

# CASE STUDY

## SIDE-BY-SIDE COST ANALYSIS PROVES ADVANTAGE OF STAND-ALONE BLAZEMASTER® FIRE SPRINKLER SYSTEM AT MADISON, WISCONSIN, TEST SITE



### Residential Fire Sprinkler Installation Madison, Wisconsin

#### California-Based Engineered Fire Systems Draws Up Different Designs to Document Cost and Performance Advantages of CPVC Over PEX

In the homebuilding industry most decisions eventually come down to cost. Especially in a challenging economy, builders and their contractors are looking for the best value—both for the homeowners they represent, as well as for their own bottom lines.

Cost is at the heart of the ongoing debate that pits traditional stand-alone fire sprinkler system designs against multipurpose systems. Although most professionals agree that a stand-alone system (in which the residential fire sprinkler and plumbing systems operate independently) offers superior integrity, many believe that a multipurpose system offers a cost advantage.

“On paper, it certainly looks like a multipurpose system—specifically a CPVC multipurpose system—would be cheaper than a stand-alone system,” said Eric Price, president of Engineered Fire Systems, Inc., a 25-year-old fire protection design company based in Grass Valley, California.

But that is not what Price found when his company designed three different systems for the same single-family home. The test home—a one-story, 2200-square-foot (4400 square feet including finished basement) home located in Madison, Wisconsin—offered no unique challenges from a design standpoint. Price’s company created blueprints for a BlazeMaster CPVC stand-alone system, a combination BlazeMaster/FlowGuard Gold® CPVC multipurpose system, and a full PEX multipurpose looped system using a tee and branch fire sprinkler design. The blueprints were given to three local contractors to secure bids that reflected prevailing local market rates.

In the final analysis, when all costs were considered for materials and labor to install the fire sprinkler and plumbing portions of the system, it was the BlazeMaster CPVC stand-alone system that proved to be the most cost-effective option. Although the cost differential of the BlazeMaster CPVC stand-alone system over the CPVC multipurpose alternative was nominal, it negated the misperception that multipurpose systems—and, more specifically, PEX multipurpose systems, offer any type of cost advantage. The actual cost comparisons are as follows:

Pricing includes material and labor for the fire sprinkler system as well as both the hot and cold water plumbing system

<b>BlazeMaster CPVC stand-alone system</b> .....	\$14,109
<b>BlazeMaster /FlowGuard Gold CPVC multipurpose system</b> .....	\$14,506
<b>PEX looped multipurpose system</b> (tee and branch design on the plumbing system) .....	\$14,857

Looking at the fire sprinkler side of the system only, the following comparisons were made:

<b>BlazeMaster CPVC stand-alone system</b>	
480 feet of 1” BlazeMaster pipe with 43 heads	
70 hours of labor	
Total installed cost of .....	\$7,210
	(\$1.66 per square foot)

<b>BlazeMaster/FlowGuard Gold CPVC multipurpose system</b>	
480 feet of 1” BlazeMaster pipe with 43 heads	
82 hours of labor	
Total installed cost of .....	\$8,282
	(\$1.91 per square foot)

<b>PEX looped multipurpose system</b>	
800 feet of PEX tubing and fittings with 43 heads plus the added cost of a pump required to deliver enough water pressure through the PEX system (this was more cost-effective than up-sizing the pipe and fittings. If the pump was not used, more fire sprinkler heads would have been necessary because of the smaller CTS pipe).	
77 hours of labor	
Total installed cost of .....	\$10,017
	(\$2.31 per square foot)

A primary reason for the cost advantage of the stand-alone system is that it does not require the additional tees and transition fittings needed to create the multipurpose systems. These items not only add to the total material costs but also, to a lesser extent, to the labor costs.

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**Type of Construction:**  
Residential – Single Family

**Installation Type:**  
New

**FBC**  
Building Solutions

"That's not to say that a multipurpose system doesn't have its advantages," added Price. "But I am not a fan of PEX, which is only approved for multipurpose systems. As an engineer, I like the look and design of the CPVC multipurpose system and the fact that it eliminates redundant piping. It transitions very well. More importantly, I like the sense of security that it represents. With a combination system, you always know it's working. And if it's not working, you are going to fix it immediately because, otherwise, your toilet won't flush or you won't have running water in the shower."

Despite this advantage, Price pointed out that few homes in the country are currently piped with a multipurpose system for several reasons. But the most important is code restrictions. Many jurisdictions, even today, do not allow multipurpose systems. In some areas, including Price's home base of California, multipurpose systems are not approved because the jurisdiction requires a water flow alarm. Although it is possible to design a multipurpose system with an alarm, it requires additional design considerations which, ultimately, increase the overall cost.

