

The acquisition and management of meteorological precipitation data —

Part 3: Specification for raingauges —

Section 3.1: Storage raingauges

ICS 07.060

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- British Hydrological Society
- British Waterways Board
- Chartered Institution of Water and Environmental Management
- Department of the Environment, Transport and the Regions — Water Land Directorate
- Environment Agency
- Institution of Civil Engineers
- Water UK

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- Institute of Hydrology
- Scottish Environment Protection Agency
- The Met. Office

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Foreword

This section of BS 7843 has been prepared by Technical Committee CPI/113. It constitutes a new section, Section 3.1, of BS 7843-3, and complements BS 7843-1 and BS 7843-2. No other standard has been superseded or withdrawn.

BS 7843-1 and BS 7843-2 provide guidance on procedures for the measurement of meteorological precipitation, and for the collection, quality control, archiving and exchange of the data obtained from the measurement. BS 7843-1 describes the users' criteria, and the design of raingauge networks to enable the desired data to be obtained. BS 7843-2 gives guidance on practical aspects of field work for the acquisition of the data, and for the subsequent transmission, quality control and archiving of the data obtained.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 23 and a back cover.

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Introduction

This part of BS 7843 describes the storage gauges referred to in BS 7843-1 and BS 7843-2. These gauge designs have evolved over the last 100 years and provide most of the rainfall records in the National Archive. This does not preclude the manufacture of any other type of raingauge, but the performance of any such raingauge should be related to that of a storage raingauge by practical comparison in field trials covering at least one year.

The daily raingauge specified in this standard is the gauge which should be used for storage measurements in accordance with BS 7843-1 and BS 7843-2. The daily raingauge has a capacity of 90 mm before the bottle overflows into the storage can; the storage can without the bottle has a capacity of 190 mm of rainfall. As a result, the Bradford gauge and the Octapent gauge (both with similar 127 mm funnel diameter) are included in this standard and allow for the measurement of larger monthly and daily rainfall totals typically encountered in upland areas.

A further type of raingauge which is not specified in detail within this standard is known as the Snowdon gauge. The portion of the Snowdon gauge above ground level is almost identical to that of the Met. Office Mk. 2 Daily raingauge, and as a result the accuracy of daily rainfall measurements made with it will meet the requirements of the National Archives. However, the base of the Snowdon gauge is cylindrical in shape and it is hence more easily displaced from the ground, thus causing changes to the height and level of its rim. Hence the Mk. 2 gauge is preferred. However, regular care and attention by the observer can easily correct such problems with the Snowdon gauge, thus ensuring that satisfactory measurements are maintained. If a Snowdon gauge is installed within a vertical tube whose top rim is just below ground level, this can allow its easy removal to facilitate grass cutting around it.

1 Scope

This part of BS 7843 gives specifications for the construction of three types of storage raingauges and two sizes of rain measures which should be used with them.

A broad comparison of the sizes and shapes of the three types of storage raingauge specified in BS 7843 is given, and the detailed construction of these three types of raingauge, together with that of the associated rain measures, is specified.

2 Raingauges

2.1 General

A broad comparison of the sizes and shapes of four types of storage raingauge specified in BS 7843 is shown in Figure 1.

2.2 The Daily rain gauge (Met. Office Mk. 2)

Construction of the components of this type of gauge shall be in accordance with the dimensions and materials specified in Figures 2, 3, 4 and 5.

The outer can (Figure 3) shall be made from 0.6 mm thick copper sheet. The finish on the inside of the outer can shall be natural, grease free and the finish on the outside of the outer can shall be polished and lacquered.

For the inner can (Figure 4) the body shall be made from 0.6 mm thick copper sheet. The handle shall be made from 2.5 mm diameter round brass bar, the rim shall be made from 1.5 mm diameter round brass bar and the handle eyes from 1.5 mm brass sheet. The finish shall be natural, grease free.

For the funnel (Figure 5) the body shall be made from 1.2 mm seamless or brazed updrawn tubing having an internal diameter of 130 mm. The top ring shall be made from brass. The tube shall be made from seamless brass. The funnel shall be made from 0.6 mm copper. The finish inside shall be natural, grease free and on the outside it shall be polished and lacquered.

The funnel shall be checked for ease of fit and correct seating over the top of the outer can. It shall be removable without undue force, but it shall fit firmly to the outer can without rocking.

The inside of the funnel shall be washed with dilute nitric acid by the manufacturer, to remove any grease or flux left behind after manufacture.

2.3 The Bradford raingauge

Construction of the components of this type of gauge shall be in accordance with the dimensions specified in Figures 6, 7, 8, 9 and 10.

