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Ordinance for Technical Specifications pertaining to Automatic Closed Sprinkler Heads  
(Ordinance of the Ministry of Home Affairs No. 2 of January 12, 1965)

Latest update: Ordinance of the Ministry of Internal Affairs and Communications No. 157 of December 26, 2008

In accordance with the provision of Article 21-2(2) of the Fire Service Act (Act No. 186 of 1948), the Ordinance for Technical Specifications pertaining to Automatic Closed Sprinkler Heads shall be specified as follows.

#### Purport

Article 1 This Ordinance covers the technical specifications applicable to automatic closed sprinkler heads (hereinafter referred to as “heads”).

#### Definitions

Article 2 In this Ordinance, the meanings of the terms listed in the following items shall be as prescribed respectively in those items.

(i) Standard head: The head that uniformly distributes the pressurized water in a circular form around the axis of the head.

(i-ii) Small-division head: The variation of standard head that distributes the pressurized water to the area prescribed in Article 14(ii)(a) and the wall prescribed in Article 14(ii)(b).

(i-iii) Tap water direct-connected head: The variation of small-division head used by the sprinkler system whose piping is connected to the tap water line.

(ii) Sidewall head: The head that uniformly distributes the pressurized water in a semicircular form around the axis of the head.

(iii) Deflector: The device that directs the water flow ejected from the discharge port.

(iv) Design load: The load that has been determined in the design in order to assemble the head.

(v) Indicated temperature: The temperature that is indicated on the head and shows the threshold at which the head will work.

(vi) Maximum ambient temperature: The temperature calculated from the following equation. (For the heads whose indicated temperature is less than 75°C, this quantity shall be 39°C.)

$$t_a = 0.9t_m - 27.3$$

where,

$t_a$ : Maximum ambient temperature

$t_m$ : Indicated temperature of the head

(vii) Discharge pressure: The static pressure of the sprayed water measured in the flow regulating cylinder shown in Appended Figure 1.

(viii) Frame: The section that connects the head mount and the deflector.

(ix) Fusible link: The heat sensitive component jointed with or composed of fusible metal material (i.e., the

component that will be broken or deformed to operate the head when it is heated to reach the predetermined temperature; hereinafter the same shall apply in the next item).

(x) Glass bulb: The heat sensitive component where the material such as liquid is sealed in a cylindrical glass.

#### Structure

Article 3 Heads shall meet the following structural requirements.

(i) During the handling, including installation to piping, the head shall not generate damage or deformation that affects the functions.

(ii) All components that will be separated from the head during the operation of the sprinkler shall be detached and thrown without disturbing the water spray.

(iii) Such the measures shall be arranged that the load applied to the assembled head may not be readjusted.

(iv) The head shall not generate functional degradation due to suspended matter such as dust.

(2) Head mount screws shall be formed into external taper pipe thread having the nominal designation shown in the following table or an equivalent designation in accordance with the nominal head size classification specified in that table. The subject external taper pipe thread shall conform to JIS (refers to the Japanese Industrial Standards prescribed in Article 17(1) of the Industrial Standardization Law (Act No. 185 of 1949); the same shall apply hereinafter) B 0203.

Nominal head size /// Nominal designation of mount screw

8, 10, 15 /// R (1 ÷ 2)

20 /// R (1 ÷ 2) or R (3 ÷ 4)

#### Material

Article 4 Heads shall meet the following material requirements.

(i) The material shall not affect the performance even if its properties change because of aging.

(ii) The head mount and frame shall be made of the material prescribed in JIS H 5120 or H 5121 or the material having the mechanical strength, corrosion resistance, and heat resistance equivalent to or higher than those achieved by the material specified in any of these JIS standards.

(ii) The deflector shall be made of the material prescribed in JIS H 3100, H 5120, or H 5121 or the material having the mechanical strength, corrosion resistance, and heat resistance equivalent to or higher than those achieved by the material specified in any of these JIS standards.

#### Strength test

Article 5 In accordance with the indicated temperature classification specified in the following table, the head shall be exposed to the test temperature prescribed in that table or the indicated temperature minus 15°C, whichever is lower, for 30 days. Then, the static hydraulic pressure of 2.5 MPa is applied to the head for 5 minutes. After the test, the head shall not generate water leak.

