



STEEL VS. CPVC FIRE PROTECTION GUIDE



WHICH IS THE
BEST CHOICE FOR
FIRE PROTECTION
SYSTEMS?

BlazeMaster[®]
FIRE PROTECTION SYSTEMS



CPVC VS. STEEL FIRE PROTECTION SYSTEMS

INTRODUCTION

For decades, steel piping systems have been the preferred material for fire sprinkler applications. Steel's strength, durability and resistance to extreme heat make it a logical choice for building owners, facility managers and contractors.

However, material engineering capabilities have come a long way since steel established itself as the norm for fire protection systems. **Specifically, chlorinated polyvinyl chloride (CPVC) has changed what you should expect of a sprinkler pipe and fitting material.**

But, why should you trust the safety of your family, occupants and property to CPVC over steel? We've detailed six reasons you should consider CPVC for your next new construction project or building retrofit.

BlazeMaster®

WHAT IS CPVC?

CPVC was commercialized by Lubrizol nearly 60 years ago. In 1984, Lubrizol introduced the material as an alternative to metal fire protection systems by launching BlazeMaster® Fire Protection Systems.

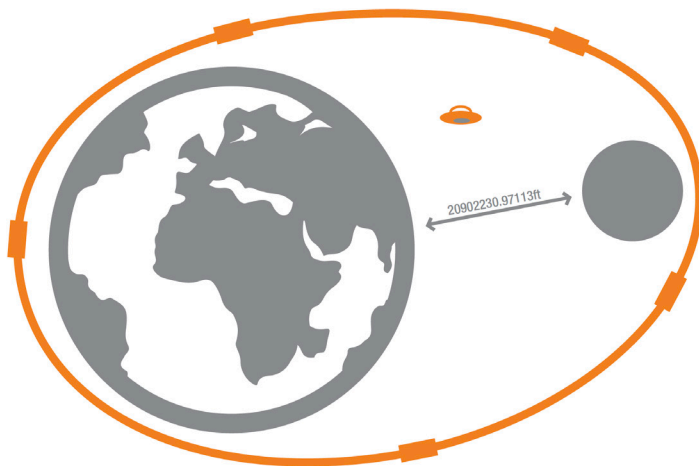
At a molecular level, CPVC is a thermoplastic made from a base PVC polymer that has been fortified with additional chlorine molecules. The extra chlorine, along with specialized additives, enables the material to reliably stand up to intense heat and pressure.

Unlike PVC and other thermoplastics, CPVC won't melt, drip, or spread a fire. At the same time, the material maintains many of the same advantageous characteristics of thermoplastics, including being light weight, easy fabrication, flexibility and corrosion resistance.

It's these characteristics that have helped BlazeMaster CPVC Fire Protection Systems establish a proven track record of reliable performance.



In nearly 35 years, more than 2 billion feet (600 million meters) of BlazeMaster CPVC piping systems have been installed.



More than 60 different countries have used CPVC.

HOW CPVC COMPARES TO STEEL

FLAME RESISTANCE

One of the primary advantages of CPVC over other thermoplastics is its resistance to heat and fire. CPVC maintains its structure and retains its internal water pressure when directly exposed to flame, ensuring sprinkler water will reach and [extinguish a fire](#).

In fact, BlazeMaster CPVC piping forms a charring layer on the outside of the pipe, which then functions as a thermal barrier, reducing the conduction of heat. The water flowing through the pipe also cools the inside, further reducing the burning rate.

BlazeMaster CPVC has achieved the best possible fire protection classification of a non-metal material—Bs1d0.

- **Fire Behavior (B):** BlazeMaster CPVC requires 60% oxygen in the atmosphere to sustain a flame. For reference, the Earth's atmosphere is made up of 21% oxygen.
- **Smoke Development (s1):** The material limits smoke generation, which helps fire departments reach fires more quickly and lessens property damage.
- **Flaming Droplets (d0):** CPVC does not melt in the way other plastics do, which eliminates the threat of flaming plastic droplets spreading a fire.



