

Steel vs. BlazeMaster® Fire Protection Systems

Which is the best choice for NFPA 13 Light Hazard commercial fire sprinkler systems?



SCIENCE. SERVICE. SAFETY.



Introduction

BlazeMaster® CPVC vs. Steel in Fire Protection Systems. Advancements in material engineering, particularly with chlorinated polyvinyl chloride (CPVC), have provided new options for fire protection systems. This raises the question: why should BlazeMaster Fire Protection Systems be trusted over steel for ensuring the safety of occupants and property? In this document, we outline six compelling reasons to consider BlazeMaster Fire Sprinkler Systems for your next construction project or building retrofit.

What is CPVC?

CPVC was initially developed by Lubrizol nearly six decades ago. In 1984, Lubrizol introduced the material as an alternative to metal fire protection systems by launching BlazeMaster Fire Protection Systems. This material, a thermoplastic derived from a base PVC polymer augmented with additional chlorine molecules at the molecular level, boasts enhanced resistance to intense heat and pressure thanks to its unique composition and specialized additives.

Unlike PVC and other thermoplastics, CPVC exhibits exceptional fire resistance, remaining intact without melting, dripping, or facilitating the spread of fire. Furthermore, it retains many advantageous properties typical of thermoplastics, including lightweight construction, ease of fabrication, flexibility, and corrosion resistance.

Trusted for Fire Sprinkler Systems Since 1984

In 40 years, more than 2 billion feet (600 million meters) of BlazeMaster CPVC piping systems have been installed worldwide

Meeting all the necessary standards, codes, and approvals to be a trusted material choice in the fire protection industry.

Fire Protection Systems are UL listed and FM approved for light hazard occupancies as defined by NFPA 13.

These inherent characteristics have solidified BlazeMaster Fire Protection Systems' reputation and proven track record of reliable performance over the past 40 years.



BlazeMaster CPVC is UL Listed and FM Approved

One of the key advantages of CPVC over alternative thermoplastics lies in its exceptional resistance to heat and fire. CPVC demonstrates remarkable durability under direct exposure to flame, maintaining its structural integrity and internal water pressure. This characteristic ensures that sprinkler systems remain effective in extinguishing fires by reliably delivering water to the source.

Specifically, BlazeMaster CPVC is designed to form a protective charring layer upon exposure to fire, serving as a thermal barrier that inhibits heat conduction. Furthermore, the flow of water through the pipe contributes to cooling its interior, thereby reducing the burning rate.

BlazeMaster Fire Protection Systems have been awarded the highest possible fire protection classification for non-metal materials—Bs1d0. This designation reflects its outstanding performance across various fire safety parameters:

- **Fire Behavior (B):** BlazeMaster CPVC needs a minimum oxygen concentration of 60% in the surrounding atmosphere to sustain a flame. By comparison, the Earth's atmosphere is typically comprised by 21% oxygen.
- **Smoke Development (s1):** The material exhibits limited smoke generation, facilitating shorter times for fire departments to locate the seat of the fire and minimize property damage.
- **Flaming Droplets (d0):** Unlike many other plastics, CPVC does not melt in a manner that produces flaming droplets, thereby eliminating the threat of fire spread caused by burning droplets.

Even when exposed to flame, Fire Sprinkler Systems are listed for a rated pressure of 175 psi at 150°F. In summary, the exceptional fire resistance and safety features of BlazeMaster CPVC make it a highly reliable choice for fire protection systems in both residential and light hazard commercial occupancies.



BlazeMaster CPVC in Fire Plume Test

During a UL test, a fire plume between 698°F and 901°F (370°C and 483°C) came in direct contact with BlazeMaster CPVC piping and fittings for 10 minutes. The pipe continued to perform throughout the test.



BlazeMaster CPVC Resists Corrosion

Corrosion poses a persistent challenge in metallic piping systems, notably steel. It gradually deteriorates the interior of pipes, resulting in increased interior surface friction. This elevated friction reduces the flow rate of water, particularly during emergency situations. Additionally, steel pipes are susceptible to scaling, wherein dissolved minerals deposit onto the pipe wall, commonly accumulating near fittings and bends. Over time, this scaling can impede or completely obstruct water flow.

