SpecSeal FIRESTOP PRODUCTS®

Technology Update

Firestopping Sheet Metal Ductwork

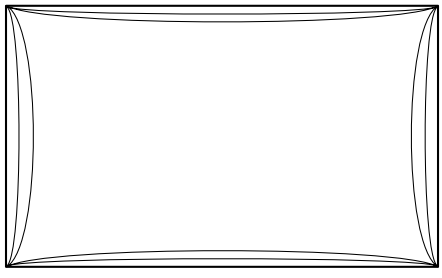
Understanding the Forces At Work During A Fire Will Make The Job Easier

Firestopping as an industry, is relatively new. While under normal circumstances, testing is generally intended to provide engineering information... In the case of firestopping, it has become "an approval". Thus there is a tendency to look in the UL Fire Resistance Directory for an "approved method". With this mentality at work, there will always be an endless amount of testing and there will always be an untested condition.

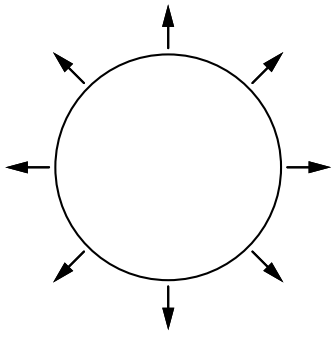
Fig. 1

Round Vs. Rectangular Ducts

How Expansion During A Fire Changes The Geometry



Square or Rectangular Ducts: The expanding metal wants to expand logitudinally but cannot, thus it deflects inward, creating an opening around the duct



Round Duct: Stronger due to its geometry, the duct cannot collapse inward and thus tends to expand.

Ducting systems will almost always represent an untested condition for a variety of reasons. While pipes and cables tend to be made according to very strict standards in a factory environment, ducting systems out of necessity, are subject to a great deal of field fabrication. It's definitely one of those areas where we as a manufacturer could test and test and perhaps not be able to offer a guarantee of similar performance in real life without taking precautions that cover the broad range of potential issues.

What kinds of ductwork are we talking about? This is an important question! You can't treat all ductwork the same. For the sake of our discussion, let's break it into two categories. The first category will be air-handling and the second will be exhaust or flue ducting. I realize that this may seem simplistic. It's also not intended to necessarily follow any HVAC industry jargon. It's also important to distinguish between combustible and noncombustible materials used in the construction of ductwork. In this discussion, we're going to consider any material that could burn or melt out during a fire as being combustible. This would include plastics, some insulation materials, as well as some metals such as aluminum.

Noncombustible Air Handling Duct

Even though galvanized sheet metal ductwork will not burn, it still poses some considerable hazards if improperly firestopped. Before we discuss the problems and the solutions, let's stress one thing right away... THESE DISCUSSIONS DO NOT APPLY TO DAMPERED ASSEMBLIES! ALWAYS FOLLOW THE DAMPER MANUFACTURER'S GUIDELINES WHEN IT COMES TO INSTALLATION AND SEALING OF THESE ASSEMBLIES. If you are reading this information prior to the installation of firestopping around ducts, be sure to verify that you are not dealing with *aluminum* duct.

What are the problems? Figure 1 (above) is intended to depict the difference between round and rectangular duct when it comes to performance in a fire. If you can understand this difference, the firestopping solution becomes more obvious.

Round duct will behave in a fashion similar to a pipe. During a fire the metal will expand as it heats. Because of its shape, this expansion and its stresses will be distributed fairly uniform around the duct. Thus designs similar to those used for pipes will generally work very well. If the duct is insulated, the problem becomes a bit more acute. It should be noted that duct insulation is usually the very low density, fluffy

fiberglass type. This type of insulation will very readily burn. Thus it requires greater precautions. Either stripping the insulation away where the duct penetrates the barrier, or using aggressively intumescent materials may be required. (Where this type of insulation is used we suggest the following... 1-If possible strip it back. 2-If it is left in place, compress it and use a firestop system incorporating a wrap strip).