The outer can (Figure 7) shall be made either from 127 mm × 1.2 mm seamless drawn copper tube, and 1.2 mm copper sheet, and 0.6 mm diameter brass bar (construction type A) or from 0.7 mm copper sheet (construction type B).

The support pins (detail B, Figure 7) shall be soldered or riveted into the outer can at three equally spaced angular positions. The finish on the inside of the outer can shall be natural, grease free and the finish on the outside of the outer can shall be polished and lacquered.

For the inner can (Figure 8) the body shall be made from 1.6 mm thick copper tube, 114.3 mm $\pm$ 0.25 mm internal diameter. The diaphragm shall be made from 0.6 mm copper sheet. The handle shall be made from 3 mm diameter round brass bar, the base shall be made from 1.6 mm copper sheet and the handle eyes from 2 mm copper sheet. The finish shall be natural, grease free.

For the funnel (Figure 9) the body shall be made from 1.2 mm seamless or brazed updrawn tubing having an internal diameter of 130 mm. The top ring shall be made from brass. The tube shall be made from seamless brass. The funnel shall be made from 0.6 mm copper sheet. The finish inside shall be natural, grease free and on the outside it shall be polished and lacquered.

The funnel shall be checked for ease of fit and correct seating over the top of the outer can. It shall be removable without undue force, but it shall fit firmly to the outer can without rocking.

The inside of the funnel shall be washed with dilute nitric acid by the manufacturer, to remove any grease or flux left behind after manufacture.

The dip rod (Figure 10) shall be made from cedar with the cut edges sealed with varnish. Each full division shall be 24.88 mm apart which represents 2 cm of rain, the engravings shall be 0.4 mm wide, filled black. After final assembly the engraved faces shall be roughened parallel to the scale markings using grade 80 emery cloth.

2.4 The Octapent raingauge Mk. 2a

Construction of the components of this type of gauge shall be in accordance with the dimensions specified in Figures 11, 12, 13, 14, 15 and 16.

The outer can (Figure 12) shall be made from 0.6 mm thick copper sheet. The finish on the inside of the outer can shall be natural, grease free and the finish on the outside of the outer can shall be polished and lacquered.

For the inner can (Figure 13) the body, base, handle eyes and large tube shall be made from 1.6 mm copper. The handle shall be made from 3 mm diameter round brass bar, the top cone and small tube shall be made from 0.6 mm copper and the side plate from 1 mm copper. The finish shall be natural, grease free.

For the funnel (Figure 14), the body, the funnel and cone shall be made from 0.7 mm copper, with the top ring made from brass and the tube from seamless brass. The finish inside shall be natural, grease free and on the outside it shall be polished and lacquered.

The funnel shall be checked for ease of fit and correct seating over the top of the outer can. It shall be removable without undue force, but it shall fit firmly to the outer can without rocking. The inside of the funnel shall be washed with dilute nitric acid by the manufacturer, to remove any grease or flux left behind after manufacture.

The frost protector (Figure 15) shall be made from 50 mm i.d., 5 mm thick ply rubber, with the ring made from 1 mm brass and the plug made from lead. The finish shall be natural. To assemble the frost protector, slip the brass ring over the tube into its place and force the lead plug into the tube.

The dip rod (Figure 16) shall be made from cedar with the cut edge sealed with varnish. Each full division shall be 10.24 mm apart, this represents 20 mm of rain. The engravings shall be 0.4 mm wide, filled black. After final assembly, the engraved faces shall be roughened parallel to the scale markings using grade 80 emery cloth.

3 Rain measures

3.1 The 10mm rain measure

The details of the widely used 10 mm rain measure are shown in Figure 17.

The 10 mm rain measure shall be manufactured from good quality, clear, soda lime glass not less than 1.5 mm thick, of uniform thickness throughout, well annealed and free from striations and other visible defects.

The dimensions and shape of the measure shall be as shown in Figure 17. The portion "A-B" shall be cylindrical, the portion "B-C" shall taper towards the lower end and the open end shall be splayed and shall have a lip "L".

The graduation marks shall be fine, clearly etched and permanent lines of uniform thickness. When the measure is held in a vertical position with the lip to the left, the centres of the graduation marks shall lie in a vertical line down the front of the measure, and all lines shall be horizontal and evenly spaced.

The measure shall be graduated for 0.1 mm of rainfall from 0.1 mm to 10.5 mm with an additional graduation at 0.05 mm. The whole millimetre graduation lines shall be marked on the back of the measure as well as on the front. The 0.05 mm graduation line shall be extended round the measure. The 1 mm mark shall appear on the parallel section of the body of the measure.

Graduations shall be plainly figured, to the right of and immediately opposite the end of the graduation lines. The 0.05 mm graduation extending around the measure shall not be annotated.

