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PROPERTY INSURANCE COMMITTEE Prevention Specifications

Specifications for Sprinkler Systems Requirements and test methods for K 57, K 80, K 115 and K 160 Sprinklers

CEA 4023: December 1999 (en)

(EFSAC endorsed)

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Contents

Foreword 3

1 Scope 3

2 References 3

3 Definitions 3

4 Requirements 4

4.1 Requirements and test methods of prEN 12259-1:1997 4

4.2 Droplet size of K 160 sprinklers 4

4.3 Single K 160 sprinklers water distribution..... 4

5 Test methods 4

5.1 Droplet size test for K 160 sprinklers 4

5.2 Water distribution test for single K 160 sprinklers 5

6 Amendment to prEN 12259-1:1997 6

6.1 Amendment to clause 4.2 of prEN 12259-1:1997, Dimensions 6

6.2 Amendment to clause 4.5.1 of prEN 12259-1:1997, K-factor 6

6.3 Amendment to clause 4.5.2.1 of prEN 12259-1:1997, Water distribution;
conventional, spray, flat spray and dry pattern sprinklers 7

6.4 Amendment to Annex C of prEN 12259-1:1997, Water flow test..... 7

6.5 Amendment to Annex D of prEN 12259-1:1997, Water distribution test 7

6.6 Amendment to Annex N of prEN 12259-1:1997, Water hammer test..... 9

6.7 Amendment to Annex P of prEN 12259-1:1997, Thermal response test..... 10

Foreword

It has been assumed in the preparation of these CEA Specifications that the execution of their provisions is entrusted to appropriately qualified and experienced organisations.

NOTE: All pressure data in these CEA Specifications are given as gauge pressures in bar¹⁾.

¹⁾ bar = 10⁵ Pa

1 Scope

These CEA Specifications specify requirements for construction and performance of Sprinklers, which are operated by a change of state of a fusible element or bursting of a glass bulb under the influence of heat, in automatic sprinkler systems conforming to the Comité Européen Des Assurances Rules for Sprinkler Systems Planning and Installation.

These CEA Specifications are applicable to

- spray pattern sprinklers with K-factors 57, 80, 115 and 160 and
- conventional, flat spray and sidewall pattern sprinklers with K-factors 57, 80 and 115

These CEA Specifications specify requirements and test methods for these sprinklers

- by reference to the Draft European Standard for Sprinklers (prEN 12259-1: 1997) or
- detailed description of additional requirements and test methods in these CEA Specifications.

Special attention should be paid to the fact that these CEA Specifications include K 160 sprinklers, which are not covered by prEN 12259-1: 1997.

2 References

These CEA Specifications incorporate by dated or undated references, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to these CEA Specifications only when incorporated in them by amendment or revision. For undated references the latest edition of the publication referred to applies.

CEA	-	Rules for Sprinkler Systems Planning and Installation
prEN 12259-1 1997	-	Fixed fire-fighting systems - Components for sprinkler and water spray systems - Part 1: Sprinklers

3 Definitions

For the purpose of these CEA Specifications the definitions of prEN 12259-1:1997 and the following definitions apply.

K 160 sprinkler: Spray sprinkler with a flow constant nominal K-factor value of 160.

4 Requirements

4.1 Requirements and test methods of prEN 12259-1:1997

Sprinklers shall fulfil the requirements of prEN 12259-1:1997 including the amendment described in clause 6.

Sprinklers shall be tested in accordance with prEN 12259-1:1997 including the amendment described in clause 6.

4.2 Droplet size of K 160 sprinklers

The droplet size of K 160 sprinklers shall be known and shall be tested as described in clause 5.1.

When tested in accordance with clause 5.1, the average droplet size distribution for each measurement circle shall be as follows:

- at a pressure of 0.5 bar: 50 % of the mass of water shall be delivered in droplets equal to or larger than 2 mm in diameter
- at a pressure of 4 bar: 50 % of the mass of water shall be delivered in droplets equal to or larger than 1 mm in diameter.

