If You Don't Do Firestopping, Who Will?

By Randy G. Clark

Left: High-rise fires present unique challenges both in evacuation and in knocking down the fire. Below: Improper coordination between trades can result in a nightmare for the firestop contractor. (Photo courtesy of Randy Clark)

Engineers share responsibility for systems that save lives.

Since I first got my start in firestopping more than 25 years ago, I've seen many changes. The number of manufacturers with listings for firestop systems has increased more than threefold. The model codes have gone from unclear firestopping references to specific language within a section devoted exclusively to firestopping.

With these code refinements came increased enforcement by local building officials. Architects have become much more aware of the need to provide clear and specific details of firestop conditions needed within their building designs. Mechanical, electrical and plumbing engineers now automatically incorporate proper firestopping techniques, which influence the design of their individual service runs.

The types of products offered now include: sealants, putties, mortars, pillows, boards, wrap strips and devices. Through the many changes, one persistent question remains: *Whose responsibility is it to do the firestopping?* Before we deal with this issue, we need to review the following: What is firestopping, why do we need to firestop, and how are through-penetration firestops materials tested?

One way to look at firestopping is as a material or combination of materials used to re-establish the fire integrity of a rated wall or floor assembly after its rating has been compromised by the inclusion or exclusion of a penetrant. To simplify, one must maintain the time-rated integrity of an assembly after any alteration. As an example, when an insulated pipe is installed

If You Don't Do Firestopping, Who Will?

A fire test is conducted on 12-inch PVC DWV pipe. Product testing is the responsibility of the firestop manufacturer. (Photo courtesy of Randy Clark)

through a two-hour rated gypsum wall, that pipe has destroyed the original rating of the wall. If the contractor follows a tested firestop configuration and properly installs the listed firestop materials, the original rating of the wall with its penetrant is maintained.

The Need To Firestop

First, various building codes require firestopping. All major building codes have at their foundation fire protection. The integrity of a building during a fire must be maintained for a safe evacuation of its occupants. The integrity also needs to be maintained to provide firefighters their best opportunity to put out the fire.

Second, firestopping is a matter of life safety. The lives of the firefighters as well as those of the building's occupants could depend on having properly firestopped penetrations. Using a product that is part of a recognized firestop system configuration will meet the requirements of the codes.

The industry and code officials both recognize the established test standard ASTM E814 or UL 1479, "Fire Tests of Through-Penetration Firestops," which mandates that the fire endurance of the firestop system configuration be not less than that of the fire-rated assembly when tested under a minimum positive pressure and to the standard time-temperature curve. After the successful passage of the fire endurance portion of the test, the entire assembly is subjected to the erosion, impact and cooling effects of a high-pressure fireman's hose. The fire endurance as well as the high-pressure hose portions must be passed successfully to meet the requirements of this standard.

Whose Responsibility Is It?

Let us examine several layers of responsibility: The architect/engineer, the local building official, the general contractor, the subcontractor/specialty contractor and the firestop manufacturer. When it comes to firestopping, each shares a common responsibility: life safety.

Architects/engineers for the project are responsible for developing a concept and committing it to paper. They also are responsible for hundreds of building elements, not only specifying which to use, but also making sure that each will function as intended and in harmony with the others.

The design and its elements must meet local code requirements. The design configurations can make an impact on the method of firestopping, the complexity of the system and its overall cost. These parameters include: the selection of materials, the size of the opening, the quantity of penetrants within the opening and the intended conditions to which the penetrants will be subjected.

Selection of materials. After the architect has established a design to match the owner's requirements, the various engineers set to work designing specific service runs. These runs may be for electrical conduit or cables, piping for domestic water, DWV, steam or chilled water, HVAC ductwork or other services.

The choice of a particular run could affect the method and materials used in firestopping and its overall cost. For example, combustible penetrants (especially various types of plastics) are usually more difficult than metallic penetrants to firestop and sometimes require the use of special collars or wraps. These collars extend beyond the diameter of the pipe and, because of their anchoring, more space is required between penetrants. In addition to complications with combustible penetrants, some types of pipe insulation materials are more difficult than others to firestop.