The inscription "Gauge diameter 127 mm (5 inches)" shall be marked to the left of the scale.

The inscription "mm" shall be made above the scale between the 10.5 mm graduation mark and the top of the measure.

All graduations, letters and figures shall be not less than 4 mm high and filled permanent white.

The measure shall contain 126.68 cm³ of water when filled to the 10 mm graduation mark, the bottom of the meniscus being in the horizontal plane containing the graduation mark.

The maximum error allowed at the 2 mm graduation and at any higher graduation mark shall be ± 0.05 mm of rainfall. The maximum error allowed at any graduation mark below 2 mm is ± 0.02 mm of rainfall.

3.2 The 50 mm rain measure

The details of the widely used 50 mm rain measure are shown in Figure 18.

The 50 mm rain measure shall be manufactured from good quality clear soda or borosilicate glass not less than 1.5 mm thick, of uniform thickness, well annealed and free from striations and other visible defects.

The dimensions and shape of the measure shall be as shown in Figure 18. The open end shall be splayed and provided with a lip. The measure shall stand vertically on a horizontal surface; if necessary the base shall be ground to achieve this.

The graduation marks shall be fine, clearly etched and permanent lines of uniform thickness. When the measure is placed in a vertical position with the lip to the left, the centres of the graduation marks shall lie in a vertical line down the front of the measure, and all lines shall be horizontal and evenly spaced.

The measure shall be graduated for every 1 mm of rainfall from 2 mm to 50 mm. The 1 mm graduation lines shall be 10 mm long. The 5 mm graduation marks shall be 20 mm long. The 10 mm graduation marks shall be 25 mm long and shall be marked on the back of the measure as well as on the front.

The 10 mm, 20 mm, 30 mm, 40 mm and 50 mm graduation marks shall be boldly figured, at the right hand side opposite the end of the graduation lines.

The inscription "Gauge diameter 127 mm (5 inches)" shall be marked to the left of the scale.

The inscription "mm" shall be made above the scale between the 10.5 mm graduation mark and the top of the measure.

All graduations, letters, and figures shall be not less than 5 mm high and filled permanent white.

The measure shall contain 633.38 cm³ of water when filled to the 50 mm graduation mark, the bottom of the meniscus being in the horizontal plane containing the graduation mark.

The maximum error allowed at any graduation mark is ± 0.2 mm of rainfall.

4 Identification of raingauges

Each raingauge funnel shall be clearly marked with the manufacturer's name, mark, badge or label, together with an indication of the raingauge model or type.

5 Construction of joints

Particular attention shall be given to all the joints.

Soldered joints shall be securely soldered, with no gaps to hold water, and no roughness nor any lumps of solder left on the joints.

Rolled or folded joints shall be checked to ensure tightness and a correct fit between mating parts.