4.3 Single K 160 sprinklers water distribution

When a single K 160 sprinkler is tested in accordance with clause 5.2, using the parameters given in columns 1 and 2 of table 1, it shall meet the requirements specified for water coverage in columns 3 and 4 of Table 1.

Table 1: Water distribution requirements for single K 160 sprinkler tests

1	2	3	4
Distance ceiling/containers [mm]	Flow [l/min]	Min. collection on 9 m ² [%] ¹⁾	Min. collection on 25 m ² [%] ¹⁾
2700	112.5	45	85
2700	270	45	85
¹⁾ % of the total water flow			

5 Test methods

5.1 Droplet size test for K 160 sprinklers

1 single sprinkler shall be tested. Two tests shall be conducted with the flow rates 113 l/min (at 0.5 bar) and 320 l/min (at 4 bar).

Install, in a test chamber, one sprinkler on a pipe with a nominal internal diameter 50 mm in accordance with the manufacturer’s instructions. Ensure the yoke arms of the sprinkler are parallel to the pipe. Position upright sprinklers with a distance of (50 ± 5) mm and pendent sprinklers with a distance of (275 ± 5) mm between the ceiling and the deflector. The ceiling shall be of minimum dimensions 5 m x 5 m.

Measure the droplet size on 1 horizontal measurement area (perpendicular to the sprinkler axis) at a distance of $(2,7 \pm 0,025)$ m from the ceiling, at least on 6 measurement circles with diameters 1 m, 2 m, 3 m, 4 m, 5 m and 6 m. On each circle, the average droplet size is either measured by rotating the sprinkler respectively the measurement apparatus or the local droplet size is measured on measurement points in steps of maximum 15° .

Each measurement shall be conducted until the measure is stable.

The test apparatus may be a phase doppler anemometer or a momentum measuring device. By using the momentum measuring device, the droplet velocity will be assumed to be caused by gravity only, and the droplet diameter is then calculated from the droplet mass.

5.2 Water distribution test for single K 160 sprinklers

3 single sprinklers shall be tested. With each sprinkler, two tests with the distance ceiling/containers given in column 1 of table 1 and the water flow given in column 2 of table 1 shall be conducted.

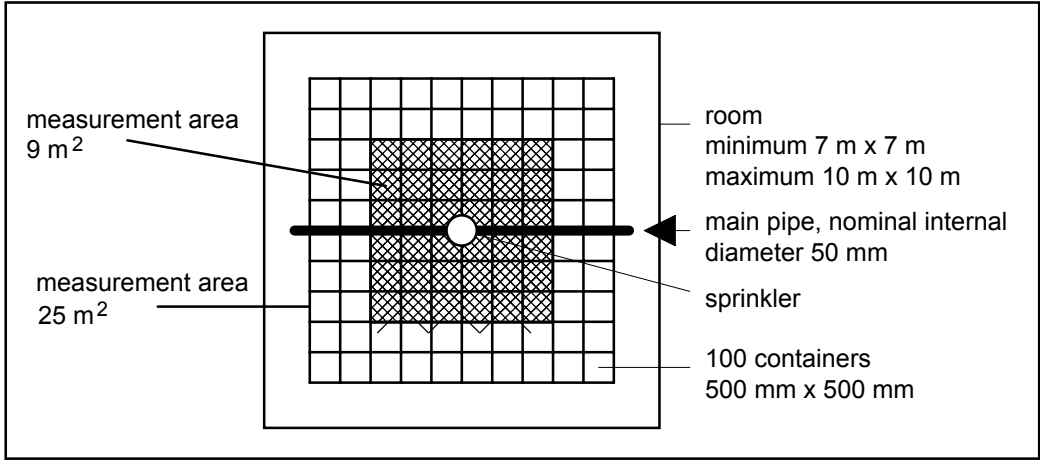
Install, in a test chamber of minimum dimensions 7 m x 7 m and maximum dimensions 10 m x 10 m, one sprinkler on piping prepared for this purpose. Use the arrangement of the piping, sprinkler and containers shown in figure 1. Ensure the yoke arms of the sprinkler are parallel to the main pipe.

