

# Technical bulletin

## Proper Sprinkler Protection for Foam Plastics

In recent years some building owners and designers have opted to install Early Suppression Fast Response (ESFR) sprinklers in warehouses with the intention of providing fire suppression systems which are suitable for all future tenants that may occupy the facility. ESFR sprinklers are designed for early activation and rely on larger water flow rates to suppress rather than control a fire. Acceptable for a wide range of applications, ESFR sprinklers can be used to eliminate in-rack sprinkler requirements.

There are two key factors to consider when designing the proper fire protection for warehouse storage: the commodity classification and storage configuration. The four classes of materials commonly found in a typical warehouse setting range from Class I commodities, which include metal and slow-burning paper, to Class IV commodities, which include plastics and highly combustible cardboard. However, some interpretations conclude that, if less than 5% by weight or volume is unexpanded or expanded plastic, the commodity is classified as a Class I—III; not Class IV. Storage configuration takes into account racking versus stacking methods, the height of the building relative to the height of the storage configuration and the space between the storage and the sprinklers, among others.

NFPA 13 *Standard for the Installation of Sprinkler Systems* provides specific details with respect to the use of special application sprinklers, such as ESFR sprinklers and the commodities they are intended to protect. Under NFPA 13, a plastic commodity is defined by having more than 15% by weight or 25% by volume of plastic and can be classified as Group A, B or C. Foam plastics (also referenced as expanded plastics) are typically classified in NFPA 13 as Group A plastics.



*When assessing sprinkler needs in a warehouse facility it is important to properly evaluate the commodity classification and fire protection methods recommended under NFPA 13.*

Commodity Classification	NFPA 13	Factory Mutual
Group A	FM Group A & B materials.	High heat of combustion (btu/lb) and burning rate higher than Group B.
Group B	FM Group C materials.	Heat release rates that are higher than ordinary combustibles but less than Group A. The heat of combustion may be as high or sometimes higher than Group A but the burning rate is lower than a Group A plastic.
Group C		Plastic products that incorporate heat of combustion and burning rates that are similar to Class 3 ordinary combustibles.

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*There is an existing ESFR sprinkler which has achieved a UL listing for the protection of exposed, expanded group A plastics stored to 25 feet in buildings with a roof height of up to 40 feet. However, utilization of the sprinkler requires a design demand that is significantly greater than that used for most typical ESFR systems.*

Expanded polystyrene and similar materials categorized as Group A plastics can present difficult fire scenarios due to the higher heat release rates associated with lower density plastics. Storage areas, which incorporate large volumes of products, can present particularly challenging fire scenarios. As a result, it is essential that properly designed and installed sprinkler systems are utilized for the protection of expanded exposed group A plastic storage applications. However, with appropriate limits of pile size and pile height many sprinkler designs allow the storage of Group A plastics. Each case has to be individually researched to determine what the correct sprinkler system is for any given storage scenario.

Recently, fire marshals and insurance companies have expressed concerns that the proper sprinkler system be in place for

warehousing of foam plastics. In accordance with NFPA 13, ESFR sprinklers are not typically recommended for the protection of storage occupancies housing exposed expanded Group A plastics. Again, each situation should be carefully reviewed in context with either existing or future variables. When necessary, correction of an existing sprinkler configuration that no longer meets the performance criteria needed, can require significant modifications. When addressing and ESFR sprinkler system upgrade, modifications can encompass replacement of fire pump systems, upgrades to the water supply source and in the worst case scenario, complete system replacement using different types of sprinklers .

It is important to note that ESFR sprinklers should not be used for the protection of plastics manufacturing areas since they are application-specific and thereby intended exclusively for the protection of storage occupancies.

Proper fire suppression system design is essential for protection of storage occupancies to prevent catastrophic losses to facilities as a result of these challenging fire scenarios. There are many design parameters that must be considered when evaluating a fire sprinkler system designed for the protection of expanded exposed Group A plastics. While all sprinkler systems should be evaluated for their effectiveness when there is a change in building use, tenants or building owners that manufacture and store exposed expanded Group A plastics should exercise due diligence to ensure they have adequate protection. Those utilizing ESFR sprinklers for protection of their facility should consult a fire protection engineer to determine the appropriate course of action to upgrade their sprinkler systems if warranted.

## Sources

NFPA 13 Standard for the Installation of Sprinkler Systems  
2007 Edition

Risk Logic Inc., <http://www.risklogic.com/may2006.html>

Suppression Mode Sprinkler System Installation Issues, FM  
Global

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