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



WHERE CPVC STANDS APART

CPVC IS EASY TO INSTALL

Steel piping is not easy to work with. For starters, steel is heavy. It requires special equipment to move around a job site and often two or more installers working in the same area. Its rigidity makes it difficult to maneuver through tight spaces and install in hard-to-reach areas. It also requires torches and loud threading machines to fabricate and join the system, which means costly hot-work permits, prefabrication, and vacating occupants from the premises.

Comparatively, CPVC piping systems weigh less, are flexible and joined together using a quick, one-step solvent cement process. This translates to:

- Cleaner, quieter installation.
- Less labour cost since one contractor can install an entire area by himself/herself.
- Time savings since any fabrication can easily be completed on the spot.
- Less disruption since occupied buildings don't have to be vacated.

To sum it all up for building owners and homeowners, CPVC can speed up construction, lessen costs and limit disruption. For contractors, it means high-performing systems with less manpower, in fewer hours and without any specialized equipment.

"We believe it's the easiest medium to work with and it allows a flexibility to the design. The amount of changes that were forced upon us during the installation would have resulted in very high additional costs if BlazeMaster Piping Systems hadn't been used."

Colin Taylor
Head of the Oxfordshire office for Domestic Sprinklers



Where
CPVC
Stands
Apart

CPVC CREATES COST SAVINGS

With the rising costs of steel over the past year, up to 30% cost savings is estimated when installing a BlazeMaster® Fire Sprinkler System instead of a traditional all-steel solution, depending on the building structure and the amount used.

With CPVC, installations are faster and easier to complete, saving time and resources. Depending on the size of the building and amount of material being used, this can mean substantial savings for both the installer and building owner.

In addition, CPVC:

- Offers a lower, more stable material cost in comparison to steel.
- Does not require as much continual maintenance.
- May allow for smaller pipe diameters due to better hydraulics, helping to reduce overall material costs.
- Allows for quick and easy repairs.

Staggering Increases in Steel Prices Over the Past 18 Months



SOURCE: TRADINGECONOMICS.COM | OTC

A savings of over 50% on installation time.

The initial installation cost of CPVC versus steel was tested by Lubrizol, as reported by BAFSA. In the example of a 40-bed care home requiring a retrofit fire sprinkler solution, CPVC pipes and fittings required **nearly 700 fewer hours to install compared to those made from steel** (640 hours versus 1,323 hours for steel).




CPVC RESISTS CORROSION

Corrosion is always a long-term issue for any metallic piping system, including steel. Steel piping corrosion eats away at the interior of a pipe, creating more friction along the surface. The more friction, the slower the water flows in the event of an emergency.

Steel pipes also have to contend with scaling. Scaling happens when dissolved minerals drop out of the water and attach to the pipe wall, often near fittings and corners. As this scaling builds up, it can limit or even prevent the flow of water entirely.

In comparison, CPVC resists corrosion and scaling for up to 50 years of service life, even in salt air environments or with fluctuating water pH balances. CPVC is also naturally immune to microbiologically influenced corrosion (MIC).



An article by Potter Electric Signal cited research by VdS, a German fire safety firm, which claimed that **73% of dry steel systems have significant corrosion issues at 12.5 years old** and **35% of wet systems have significant corrosion issues after 25 years**. However, these damages can occur “as soon as two years after installation.”

CPVC OFFERS RELIABLE HYDRAULIC PERFORMANCE

Reliable hydraulic performance ensures enough water reaches a fire, effectively extinguishing or suppressing it. A pipe's surface has a direct impact on this—the rougher the surface, the more energy is needed to pump the water through the system.

The Hazen Williams formula was developed to help calculate this by measuring the friction and roughness along a pipe material's surface. BlazeMaster CPVC has a Hazen-Williams C-Factor of 150, and retains this rating throughout its life. Conversely, new steel pipe starts with a C-Factor of 120, which dropped by over 50% for pipes that were in service for between 4 and 40 years. Over a relatively short period, steel pipe's surface deterioration limits the fire protection system's hydraulic performance as compared to CPVC.