Position upright sprinklers in accordance with the manufacturer’s instructions with a distance of (50 ± 5) mm and pendent sprinklers in accordance with the manufacturer’s instructions with a distance of (275 ± 5) mm between the ceiling and the deflector.

Position the upper edge of the measuring containers in relation to the ceiling in accordance with the measurements given in column 1 of table 1. Collect the water for at least 120 s or until a measurement has been recorded. Measure the volume of water distributed over the measurement area indicated in figure 1.

Determine the flow rate of water into each of the designated containers and analyse the results to determine compliance with table 1.

Figure 1: Layout of water distribution collection room for single K 160 sprinklers



6 Amendment to prEN 12259-1:1997

NOTE: Sentences and tables meant to change or to be added to prEN 12259-1:1997 are given in italics.

6.1 Amendment to clause 4.2 of prEN 12259-1:1997, Dimensions

6.1.1 Changed table 1:

Table 1: Orifice and thread dimensions

<i>Nominal diameter of orifice [mm]</i>	<i>K-factor [l min⁻¹ bar^{-1/2}]</i>	<i>Nominal pipe thread size [in]</i>
<i>10</i>	<i>57</i>	<i>3/8</i>
<i>15 and 20</i>	<i>80 and 115</i>	<i>1/2</i>
<i>20</i>	<i>115</i>	<i>3/4</i>
<i>25</i>	<i>160</i>	<i>3/4</i>

6.1.2 Additional sentence in clause 4.2.3:

Sprinkler having a 25 mm nominal diameter orifice in combination with a 3/4 in nominal thread size, shall have a pintle, (10 ± 2) mm long and having a diameter of (5 ± 2) mm, permanently attached at the deflector for identification purposes.

6.2 Amendment to clause 4.5.1 of prEN 12259-1:1997, K-factor

Changed table 4:

Table 4: K-factors

<i>Nominal diameter of orifice [mm]</i>	<i>K-factor [l min⁻¹ bar^{-1/2}]</i>	
	<i>Sprinklers other than dry types</i>	<i>Dry sprinklers</i>
<i>10</i>	<i>57 ± 3</i>	<i>57 ± 5</i>
<i>15</i>	<i>80 ± 4</i>	<i>80 ± 6</i>
<i>20</i>	<i>115 ± 6</i>	<i>115 ± 9</i>
<i>25</i>	<i>160 ± 8</i>	<i>160 ± 13</i>

6.3 Amendment to clause 4.5.2.1 of prEN 12259-1:1997, Water distribution; conventional, spray, flat spray and dry pattern sprinklers

Changed wording of whole clause 4.5.2.1:

4.5.2.1 Conventional, spray, flat spray and dry pattern sprinklers

When sprinklers are tested in accordance with D.1, using the parameters given in columns 3, 4 and 5 of table 5, the number of containers in which the quantity of water corresponds to less than 50% of the water coverage specified in column 6 of table 5 shall be not more than the appropriate maximum specified in column 7 of table 5.

Table 5: Water distribution parameters

1	2	3	4	5	6	7
Nominal diameter of orifice [mm]	K-factor [l min ⁻¹ bar ^{-1/2}]	Flow rate per sprinkler [l/min]	Measurement area [m ²]	Sprinkler spacing [m]	Water coverage [mm/min]	Maximum number of containers with a lower content of water
10	57	50.6	20.25	4.5	2.5	8
15	80	61.3	12.25	3.5	5.0	5
15	80	135.0	9.00	3.0	15.0	4
20	115	90.0	9.00	3.0	10.0	4
20	115	187.5	6.25	2.5	30.0	3
25	160	112.5	9.00	3.0	12.5	3
25	160	270.0	9.00	3.0	30.0	3

