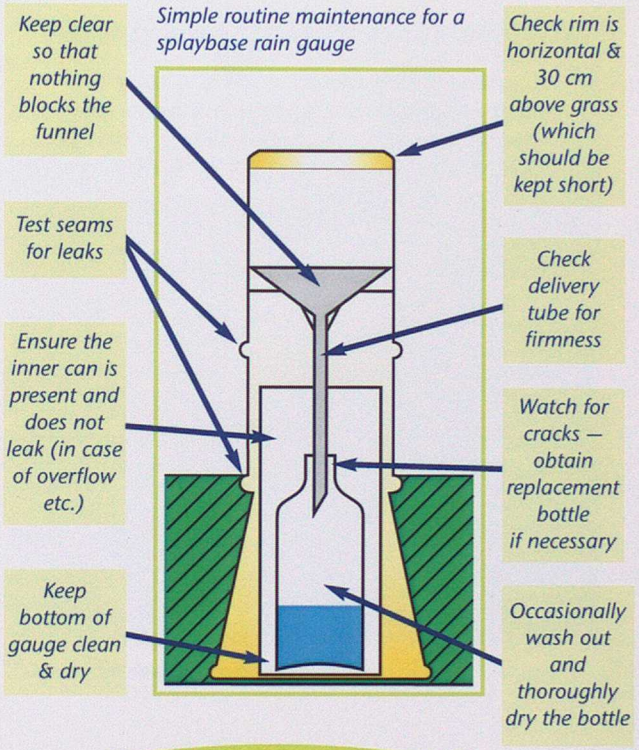
Precipitation

Precipitation is 'any liquid or solid aqueous deposit from the atmosphere'. This includes rain, drizzle, snow, ice, hail, diamond dust, snow grains, snow pellets, ice pellets, rime, glaze, frost and dew, and any deposit from fog. The term 'rain' instead of 'precipitation' will be used here for simplicity.

There are two kinds of rain gauge — storage and automatic. The storage type collects the rain and stores it in a container for you to measure on a routine basis. The automatic type makes a record of each time a container of a specified volume is filled and emptied. The notes below are mainly for storage gauges, of approved design.

- Make sure the amount of rain collected is not increased by condensation, splash-in, or flooding, and is not decreased by evaporation, leaks or splash-out.
- Occasionally test the funnel for leaks by placing thumb over the tube end and pouring water into the funnel. Or trap air in the funnel with your thumb while lowering it upside down into a bucket of water — air will escape through any leaks. If necessary, request a replacement.

Simple routine maintenance for a splaybase rain gauge



Measurements from storage gauges

- All measurements should be made as close as possible to 10 a.m. during British Summer Time or 9 a.m. for the rest of the year, unless you have an alternative arrangement, or you are unable to make the measurement for some reason.
- Always note the date and time of your reading. If your reading is not at your usual time, make a note of why not.
- If you provide values weekly instead of daily, make sure you do them on the same day each week and on the 1st of each month.
- Monthly gauge readings should be done on the 1st of each month.
- Make sure you use the measure that is appropriate for your size of rain gauge – commonly a tapered 10 mm measure for daily read gauges, or flat-base 50 mm measure for Octapents or large Bradfords.

To measure liquid precipitation

- Carefully the lift funnel out of the base of the rain gauge.
- Lift out the collection bottle.
- Carefully pour the water into the rain measure. If there is too much for the measure, pour in less than a full measure each time, write down each value, then add them all up to get the total.
- Then empty each amount into a spare container to repeat the process to check the total.
- Carefully replace the empty bottle and put the funnel back into it.
- For accuracy, read the measure with the water surface at your eye level and the measure vertical, held between thumb and first finger.
- You can check the measure is vertical by making sure that the scales on both sides of the measure are lined up as you look through the glass.

- Take the reading from the lowest part of the water surface, which rises when it meets the sides of the measure (the meniscus).

See which line on the scale is closest to the meniscus – this may be above or below the meniscus.

- Record your measurement in millimetres (mm) to one decimal place, e.g. 0.6, 1.3, 24.0 (taking extra care if you are adding up several amounts to get the total).

If you don't hold the measure so that the water level is horizontal, you may be making a very small error on a regular basis. Each error may be very small but, when they are added together over a whole year, they could make a total error of several millimetres to the annual rainfall at your site.

