



SLOVENSKI STANDARD

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Vgrajene naprave za gašenje - Avtomatski sprinklerski sistemi - 3. del: Navodila za zaščito pred potresi

Fixed firefighting systems - Automatic sprinkler systems - Part 3: Guidance for earthquake bracing

Ortsfeste Brandbekämpfungsanlagen - Automatische Sprinkleranlagen - Leitfaden für Erdbebensicherungen

Installations fixes de lutte contre l'incendie - Systèmes d'extinction automatiques du type sprinkleur - Partie 3: Recommandation pour le contreventement sismique

Ta slovenski standard je istoveten z: EN 12845-3:2024

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Fixed firefighting systems - Automatic sprinkler systems - Part 3: Guidance for earthquake bracing

Installations fixes de lutte contre l'incendie - Systèmes
d'extinction automatiques du type sprinkleur -
Partie 3 : Recommandation pour le contreventement
parasismique

Ortsfeste Brandbekämpfungsanlagen - Automatische
Sprinkleranlagen - Teil 3: Leitfaden für
Erdbebensicherungen

This European Standard was approved by CEN on 8 April 2024.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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European foreword

This document (EN 12845-3:2024) has been prepared by Technical Committee CEN/TC 191 “Fixed firefighting systems”, the secretariat of which is held by BSI.

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of an identical text or by endorsement, at the latest by November 2024, and conflicting national standards shall be withdrawn at the latest by November 2024.

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

This document supersedes CEN/TS 17551:2021.

In comparison with the previous edition, CEN/TS 17551:2021, the following technical modifications have been made:

- scope of the document has been adjusted;
- ambiguities in the body text have been redrafted;
- figures have been updated.

This standard is included in a series of European standards:

CEN/TS 14816, *Fixed firefighting systems — Water spray systems — Design, installation and maintenance*;

EN 671 (all parts), *Fixed firefighting systems — Hose systems*;

EN 12094 (all parts), *Fixed firefighting systems — Components for gas extinguishing systems*;

EN 12101 (all parts), *Smoke and heat control systems*;

EN 12259 (all parts), *Fixed firefighting systems — Components for automatic sprinkler and water spray systems*;

EN 12416 (all parts), *Fixed firefighting systems — Powder systems*;

EN 12845-1, *Fixed firefighting systems — Automatic sprinkler systems — Part 1: Design, installation and maintenance*;

EN 12845-2, *Fixed firefighting systems — Automatic sprinkler systems — Part 2: Design and installation of ESFR and CMSA sprinkler systems*;

EN 13565 (all parts), *Fixed firefighting systems — Foam systems*;

EN 14972 (all parts), *Fixed firefighting systems — Water mist systems*;

EN 17451, *Fixed firefighting systems — Automatic sprinkler systems — Design, assembly, installation and commissioning of pump sets*.

Any feedback and questions on this document should be directed to the users' national standards body. A complete listing of these bodies can be found on the CEN website.

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According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

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Introduction

This document specifies requirements for earthquake protection of automatic sprinkler systems (see the EN 12845 series of standards) and can be applicable to other water based fixed manual or automatic fire fighting systems, according to local requirements. Requirements made herein are intended to greatly improve the likelihood that the fire protection systems will remain in working condition during and after an earthquake and minimize or prevent any potential water damage from fixed firefighting systems leakage due to an earthquake.

This document does not cover all legislative requirements. In certain countries, specific national regulations apply and take precedence over this document. Users of this document are advised to inform themselves of the applicability or non-applicability for this document by their national responsible authorities.

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EN 12845-3:2024 (E)**1 Scope**

This document specifies requirements for earthquake protection of automatic sprinkler systems in accordance with EN 12845:2015+A1:2019.

This document applies only to locations in earthquake zones in accordance with EN 1998-1:2004, 3.2.1¹ and the Nationally Determined Parameters.

NOTE The requirements in this document are based on the principle that certain peak ground acceleration values are considered as an earthquake which require special means. Attention is drawn to EN 1998-1:2004¹, where a peak ground acceleration above 0,08 g (0,78 m/s²) is considered an earthquake risk. Additional characteristics, NDP and/or NCI can exist in some countries as well as national annexes.