6.4 Amendment to Annex C of prEN 12259-1:1997, Water flow test

Changed wording of explanation A of figure C.1:

A: Steel tube nominal internal diameter 40 mm (in the case of K 160 sprinklers 50 mm), medium weight (in accordance with ISO 65)

6.5 Amendment to Annex D of prEN 12259-1:1997, Water distribution test

6.5.1 Changed wording of whole Annex D.1:

D.1 Conventional, spray, flat spray sprinklers (including dry types)

Install, in a test chamber of minimum dimensions 7 m x 7 m and maximum dimensions 10 m x 10 m, four sprinklers of the same type, arranged in a square, on piping prepared for this purpose. Use the arrangement of the piping, sprinklers and containers shown in figures D.1 to D.4. Ensure the yoke arms of the sprinklers are parallel to the range pipes.

Position upright sprinklers with a distance of (50 ± 5) mm and pendent sprinklers with a distance of (275 ± 5) mm between the ceiling and the deflector. Mount K 160 sprinklers in accordance with the manufacturer's instructions.

Mount flush pattern, concealed and recessed sprinklers in a false ceiling of dimensions not less than 5 m x 5 m, arranged symmetrically in the test chamber. Fit the sprinklers directly into the horizontal pipework by means of "tee" or "elbow" fittings.

Collect the water for a period of at least 120s or until a measurement has been recorded. Measure the water distributed over the measurement area between the four sprinklers by means of square measuring containers with sides of (500 ± 10) mm, positioned with a distance of $(2,7 \pm 0,025)$ m between the ceiling and the upper edge of the measuring containers. Additionally, test flat spray sprinklers with a distance of $(0,3 \pm 0,025)$ m between the deflector and the upper edge of the measuring containers. Position the measuring containers centrally in the room, beneath the four sprinklers as shown in figures D.1 to D.4.

Determine the number of containers in which the quantity of water corresponds to less than 50% of the water coverage given in table 5, column 6.

Figure D.1: Layout of water distribution test chamber (measurement area 20,25 m²)

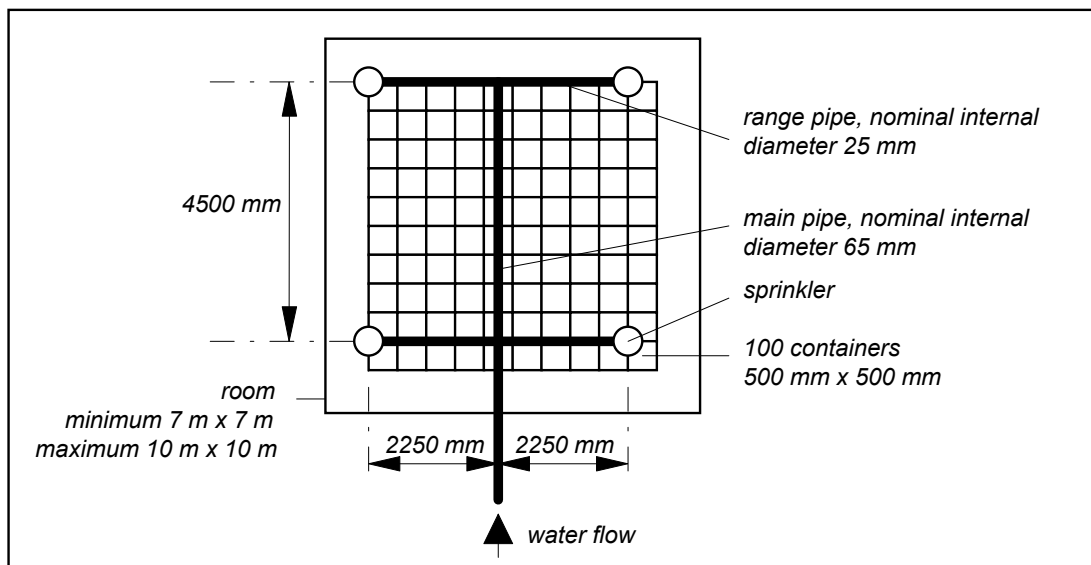


Figure D.2: Layout of water distribution test chamber (measurement area 12,25 m²)