Approved plastic bottles can now be used in the storage gauge.

The inner can may be raised by resting it on a block of wood or part-brick. This helps when putting the funnel back into the neck of the bottle.

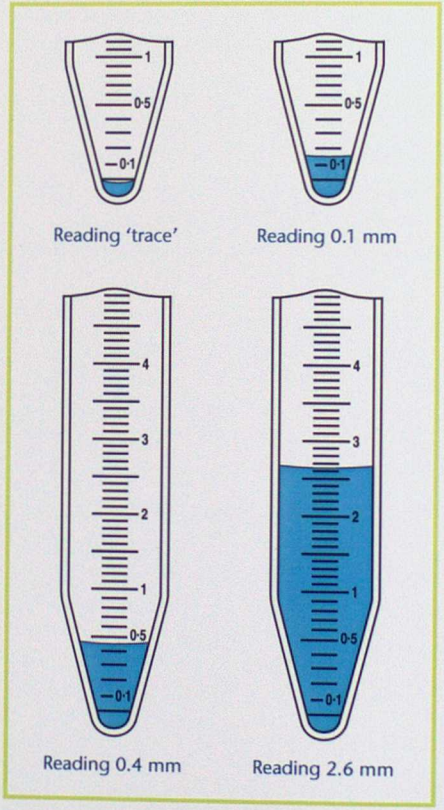
Observer reading the rain measure

Measuring a trace

There is a continuous ring below the 0.1 mm mark on the rain measure. This shows the limit of a trace.

- If the rain amount is exactly on or above that mark, your reading should be 0.1 mm.
- Record a trace when the amount is below that mark (and you are sure this is from precipitation since your last measurement).
- Also, record a trace if there have been a few spots of rain, drizzle, etc. since your last reading but the bottle is dry.
- If you know the weather has been dry since your last reading, do not record droplets left over from your previous measurement as a trace.

Take care to consider if there has been dew or frost, and make a note if there was.



Reading the rain measure

Heavy rain

To get more information about heavy rain in short periods, you can measure the rainfall as soon as it stops.

- ✓ Put the rain back into the bottle so that the next reading is not affected.
- ✓ Note the start/stop times of the rain. If it is raining heavily through the day, check that the gauge won't overflow by taking a reading and discarding the water.
- ✓ Remember to add the amount to the next routine measurement.

Measuring liquid equivalent of solid precipitation

- ✓ Always try to note the type of precipitation — whether it is snow, ice pellets, hail, etc.

Slight falls

If precipitation is not falling, take the funnel and collecting bottle indoors to melt the snow.

- ✓ Keep the funnel covered while the snow is melting to prevent evaporation.

If snow is falling, you can either:

- pour in a measured amount of warm water (but not hot, as it may crack the bottle) to melt the snow. Measure the total then subtract the amount of warm water you poured in;
- or wrap a cloth dipped in hot water around the bottle and funnel to melt the snow and then measure it in the usual way. Make sure water from the cloth does not get into the bottle or freeze the cloth to the funnel.

Moderate or heavy falls

Measurement can be complicated because wind eddies may carry snow over or blow it out of the gauge, or even lift lying snow and blow it into the gauge. Sometimes the gauge may be completely buried in snow. However, your readings are very important, particularly for assessing the risk of flooding if the snow thaws quickly.

(a) If there was no snow lying when you made your previous reading, take a sample of the (level, undrifted) snow by pressing the inverted funnel of the gauge downwards through the snow.

Take this sample indoors to melt it and measure the water.

- It is a good idea to make three readings like this, as it is often difficult to find a representative sample of snow. Take each sample about a metre apart and report the average of these three samples.

(b) If snow was lying when you made your previous reading, you need to be able to measure the fresh snow that has fallen since. You can do this by placing a board onto and flush with the old snow. Sweep the board clean after measuring the snow on it, by taking a funnel sample as in (a), and then replace the board, ready for later measurements. You may wish to mark the place of the board with a thin cane so you can find it under new snow.

- If the gauge becomes covered with snow, make a measurement as soon as you can and clear the gauge to continue collecting. Add this measurement to your next routine reading.

Solid and liquid precipitation between readings

Extra care is needed if a mixture of rain and snow has fallen. If it is a slight fall of snow, follow the guidelines for slight falls.