Indicated temperature classification /// Test temperature

Under 75°C /// 52°C

75°C to 121°C, not incl /// 80°C

121°C to 162°C, not incl /// 121°C

162°C to 200°C, not incl /// 150°C

200°C or over /// 190°C

(2) Even when the maximum impact acceleration of 100 G (G shall be a gravitational acceleration) is input to the head 5 times in an arbitrary direction, the head shall not generate functional degradation.

(3) When the tensile load twice the design load is applied to the head in its axial direction, the permanent transformation generated in the frame shall be not more than 50% of the transformation observed at the design load.

#### Strength of fusible link

Article 6 When the load 13 times the design load is applied to the fusible link in the air at 20°C (maximum ambient temperature minus 20°C if the indicated temperature is 75°C or more) for 10 days, the link shall not be damaged.

#### Strength of glass bulb

Article 7 The glass bulb is heated to the temperature at which air bubbles in the glass bulb completely disappear (if the air bubbles do not disappear even at 93% of the indicated temperature, that 93% temperature shall be the final value) at the rate of 1°C per minute, starting from the indicated temperature minus 20°C, and is left in the air until it is cooled to the ordinary temperature. After this test cycle is repeated 6 times, the glass bulb shall not generate troubles.

(2) The glass bulb is heated to the indicated temperature minus 10°C at the rate of 1°C per minute, starting from the indicated temperature minus 20°C, and this final temperature is maintained for 5 min. When the glass bulb is put into water at 10°C, it shall not be cracked or damaged.

(3) When the load 4 times the design load is applied to the glass bulb in the axial direction of the head, it shall not be cracked or damaged.

#### Strength of the detachable unit

Article 8 When the external load twice the design load is applied to the head in its axial direction, its detachable unit shall not be broken.

#### Vibration test

Article 9 When the vibration characterized by double amplitude of 5 mm and 1500 cycles per minute is input to the head for 3 h and then the pressure of 2.5 MPa is applied for 5 minutes, the head shall not generate water leak.

#### Water hammer test

Article 10 When the pressure fluctuation where the pressure is changed between 0.35 and 3.5 MPa per second is continuously applied to the head 4000 times by using a piston pump and then the pressure of 2.5 MPa is applied for 5 minutes, the head shall not generate water leak.

#### Corrosion test

Article 10-2 When the head is immersed in aqueous nitric acid solution with density of 50% for 30 s, rinsed with water, and immersed into aqueous mercury nitrate solution with density of 10 g/L for 30 min, it shall not be cracked or damaged.

(2) When the head is subjected to the specified corrosion test, it shall not generate functional degradation. The test sequence is as follows: Pour 500 mL of aqueous sodium thiosulfate solution with a density of 40 g/L in a 5-L beaker; dilute sulfuric acid using distilled water and control the ratio of sulfuric acid to distilled water at 1:35 in volume percent and prepare 156 mL of this solution and add it to 1000 mL of water; add 10 mL of the aqueous sulfuric acid solution to the aqueous sodium thiosulfate solution every 12 h to generate sulfur dioxide gas; and place the head in this sulfur dioxide atmosphere for 4 days.

#### Operation test

Article 11 When the head is placed in a liquid vessel and heated from its indicated temperature minus 10°C at the rate of not more than 1°C per minute, the measured head operation temperature shall stay within the range from 97% to 103% of the indicated temperature (from 95% to 115% for the head equipped with glass bulb).

(2) When the head with glass bulb is subjected to the test prescribed in Article 7(1), the measured temperature at which air bubbles in the glass bulb completely disappear shall stay within the range from 97% to 103% of the standard bubble elimination temperature.

(3) When the head is slantingly mounted so that its axial line stays within the range from upright to 45° tilt position and water is sprayed at the discharge pressure of 0.1 MPa (for the tap water direct-connected head, this pressure shall be the minimum discharge pressure (0.02 MPa or the discharge pressure achieved at the discharge volume of 15 L/min, whichever larger; the same shall apply hereinafter)), it shall work normally.

#### Sensitivity test

Article 12 When the head is exposed to the horizontal air stream under the test conditions provided in the following table in accordance with the head's indicated temperature and type classifications specified in that table, it shall work within the time calculated by the equation specified below.

