

Guide to the acquisition and management of meteorological precipitation data —

Part 2: Field practices and data management —

Section 2.2 Methods of observation and data tabulation

Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee CPL/113, Flow measurement of surface and ground water, upon which the following bodies were represented:

- British Waterways Board
- Clyde River Purification Board
- Department of the Environment
- Institute of Measurement and Control
- Institution of Civil Engineers
- Institution of Water and Environmental Management
- National Rivers Authority
- Water Services Association of England and Wales

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

- Forth River Purification Board
- Imperial College, London
- Institute of Hydrology
- Meteorological Office

This British Standard, having been prepared under the direction of the Electrotechnical Sector Board, was published under the authority of the Standards Board and comes into effect on 15 July 1996

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The following BSI references relate to the work on this standard:
Committee reference CPL/113
Draft for comment 92/05954 DC

ISBN 0 580 25399 6

Amendments issued since publication

Amd. No.	Date	Comments

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Foreword

This Section of BS 7843 has been prepared by Technical Committee CPL/113. BS 7843 is a new publication and no other standard has been superseded or withdrawn.

This Section is one of a series of related publications on the acquisition and management of meteorological precipitation data, the overall structure of which is as follows:

- *Part 1: Network design;*
- *Section 1.1: The user requirement for precipitation data;*
- *Section 1.2: Network design and monitoring;*
- *Part 2: Field practices and data management;*
- *Section 2.1: Technical aspects in the field;*
- *Section 2.2: Methods of observation and data tabulation;*
- *Section 2.3: Data management;*
- *Section 2.4: Areal rainfall.*

This British Standard 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.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 12, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

British Standard BS 7843 provides guidance on procedures for the observation and measurement of meteorological precipitation, and for the collection, quality control, archiving and exchange in the United Kingdom of the data obtained from the measurements.

Part 1 of BS 7843 describes the data users' criteria, and the design of raingauge networks to enable the desired data to be obtained.

Part 2 of BS 7843 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.

This Section deals with data terminology used in rain and snowfall measurements, the manual and automatic observational methods used and the types of tabulation used to record and to exchange such data.

2 Normative references

This standard incorporates, by dated or undated reference, provisions from other publications. These normative references are made at the appropriate places in the text and the cited publications are listed on the inside back cover. For dated references, only the edition cited applies; any subsequent amendments to or revisions of the cited publication apply to this Section of BS 7843 only when incorporated in the reference by amendment or revision. For undated references, the latest edition of the cited publication applies, together with any amendments.

3 Definitions

For the purposes of this Section of BS 7843, the definitions given in BS 7843-1.1 apply.

4 Data terminology

4.1 General data structure

The variability of data structure requires that rainfall data be archived according to three parameters; rainfall amount, accumulation period over which the rainfall amount was measured and the time of the end of the accumulation period. Often the accumulation period is not specifically stated but is implicit in the fact that measurements are made at regular time intervals.

4.2 Daily rainfall totals

It is standard observing practice that manual measurements are made daily at 0900 UTC; however, because the measurement is an accumulation over 24 h, each observation is credited to the previous day.

4.3 Monthly rainfall totals

Monthly rainfall totals are obtained from the sum of daily values or from monthly raingauges in remote and mountainous areas.

4.4 Sub-daily data

This is a general term for any measurement made over a time interval of less than one day. The following are two common forms of measurement.

a) A tipping-bucket raingauge linked to recording equipment records the time at which a fixed volume of water is measured. Each unit of water is equivalent to a fixed amount of rainfall. The subsequent data pair of time of event and rainfall amount is termed event data.

b) Automatic measurements are obtained from autographic charts taken from tilting siphon raingauges (TSR) which contain a continuous record of rainfall amount against time. Charts may be analysed by hand or by machine and the rainfall amounts are recorded in fixed time increments, e.g. as hourly totals. A more complete representation of the original chart record is obtained by recording the turning points in the record which result in a data record containing variable increments of both time and rainfall amount. Data from such systems are termed autographic chart tabulations and the methods used are discussed in 6.3.

An alternative, recommended form of presenting TSR tabulations involves carrying out the turning point digitization (see 6.3), then changing the results into fixed event increments. This has the advantage that the final data matches that of current tipping bucket instruments.