- If the fall is moderate or heavy, then follow the guidelines for moderate or heavy falls. Don't forget any liquid precipitation in the bottle and make a note of the amount from melting, if possible.
- Do not throw away snow or hail in the funnel when you make a measurement — melt it and add it to the bottle to be measured in the usual way.

If measurement is not possible, leave the snow in the funnel to melt in its own time, but please note this on the relevant form (Rainfall data or 3208b) along with the reason, such as the examples below.

- snow filling funnel — no more snow can enter
- snow being blown out of funnel, even if not full
- drifting or blowing snow being deposited in funnel
- gauge covered by snow due to heavy falls or drifting

Measuring the depth of frozen precipitation

This includes snow, hail and ice pellets.

- If, at the time of your observation, the ground representative of the station is more than half covered by snow or other solid precipitation, then the depth should be measured and reported.
- Measure the depth in centimetres using a ruler held vertically in a location free from drifting or scouring by wind.
- Choose a location as near as possible to the rain gauge. Ideally, take three measurements at different places and report the average of these.

You must ensure that the ruler is either adapted to read zero at ground level or you take account of the length of the short gap between the end of the ruler and the zero mark, when you make your measurement.

- Make sure your ruler does not pierce the grass or other ground surface beneath the frozen precipitation, as this will give a false reading.

Entering readings onto a rainfall data form

- When recording rainfall amounts by hand, throw the reading back to the previous day. When you measure the rainfall total, for example at 9 a.m. on Monday, record that amount against Sunday on the form. This is because most of the 24 hours up to 9 a.m. on Monday are actually from Sunday.

Stn. name... LITTLE BOTLINGTON

Enter amount measured at 9h UTC *against* YESTERDAY'S *date*

Date	mm	FOR M.O. USE ONLY	*Enter time of measurement if not close to 9h UTC and notes on significant weather*
1	2 • 6		Rain until midday.
2	7 • 5		Showery day, heavy at times.
3	tr •		One slight shower midday.
4	– •		
5	– •		
6	– •		
7	7 • 5		Rain between midday and 8.00 PM.
8	47 • 3		Cont. heavy rain – most of day & night.
9	12 • 7		Squally showers by day, clear evening.
10	•		Showers of sleet, heavy in afternoon.
11	•		
12	•		
13	20 • 3		Mainly dry day

ges of equipment or its location during this month

S FOR RAINFALL OBSERVERS gives details
serving procedures.

Example rainfall data form (single reading covers 10th-13th inclusive)

- Throw back your reading even if you know that, for example, Sunday was dry all day and the rain you measured on Monday morning had fallen a couple of hours before 9 a.m.
- If your reading is for more than one day, group the dates it applies to with a bracket. So, if you couldn't make daily readings on the 11th, 12th and 13th, then read the accumulated total on the 14th. You would bracket the 10th, 11th, 12th and 13th together for that total.
- Always enter readings to one decimal place, for example: 0.7, 1.6, 32.0, etc.
- If you use a card, record a short dash for any day when you know there was no rain, even at times when some drops remain in the bottle from your previous measurement.
- If you are unsure about any figure, put a '?' beside it and add a note explaining why you are unsure.
- If your reading is from melted precipitation, put an 's' beside your entry on the form. It is also useful to give details of the start/stop time of precipitation and what type it was, e.g. snow, rain and snow, hail, etc.
- When recording a trace, show what caused it by entering it:

  tr for rain, tr(fe) for fog, tr(x) for frost, or tr(w) for dew.

- Avoid accumulated readings (have someone make readings in your absence).
- Make a note if the gauge is flooded, buried in snow, or to confirm a high daily amount.
- Enter weekly readings in the same way as a seven-day accumulation — with a bracket to group the seven days for which your reading applies. For monthly readings, enter the monthly total in the total column — there is no need to use brackets.
- Check that your records have the station name, time of measurement, year and month.

Automatic gauge measurements

Increasingly, automatic gauges are needed to make measurements in remote areas. A tipping-bucket gauge is often used and must be kept clear of funnel blockages.

Generally, a storage gauge is positioned nearby to make check readings — at least weekly. At remote sites an Octapent gauge can be used for making check readings monthly.

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