

Passive Fire-Proofing Options for Builders & Architects



Fire Resistive Solutions that Save Time,
Money and Align with Design Aesthetics



INTRO

Fire protection is a significant factor in architectural design. In a survey of more than 200 construction professionals, over half (51%) of architects report that liability as it regards to fire safety is one of the largest challenges their company faces¹. A further 43% report that they are always concerned about liability when it comes to the specification of systems for fire safety.

Fire protection systems are the features that either actively or passively work to mitigate the spread of fire and therein the amount of resulting damage. With fire safety such a prominent concern among construction professionals, it is more important than ever to be informed of the various fireproofing methods available to architects.

There are many considerations to take into account, but one of the most essential is the structural integrity of the building itself. The longer the load-bearing points—those often bolstered by internal columns—can withstand the flames and extreme heat, the more occupants can get to safety and the more of the building itself can be preserved.

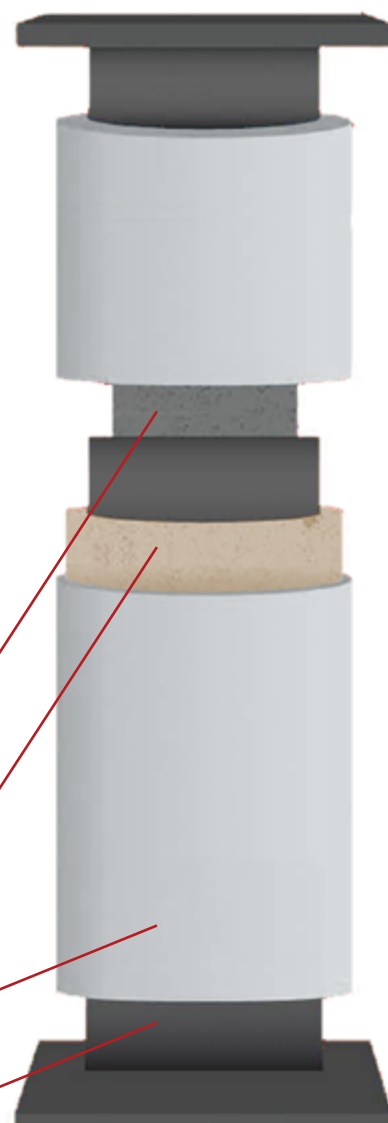
Of the options available, prefabricated fireproof structural columns provide the most in performance and lifetime savings when compared to the available alternatives. As these columns arrive on a job-site ready to be erected, they also reduce the amount of time and labor needed for installation.

Concrete

Fireproofing Material

Outer Steel Shell

Structural Steel



¹ <https://internationalfireandsafetyjournal.com/fire-safety-liability-one-of-architects-biggest-challenges/>

PASSIVE AND ACTIVE

There are two types of fire protection systems incorporated into standard building design. Passive fire protection prevents the spread of a fire by resisting ignition. Fire doors, cladding, fire and smoke dampeners, and fire curtains all fall under this umbrella, as do the safeguards in place to protect a building's structural integrity. Vulnerable load-bearing points, supported by beams or columns, are also addressed to ensure their resilience in the event of a fire to help prevent the building from collapsing, either in part or in whole.

Active systems are those most commonly associated with a fire, such as fire alarms, standpipes, sprinkler systems, fire extinguishers, and hoses. These are designed to warn occupants about the danger and address the fire itself and require human action or mechanical trigger to activate.

Passive and active fire protection systems work in tandem—a true successful fire safety system must have both. While the passive systems help keep the fire contained, the active will work to put it out altogether.



There are a number of solutions available for reinforcing steel columns that meet current safety code requirements, as well as UL rated prefabricated fireproof columns that require no additional treatment before installation to make them fire ready.

Passive Fire Protection (PFP)

Fire protection materials that slow or impede the spread of fire without system activation.



Spray Applied Coatings



Intumescent



UL Rated Pre-Fabricated
Fireproof Columns



Dry Wall Encasement



Concrete Encasement

Active Fire Protection (AFP)

Fire Protection that requires human action or mechanical trigger to work.



Standpipes



Sprinkler Systems



Fire Extinguishers



Fire Alarms



Hoses

UNDERSTANDING FIRE-RATINGS

Some material burns quicker and more effectively than other material. While it is not possible to construct a building that is entirely fireproof, the fire-rating assigned to the material will let you know how well that material resists fire and how long it can withstand extreme heat before beginning to degrade.

Underwriters Laboratories (UL) and American Society for Testing and Materials (ASTM) perform a number of rigorous tests in a multitude of environments to help inform the fire resistance rating, which is then referred to by the International Building Code (IBC) in code creation, as well as the local agencies that govern building codes in specific cities, states, and regions.