The principles defined in this document can be applicable to other water based fixed manual or automatic fire fighting systems, according to local requirements.

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.

EN 1992-4, *Eurocode 2 — Design of concrete structures — Part 4: Design of fastenings for use in concrete*

EN 1998-1:2004¹, *Eurocode 8: Design of structures for earthquake resistance — Part 1: General rules, seismic actions and rules for buildings*

EN 12845, *Fixed firefighting systems — Automatic sprinkler systems — Design, installation and maintenance*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 1998-1:2004¹, EN 12845 and the following apply.

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

— ISO Online browsing platform: available at <https://www.iso.org/obp>

— IEC Electropedia: available at <https://www.electropedia.org/>

3.1**zone of influence**

portion of the piping system reinforced by a single sway brace which is calculated on both risers and horizontal pipes

Note 1 to entry: Depending if related to a lateral or a longitudinal brace, it can include main distribution or distribution pipes and range pipes or main distribution or distribution pipes only (see 5.2.3.4, 5.2.3.5, 5.2.3.6).

3.2**seismic separation assembly**

equipment of fittings, pipe, flexible pipe, and/or couplings that permits movement in all directions to accommodate seismic differential movement across building seismic separation joints

¹ As impacted by EN 1998-1:2004/AC:2009 and EN 1998-1:2004/A1:2013.

3.3**tension only bracing**

equipment with slenderness ratio length to least radius of gyration larger than 200

3.4**fastener**

attachment elements to the structure

3.5**sway brace**

group of elements intended to prevent differential movements between pipes and structural elements

4 Design principles

Requirements given in this document fall into the following seven principles:

- brace sprinkler piping and other sprinkler related equipment (see 8.2) to minimize uncontrolled differential movement between these installations and structures they are attached to; and
- provide flexibility on piping systems and on equipment where differential movement between portions of those piping systems or equipment is expected; and
- provide clearance between sprinkler piping and structural members, walls, floors or other objects so that potential damage from impact is minimized; and
- provide anchorage or restraint to minimize potential sliding and/or overturning of equipment such as the booster pump, jockey pump, tanks, controller, battery package and diesel tank; and
- use types of pipe hangers in accordance with EN 12845 and sway bracing as required in this document to minimize the potential for pull-out, properly locate them and attach them to structural members only; and
- use types of pipe joining methods in accordance with this document to minimize potential pipe breaks; and
- provide fire protection system plans and calculations with proper verification of design and proper verification that the completed installation is in accordance with this document and installed in accordance with EN 12845.

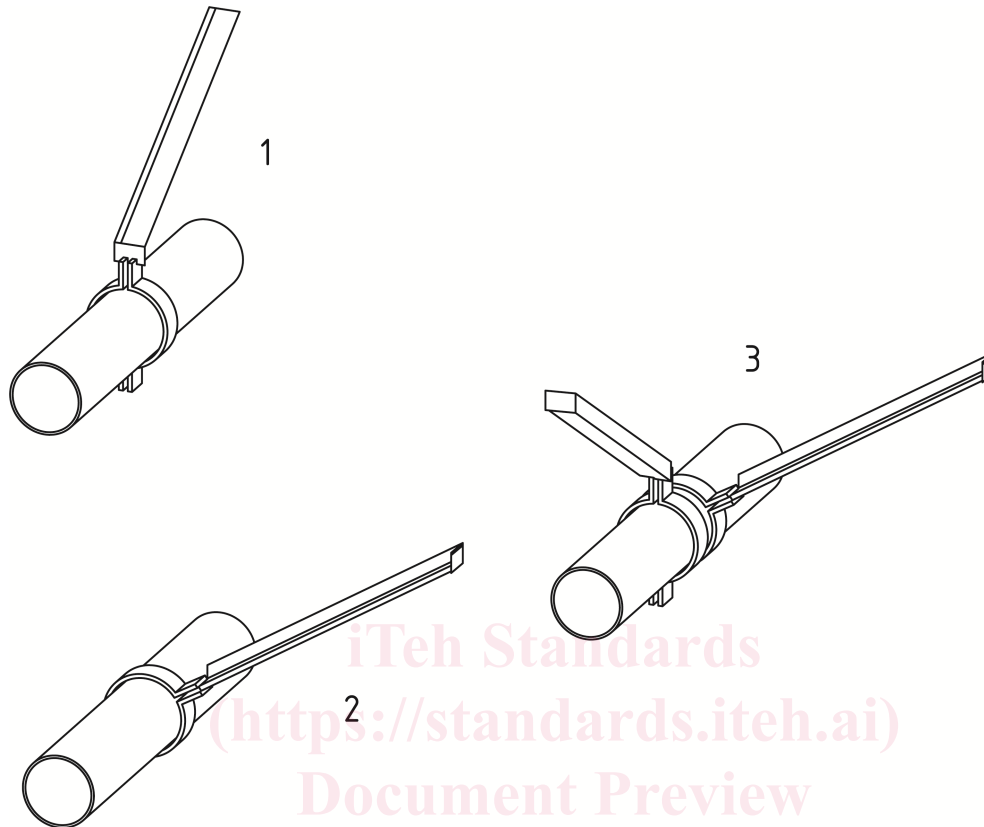
5 Sway bracing and sprinkler pipe support**5.1 General**

