

BS 7843-2:2012



BSI Standards Publication

Acquisition and management of meteorological precipitation data from a raingauge network

Part 2: Code of practice for operating raingauges and managing precipitation data

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Summary of pages

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Foreword

Publishing information

This part of BS 7843 is published by BSI and came into effect on 31 December 2011. It was prepared by Technical Committee CPI/113, *Hydrometry*. A list of organizations represented on this committee can be obtained on request to its secretary.

Supersession

BS 7843-2:2012 supersedes BS 7843-2.2:1996 and BS 7843-2.3:1996, which are withdrawn. Together with BS 7843-1, it also supersedes BS 7843-2.1:1996, which is withdrawn.

Relationship with other publications

BS 7843, *Acquisition and management of meteorological precipitation data from a raingauge network*, comprises four parts.

- *Part 1: Guide for design, development and review of a raingauge network.*
- *Part 2: Code of practice operating raingauges and managing precipitation data.*
- *Part 3: Code of practice for the design and manufacture of storage and automatic collecting raingauges.¹⁾*
- *Part 4: Guide for the estimation of areal rainfall.¹⁾*

Information about this document

This is a full revision of the standard.

Use of this document

As a code of practice, this part of BS 7843 takes the form of guidance and recommendations. It should not be quoted as if it were a specification and particular care should be taken to ensure that claims of compliance are not misleading.

The provisions in this standard are presented in roman (i.e. upright) type. Its recommendations are expressed in sentences in which the principal auxiliary verb is “should”.

The word “may” is used in the text to express permissibility, e.g. as an alternative to the primary recommendation of the clause. The word “can” is used to express possibility, e.g. a consequence of an action or an event.

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

Any user claiming compliance with this British Standard is expected to be able to justify any course of action that deviates from its recommendations.

Presentational conventions

The provisions in this standard are presented in roman (i.e. upright) type. Its recommendations are expressed in sentences in which the principal auxiliary verb is “should”.

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

¹⁾ In preparation. Publication expected early in 2012.

Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

Introduction

Many different types, shapes and sizes of raingauge are acceptable for the measurement of rainfall, each reflecting a specific requirement. Most consist of a circular collecting device, delineating the fixed area of the sample, and a funnel leading into a storage reservoir and/or measuring system. Some types of automatic gauge do not require a funnel.

1 Scope

This part of BS 7843 gives recommendations for all operational practices relating to the site location, installation, inspection and maintenance of the site and raingauge, manual readings, data management, fault management and corrective action, quality control and archiving of precipitation data, and management review.

It is not applicable to the design, development and review of a raingauge network. Such guidance is given in BS 7843-1.

2 Normative references

The following referenced documents are indispensable for the application 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.

BS 7843-1, *Acquisition and management of meteorological precipitation data from a raingauge network – Part 1: Guide for design, development and review of a raingauge network*

BS EN ISO 772:2001, *Hydrometric determinations – Vocabulary and symbols*

3 Terms and definitions

For the purposes of this part of BS 7843, the terms and definitions given in BS EN ISO 772:2001 and the following apply.

3.1 areal precipitation

value of precipitation within a specified time interval averaged over a specified area

3.2 calibration

process which establishes, under specified conditions, the relationship between the values indicated by a raingauge and the corresponding known values indicated by a measurement standard with associated measurement uncertainties

3.3 daily precipitation

total precipitation that accumulates over 24 h ending at 0900 UTC

NOTE Some newspapers and websites attribute the 24 h accumulation measured at 0900 UTC to the previous day.

3.4 data flag

indicator relating to the quality and characteristics of a precipitation value

3.5 exposure

extent of shelter or protection from the weather

- 3.6 inspection**
review of the suitability and effectiveness of all aspects of the site, the equipment and the processes that impact on the quality of precipitation data from the site
- 3.7 maintenance**
process that ensures that the site and equipment continue to function correctly for the measurement of precipitation
- 3.8 manual reading**
measurement of precipitation made by an observer using a storage raingauge and a rain measure
- 3.9 monthly precipitation**
total precipitation from 0900 UTC on the first day of the month to 0900 UTC on the first day of the following month
- 3.10 observer**
person who takes manual readings
- 3.11 observing system**
equipment and processes at the site employed for the measurement of precipitation and the logging and processing of precipitation data
- 3.12 operational (adj)**
undertaken regularly, on a permanent basis and according to well-defined methods
- 3.13 operational performance monitoring**
process for identifying possible problems or incidents with the production of precipitation data on short timescales
NOTE Generally less than 24 h.
- 3.14 precipitation**
water or ice derived from the atmosphere and deposited at ground level
NOTE Measured in terms of the depth in mm of its liquid equivalent.
- 3.15 precipitation metadata**
records relating to the site, the equipment and the operating practices that specify the circumstances under which precipitation measurements are made
- 3.16 production system**
equipment and processes employed for the operational production of precipitation data
- 3.17 quality control**
process for identifying measurements of precipitation which are erroneous to the extent that they lie outside the range of values that might be reasonably expected
NOTE The quality control process includes the provision of best estimates of the true values of erroneous data.
- 3.18 rainfall**
total liquid component of precipitation, including condensation from the atmosphere collected and measured by a raingauge

