unprotected flat steel, no less than 3 mm thick, is acceptable for use as a clevis-type hanger, band hanger, adjustable swivel band hanger and for other flat iron hangers, if the pipe hanger is at least 25 mm wide and if the pipe hanger exhibits strength values of at least 150 % of the required test load specified in [Table 1](#).

6.1.2 A C-clamp formed of a double thickness, no less than 3 mm thick, unprotected steel so as to form a 6 mm thick section is acceptable if the clamp exhibits strength value of at least 150 % of the required test load specified in [Table 1](#).

6.1.3 A pressed-steel concrete insert formed from unprotected steel, no less than 3 mm thick, is acceptable if it complies with all other requirements.

6.1.4 Except as noted in [6.1.1](#), if a pipe hanger or part of a pipe hanger is made of flat iron or steel, the thickness of the metal shall be at least 4,8 mm.

6.2 Coated material thickness

6.2.1 A pipe hanger or part of a pipe hanger shall have a minimum thickness of 3 mm provided it has an acceptable protective coating. Acceptable coatings are as follows:

- a) a zinc coating having a minimum thickness of 12,7 µm on all outside surfaces and 7,6 µm on all inside surfaces; or
- b) a Z180 continuous hot-dip zinc-coated steel sheet coating as specified in ISO 4998:2014, Table 3, or ISO 3575:2016, Table 2; or
- c) any other metallic or non-metallic finish or combination of the two which, when subjected to comparative tests, provides corrosion protection equivalent to a) or b).

The coating thickness shall be determined in accordance with [8.1](#).

6.2.2 Coated flat steel material, no less than 1,5 mm thick, is acceptable for use as a clevis-type hanger, band hanger, adjustable swivel loop hanger and as part of other flat iron hangers for pipes DN 50 or

less in size provided the pipe hanger exhibits a strength value of at least 150 % of the required test load specified in [Table 1](#).

Coated flat steel material, no less than 2,5 mm thick, is acceptable for use as a clevis-type hanger, band hanger, adjustable swivel loop hanger and as part of other flat iron hangers for pipes greater than DN 50 in size provided the pipe hanger exhibits a strength value of at least 150 % of the required test load specified in [Table 1](#).

7 Performance requirements

7.1 General

A pipe hanger or building attachment component shall be tested to the pull test load requirements in [Table 1](#) using the values for the largest size of nominal piping that the pipe hanger can accommodate or for the maximum load of the largest rod size to which it can be attached, whichever load is larger. Unless otherwise stated, the tolerances given in [Annex A](#) shall apply.

7.2 Elongation and pull requirements

7.2.1 When tested in accordance with [8.2](#), a pipe hanger, after initially being preloaded, shall support the elongation test load selected from [Table 1](#) for 1 min without exceeding an elongation of 5 mm.

Exception — No elongation is permitted for building attachment components that are not provided with a clip or retaining strap to maintain securement to the building member.

Table 1 — Pull test load requirements

Nominal pipe size DN	Pipe outside diameter mm	Minimum threaded rod size ^c mm	Pre-load ^a N	Elongation test load ^a N	Required test load ^b N
20	26,7	10 or 8	100	1 700	3 400
25	33,4	10 or 8	150	1 700	3 400
32	42,4	10 or 8	200	1 700	3 400
40	48,3	10 or 8	250	1 700	3 400
50	60,3	10 or 8	350	1 700	3 400
65	76,1	10	539	2 084	4 168
80	88,9	10	785	2 354	4 707
90	101,6	10	883	2 795	5 590
100	114,3	10	1 128	3 334	6 669
125	139,7	12	1 569	4 462	8 924
150	168,3	12	2 109	5 884	11 768
200	219,1	12	3 334	9 022	18 044
250	273,0	16	5 002	13 019	26 038
300	323,9	16	6 816	17 579	35 158

^a Equivalent to 50 % of 5 times the weight of a 4,6 m span of water-filled Schedule 40 steel pipe plus a fixed mass of 115 kg.

^b Equivalent to 5 times the weight of a 4,6 m span of water-filled Schedule 40 steel pipe plus a fixed mass of 115 kg.

^c The threads should be in accordance with ISO 1502.

NOTE For hangers with pipe outside diameters not listed above use load values in accordance with those defined in notes a and b.

7.2.2 Following the elongation test, the pipe hanger shall then be subjected to the required test load specified in [Table 1](#) for 1 min without rupture, pull out, or complete release.

7.3 Concrete inserts

When tested in accordance with 8.3, pipe hangers and building attachments intended for installation in concrete are to be installed in a manner representing their intended field installation in concrete blocks. They shall then be capable of supporting the required test load specified in Table 1 for 1 min without rupture, pull out, or complete release of load.

7.4 Vibration requirements

When tested in accordance with 8.4, expansion shells (cases, shields, or bases), powder-driven fasteners, welded studs, C-clamps not provided with a locknut or retaining strap, and any other pipe hangers that may be subject to change in their ability to retain their installation holding power, are to be vibrated for a period of 100 h at a frequency of 35 Hz and an amplitude of $(0,825 \pm 0,05)$ mm and shall then comply with the elongation and pull requirements specified in 7.2.

8 Test methods

8.1 Metallic coating thickness test (see 6.2)

8.1.1 General

The conventions and definitions concerning the measurement of coating thickness given in ISO 2064 shall apply. The coating thickness may be determined by one of the methods given in 8.1.2 to 8.1.4. The method used shall be agreed by all parties; in cases of dispute the method given in 8.1.2 shall be used.

8.1.2 Gravimetric determination of the mass per area

The mass per unit area of the zinc coating shall be determined in accordance with the method described in ISO 1460.

8.1.3 Measurement of coating thickness by X-ray spectrometry

The coating thickness shall be determined in accordance with the method described in ASTM B568 or another equivalent method.

8.1.4 Magnetic determination of coating thickness

The coating thickness shall be determined in accordance with the methods described in ISO 2178. The instruments shall be handled and calibrated according to manufacturer's instructions.

8.1.5 Other methods

Other methods may be used providing they meet the general requirements given in 8.1.1.

8.2 Tests for rods and pipe attachments (see 7.2)

8.2.1 Sample rods and pipe attachments are to be installed in a tension-compression test apparatus in a manner duplicating their intended field installation.

8.2.2 The test machine is to be operated at a speed sufficient to produce an elongation of the test samples at the rate of $1,27 \text{ mm/min} \pm 10 \%$.

8.2.3 A pipe hanger other than a riser clamp, whose holding power is dependent on the tightness of a bolt, nut, cap screw, lock nut, setscrew, or other machine or roll-threaded part, is to be installed in the