

## Are Proprietary Siphonic Roof Drainage Systems Necessary?

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Popular in Europe, siphonic roof drainage systems also have spurred plumbing engineers' interest in the United States. The system on the Boston Convention and Exhibition Center's roof was the first of several that have been installed in this country. Currently, siphonic systems are installed or are under construction on nearly six million square feet of roof surface. Thus far, the installed systems in the United States have performed as intended because an experienced consulting engineer carefully designed each one using a thorough set of calculations. None of these systems were designed by the pipe or drain manufacturer, and none use proprietary pipe or fittings.

### Siphonic Roof Drainage in the United States

Simply put, siphonic roof drainage systems are configured and designed to prime full of water during heavy rainfall events to trigger sub-atmospheric conditions in the piping to draw water off the roof while preventing the ingestion of air through the drains. In a way, a primed system constitutes a closed system much like a hose siphoning water from an aquarium to a drain.

The pipes used for each siphonic system in the United States are listed in the existing plumbing codes and comply with the appropriate ASTM International standards for manufacturing, quality control, marking, and installation. Materials include ASTM A888 (CISPI 301) no-hub cast-iron pipe and fittings with heavy-duty cast-iron couplings for system pressures at or below atmospheric. ASTM D2665 Schedule 40 solid wall PVC has been used outside of return air plenums where allowed by the local authorities. ASTM A53 Schedule 10 galvanized steel with roll-groove couplings, with PVC pipe used below grade, was used on a New Jersey building. In the case of the Boston Convention and Exhibition Center, ASTM A312 Schedule 10 Type 304 stainless steel with roll-groove joints was installed.

In Europe and elsewhere overseas, siphonic product manufacturers can provide the labor to install the piping. Also, these companies typically provide only one pipe material, high-density polyethylene (HDPE), which is a difficult material to fuse in the field and currently is not listed in any model code as an approved material for storm drainage either aboveground or belowground.

Of course, in the United States the installer of any plumbing

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system, whether it is an engineered system or not, must be a licensed plumber and/or a licensed contractor in the appropriate jurisdiction. Likewise, the designer of any engineered plumbing system must be a licensed professional engineer in private practice as a sole proprietor or employed by a registered design firm meeting state statutes. The engineer also may work for a licensed design-build contractor. European siphonic roof drainage product manufacturers cannot qualify for any of these criteria; therefore, they legally cannot engage in consulting engineering or installation in the United States. This fact is perhaps the primary reason why siphonic roof drainage has not penetrated the U.S. market in the past 30 years.

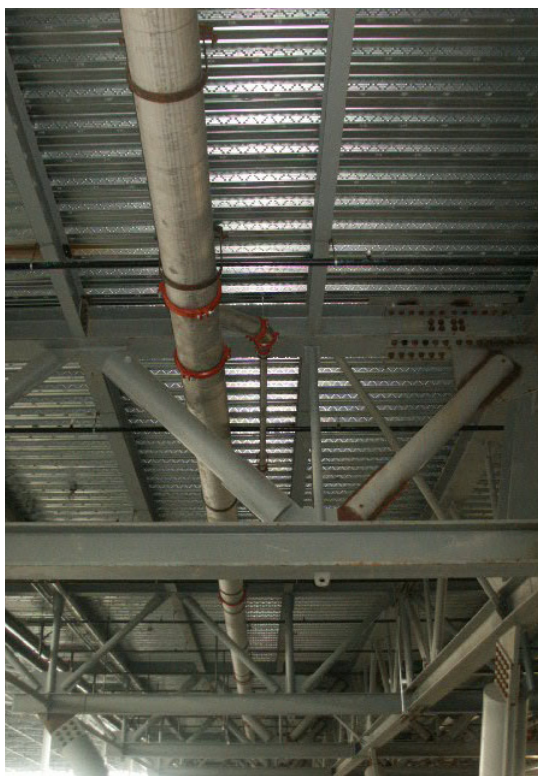
### The Proprietary Problem

Since they can't install systems, European manufacturers can make money in the United States only by selling pipe and drains. Most European companies manufacture their own siphonic roof drains and pipe materials as packaged systems. These companies advertise that they are the "leading" company and that their systems require specialized computer analysis and installation, possibly leading American plumbing engineers to believe that these systems can be designed and

installed only with the manufacturer's design software and, more significantly, its proprietary pipe materials and fittings.

Manufacturers follow this business model because the real profit is in the sale of the pipe materials and in the final installation. Siphonic drains alone are a minimal part of the cost of a siphonic roof drain system; they cost about as much as conventional ANSI/ASME A112.6.4 roof drains with accessories. Therefore, the only business opportunity is selling proprietary pipe. To secure a market, a manufacturer must make plumbing engineers and contractors believe that only its pipe will work.

Thus, European manufacturers would like plumbing engineers to believe that system failure is highly likely if their companies did not do the computer analysis or supply and install the piping. Siphonic system failures have occurred overseas, mostly because the required calculations were not performed, inappropriate pipe materials were used, or roofs and gutters were installed outside acceptable construction tolerances for level. It is safe to assume that a lack of standardization in



**As part of the Boston Convention and Exhibition Center's siphonic roof drainage system, the main collection manifold runs through the beam structure with a small branch that connects to the roof drain.**

construction and product manufacturing played a role in these failures, as not one installation in the United States designed by proper calculations has failed.

American owners, builders, and designers typically are reluctant to use proprietary products and systems. The U.S. construction and manufacturing industries instead rely on standardization and competition. Each state has a building code that references standards for pipe, devices, and fixtures established by ASTM, the American National Standards Institute, the American Society of Mechanical Engineers, the American Society of Sanitary Engineering, and others. Recently, the ASME A112 Committee for Plumbing Fixtures and Equipment established a standard for siphonic roof drains, designating it ASME A112.6.9. This standard will serve as the basis for the manufacture and performance testing of siphonic roof drains.

The U.S. siphonic roof drainage market looks promising. Each new installation provides testimonial evi-

dence of this drainage technique's validity and effectiveness. As plumbing engineers, we need to move forward within the framework of our existing statutes, regulations, and standards. HDPE pipe and fittings manufacturers are free to establish appropriate ASTM standards for this material and to have these ASTM standards referenced in model codes. However, until then we can choose from several materials and manufacturers right here in the United States.

Plumbing engineers need the freedom to choose pipe materials based on design conditions. Can HDPE pipe be installed in HVAC return air plenums? What is the UL 1479 fire-stopping assembly for HDPE pipe manufactured to a European outer diameter? These questions and others will need to be answered, but why worry about it when PVC, cast iron, copper, and steel are already available?

So don't let proprietary manufacturers fool you. Specialization of materials and design is neither required nor desired. Consensus standardization, statutes

regulating construction and engineering, and building codes work. There is no need to invent a new paradigm in the United States for a drainage technique that consists simply of pipe and roof drains. The design process is not as difficult as proprietary manufacturers would like you to believe. Manufacturers cannot and should not engineer plumbing systems. If a licensed engineer can design a hydraulically dimensioned automatic wet pipe sprinkler system, he can design a siphonic roof drainage system. The pipe materials and installation expertise are already available. ♦



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