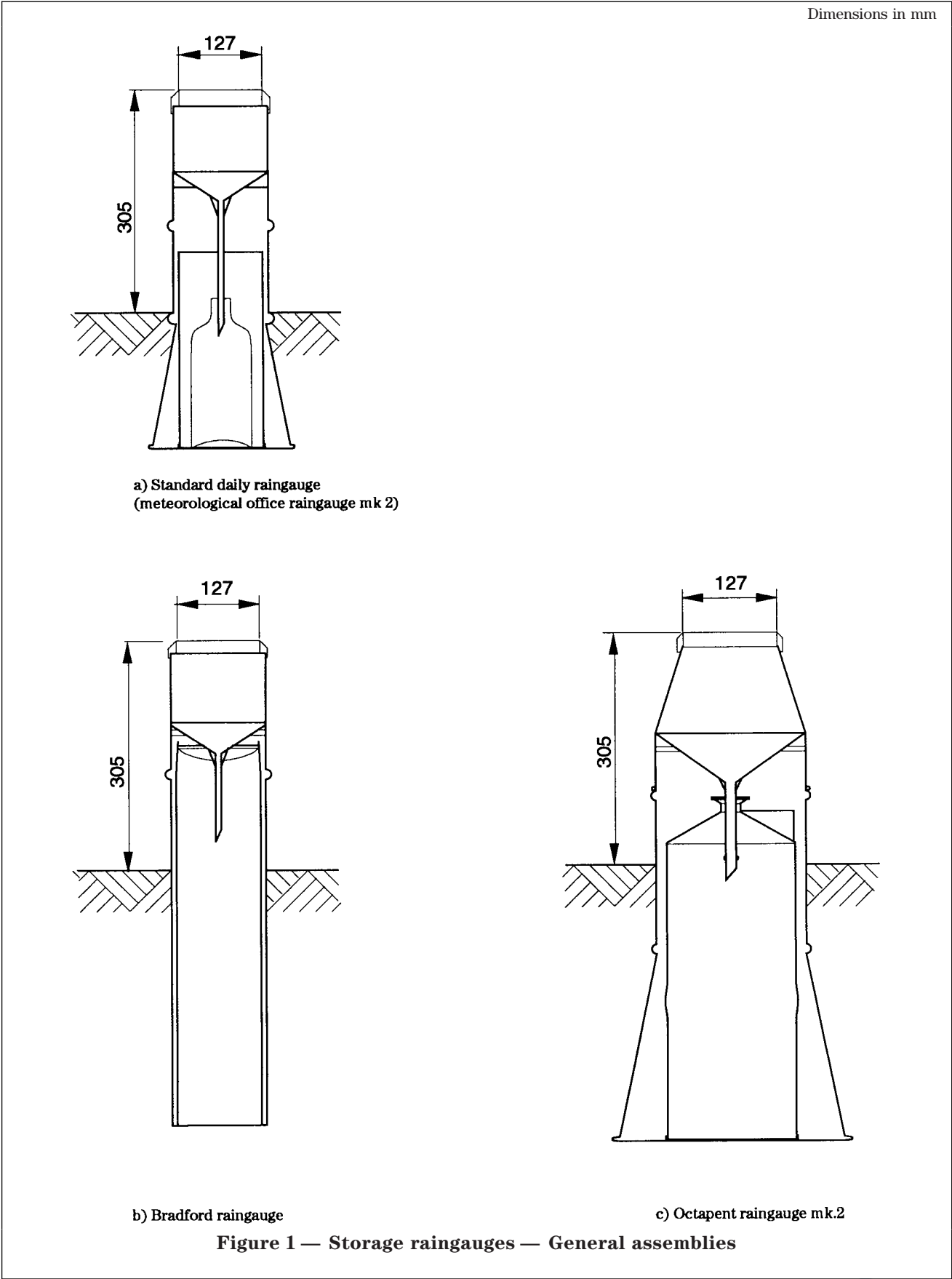
6 Tests for leakage

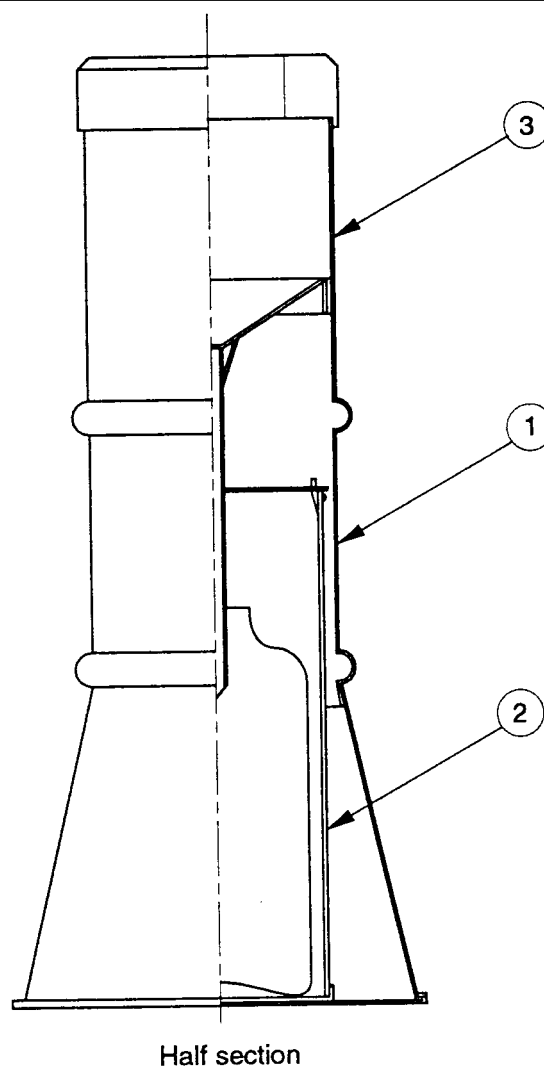
Tests for leakage shall be conducted on each inner can, outer container and funnel as follows.

Each inner can shall be filled with water and left to stand for 2 h. No leaks or seepage shall be apparent.

Each outer can shall be inverted and submerged under water. No bubbles of escaping air shall be apparent.

Each funnel spout shall be sealed by placing a finger over the end of it, and the funnel shall then be inverted and submerged under water. No bubbles of escaping air shall be apparent.





Half section

- 1 Can outer (see Figure 3)
- 2 Can inner (see Figure 4)
- 3 Funnel (see Figure 5)

Figure 2 — Daily raingauge — General assembly