Additionally, the long-term smoothness of CPVC pipe can often mean smaller pipe sizes are required for the same level of flow security in a fire protection system. This can translate directly to building and home owners saving on installation costs.





Where
CPVC
Stands
Apart

CPVC IS ENVIRONMENTALLY FRIENDLY

The environmental impact of manufacturing has become increasingly widespread. To combat this, building owners and contractors are consciously choosing products and materials that do the least amount of damage to the environment—and that selection process extends to fire sprinkler systems.

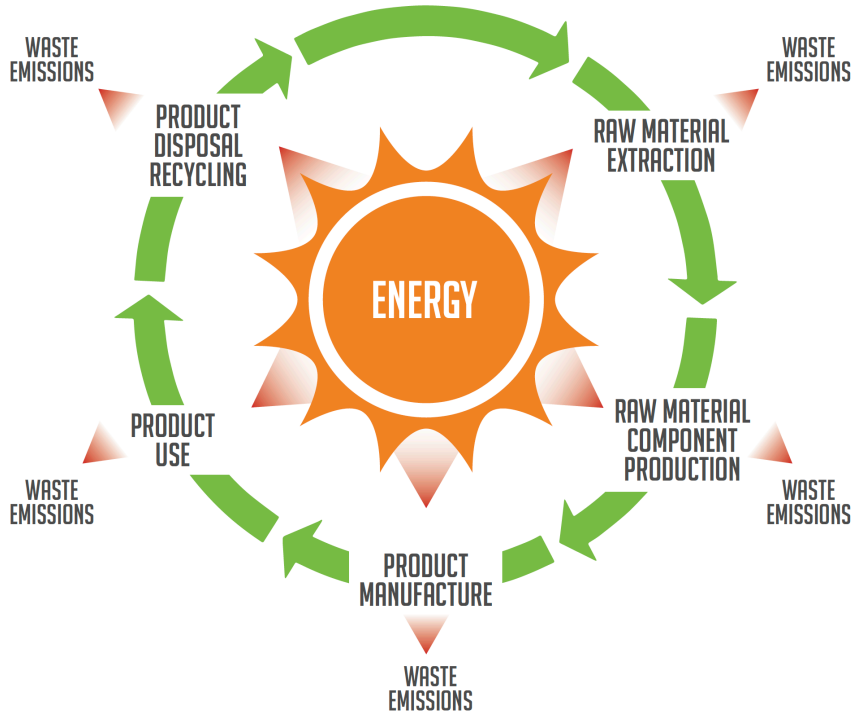
CPVC is much less harmful to produce and has half the climate change impact compared to steel.

According to an ISO-compliant life-cycle assessment, BlazeMaster CPVC systems outperformed steel systems in 12 out of 13 environmental categories, including:

- Eutrophication.
- Aquatic ecotoxicity.
- Human toxicity.
- Terrestrial toxicity.
- Photochemical smog formation.
- Mineral depletion.
- Climate change.
- Water depletion.
- Acidification.
- Nonrenewable energy use.
- Fossil depletion.
- Ozone depletion.
- Renewable energy use.