Indicated temperature classification /// Head type /// Test conditions

Temperature of air stream, °C /// Velocity of air stream, m/s

Under 75°C /// Type 1 /// 135 /// 1.8 /// Type 2 /// 197 /// 2.5

75°C to 121°C; not incl /// Type 1 /// 197 /// 1.8 /// Type 2 /// 291 /// 2.5

121°C to 162°C; not incl /// Type 1 /// 291 /// 1.8 /// Type 2 /// 407 /// 2.5

162°C or over /// Type 1 /// 407 /// 1.8 /// Type 2 /// 407 /// 2.5

$$t = \tau \times \log_e [1 + \{(\theta - \theta\gamma) \div \delta\}]$$

where,

t: Operating time, s

$\tau$ : Time constant, s (50 for type 1 head and 250 for type 2 head)

$\theta$ : Indicated temperature of the head, °C

$\theta\gamma$ : Temperature of head before test, °C

$\delta$ : Difference between air stream and indicated temperatures, °C

#### Discharge volume test

Article 13 When the total discharge volume of the head is measured at the discharge pressure of 0.1 MPa (minimum discharge pressure for the tap water direct-connected head), the parameter K in the equation below shall stay within the allowable range prescribed in the following table in accordance with the nominal designation classification specified in that table.

$$Q = K\sqrt{10P}$$

Where,

Q: Discharge volume, L/min

P: Discharge pressure, MPa

K: Flow constant

Nominal designation /// 8/// 10 /// 15 /// 20

Allowable range of K /// Application value: 30 to 50; not incl  $(1 \pm (5/10))$  ///  $50 \times (1 \pm (5/100))$  ///  $80 \times (1 \pm (5/100))$  ///  $114 \times (1 \pm (5/100))$  ///

#### Water spray distribution test

Article 14 When water is sprayed under the pressure ranging from 0.1 to 1 MPa, the spray distribution of the head shall meet the following requirements.

(i) Standard head (except for small-division head): When the amount of water sprayed to the water collection measures, all of which are round dishes having the head axis center as their centers, is measured by using the water spray distribution test apparatus shown in Appended Figure 2; the distribution curve plotted by using the mean collected water volumes in these water collection measures shall be located above the curve in Appended Figure 3 (this curve is only applicable to the effective water spray radius (hereinafter referred to as “r”) of 2.3 or the curve in Appended Figure 4 (this curve is only applicable to r2.6). At least 60% of the total discharge volume shall be within the radius of 300 cm (limited to r2.3) or within the radius of 330 cm (limited to r2.6); and the difference of water volume among these concentric water collection measures shall be minimum.

(ii) The small-division head shall meet the following requirements.

(a) When the amount of water sprayed to the water collection measures is measured by using the water spray distribution test apparatus shown in Appended Figure 2, the mean collected water volumes in these water collection measures within the radius of 260 cm (the head axis center is the center of this circle) shall be not less than 0.2 L/min; and the water collection volume of each measure shall be not less than 0.02 L/min.

(b) When the amount of the water sprayed to the walls is measured by using the wall surface water spray distribution test apparatus shown in Appended Figure 5, the mean collected water volume for each wall shall be not less than 2.5 L/min. In this case, the water sprayed shall effectively wet the floor and the wall area ranging from the bottom to the position 0.5 m below the ceiling.

(iii) Sidewall head: When the amount of water sprayed to the water collection measures is measured by

using the water spray distribution test apparatus shown in Appended Figure 6, the mean collected water volumes in those measures mounted at the front of the head and parallel to the wall shall be located above the curve in Appended Figure 7; the mean collected water volumes in those measures mounted on both sides of the head and placed on the lines perpendicular to the wall shall be located above the curve in Appended Figure 7; the difference of water volumes among these water collection measures shall be minimum; and the water sprayed shall wet the wall.

(2) Tap water direct-connected head: When the amount of water sprayed to the water collection measures at the minimum discharge pressure is measured by using the water spray distribution test apparatus shown in Appended Figure 8, the mean collected water volumes in these measures shall be not less than 0.08 L/min; and the water collection volume of each measure shall be not less than 0.02 L/min.

