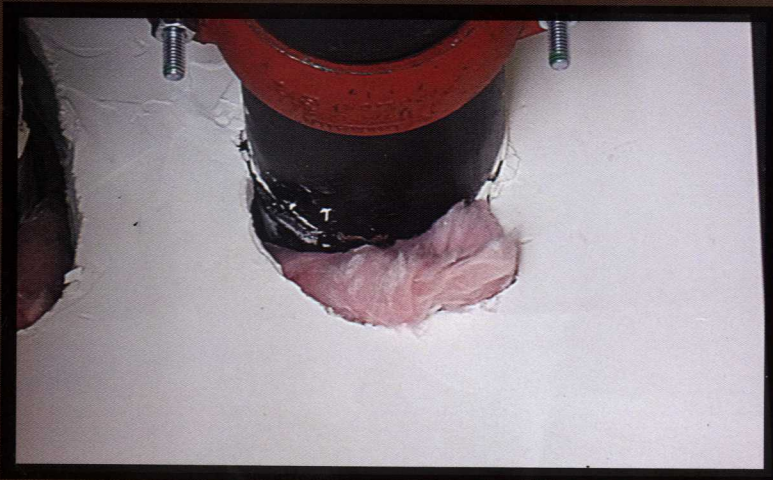
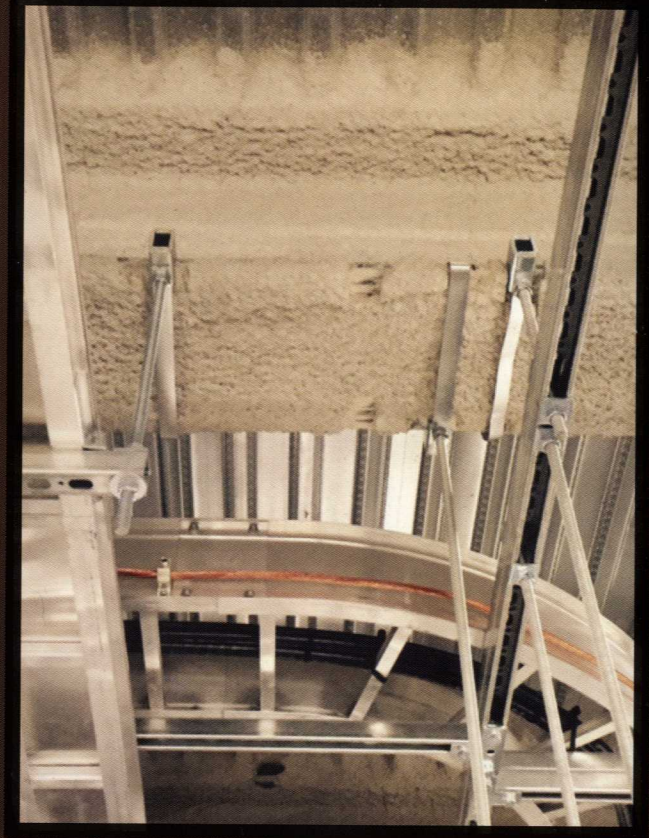


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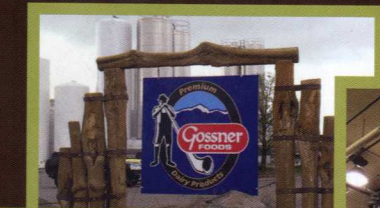


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# Making Holes and Firestops

Subcontracting  
Subcontracts  
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*With Thanksgiving to God  
and the Fire Sprinkler Industry*



## Precautions for Residential Fire Sprinklers Installed in Warm Climates

By James Langhorne, FPE

As residential fire sprinklers gain more acceptance as a minimum life-safety standard, more states and municipalities are following the lead of the IRC model building code in requiring them in all new homes. Early adopters include areas in the desert southwest, such as parts of Arizona and Nevada, as well as California, which implemented a statewide requirement in 2012. To ensure the proper function of sprinkler systems in hot climates, adherence to both code requirements and common sense best practices are vital. It is crucial that all parties involved in the manufacture, distribution, installation, and inspection of fire sprinklers understand the effect that exposure to excessive ambient heat can have on sprinkler system performance.

Residential fire sprinklers are, by design, heat sensitive. They are engineered to operate within a relatively narrow temperature range, such that they activate quickly in an incipient fire to control heat and smoke, thus providing a tenable environment for occupants to escape. If a residential sprinkler is exposed to excessive ambient heat, there is an elevated risk of a non-fire related activation. To reduce this risk extra care must be taken to protect all components of the system, particularly the sprinklers and water-filled piping network, from exposure to the temperature extremes. The NFPA 13, 13R, and 13D installation standards provide guidance for these situations. Strictly adhering to these requirements and following certain best practices will help to minimize the potential negative impacts of high-heat environments on residential sprinkler systems.

First, keep sprinklers in a cool, dry place. Avoid direct exposure to sunlight and do not store in confined areas subject to high heat. Specifically, ordinary temperature-rated sprinklers, which are defined by NFPA as having an operating temperature between 135°F and 170°F, must be protected from any exposure to greater than 100°F.<sup>1</sup> For example, on a hot day, storing

sprinklers outside at a job site or in an unconditioned vehicle are common situations where exposure above 100°F is likely. In these situations, the fusible link operating element of an ordinary temperature-rated sprinkler can be damaged at these excessive temperatures. While a weakened sprinkler may not fail immediately, it could potentially operate at an undetermined point in the future in the absence of a fire. This activation could be triggered by a spike in system pressure, for example, or by the progressive weakening of the sprinkler's operating element from continued exposures to high ambient heat.