The UL 10D product safety standard, developed by UL in 2014, is considered the minimum international testing and rating method. Under the UL 10D standard, a rating of 240 minutes, for instance, means that the item in question can retain its structural integrity for up to four hours.

These ratings are issued once UL and/or ASTM have performed their tests of the material in a controlled environment. The UL rating is especially important, as it is what code enforcement officials rely upon. It also instills confidence that products and systems meet regulatory and market requirements.



“The UL 10D product safety standard, developed by UL in 2014, is considered the minimum international testing and rating method.”

SPRAY APPLIED FIREPROOFING (SFRM)

Spray applied fireproofing is applied directly to structural components of a commercial building, such as columns, beams, decking, and steel joists. It is primarily a composite of cement or gypsum, often mixed with materials such as perlite, mineral wool, quartz, or vermiculite. The primary components are used to harden the solution as it dries after it has been applied; the materials with which it is mixed serve to either add air or lighten the solution itself.

SFRM can be applied either as a wet or dry spray formula. Alternatively, the application can be troweled onto desired surface. It generally arrives on job-sites as a powder that has to be mixed with water, with required safeguards in place to protect eyes and lungs. These safeguards must be worn or enforced during both the mixing of the solution and making the application.

While SFRM is generally low maintenance, there are considerations to keep in mind. Firstly, the time and preparation required on the job-site itself to make the solution. It also isn't intended for surfaces that are routinely exposed to moisture or high humidity levels. Not only can this deteriorate the application, but it can result in mold growth, as SFRM is porous in nature. The spray must likewise be applied strictly based on the manufacturer's recommendation to meet the fire rating and ensure the product adheres to the application.

Furthermore, there's a certain amount of preparation that must be followed before applying SFRM. Such as, there are minimum temperature requirements that must be followed 24 hours prior to and following the application itself. If a more architecturally exposed column is what you're looking for, you may wish to use a column cover to hide the unsightliness of the SFRM. The cost of the column cover should also be factored in, which can eat up any cost savings initially scored in the product itself.

And while SFRM may be low maintenance, it does require regular inspections from property owners to ensure that the material is in good shape. Should it be cracked, loose, or otherwise damaged, it will need immediate repair.



PROS

- Provides protection
- Can be low maintenance

CONS

- Messy to mix — caution needs to be used when mixing due to dangerous chemicals
- Time consuming application
- Requires regular inspections

INTUMESCENT COATINGS

PROS

- Provides light fire protection

CONS

- Messy application
- Takes 3–5 days to apply
- Can chip
- Expensive

The lightest form of passive fire protection available, intumescent paint is applied to surfaces—most commonly structural steel—and, through sublimation, transforms when exposed to extreme heat. The paint itself will expand and thicken (by as much as 100 times), to form a durable carbonaceous char that protects the material onto which it was applied through a reduction in heat conduction. This creates time for first responders to put the flames out before the protected building components are compromised.

Most commonly, intumescent coatings are applied via airless spray paint equipment, though more traditional brushes and rollers can be used as well. In most instances, numerous coatings will be required to achieve the thickness needed to ensure the structure is fully protected.

There are likewise different types of intumescent coatings for consideration. Water-based intumescent paint is more eco-friendly and won't have as much of an overpowering chemical smell associated with alternatives. However, they may be more difficult to cure in low-temperature or especially humid environments.

Solvent-based intumescent coating is generally more flexible, having been tested against variations in temperature and weather conditions. It will likewise dry faster than its water-based counterparts.

The final category is epoxy-based intumescent, which is typically used for projects in harsher environments.

Intumescent coating tends to be pricier than some alternatives. Like with spray applied fireproofing, the environmental conditions need to be perfected in order to ensure the application provides the needed protection.

Furthermore, some expertise in intumescent coatings is essential for the application to work properly. They also tend to average around three days of lost time onsite and require a special inspection to proceed. And even when everything is done right, there tends to be more long-term maintenance required to maintain full efficacy. A chip or a crack might not damage the integrity too much by itself, but it can be an opening for moisture to degrade the quality and reliability of the offered fire protection.



UL RATED PREFABRICATED FIREPROOF COLUMNS

Unlike other passive fire-protection options, prefabricated fireproof columns are not applications made to an existing beam or column. Rather, they are the column itself, manufactured and fully fireproofed at an AISC certified facility like [Fire Trol](#), and arrive on the job-site ready to be erected with UL-certified 2-, 3-, or 4-hour fire-ratings. Unlike traditional steel columns, these columns are designed specifically with fire protection in mind.