The requirements given in this document are additional to the requirements for pipe support given in EN 12845. Sway bracing of steel pipes for sprinkler systems minimize differential movements between the piping system and the structure to which it is attached.

Actual design of sway bracing is based on horizontal seismic load. Acceptable sway bracing type, orientation and attachment methods (to both the sprinkler pipe and the structure) shall simultaneously provide adequate resistance to both the horizontal seismic load and the net vertical uplift force component resulting from the horizontal seismic load less any effective offset to that vertical force component due to sprinkler piping dead weight.

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For sprinkler piping within a building, there are two types sway bracing designs two-way and four-way. Figure 1 shows two-way and four-way braces. They may be either longitudinal or lateral. Longitudinal and lateral braces shall resist differential movement parallel and perpendicular, respectively, to the axis of the pipe, regardless the slope of the pipe, and may be used on trunk mains, distribution pipes, regardless of size, and system range pipes that are DN65 and larger in diameter (see 5.2.2.5.2 and 5.2.2.5.3).

**Key**

- | | | | |
|---|----------------------------|---|----------------|
| 1 | two-way brace longitudinal | 3 | four-way-brace |
| 2 | two-way brace lateral | | |

Figure 1 — Sway bracing identification

For sway braces to protect the fire sprinkler pipelines against damage from earthquakes, their components (with the exception of concrete anchors or dowels, see 5.2.5.3) shall be designed for a seismic load capacity using a minimum 1,5 safety factor over the design earthquake load.

