SIPHONIC ROOF DRAINAGE

REVISED VERSION

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METAL GUTTER MANUFACTURERS ASSOCIATION

MGMA Information Sheet No 06 **June 2012**

INTRODUCTION

Siphonic roof drainage is not a new concept. It was originally developed by the Finnish engineer Ovlai Ebling in the late 1960s and the first commercial installation was in a Swedish turbine factory in 1972. Since its inception, siphonic roof drainage systems have been fitted throughout the world, with the UK market having a number of manufacturers.

Siphonic pipework horizontal at high level

During the 1980s and 1990s roof drainage was designed in accordance with BS6367:1983 which had been written when construction methods and materials were very different. Larger buildings, with end uses more susceptible to rain damage and the move from fibre cement to plastisol-coated roof sheets, all contributed to issues with roof drainage systems. The ambiguities in the design guidance in BS6367 with respect to suitable rainfall intensities meant that many gutters were under designed. Although this problem occurred in both gravity and siphonic drainage systems; in the case of the siphonic installation it was the method of drainage that was blamed rather than the design guidance.

In June 2004, the Siphonic Roof Drainage Association (SRDA) was formed with the objective of promoting best practice in the siphonic industry (www.siphonic.org). In collaboration with the industry and BSi, the SRDA was instrumental in the introduction of a British Standard for Siphonic Roof Drainage, BS8490:2007.

HOW IT WORKS

All siphonic roof drainage systems work in exactly the same way. Air is excluded by a baffle plate over the outlet hole, which causes the pipes to run full of water. When the pipes are full of water the height difference between the gutter and the discharge point creates negative pressures in the pipe system, which draws water through the system. The greater the drop, the greater the potential energy available, and the greater the overall flow capacity of the outlet. However, if negative pressure becomes too large, cavitation and pipe implosion are risk factors, and so designs must be carried out by a competent person using suitable software.

In the UK, the practice is for a number of outlets to be joined via small diameter tail pipes into a collector main which runs to a single discharge point. On larger buildings there may be many of these systems. A key factor is to

Vented lid on discharge manhole

ensure that the tail pipes are able to fill the collector pipe in a reasonable time. In the UK, a two minute storm (i.e., the design rainfall event when a storm is at its most intense) is used to determine roof drainage design and therefore if the system takes longer than 60 seconds to fill, then it will be ineffective *(refer to MGMA information data leaflet No 3)*.

As buildings, and thus systems, have got larger in the UK this has become a key element of design.

In many larger systems, drainage is divided into a primary and secondary system. The primary system drains the day to day rainfall but in heavier storms, the secondary system will cut in and remove large volumes of water. Often these secondary systems will discharge onto car parks and other hard surfaces, as underground drainage will often not have the capacity required to accept all the drainage flow. This is a sustainable approach, which reduces the shock load on the drainage system downstream.

Typical primary and secondary siphonic outlets in gutter

One key point is that there are no essential differences in technology between the various manufacturers; all siphonic systems work in the same way.

ADVANTAGES

The key advantages of a siphonic system are:

- Drainage pipework is mostly horizontal at high level, freeing space in the building.
- The system is installed later in the construction programme, speeding up the groundworks.
- Underground pipework in the building is virtually eliminated.

Other factors to consider:

- Systems must be regularly maintained to guard against blockages.
- Care must be taken to install systems in locations where acoustics are not a prime consideration.

SUMMARY

Siphonic roof drainage is the best method of draining large volumes of water from large buildings; however, it is important that regular maintenance is carried out to keep the systems functioning in prime condition. All siphonic systems work in the same way, and the most important factors are how the pipework is sized, to achieve flow balance in system, and the speed with which the system will begin to operate. All siphonic companies should be able to produce calculations showing the system balance, fill time and gutter performance, and it is up to specifiers to make sure that they do.

Dr Malcolm Wearing is managing director of CRM Rainwater Drainage Consultancy Ltd, the UK's principal independent testing organisation for siphonic roof drainage equipment. He sat on both UK and American Society of Mechanical Engineers Standard development groups, as well as being technical consultant to the SRDA and MGMA.

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