(3) The provision in Paragraph (1) (except for Items (i) and (iii)) shall apply mutatis mutandis to the water spray distribution of the tap water direct-connected head. In this case, descriptions “0.1 MPa” in Paragraph (1), “0.2 L/min” in Item (ii)(a) of the paragraph, and “2.5 L/min” in Item (ii)(b) of the paragraph shall be deemed to be replaced with “0.05 MPa or the discharge pressure achieved at the discharge volume of 30 L/min, whichever is larger,” “0.08 L/min,” and “not less than 0.8 L/min and the volume of water sprayed to four walls shall be 4 L in total,” respectively.

#### Indication

Article 15 The information specified in the following items shall be indicated on all heads at easily observable place in such the manner that the subject information may not be readily erased.

(i) Manufacturer’s name or trademark

(ii) Year of manufacture

(iii) Indicated temperature and color determined by indicated temperature classification specified in the following table

Indicated temperature classification /// Color

Under 60°C /// Black

60°C to 75°C; not incl /// None

75°C to 121°C; not incl /// White

121°C to 162°C; not incl /// Blue

162°C to 200°C; not incl /// Red

200°C to 260°C; not incl /// Green

260°C or over /// Yellow

(iv) Direction of installation

(v) Type 1: Term “○1” or “QR”

(vi)  $r = 2.6$ : Term “2.6”

(vii) Small-division head (except for tap water direct-connected head): Term “Small” or “S” and flow constant K

(viii) Tap water direct-connected head: Term “W,” flow constant K, or 0.05 MPa or the discharge pressure achieved at the discharge volume of 30 L/min, whichever is larger

#### Exemption from standards

Article 16 When the Minister of Internal Affairs and Communications recognizes that heads newly created as a result of technology development activities have the performance equivalent to or higher than those conforming to the provisions prescribed in this Ordinance, judging from their profiles, structures, materials, and performance, the technical standards specified by the Minister of Internal Affairs and Communications shall apply to these new developments notwithstanding the provisions of this Ordinance.

#### Supplementary Provisions

This Ordinance shall come into effect as of June 1, 1965.

#### Supplementary Provisions (Ordinance of the Ministry of Home Affairs No. 1 of January 27, 1976)

(1) This Ordinance shall come into effect as of February 1, 1976.

(2) For tests pertaining to automatic closed sprinkler heads whose application for test has been already made to have the fire extinguishing equipment apparatus tested by the Japan Fire Equipment Inspection Institute at the time of enforcement of this Ordinance, the provisions then in force shall remain applicable.

(3) For automatic closed sprinkler heads that have already got model approvals and automatic closed sprinkler heads that have got model approvals based on the results from the tests identified by the prescription “provisions then in force shall remain applicable” as described in the preceding paragraph at the time of enforcement of this Ordinance, their model approvals shall be still effective by January 31, 1978.

#### Supplementary Provisions (Ordinance of the Ministry of Home Affairs No. 7 of March 18, 1987)

This Ordinance shall come into effect as of the day of promulgation.

#### Supplementary Provisions (Ordinance of the Ministry of Home Affairs No. 7 of September 13, 1995)

(1) This Ordinance shall come into effect as of October 1, 1995.

(2) For tests pertaining to automatic closed sprinkler heads whose application for test has been already made to have the target equipment tested by the Japan Fire Equipment Inspection Institute at the time of enforcement of this Ordinance, the provisions then in force shall remain applicable.

(3) For automatic closed sprinkler heads that have already got model approvals and automatic closed sprinkler heads that have got model approvals based on the results from the tests identified by the prescription “provisions then in force shall remain applicable” as described in the preceding paragraph at the time of enforcement of this Ordinance, their model approvals shall be deemed as those provided in accordance with the standards prescribed in the amended Ordinance for Technical Specifications pertaining to Automatic Closed Sprinkler Heads.

#### Supplementary Provisions (Ordinance of the Ministry of Home Affairs No. 37 of September 29, 1997)

This Ordinance shall come into effect as of October 1, 1997.

Supplementary Provisions (Ordinance of the Ministry of Home Affairs No. 37 of September 28, 1998)-Excerpt

Effective date

Article 1 This Ordinance shall come into effect as of October 1, 1999.