The Fire Trol prefabricated fireproof column is composed of the structural steel member, a 4,000psi concrete mix (if HSS steel is used for the structural member), fireproofing material and an outer steel shell. They are likewise available in a range of shapes and sizes to best complement the design structure and meet construction needs.

The prefabricated fireproof column removes the need to invest in other products designed to protect exposed columns, keeping construction costs down without sacrificing the structure's desired aesthetic appeal. Their design is also very fluid, with applications blending seamlessly into the overall design of buildings and structures across multiple industries, including commercial, education, healthcare, hospitality, housing, institutional, transportation, and public use facilities.

All prefabricated columns are thoroughly inspected before being shipped directly to the job-site, have excellent durability and require little ongoing maintenance to maintain performance for years to come.

PROS

- Pre-manufactured, fully fireproofed, and AISC certified
- Arrive ready to use
- UL-certified
- Aesthetic design
- Durable — require little maintenance

CONS

- More expensive than some other methods

DRYWALL ENCASEMENT

Drywall encasement, or enclosing the column, beam, or pillar with fire-rated drywall can help achieve the desired aesthetic, but there are some weaknesses that architects will want to take into account before committing.

While all drywall has some innate fire resistance, fire-rated drywall is what is used in drywall encasement. There are two types of fire-rated drywall—Type X and Type C.

Type X drywall is manufactured with a range of special additives to bolster mold, mildew, and fire protection. The sheets of drywall themselves tend to be around five-eighths of an inch in thickness and provide as much as two hours of protection. You need two sheets of five-eighths of an inch drywall for a two hour fire rating.

For even more robust protection, Type C drywall can provide up to four hours of fire resistance. It's also very smooth and easy to paint, for aesthetic consideration.

As noted, though, drywall has its weakness. It can't withstand durability tests in high-traffic areas and requires a lot of additional maintenance to function as intended.

PROS

- Can help achieve aesthetic

CONS

- Not durable in high-traffic locations
- Requires significant maintenance

PROS

- Durable

CONS

- Long cure times
- Needs sealant to prolong lifespan
- Framework is required prior to installation
- Expensive

CONCRETE ENCASEMENT

Concrete encasement isn't seen as much since the sprays and paints were introduced to the market, but it was once the most popular solution for protecting structural steelwork and is still used in some applications.












Due to its durability, concrete may be the obvious choice in locations susceptible to impact damage, extreme weather exposure, and other elements that can cause abrasion. However, there are some considerable caveats on top of the already hefty price-tag.

For one, concrete comes with a long cure time. It also requires a sealant to prolong the lifespan, and doubles the size of the column. The framework is required prior to installation and tradespeople must be on-site to pour.

DETERMINING WHAT SOLUTION IS BEST

While all solutions will provide a level of passive fire-protection, there are factors to keep in mind when determining which solution makes the most sense both in the construction phase and for the end user. Which will be the most time-intensive to install and maintain, and which has the structural integrity to last.

Not only do prefabricated fireproofed columns arrive on the job-site ready to be erected, resulting in no construction delay, they are also cost-effective when breaking down the cost-analysis of each strategy. In fact, in a direct comparison of the alternatives at a 2-hour fire rating and a size of 10 x 10 x ½ HSS, fireproof columns were the most cost-effective when considering aesthetic, size, maintenance, durability, and trades.

	Aesthetic	Size	Maintenance	Affordable	Trades
Spray on w/ Cover		×	×	×	×
Drywall		×	×		×
Concrete	×	×		×	×
Intumescent Paint	×		×		×
Fireproof Column					

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“We were very happy with the Fire Trol Fireproof Columns we used at the Taconic High School Project. They eliminated the need for messy Intumescent Paint that would otherwise have been required on the exposed columns. The use of the Fire Trol Fireproof Columns allowed our schedule to be expedited, without having to go back to fireproof the columns and it resulted in cost efficiencies eliminating the need for expensive Intumescent Painting.”

David Deforest
Project Executive

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CONCLUSION

With an increasingly volatile natural environment as well as the many ways fire can originate during construction and at completed job-sites, it is hardly surprising that industry concerns about liability and fire safety are at an all-time high. Architects and builders need the most robust but solutions to meeting fire safety and fire code requirements without adding to labor or prolonging the construction itself.

Of the options available, only prefabricated fireproof columns require no on-site preparation, additional labor from specialists, or excessive maintenance while maintaining durability, flexibility, and complementing the desired aesthetic. Contractors can begin erecting them immediately upon receipt, saving time and money. Fire-Trol assures quality of its prefabricated fireproof columns with rigorous quality control performed by in-shop AISC certified specialists.

Contact Fire Trol today and learn how we can help strengthen and streamline your next project.

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PREFABRICATED FIREPROOF COLUMNS