3.19 rain measure

graduated measuring cylinder made of clear glass or plastic used by the observer for measuring the volume of collected liquid and melted solid precipitation

3.20 raingauge**3.20.1 automatic raingauge**

collecting raingauge that measures rainfall by automatic means

NOTE Also known as a recording rain gauge This may include data processing and logging capability.

3.20.2 collecting raingauge

instrument that collects precipitation falling through an orifice of known cross-sectional area for the measurement of its water equivalent volume, mass or weight accumulated over a measured period

3.20.3 storage raingauge

collecting raingauge that accumulates rainfall and melted solid precipitation in a collecting vessel for manual measurement of its volume

3.21 real-time data

data obtained while the precipitation event to which it relates is occurring

3.22 site

area of ground where a raingauge is deployed for measurement or has been deployed in the past

NOTE Other instruments for measuring the environment may also be deployed at the site.

4 Siting and installation

4.1 Site location**4.1.1 General**

The choice of raingauge site should be based on user requirements, operational constraints and such factors as:

- a) the number and distribution of other precipitation measurements in the locality;
- b) the representativeness of the site with respect to the local area;
- c) the degree of shelter from the wind and the presence of trees or large structures nearby;
- d) the need to meet a specific user requirement in the locality;
- e) the need to collocate precipitation measurements with other environmental measurements, particularly other meteorological or hydrometrical measurements;
- f) the long-term viability of the site for precipitation measurements;
- g) the availability of power at the site (if required);
- h) the security of the site; and
- i) the availability of observers and the accessibility of the site, particularly where daily manual readings are taken.

NOTE 1 These and other factors are considered in more detail in BS 7843-1.

The site should be representative of the local area defined by the typical separation of precipitation sites within the network. In particular, the altitude of the site should not differ greatly from the average for the local area. Ideally, the raingauge should be on level ground with no steep slopes in the area immediately surrounding it.

NOTE 2 The measurement of precipitation is highly dependent on the altitude of the site and the topography.

Where a second raingauge is deployed at the site for check or backup purposes, it should be positioned close to the primary gauge.

NOTE 3 A separation of at least 1.5 m is recommended.

4.1.2 Local terrain

If the only site available is near a terrace, cliff, steep bank or a sharp discontinuity in the slope of the ground, the raingauge should be located no nearer to the feature than a distance equal to four times the height of the feature above the rim in order to minimize the effects of turbulence.

NOTE In particularly mountainous or hilly regions it might not be possible to meet the recommendation for level ground in the immediate vicinity of the raingauge.

4.1.3 Urban sites

Where there are no alternative sites, a flat rooftop or non-standard mounting on top of a long pole may be used, though users should be informed of the large uncertainties in the measurements.

NOTE Urban environments pose severe problems for the accurate measurement of precipitation as urban structures have a large, unpredictable impact on the collection of precipitation and security considerations often greatly limit the choice of site.

4.1.4 Changes in the location of the raingauge

To ensure consistency of measurement the raingauge should be deployed at the same location at all times wherever possible. Where events force a move (e.g. an owner does not allow a sheltering tree to be lopped), a new location for the raingauge should be found as close as possible to the original location to offer the best long-term continuity of measurement. Where the new location is within a horizontal displacement of 400 m of the previous location and the new raingauge altitude is within 15 m of the previous altitude, the change should be treated as a minor change to the deployment at the site for which the details should be recorded by precipitation metadata in accordance with 7.3. Where either of these criteria are exceeded, a new site should be defined.

4.2 Raingauge exposure

4.2.1 General exposure considerations

When choosing a site particular attention should be paid to its exposure to wind. Uniform obstacles in the surrounding area reduce the overall wind speed and improve raingauge collection efficiency, provided such objects are not so large as to cause the wind to eddy and gust to higher speeds near the raingauge nor so close to the raingauge that they prevent precipitation entering the collector.

NOTE The largest errors in the measurement of precipitation are usually caused by the effects of wind in the immediate surroundings of the raingauge. Such errors may be minimized by installing reference raingauges in a ground level raingauge pit. The construction of such a pit for reference purposes is specified in BS EN 13798. This design, though optimum, might not be used widely in the precipitation network on grounds of cost and difficulty of maintenance.

4.2.2 Exposure criteria

One or more of the following methods should be used to reduce overexposure.