Transitional measures

Article 2 For tests pertaining to fire extinguishers, fire extinguishing agents, automatic closed sprinkler heads, fire hoses, deluge valves, foam concentrates, detectors and manual call points, water flow detecting devices, plug-in couplings, and screw couplings whose application for test has been already made to have the target equipment tested by the Japan Fire Equipment Inspection Institute at the time of enforcement of this Ordinance, the provisions then in force shall remain applicable.

(2) For fire extinguishers that have already got model approvals and fire extinguishers that have got model approvals based on the results from the tests identified by the prescription “provisions then in force shall remain applicable” as described in the preceding paragraph at the time of enforcement of this Ordinance, their model approvals shall be deemed as those provided in accordance with the standards prescribed in the Ordinance for Technical Specifications pertaining to Fire Extinguishers amended according to the provisions of Article 1.

(3) For fire extinguishing agents that have already got model approvals and fire extinguishing agents that have got model approvals based on the results from the tests identified by the prescription “provisions then in force shall remain applicable” as described in Paragraph (1) at the time of enforcement of this Ordinance, their model approvals shall be deemed as those provided in accordance with the standards prescribed in the Ordinance for Technical Specifications pertaining to Fire Extinguishing Agents amended according to the provisions of Article 2.

(4) For automatic closed sprinkler heads that have already got model approvals and automatic closed sprinkler heads that have got model approvals based on the results from the tests identified by the prescription “provisions then in force shall remain applicable” as described in Paragraph (1) at the time of enforcement of this Ordinance, their model approvals shall be deemed as those provided in accordance with the standards prescribed in the Ordinance for Technical Specifications pertaining to Automatic Closed Sprinkler Heads amended according to the provisions of Article 3.

(5) For fire hoses that have already got model approvals and fire hoses that have got model approvals based on the results from the tests identified by the prescription “provisions then in force shall remain applicable” as described in Paragraph (1) at the time of enforcement of this Ordinance, their model approvals shall be deemed as those provided in accordance with the standards prescribed in the Ordinance for Technical Specifications pertaining to Fire Hoses amended according to the provisions of Article 4.

(6) For deluge valves that have already got model approvals and deluge valves that have got model approvals based on the results from the tests identified by the prescription “provisions then in force shall remain applicable” as described in Paragraph (1) at the time of enforcement of this Ordinance, their model approvals shall be deemed as those provided in accordance with the standards prescribed in the Ordinance for Technical Specifications pertaining to Deluge Valves amended according to the provisions of Article 5.

(7) For foam concentrates that have already got model approvals and foam concentrates that have got model approvals based on the results from the tests identified by the prescription “provisions then in force shall remain applicable” as described in Paragraph (1) at the time of enforcement of this Ordinance, their model approvals shall be deemed as those provided in accordance with the standards prescribed in the Ordinance for Technical Specifications pertaining to Foam Concentrates amended according to the



provisions of Article 6.

(8) For detectors and manual call points that have already got model approvals and detectors and manual call points that have got model approvals based on the results from the tests identified by the prescription “provisions then in force shall remain applicable” as described in Paragraph (1) at the time of enforcement of this Ordinance, their model approvals shall be deemed as those provided in accordance with the standards prescribed in the Ordinance for Technical Specifications pertaining to Detectors and Manual Call Points of Fire Detection and Fire Alarm Systems amended according to the provisions of Article 7.

(9) For water flow detecting devices that have already got model approvals and water flow detecting devices that have got model approvals based on the results from the tests identified by the prescription “provisions then in force shall remain applicable” as described in Paragraph (1) at the time of enforcement of this Ordinance, their model approvals shall be deemed as those provided in accordance with the standards prescribed in the Ordinance for Technical Specifications pertaining to Water Flow Detecting Devices amended according to the provisions of Article 8.

(10) For plug-in couplings that have already got model approvals and plug-in couplings that have got model approvals based on the results from the tests identified by the prescription “provisions then in force shall remain applicable” as described in Paragraph (1) at the time of enforcement of this Ordinance, their model approvals shall be deemed as those provided in accordance with the standards prescribed in the Ordinance for Technical Specifications pertaining to Plug-in Couplings used for Fire Hoses amended according to the provisions of Article 11.