In contrast, CPVC offers a durable solution, resisting both corrosion and scaling throughout its service life, which can extend up to 50 years. Even in harsh conditions such as salt-laden air or fluctuating water pH levels, CPVC maintains its integrity. Moreover, CPVC exhibits natural resistance to microbiologically influenced corrosion (MIC).



Corrosion Issues with Steel Pipe Systems

70% of corrosion in steel systems are found in the horizontal mains Schedule 10 steel pipe has a 47% life expectancy compared to Schedule 40 steel pipe yet it is the most common pipe used for mains.

*Source: Factory Mutual report <https://www.fmglobal.com/-/media/Files/FM-Global/Research-Technical-Reports/P14180.pdf>

BlazeMaster CPVC Offers Reliable Hydraulic Performance

Effective fire suppression relies on consistent hydraulic performance to ensure an adequate supply of water reaches the fire. The interior surface characteristics of piping play a crucial role in this process, as smoother surfaces require less energy to move or pump water through the system.

The Hazen-Williams formula is utilized to assess this, gauging the friction and roughness of a pipe's surface material. BlazeMaster Fire Sprinkler Systems, for instance maintain a Hazen-Williams C-Factor of 150 over its lifespan. This deterioration in steel pipe surfaces significantly impairs the hydraulic performance of fire protection systems when compared to CPVC.

Material	C Factor	
	New	After 4–40 Years of Service
CPVC	150	150
Copper/Steel	130–140	60–120

Moreover, CPVC's enduring smoothness often permits the use of smaller pipe sizes to achieve the same level of flow security in fire protection systems. Consequently, this can lead to cost savings for building and homeowners during installation.



BlazeMaster CPVC is Easy to Install

Working with steel piping presents several challenges. First, its weight necessitates specialized equipment for transportation and often requires multiple installers to work concurrently in a single area. Its rigidity makes it challenging to navigate through tight spaces and install in inaccessible areas. Additionally, steel piping fabrication and joining processes can involve the use of torches and loud threading machines, resulting in the need for hot-work permits, prefabrication, and evacuating occupants from the premises.

In contrast, BlazeMaster Fire Protection Systems offer several advantages. They are lighter in weight, flexible, and can be joined together using a quick, one-step solvent cement process. This leads to cleaner, quieter installations, reduced labor costs as one contractor may handle an entire area alone, time savings as fabrication can be done on-site, and less disruption since occupied buildings typically do not need to be evacuated.

In summary, BlazeMaster CPVC can accelerate construction, reduce costs, and minimize disruption for building owners and homeowners. For contractors, it means implementing high-performing systems with less manpower, in fewer hours, and without the need for specialized equipment.



The many design alterations throughout construction made the use of BlazeMaster CPVC a more easily adaptable system than steel, which would have required refabbing in the field.

—Chris Alexander
Vice President
SFS Security Fire Systems



BlazeMaster CPVC Creates Cost Savings

Due to the significant increase in steel costs observed trending over the past years, substantial cost savings of up to 30% are projected when opting for a BlazeMaster Fire Sprinkler System instead of traditional all-steel alternatives. The actual savings depend on factors such as the building's structure and the quantity of materials utilized.

Save time and money. Win more bids.

When the Colorado Independent School District needed a new fire protection system, a bid involving BlazeMaster CPVC was up to 10% lower than competing bids because of lower installation costs.

By utilizing CPVC, installations are expedited and simplified, resulting in saved time and resources. This can translate into notable cost reductions for both the installer and the building owner, particularly contingent upon the size of the building and the volume of materials required. Moreover, CPVC presents several advantages:

- It boasts a lower and more consistent material cost compared to steel.
- It necessitates less ongoing maintenance.
- It may permit the use of smaller pipe diameters due to improved hydraulic properties, thereby contributing to overall material cost reductions.

BlazeMaster CPVC is Environmentally Friendly

The environmental ramifications of manufacturing have become increasingly widespread. To address this concern, building owners and contractors are proactively selecting products and materials that minimize harm to the environment, including fire sprinkler systems.