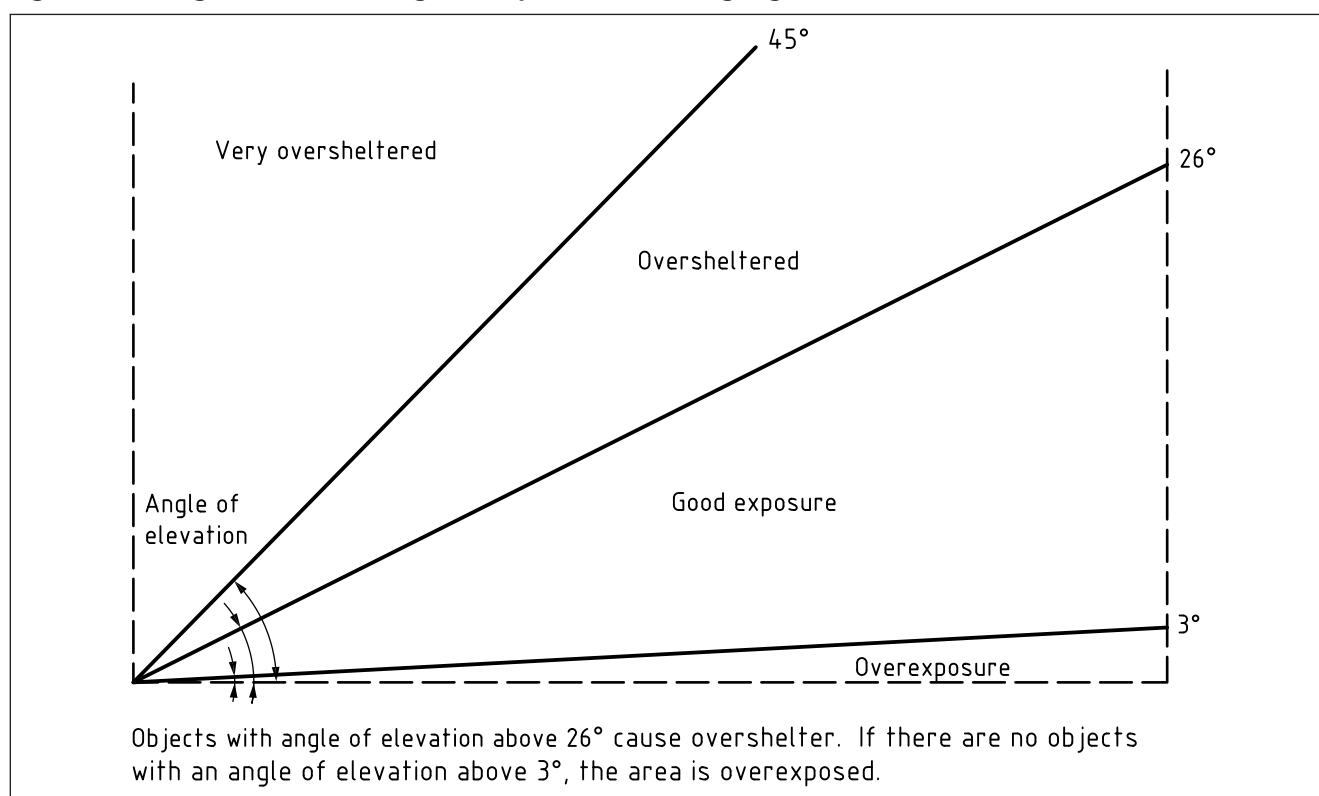
- a) Placing a windshield around the raingauge.
- b) Siting the raingauge in a small hollow or natural dip.
- c) Placing a windbreak in the vicinity of the raingauge.
- d) Building a turf wall.
- e) Installing a ground level raingauge.

NOTE 1 Raingauge sites that are subject to strong winds and have no shelter (e.g. moorland sites) are overexposed (overexposure normally reduces the raingauge catch). Obstacles around the site such as trees or buildings act as windbreaks and can be effective for a distance of up to 30 times their height (2° angle of elevation from the rim of the raingauge to the top of the windbreak). Greater effect is achieved where the distance from the raingauge is 20 times their height [3° angle of elevation (see Figure 1)].

NOTE 2 Sites where the distance between the raingauge and the surrounding objects is less than twice the height of the object above the rim are considered to be underexposed (angle of elevation greater than 26°). Generally, the raingauge catch is reduced by an amount dependent on the wind speed at an underexposed site.

Where possible, only those sites with good exposure (angle of elevation between 3° and 26°) in most azimuth directions, especially in the direction of the prevailing wind, should be selected.

