METAL GUTTER MANUFACTURERS ASSOCIATION

MGMA Information Data Leaflet

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RAINWATER DRAINAGE DESIGN EN12056:3 - 2000

The approved method for calculating the sizing of guttering and downpipes is now EN12056:3-2000, which has replaced the old BS6367 (1983 until 2000). This new standard, although similar in many ways to its predecessor, incorporates a number of important changes that affect the specification and selection of rainwater goods.

The primary considerations to be taken into account when specifying rainwater goods are rainfall intensity, catchment area, gutter capacity and outlet/downpipe capacity. However, it is important to remember that the harmonisation of differing standards into one European standard involved taking into account the various weather patterns and gutter materials, shapes and sizes.

Rainfall Intensity

Rainfall intensity was previously measured in millimetres per hour in the United Kingdom but was brought into line with mainland Europe and is now measured as litres per second per square metre. For example, a value of 150mm/hour is replaced by 0.042 l/(s.m^2).

Rainfall is presented on meteorological maps that record the intensity of rain likely to fall in two minutes for a given return period. For example, the normal criteria for external eaves gutters is a one year event therefore one would look at the appropriate map to check the intensity which will be a figure of, say, 0.022 l/(s.m^2) in a given geographical area.

This represents a significant departure from the way the previous British Standard was interpreted by many, in that the rainfall in the exact geographical location of the building replaces a constant value such as 75mm/hour. It may therefore be a surprise to learn that the summer time rainfall intensity in Cambridge is higher than in Manchester.

Eaves gutters are relatively simple as they can be allowed to overflow in extreme circumstances however, gutters that discharge inside are a different proposition.

There are a number of factors to be taken into account before proceeding with gutter sizing:

- **Position**
  Is the gutter external or internal and could it overflow inside or damage the building.
- **Building Life**
  If a building life is not specified, assume 60 years for a standard building and longer for important public buildings.
- **Building Use**
  Non-eaves gutters, which will include some eaves with decorative flashings, must be factored upwards which means a given life of 25 years will be multiplied as follows:

  Category 2 – normal building use
  1.5 x 60 = 90 years
  Category 3 – sensitive building use (for example, hospitals, computer rooms)
  4.5 x 60 = 270 years

  Consult the meteorological map that best reflects the figure obtained, look at the site location and you will get a higher figure, for example 0.06 l/(s.m^2).

NB The old British Standard categories do not coincide with EN12056

Catchment Area

The catchment area is not affected by the new standard in terms of how it is derived and calculated however, it is often misinterpreted. Rainfall does not often fall vertically but it is reckoned to be two vertical units to one horizontal unit = 65 degrees.

The new Standard states that half the vertical dimension of the roof section has to be in the calculation that gives you the 'Effective Roof Area'.

Furthermore, an often neglected factor is run off from vertical surfaces, for example where a small lean-to type office building abuts a factory there will be significant run off from vertical surfaces. The factor for vertical surfaces is 50 percent of the surface area and this must be added to the effective roof area before proceeding.

Gutter Capacity

According to the new Standard, there are two types of flow in gutters:

- Free flow
- Restricted flow

In free flow, the capacity of the outlet is greater than that of the gutters and therefore the gutter runs freely. However, most industrial gutters are bigger than they need to be and so large outlets would be needed to make them run free. By using smaller outlets, water builds up in the gutter and thus although outlet flow improves, gutter flow is restricted. If the restricted gutter capacity is larger than the flow coming into the gutter, this solution is acceptable and can often offer substantial material savings.

Whichever flow mode is employed, when a gutter runs from an outlet exceeds 50 times its depth, friction becomes an issue and will have to be included in calculations.

Software and expertise is available to assist with these calculations, please visit our web site for further information.

Outlet/Downpipe Capacity

It is a fact that the actual outlet point in a gutter will usually have a far lower capacity than that of the rainwater pipe it connects into.

This is because water is unable to turn corners and so at the outlet, water tends to smooth out the turn and form a narrow neck of flow. Once into the downpipe, this tends to spread out to the inside surface of the pipe and, pulled by gravity, the water accelerates away.

If the outlet has rounded shoulders or tapers from a larger diameter, this can improve capacity considerably. Hoppers and sumps can be introduced to create a head of water that will improve the performance of a system where the designer is restricted in choice.

There are some situations to be avoided or at least to be aware of:

Back or side outlets perform badly and are not recommended by the Standard. There are fabrication methods that can create a more efficient back outlet if it really cannot be avoided.

Another restricting element is a 50 percent reduction in outlet capacity where a leaf guard is fitted. This is to take into account the fact that most leaf-guards quickly attract a waterproof covering of leaves.

If the percentage of water in downpipes becomes too great, there is a risk that siphonic action will occur. In the right place, siphonic action can be very useful; allowing huge volumes of water to be moved by relatively small pipes. However, in areas where siphonic action is not expected it can cause a number of problems for example, excessive vibration and pipe wear, noise and pipe implosions.

To avoid these risks filling limits in pipes have been set as shown in the table below

Pipe Diameter (mm)	Maximum Flow (l/s)
50	1.7
75	5.0
100	10.7
150	31.6
200	68.0

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