5.2 Sway brace design

5.2.1 Steps in designing sway brace

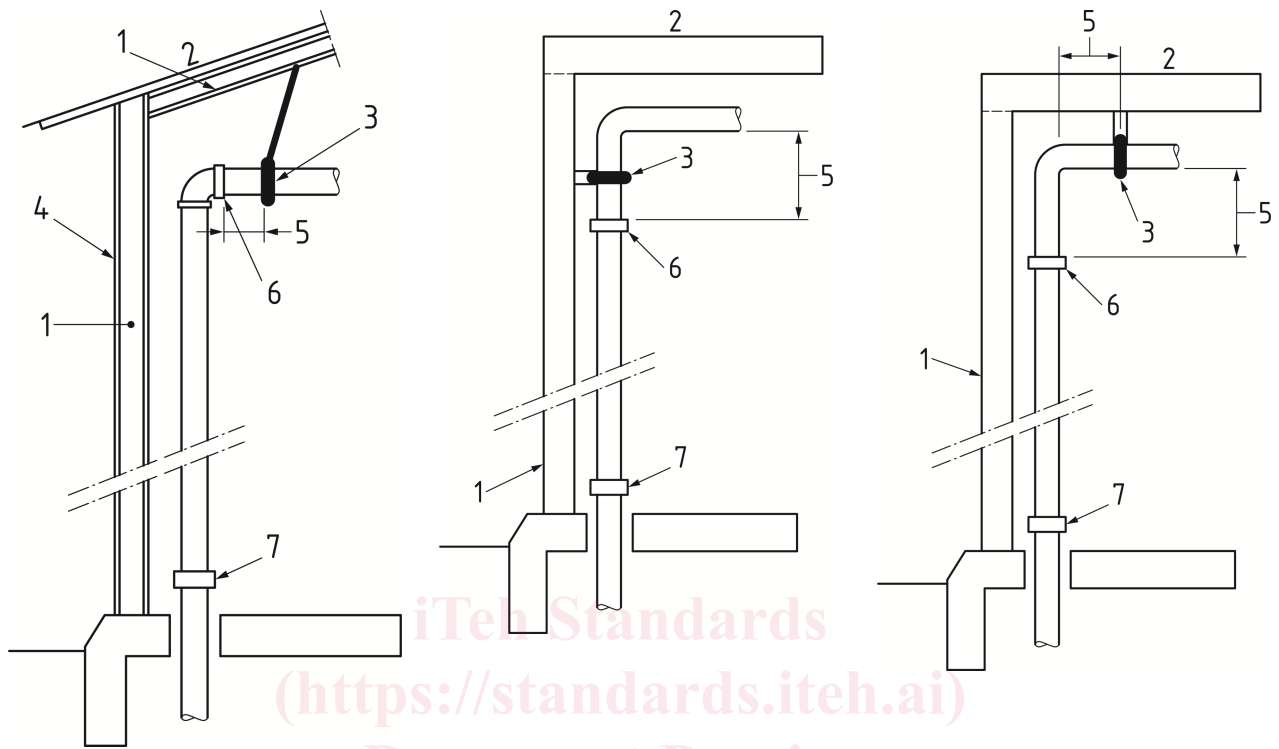
There are four general steps to properly design sway bracing.

- Step 1: Define sway bracing locations with respect to the sprinkler piping and to the structural members to which the bracing will be attached.
- Step 2: Calculate the horizontal seismic design load for each sway bracing location.
- Step 3: Select the proper sway bracing shape, angle of attachment, size and maximum length based on the horizontal design load requirement.
- Step 4: Select the proper method to attach the sway bracing to the structure and to the piping.

5.2.2 Step 1, define sway bracing locations

5.2.2.1 Risers

A four-way sway brace shall be provided for all sprinkler risers within 0,6 m of the top of the riser (see 5.2.2.5.4 for exceptions). Brace shall be attached to a structural element for risers located either on the outside or on the inside of the building. Any riser shall be braced individually. See Figure 2 and 3.