Figure 1 Diagram for assessing the exposure of a raingauge

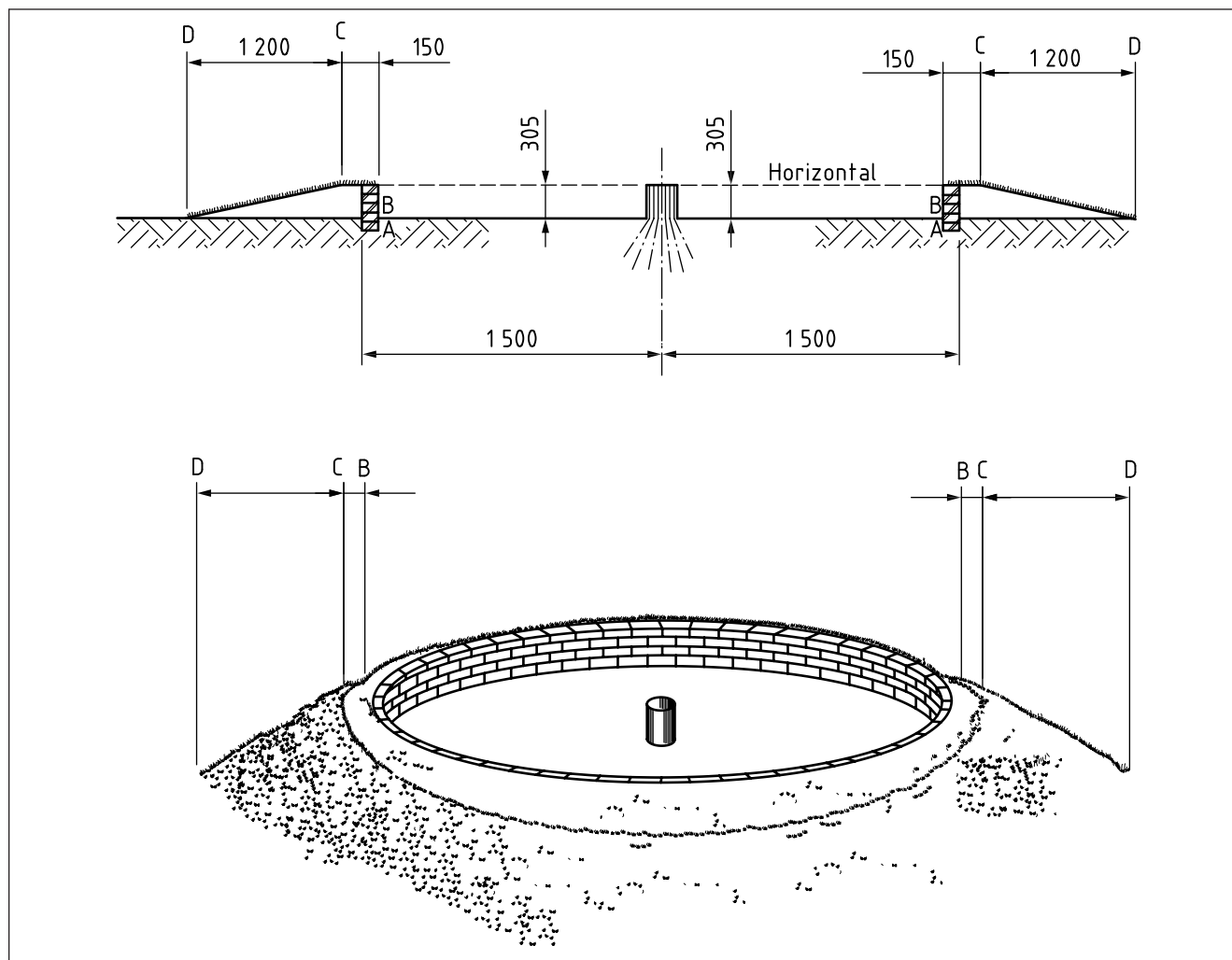


4.2.3 Turf wall construction

A circular turf wall should be erected around any raingauge (see Figure 2 for established UK practice) located in an overexposed, windswept site. The central well should be adequately drained. The raingauge rim should be level with the top of the turf wall, for example, the raingauge may be partially set into the ground.

Where a turf wall encloses more than one raingauge, the height of all the raingauge rims should be level with the top of the turf wall. The raingauges should be installed between 1 m and 1.5 m from the turf wall and any other raingauge.

Figure 2 Turf wall construction



4.3 Raingauge installation

4.3.1 Wherever possible, the raingauge should be placed within a flat area where it can be easily maintained (see 4.1.2 and 4.1.3 for exceptions).

4.3.2 The raingauge should be securely fastened with its rim horizontal at a height above the ground specified by the manufacturer or determined by established practice. Where its base is at ground level a paving slab, small enough not to cause splash-in, may be placed beneath the raingauge to provide a firm base. Some designs allow for deployment on a post while the base of some storage raingauges may be set in the soil. Wherever possible, raingauges in the network should be deployed in a consistent way.