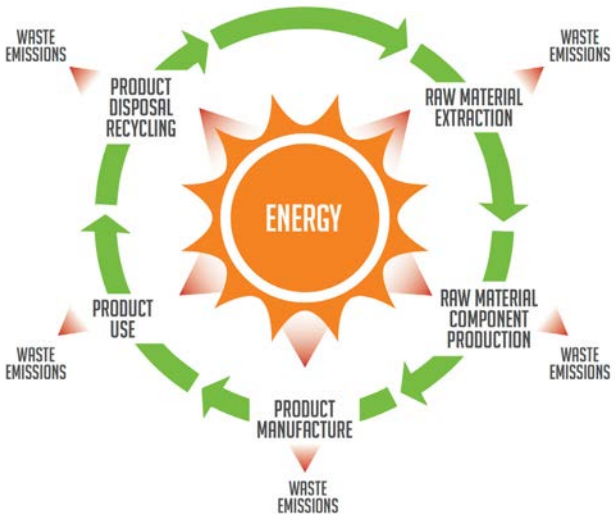
Comparatively, CPVC presents a significantly lower environmental impact during production, with half the climate change impact when contrasted with steel.

In accordance with an ISO-compliant life-cycle assessment, BlazeMaster CPVC systems outperform steel systems across various environmental metrics. These include eutrophication, aquatic ecotoxicity, human toxicity, terrestrial toxicity, photochemical smog formation, mineral depletion, climate change, water depletion, acidification, nonrenewable energy use, fossil depletion, ozone depletion, and renewable energy use.

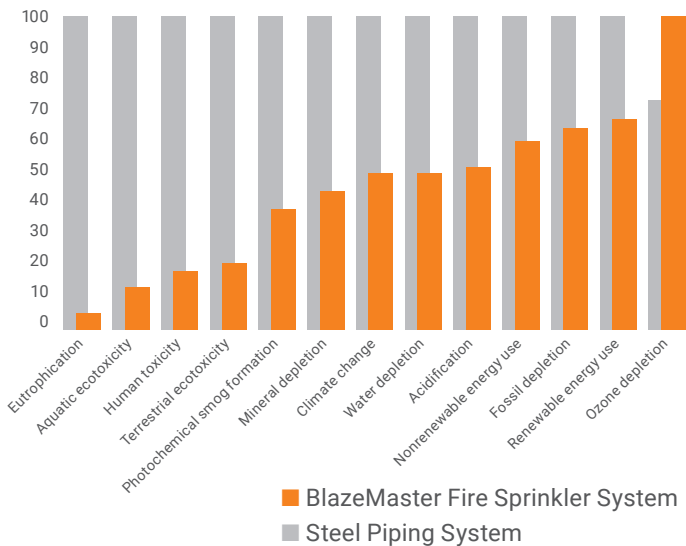
GreenCircle Certified, LLC has conducted a third-party audit and verified that Lubrizol Advanced Materials meets the +Vantage Vinyl initiative and has awarded Lubrizol a Silver achievement for the Innovative Practices in Environmental Stewardship and Advanced Practices in Social Diligence and Open Communication.



Life-Cycle Assessment (LCA)



Environmental Performance Gap





Not All Orange is Equal

Work with the Leader in CPVC Fire Protection Systems

Whether you're a builder, engineer, designer or installer, BlazeMaster Fire Protection Systems fulfill the needs of your project and provide significant cost-savings over the life of the system.

Consult with our team on your project today and find out more information on:

- Costs and timing.
- Technical specifications.
- Training workshops for your team.
- Any other questions you have in mind.

To set up up a free call or to ask a question, visit our [support page](#).



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The FBC™ System Compatible Program is a resource made available to manufacturers of ancillary products intended to be used with CPVC to help determine whether a product is chemically compatible with Lubrizol's FlowGuard®, BlazeMaster CPVC®, Corzan®, and products made with TempRite® Technology. Other manufacturers and/or brands of CPVC piping have not been tested as part of the FBC™ System Compatible Program. The FBC™ System Compatible program is, therefore, only applicable to the chemical compatibility of ancillary products with the Lubrizol brands of FlowGuard®, BlazeMaster CPVC®, Corzan®, and products made with TempRite® Technology. This distinction is made because every brand of CPVC piping is made with unique compounds, some of which may contain resins with different molecular weights and varying chlorine content. These characteristics directly impact the performance of the resulting product. Similarly, various CPVC products contain different performance additives. This too affects the performance characteristics of the ancillary product. For these reasons, Lubrizol has no responsibility for any failures occurring as a result of using products in the FBC™ System Compatible Program with CPVC products other than FlowGuard®, BlazeMaster®, Corzan®, and products made with TempRite® Technology.