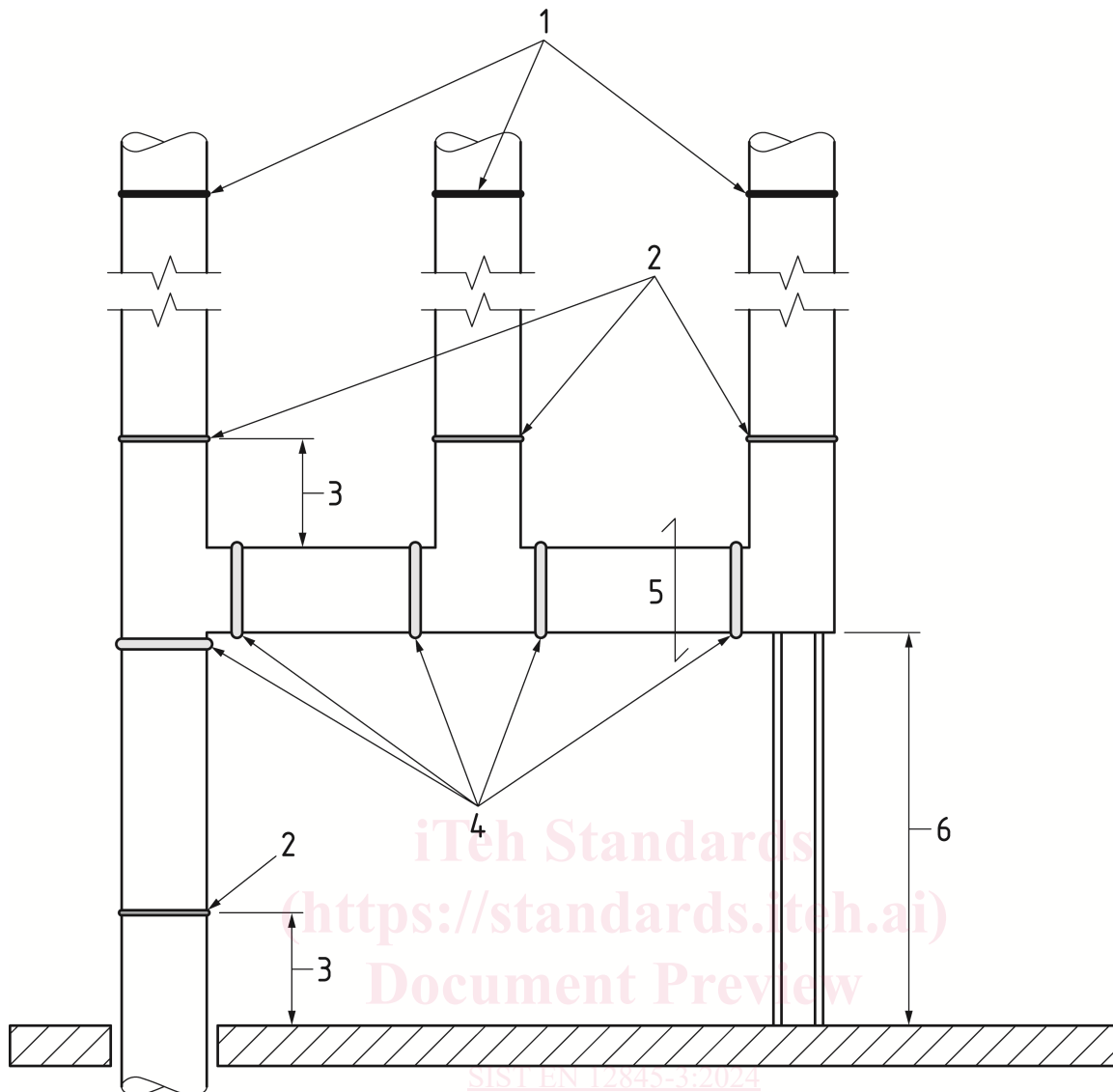


Key

- | | |
|---|----------------------------|
| 1 structural element (given as example- roof could be sloped or flat) | 5 0,6 m maximum |
| 2 roof | 6 elbow, flexible coupling |
| 3 4-way brace | 7 flexible coupling |
| 4 cladding (not structural element) | |

Figure 2 — Examples of locations of 4-ways sway bracing and flexible couplings for riser

Four-way sway bracing shall be provided at an interval (vertical distance) not to exceed 12 m. Where flexible couplings are used provide flexibility as per Clause 4 and see 6.2.2, four-way sway bracing shall be provided within 0,6 m of every other flexible coupling, with no more than two flexible couplings between sway brace locations. See Figure 3. On risers with multiple horizontal outlets a four-way brace shall be provided at each outlet.

**Key**

- | | | | |
|---|---|---|----------------------------------|
| 1 | 4-way sway bracing at top of riser and flexible couplings within 0,6 m (as shown in Figure 2) | 5 | lateral sway bracing |
| 2 | flexible couplings | 6 | manifold support (0,9 m maximum) |
| 3 | 0,6 m maximum | | |
| 4 | rigid coupling | | |

Figure 3 — Location of 4-ways sway bracing and flexible couplings for riser with manifold

A two-way lateral sway brace shall be provided within 0,6 m of the end of any horizontal manifold piping longer than 1,8 m, or when there is one or more flexible coupling(s) on either the horizontal manifold piping or on the riser stub between the floor and the connection to the horizontal manifold piping.

Four-way sway bracing shall be provided at both the top and bottom of the vertical pipe 1,8 m long or more. Each brace shall be located within 0,6 m of the respective piping turn. In addition, flexible couplings shall be provided at the top and bottom.