(11) For screw couplings that have already got model approvals and screw couplings that have got model approvals based on the results from the tests identified by the prescription “provisions then in force shall remain applicable” as described in Paragraph (1) at the time of enforcement of this Ordinance, their model approvals shall be deemed as those provided in accordance with the standards prescribed in the Ordinance for Technical Specifications pertaining to Screw Couplings used for Fire Hoses or Fire Suction Hoses amended according to the provisions of Article 12.

(12) For power driven fire pumps that were notified to the Minister of Home Affairs in accordance with the provision of Article 21-16-4(1) of the Fire Service Act (Act No. 186 of 1948) before the enforcement of this Ordinance, they shall be deemed as those that conform to the standards prescribed in the Ordinance for Technical Specifications pertaining to Power Driven Fire Pumps amended according to the provisions of Article 9.

(13) For fire suction hoses that were notified to the Minister of Home Affairs in accordance with the provision of Article 21-16-4(1) of the Fire Service Act before the enforcement of this Ordinance, they shall be deemed as those that conform to the standards prescribed in the Ordinance for Technical Specifications pertaining to Fire Suction Hoses amended according to the provisions of Article 10.

Supplementary Provisions (Ordinance of the Ministry of Home Affairs No. 44 of September 14, 2000)

This Ordinance shall come into effect as of the effective date (January 6, 2001) of the Act for Partial Revision of Cabinet Law (Act No. 88 of 1999).

Supplementary Provisions (Ordinance of the Ministry of Internal Affairs and Communications No. 157 of December 26, 2008)

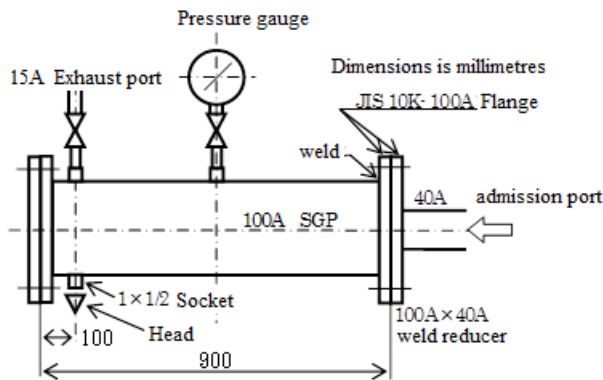
Effective date

Article 1 This Ordinance shall come into effect as of the day of promulgation.

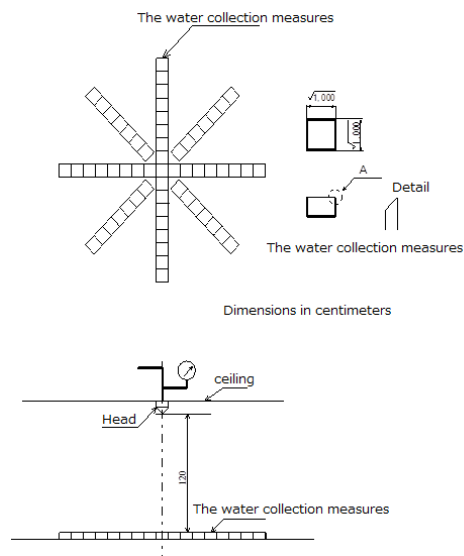
Transitional measures

Article 2 For automatic closed sprinkler heads that have already got model approvals at the time of enforcement of this Ordinance, their model approvals shall be deemed as those provided in accordance with the standards prescribed in the amended Ordinance for Technical Specifications pertaining to Automatic Closed Sprinkler Heads.

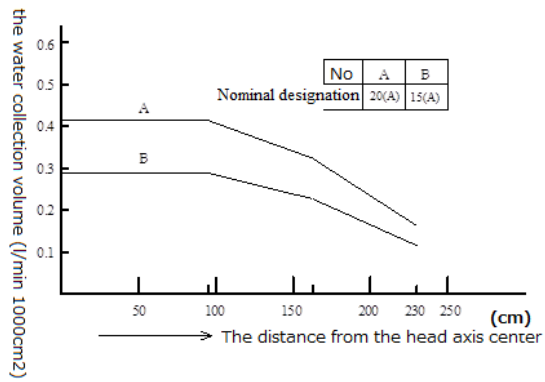
Appended Figure 1 Flow regulating cylinder (relative to Article 2)