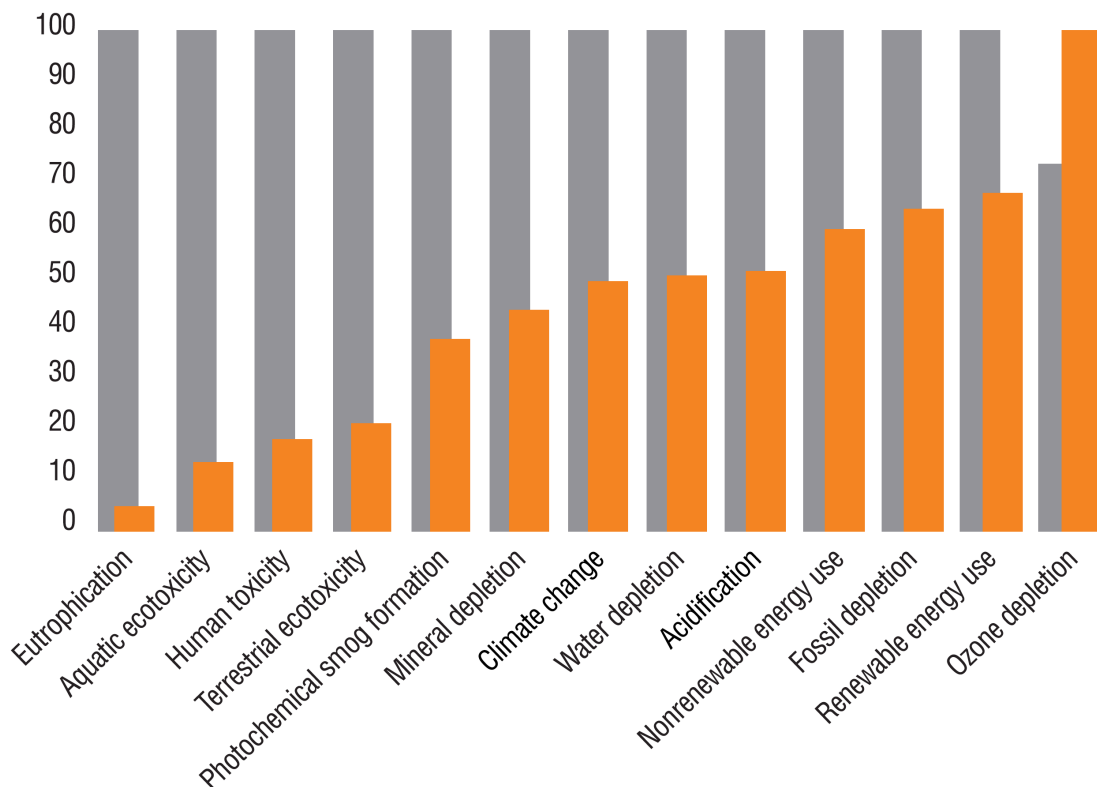
LIFE-CYCLE ASSESSMENT (LCA)



An LCA assesses the environmental impact of the manufacturing, use and end-of-life phases of a product.

ENVIRONMENTAL PERFORMANCE GAP

■ BlazeMaster® Fire Sprinkler System ■ Steel Piping System



DON'T CHOOSE JUST ANY CPVC

Not all orange pipe is the same. The quality and reliability of the piping material in your fire sprinkler system can make all the difference in the event of an emergency.

As the most specified non-metallic system in the world, BlazeMaster fire sprinkler systems exceed global performance and manufacturing standards for all CPVC systems. Its reliability, compatibility and strength make it the preferred choice.

BlazeMaster CPVC pipe and fittings carry the markings of Underwriters Laboratories, Inc. (UL & C-UL) and Underwriters' Laboratories of Canada (ULC), Factory Mutual (FM)*, The Loss Prevention Council (LPC), vertrauen durch Sicherheit (vdS), Tianjin Fire Research Institute (TFRI) and the NSF International (NSF) for use with potable water. Refer to individual manufacturers' installation instructions for specific listings and approvals.

*As manufactured by Harvel, IPEX, Nibco, Tyco and Viking.



WORK WITH THE LEADER IN CPVC FIRE PROTECTION SYSTEMS

Whether you're a builder, engineer, designer or installer, a BlazeMaster Fire Protection System fulfills the needs of your project and provides significant cost-savings over its lifetime.

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](#).



RELIABILITY TESTED FOR LIFE



BlazeMaster®
FIRE PROTECTION SYSTEMS

Visit **BlazeMaster.com/en-gb** or call
+44 07710 372281.

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