Price's experience with fire sprinkler systems spans more than 31 years. During that time, he has had the opportunity to design CPVC, PEX and steel systems—stand-alone and multipurpose—and see, firsthand, the advantages of each. In addition to his design work for projects around the globe, he has led numerous education programs in conjunction with fire departments and fire marshals.

"I wasn't surprised to see the numbers comparing the CPVC and PEX options," said Price. "People in the industry often mistakenly try to compare CPVC and PEX systems as if they would be installed in the same manner. This is not the case. CPVC and PEX systems have to be designed very differently because PEX pipe has to be looped. This means that up to twice as much pipe may be required to loop up and down."

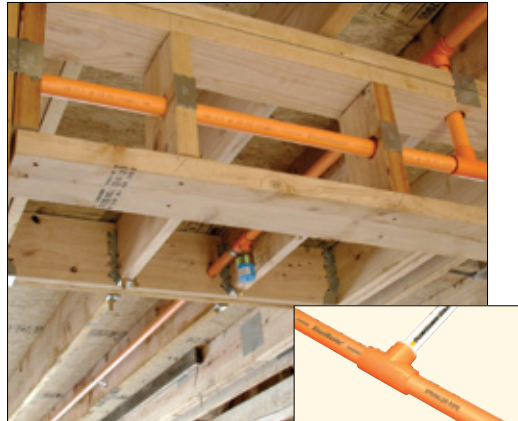
Another factor impacting cost is the internal diameter of PEX pipe, which is significantly smaller than a similarly sized CPVC pipe. In fact, the external diameter of a 3/4" PEX pipe is actually less than the internal diameter of a 3/4" CPVC sprinkler pipe. That's because CPVC sprinkler pipe is manufactured to IPS (Iron Pipe Size) SDR 13.5 dimensions to allow for increased water flow. PEX pipe, on the other hand, is manufactured to CTS (Copper Tube Size) SDR 9 dimensions. As a result, more piping loops are typically required to deliver the same amount of water through a PEX system. At the Madison test site, Price chose to add a pump, instead of increasing the PEX pipe size, in order to meet minimum flow requirements. Additional costs include electrical wiring for the pump and tank, which when added would further increase the cost of a PEX system.

"Another misperception relative to cost is the belief that labor costs will be reduced because PEX pipe is so flexible and easy to install," said Price. "While smaller diameter PEX pipe is highly flexible, the larger diameter

pipe required to meet minimum fire sprinkler flow requirements is bulky, difficult to install and, generally, much more expensive."

Price continued, "My preference for CPVC has evolved over the years. PEX looks good and the marketing materials make it sound good, but for fire sprinkler applications, it's not made in large enough internal diameters to compete with CPVC. You wind up having to use more pipe and more heads. I've had customers insist that I design their systems using PEX, only to find out that it sometimes costs three times as much as a comparable CPVC system. Of course, it all depends on the water pressure. If there is high water pressure, you might have a chance to get away with PEX without paying too much more. But you really see the difference at the lower pressure levels. At about 60 pounds of pressure, for instance, the difference is a big deal." In addition to PEX needing more water pressure to compete with CPVC, sloped ceilings, large rooms and multiple floors also add to the PEX cost difference when comparing it to CPVC.

The Madison test home, which was supplied with city water, had moderate water pressure. That's why the final design for the PEX system had to include a pump in order to provide more pressure. Homes with well water typically experience lower water pressures overall.



*This BlazeMaster Stand-alone System can easily become a Multipurpose System, the second most cost-efficient option.*

"As an independent engineer, I have no vested interest in CPVC," said Price. "I prefer CPVC as a result of its convenience factor. It's fast and easy to install. From an installation standpoint, its superior flow characteristics make it possible to downsize the pipe. Contractors like smaller pipe because they are typically working in tight areas when installing a fire sprinkler system. CPVC allows a smaller pipe size without sacrificing flow."

BlazeMaster CPVC fire sprinkler systems also offer superior fire performance over PEX fire sprinkler systems. CPVC requires more oxygen than what is present in the Earth's atmosphere in order to keep burning. As a result, CPVC does not support combustion and stops burning as soon as the ignition source is removed. PEX, on the other hand, continues to burn and drip even after the flame has been extinguished.

"Most important from a bottom line standpoint is the fact that PEX simply does not pencil out," said Price. "When you run the numbers, it just doesn't make sense. And this test project in Madison helps to prove that fact."



- FlowGuard Gold® Pipe & Fittings
- FlowGuard® MultiPort CPVC Manifold
- FlowGuard® MultiPort Commercial System
- FlowGuard® Bendable Piping
- FlowGuard™ Flex Tubing
- BlazeMaster® Fire Sprinkler Systems
- BlazeMaster® Multipurpose System

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