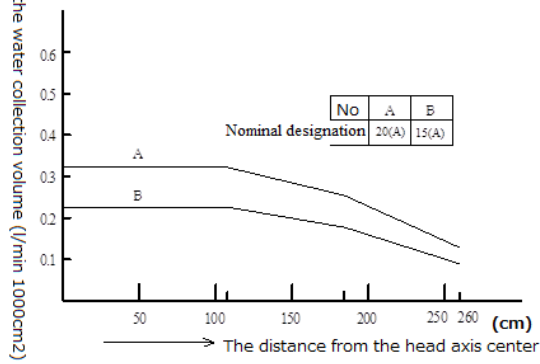
Appended Figure 2 Water spray distribution test apparatus for standard and small-division heads (relative to Article 14)



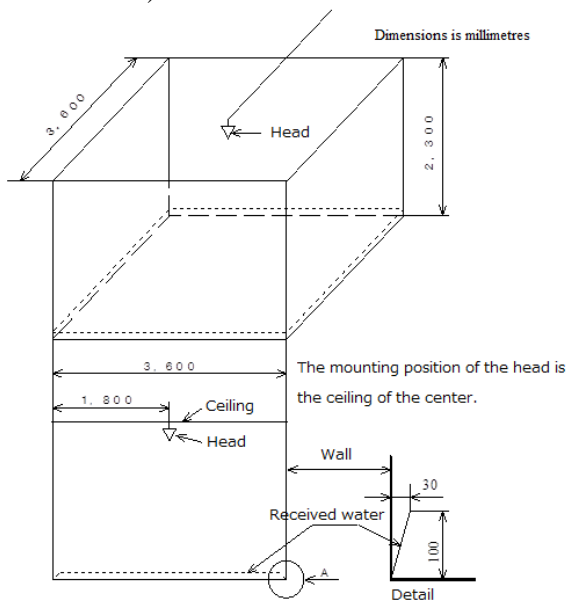
Appended Figure 3 Water spray distribution curve for standard head (r2.3) (relative to Article 14)



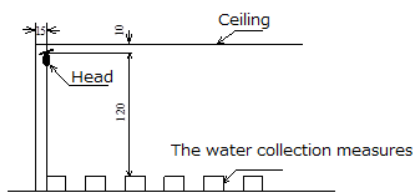
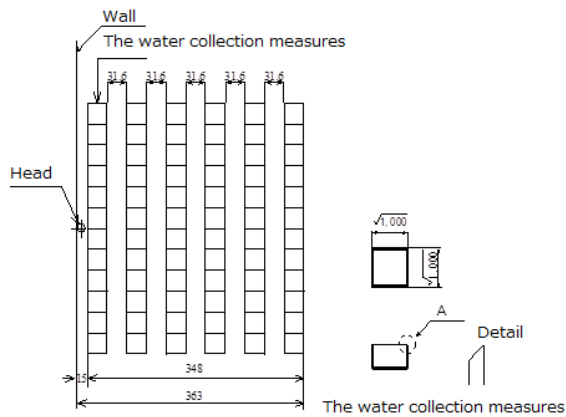
Appended Figure 4 Distribution curve for standard head (r2.6) (relative to Article 14)



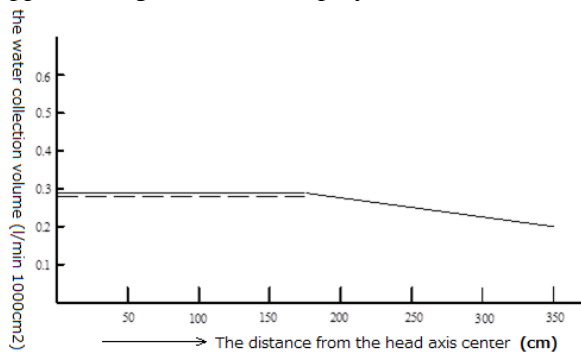
Appended Figure 5 Wall surface water spray distribution test apparatus for small-division head (relative to Article 14)



Appended Figure 6 Water spray distribution test apparatus for sidewall head (relative to Article 14)



Appended Figure 7 Water spray distribution curve for sidewall head (relative to Article 14)



Appended Figure 8 Water spray distribution test apparatus for tap water direct-connected head (relative to Article 14)