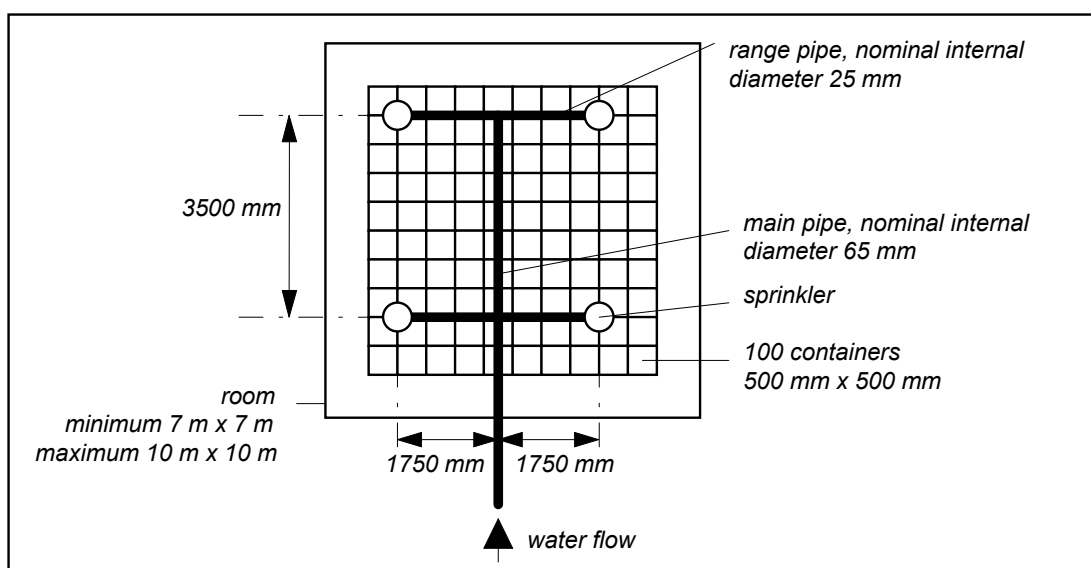


Figure D.3: *Layout of water distribution test chamber (measurement area 9 m²)*

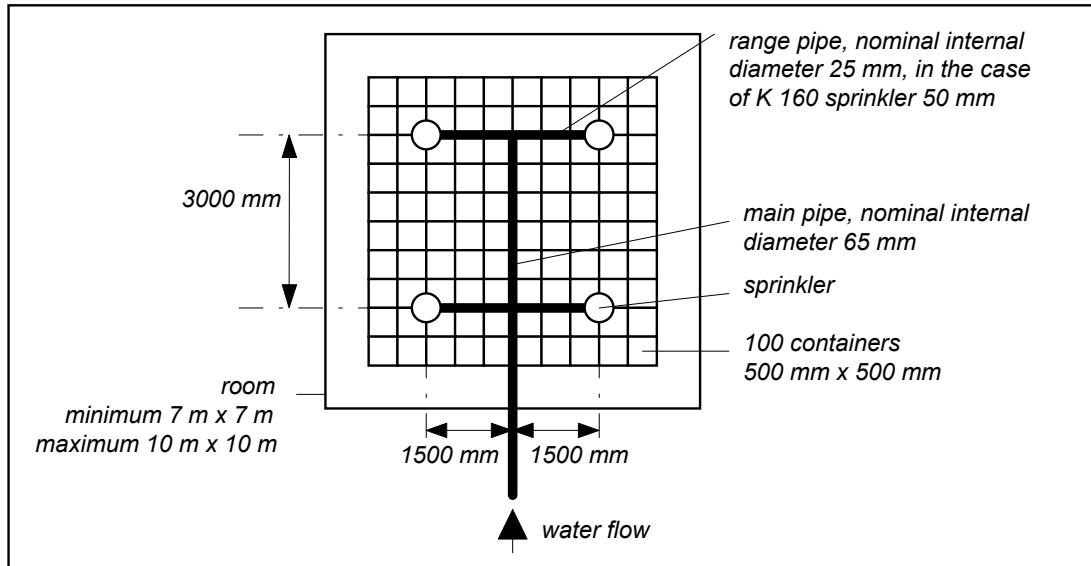
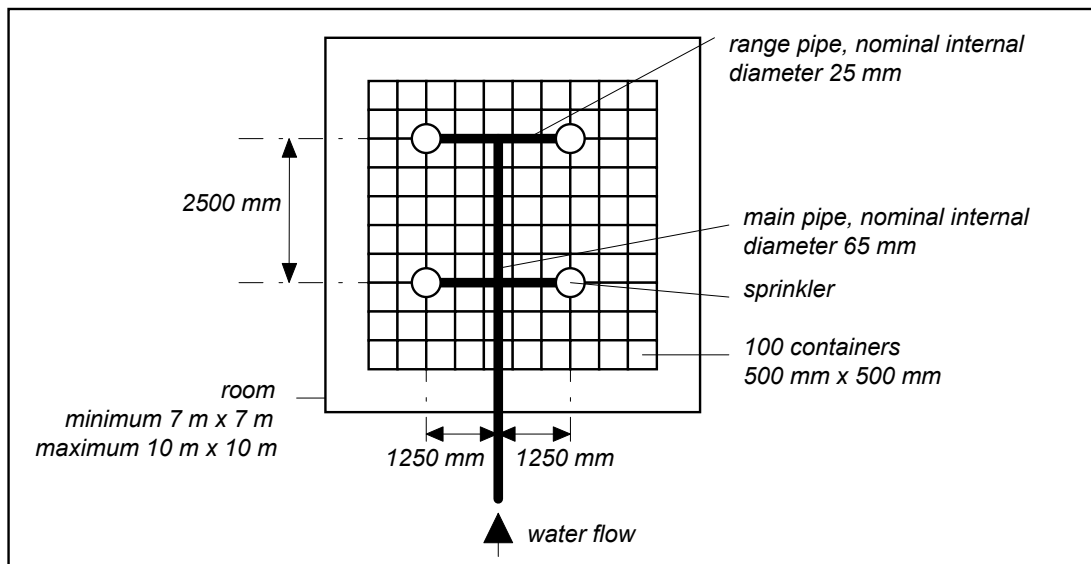


Figure D.4: *Layout of water distribution test chamber (measurement area 6.25 m²)*



6.5.2 Changed tolerance in Annex D.3, Figures D.7 and D.8:

Read: " 15 ± 10 " instead of 15 ± 1 for partition thickness

6.5.3 Changed note B in Figure D.7:

Read: "B: Circular hole ((400 ± 3) mm diameter), edges chamfered, edge angle 10° "

**6.6 Amendment to Annex N of prEN 12259-1:1997,
Water hammer test**

Changed wording of third sentence:

Subject the sprinklers to a pressure cycle, rising from (4 ± 2) bar to $(25 -0/+5)$ bar at a rate not exceeding 100 bar/s, after which the pressure shall be returned to (4 ± 2) bar.

**6.7 Amendment to Annex P of prEN 12259-1:1997,
Thermal response test**

6.7.1 Changed tolerance in Annex P.2, first paragraph:

Read: "...air stream velocity of (1 ± 0.15) m/s..."

6.7.2 Changed foot note (2) in table P.1:

(2) *The selected air velocity shall be known and maintained constant within the test section throughout the test to an accuracy of $\pm 0,15$ m/s for each selected velocity.*