Rectangular ductwork poses a greater problem when it comes to fire performance. Potential deflection must be dealt with through system design. This is a good time to discuss how UL tests firestops and what a successful system must do. UL burns penetrants installed in much the same fashion as you would see them in the field. Again however, we must caution that no amount of testing could even get us close to providing solutions for all the potential ductwork conditions that could occur in the field. So let's focus on the requirements of the test standard (ASTM E814/ANSI UL1479). These standards require that a firestop assembly must not allow the propagation of fire through the assembly and must not allow the projection of water through the assembly during a hose stream test. There are other requirements... But in simple terms, these are the one's that we address in the engineering of a firestop system.

You may have noticed that damper assemblies generally incorporate what I would call a frame or flange around the damper housing. This frame reinforces the damper and prevents the duct from collapsing inward and impeding the function of the damper (this is also why intumescent materials must never be used in this area in damper assemblies). The flange also covers the annulus or void around the damper and addresses the requirements for not allowing the passage of flames or a projection of water. For these same reasons, we think it makes good sense to frame or flange ductwork. Installing a firestop seal in the annulus utilizing a suitable packing material such as mineral wool and a good quality intumescent sealant will handle the sealing of the void around the duct. The installation of a flange will help prevent deflection and ensure that the seal remains in place during hose stream exposure.

Where fiberglass insulation has been applied to rectangular ductwork, we recommend that it be slit and pealed back to permit the installation of the flange directly to the duct. The insulation can be placed back in position after installation of the seal. There is no need to remove the insulation within the assembly. Attachment of the flange to the duct is a necessity. The need to fasten the flange to the floor or wall surface may not be depending on the size of the annulus and the gauge of the metal used for the flange.

Exhaust or Flue Ducting: The other type of ductwork that we will discuss is the type used for exhaust purposes (bathroom or kitchen vents, dryer vents) and flue pipes or stove pipes. These applications require a lot of consideration. There are a number of questions that must be asked prior to making a decision about firestopping. In fact a lot of the questions must be asked before installing the pipes themselves in order to avoid creating a fire hazard or installing a system that simply cannot be properly firestopped. Let's take them one at a time.

Room Air Vents: We're seeing a lot of this in apartment and condo construction. Caution is advised! Flexible thin gauge aluminum ductwork is frequently being used. This light gauge material will burn and melt out very quickly. A good solution is to transition to PVC pipe (where permitted by local codes) at the wall or floor and then install firestop collars. Why not substitute a short length of steel? THIS IS AN UNSAFE PRACTICE! The duct is an air vent. Fire can be blown or drawn into the duct. The fire could extend past the steel and burn its way right into the adjoining compartment.

Flue Pipes or Stove Pipes: An additional consideration here is the normal operating temperature of the pipe or duct itself. If the temperature under normal operating conditions is elevated above room temperature to any extent, care must be exercised to be sure that the sealing material will not degrade over time due to the continued exposure. Additionally, if using intumescent materials, the activation temperature of the intumescent materials must be a consideration. In general organic materials used in sealants such as acrylics, or other latex materials will degrade over time if exposed to temperatures exceeding 120°F (this will vary somewhat from material to material). Silicones will have an upper limit of as much as 350°F. In applications where temperatures exceed this figure, inorganic sealants made from colloidal silicas (furnace cements) may be the only choices. These materials do tend to be brittle however and do not compensate for expansion and contraction very well.

Double or triple wall flue or stove pipes are designed to reduce the outer temperature by permitting airflow between the layers. Attempting to seal these areas may pose a fire hazard. We generally direct questions concerning the proper installation and firestopping of these types of pipes back to the pipe manufacturer.

General: One last consideration... Fastening! Doing all the right things will do no good if all your good work becomes undone. Taping duct sections together isn't enough. Use mechanical fasteners that won't burn or melt out.