Second, intermediate temperature-rated sprinklers must always be used if exposure to high ambient heat is possible. In fact, NFPA standards require that intermediate temperature-rated sprinklers be installed where maximum ambient ceiling temperatures are between 101°F and 150°F.<sup>2</sup> Intermediate temperature-rated sprinklers, which have an operating temperature range between 175°F and 225°F, are also allowed by NFPA standards even when maximum ambient temperatures are below 100°F<sup>3</sup>, which means selecting them for use in any warm environment is a good practice to follow.

Third, if outside ambient temperatures are expected to be above 100°F, then ordinary temperature-rated sprinklers should not be installed until the protected space is conditioned. While these situations may require a return trip to the

job site by the installing contractor, any sprinklers that are exposed to high ambient heat (i.e., greater than 100°F) during rough-in of sprinkler piping are, in effect, installed in violation of NFPA standards.

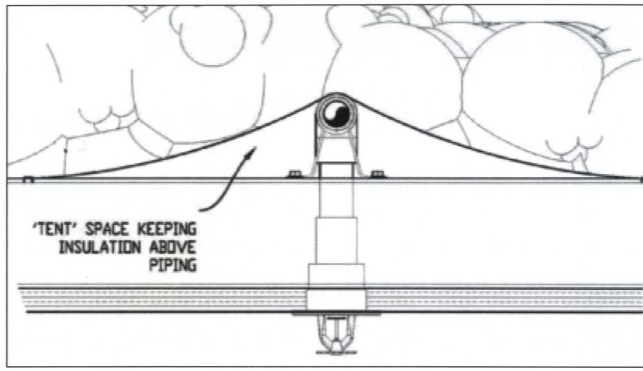
Fourth, it is vital to ensure that proper insulation practices are followed in order to shield the entire sprinkler system from excessive attic heat. Attics can reach temperatures of 150 to 160°F during a summer day, although outside air temperatures are only

*“The heat absorbed by the sprinkler water through improperly insulated pipe can then transfer through the sprinkler components to the releasing mechanism.”*



*Exposed Piping: Sprinkler system piping should not be left exposed in unconditioned attic spaces.*

95 to 97°F.<sup>4</sup> When not properly insulated, the high ambient heat in attics and other unconditioned void spaces heats up the entire system, including the sprinklers and the water-filled pipe. The heat absorbed by the sprinkler water through improperly insulated pipe can then transfer through the sprinkler components to the releasing mechanism. Heat can also be transferred from the unconditioned space to the link assembly via gaps in, or the lack of, proper insulation, which further exacerbates the issue. In addition to the direct effect of exposure of the fusible link to high temperatures, the elevated temperature of water in the piping also causes system pressures to increase significantly. For the above reasons, it is imperative that system piping is properly tented and fully insulated in all unconditioned attic spaces.



*Tented Insulation: Sprinklers and piping should be properly and fully insulated to avoid excessive system pressures and temperatures.*

Finally, a relatively inexpensive best practice is the installation of a UL Listed pressure relief valve. The volumes of water held within residential sprinkler water systems are relatively small and the system pressures, in the absence of a pressure relief valve, are “trapped” by the check valve. As a result, thermal expansion of water in system piping, due to exposure to high attic heat, can cause a significant rise in pressures within the system, which is well above the maximum pressure rating of 175 psi for residential sprinklers. A simple and inexpensive pressure relief valve will effectively and automatically limit the risk of over-pressurization of the system.

Whenever installing sprinklers in hot climates, it is critical that sprinkler contractors coordinate their work with the home builder to ensure that sprinkler system piping is insulated properly and precautions are taken to ensure sprinklers are not exposed to excessive temperatures during installation. The

installing sprinkler contractor should strongly consider providing specific direction to the builder, within the contract documents, for proper insulation of sprinkler piping. With proactive communication, and adherence to code requirements and common sense best practices, the installers, builders, and homeowners can have a greater sense of confidence that their residential sprinkler systems will perform as designed.

<sup>1</sup> NFPA 13 Standard for the Installation of Sprinkler Systems (2013 edition), Table 6.2.5.1

<sup>2</sup> NFPA 13D Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings (2013 edition), Section 7.5.6.2

<sup>3</sup> NFPA 13D Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings (2013 edition), Section 7.5.6.1

<sup>4</sup> B. R. Stewart Agricultural Engineer-Environmental Control ~ Agricultural Extension Service ~ Texas A&M University, 1995


#### About the Author:

James Langhorne is a 30-year veteran of the California Fire Service. He served 22 years as the Fire Marshal for the Montecito Fire Protection District, and was responsible for introducing fire sprinklers into the lexicon of extremely customized residences. Langhorne received a B. S. in Mechanical Engineering from the University of California at Santa Barbara, and is currently a consulting Fire Protection Engineer. His credentials include: Fire Investigator II and Chief Officer, California State Board of Fire Services; Registered Fire Instructor, Office of the California State Fire Marshal; and Fire Behavior Analyst, National Wildfire Coordinating Group.


For more information contact: James Langhorne, FPE, (805) 452-6099, langhorne1@cox.net.

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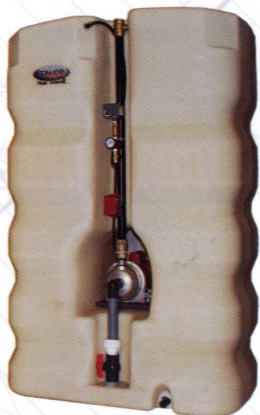
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