Further, it is important to make sure that sufficient annular space is provided for the insulation so that an appropriate amount of the selected firestop material can be used. The annular space created will be in direct proportion to the size of the hole made within the assembly and the size of the hole made can affect both the methods and materials used.

Size of the openings. Too little or too much annular space can create difficulties in properly firestopping a condition. In most cases, the size of the hole must be planned to fit the penetrants and the amount of firestop material required for the condition. >

If You Don't Do Firestopping, Who Will?

Large openings within a floor may present a problem if the annular spaces created exceed 4 inches. Since this dimension is the average width of a human foot, most specifications will require that a plate be installed or a material that could support the same weight as the floor be used. Since

Fires come in all sizes. (Photo courtesy of Shutterstock)

larger openings generally create large annular spaces, these bigger areas present a greater surface area for the fire to react against and, therefore, present more severe conditions.

One should allow for the smallest amount of annular space around the penetrants, while making sure the space provided falls within the tested configuration of the selected firestop material. This optimization could ensure minimal total cost of firestopping, while still providing a configuration that should meet with the local building official's approval. Multiple penetrants can also contribute to difficulties.

Quantity of penetrants. For simplicity, some designers utilize one large opening where many penetrants can be placed. In most cases, however, individual openings are more desirable. To firestop a single penetrant in an opening usually is more cost effective than multiple penetrants. Far more listings can be found in Underwriters Laboratories Fire Resistive Directory for single penetrants within a hole than for multiple penetrants within a hole.

Placing multiple plastic pipes (especially large diameter DWV pipes) within the same opening could result in a condition for which no currently listed firestop system exists. Plastic pipes should always be run in individual holes allowing for ample space between the openings.

Multiple penetrants, especially within a wall opening, can present a problem for the installer because of the necessity to fill the areas between the penetrants with firestopping materials. If the penetrants are too close or are too random in placement, the installer may not be able to place the materials physically into the spaces between the penetrants. This difficulty could cause great consternation and needless delays in the job.

All firestop materials are expensive and, the larger opening, the greater the total cubic inches of fill material needed. Additionally, the more complex the opening, the greater the total time required to complete the installation. Since *time is money*, increased complexity contributes to an increased installed cost.

Intended conditions. Engineers will select the appropriate service runs for the duties intended. The selection of materials will include the type and schedule of pipe, the type and size of insulation, the type and size of cables, and the size and gauge of duct. These materials have been engineered to perform within their environment and within the appropriate design limits.

Consideration must be given, however, to the firestopping methods and materials to be used if these materials are placed within fire-rated assemblies. Will the penetrants experience extreme vibration or movement? Will they experience an unusual atmosphere of high moisture, water or chemicals? Will they be exposed to elevated temperatures?

These variables could affect the selection of a proper firestop configuration. In these situations as in all unusual cases, the manufacturer should be consulted for a specific recommendation.

Others With Responsibility

Inspectors will require engineers or contractors to provide sufficient documentation to show that the firestop configuration and the products used meet the requirements of the code for the particular assembly and penetrants. Inspectors have the ultimate responsibility to approve any firestop system, whether it is a tested system or an engineered judgment.

The general contractor is under contract with the owner to construct the project in accordance with the plans and specifications. Therefore, the general contractor has the ultimate responsibility to complete the work, even if the subcontractor (who had the original responsibility) fails to complete its individual contract.

For firestopping, it is most common for the contractor making the hole to be responsible to fill it properly. During the last decade, the number of specialty contractors who concentrate on the application of firestop materials has grown.

These applicators will contract for the entire project or will subcontract only for the firestopping from the other trades on the jobsite. These specialty applicators will facilitate a more consistent approach to firestopping for the overall project. An increased number of specifications call for the firestopping to be done by a single contractor.

Lastly, manufacturers have the responsibility to develop and test products that will best meet the needs of a rapidly changing building industry. These products have to work and should be easy to install and cost effective.

Manufacturers also have the responsibility to provide documentation for their products and for the configuration in which they must be installed. If any question arises about the design or use of a particular product in a specific condition, the manufacturer should be contacted. The responsibility for proper firestopping is truly a shared one. pme

Randy G. Clark works for RectorSeal Corp. as manager of firestop technologies for the International Division and OEM sales manager. He can be reached at randyclark@rectorseal.com.