Measurements made by tipping bucket systems referred to in item a) can be accumulated into fixed time units, e.g. 15 minute periods, which then provide a record having fixed time increments and variable rainfall amounts. Such data are classified as period data.

5 Observing practices

5.1 Time conventions

All daily manual rainfall measurements should be made at 0900 UTC. If this is not possible, the time of reading should be included in any data transfer. Because there are more hours between 0900 UTC and midnight than between midnight and 0900 UTC, the reading taken at 0900 UTC is attributed to the previous day. This feature applies to daily rainfall measurements and to those made less frequently e.g. weekly or monthly readings. All other measurements are attributed to the actual measurement time, in UTC, and represent the accumulation of rainfall since the previous reading.

The following example is given: rain falls between 0200 UTC and 0400 UTC on the 21 October and is measured at a site automatically by a tipping bucket gauge and by the observer at 0900 UTC. The observer measures 2.4 mm and enters it as the daily rainfall for 20 October, the tipping bucket record shows 2.4 mm between 0205 UTC and 0352 UTC on 21 October. When, however, the daily totals are produced from the tipping bucket record its total is registered to show 2.4 mm on 20 October.

Readings from monthly raingauges are made on, or as close as possible after, the beginning of the month (ideally at 0900 UTC like a daily raingauge).

A monthly raingauge reading is allocated to the previous month, i.e. a reading taken covering the period 2 March to 4 April is recorded as the monthly total for March. Subsequent quality control action will adjust the value to compensate for rainfall lost at the beginning of March or gained at the beginning of April.

It is essential that the date and time of reading the gauge are recorded.

5.2 Manual gauges

The amount of precipitation collected by a raingauge should be measured with the aid of a rain measure (see Figure 2 in BS 7843-2.1). Long period weekly or monthly raingauges should be read in two stages, first obtaining a coarse measure by means of a dip stick and then more accurately by pouring the liquid content into the rain measure. The coarse reading should then be compared with the total of the accurate readings as a check against loss of fluid due to spillage or mathematical error.

5.3 Reading the measure

Surface tension causes the surface of the water to be drawn up the glass sides of the measure for a short distance. The resulting concave meniscus should be measured at its lowest point while the measure is held vertically and level with the observer's eye. Duplicate engravings of the main graduations are marked on the back of the measure to reduce parallax errors and to facilitate accurate reading.

Readings should be recorded to the nearest tenth of a millimetre, taking the odd value if exactly midway between two graduations. If the meniscus is seen to be below the 0.05 mm mark, the reading is recorded as a "trace" (TR). Precipitation quantities greater than the capacity of the measure should be totalled from a number of readings.

Every drop of precipitation should be poured from the collecting vessel and, after the reading is complete, the measure should be stored in an inverted position to drain. During inclement weather, it may be appropriate to exchange the collecting vessel in the gauge with a clean one so that losses of precipitation are kept to a minimum and measurement can be done under cover to reduce the risk of spillage and error.

5.4 Measurement of snow

5.4.1 Snow

It is necessary to define snow measurements carefully, as follows.

- a) The depth of new snow is measured at 0900 UTC. Each daily measurement is made on a clear surface which is flush with the previous day's snow surface.
- b) The water equivalent of new snow is obtained by melting "new" snow and is recorded as the daily precipitation measurement.
- c) The total snow depth is measured at 0900 UTC and recorded in centimetres.
- d) The water equivalent of lying snow is obtained by melting snow obtained from an untouched location and will be made up of the day's new snow and any accumulations from previous snowfalls.

In snow conditions, water equivalent of new snow provides the precipitation data in the National Archive, whilst the record of water equivalent of lying snow provides information for hydrologists on unmelted water resources.

5.4.2 Hail and hoar frost

No special distinction is made for hail or hoar frost, when present in the gauge at the time of measurement. They are dealt with as described in 5.4.3 b).

5.4.3 Slight snowfalls

Measurement of slight snowfall in the area of a daily check gauge can easily be accomplished in one of the following two ways.

- a) If precipitation is not falling, the funnel with its snow catch and the collecting bottle may be taken to a warm place to melt while covered to prevent evaporation. The resultant quantity is measured in the usual way (see 5.3).