

DECODING THE CODE

W-Rating

Many people involved in commercial construction understand that firestopping is required by the individual building codes. However, there are many misunderstandings as to what is required by the code. Recently a W-Rating has been established by UL as part of the ANSI/UL 1479 test procedure. While this is not yet required by any of the model building codes, it may one day be.

The number one problem in construction is water. We develop air barrier systems, vapor barrier systems, roofing systems, flashings, and ground water barrier systems to keep weather and water out of the building. And, a great deal of money is spent on additional waterproofing systems that are installed after construction to cure water problems.

The present concerns about indoor air quality and mold growth have drawn more attention to the problem of water damage. Increased measures are being taken to prevent mold and to control water before mold becomes an issue. Drywall manufacturers have begun providing mold resistant drywall. Piping systems (PEX) with virtually no fittings are becoming more popular. Concrete slabs are being sealed for water.

Another area that has been receiving increased focus is making floors more watertight. For many years engineers have specified the installation of steel sleeves for pipe penetrations. These protrude above the floor creating a water dam. This water dam is supposed to prevent the flow of water to the next floor below should an overflow occur. Of course, many of these sleeves have pipes or conduits in them, the annular space must also be sealed for fire and smoke. Other than the stairway and elevator shaft, they represent the greatest path for water flow from floor to floor.

If there is a leak in the pipe the water will run down the pipe from floor to floor following the pipe. When it encounters a fitting, the water splashes onto the walls, increasing the likelihood of mold growth. Also, over time, the concrete shrinks away from the sleeve leaving a path for the water to flow past the sleeve and down to the floor below.

There is no need to mention the full list of things that can go wrong beyond pipes bursting, tubs overflowing, and sprinkler heads going off accidentally. The issue of sprinkler heads going off has become so important (It costs an average of \$25,000 to clean up afterward if a sprinkler head goes off in a commercial building) that hotels are putting stickers by each head in the hotel room asking the guest not to hang their clothes on the sprinkler head.



This problem has become so noticeable that Architects have sought help. Since most of these openings must also be firestopped, Architects asked the firestop industry for help in addressing this issue. Thus, with the help of UL and the STP process, the W-Rating was developed.

The Standards Technical Panels (STPs) are an important part of the process by which UL develops and maintains its Standards for Safety. An STP is a group of individuals, representing a variety of interests, formed to review proposals related to UL Standards for Safety. When the American National Standards Institute (ANSI)/UL Standard for Safety is involved, an STP serves as the consensus body to review and vote on proposals prior to publication.

The development of ANSI/UL Standards for Safety greatly benefits from the expertise of individuals interested in the products affected by ANSI/UL Standards.

UL Standards are recognized nationally and internationally as the benchmarks for product safety. The Standards Technical Panels (STPs) provide UL with the means to receive early input from those who are interested in the standards development process.

Most new standards are developed from previous standards. In the case of the W-rating the previous standard was a standard for water sealing of bulkheads. For firestopping penetrations the standard had three classes. Class I was 3 feet of head pressure, Class II was 27 feet of head pressure, and Class III was 54 feet of head pressure. While this worked fine for boats it wasn't very practical for buildings. So, the committees settled on a Class I rating.

- ⦿ The Class I W rating determines the capability of the firestop system to maintain water-tightness of the penetration through a floor or wall construction at ambient air conditions under 3 ft of water pressure head (1.3 psi) for a period of 72 hours. The W rating may be applicable for building structures whose floors are subjected to incidental standing water and/or for buildings that house critical equipment as described in ANSI/NFPA 75, "Standard for the Protection of Information Technology Equipment," and ANSI/NFPA 76, "Standard for the Fire Protection of Telecommunications Facilities."
- ⦿ W-Rating is measured after a 28 day cure of the firestop sealant which is mounted in an assembly and protected from movement and contact for the cure period.
- ⦿ Real life conditions on a job site may not be the same.
- ⦿ Pipes and concrete must be clean, free from oily residue and dry for sealants to properly bond.
- ⦿ Priming may be required for long term bond.

Waterproofing anything, with sealant, has challenges. Anyone who has done this before knows that waterproofing sealants don't work unless the surfaces are properly prepared. Some surfaces even require priming. It is no different with firestop sealants. The openings must be clean, dry, and free from debris. Also the

pipes must be cleaned of the oily residue present from the manufacture of the pipe. All pipes have this residue. The only way to clean it is with a solvent.

Perhaps you could actually observe a plumber or electrician cleaning the pipe and sitting on the floor with a hair dryer to dry the opening, but it is doubtful. The sealant must remain undisturbed for the 28 day cure period, also something not likely to occur in real life. The contractor, after caulking the hole, will probably use the pipe he has just caulked to pull himself up, thus disturbing the seal he just installed. Anybody incidentally moving the pipe on floors above could easily compromise the seal as well.

To apply the sealant adequately enough to provide a proper seal, the riser clamp must first be removed, to gain access to the full surface of the hole. This requires extra time and a wrench, both rarely used by a firestop contractor.

Over time many sealants dry out and crack. If the pipe moves from normal expansion and contraction, the seals can move out of the hole. Perhaps you have seen globs of sealant attached to the pipe two inches from the hole because the pipe was moved after the sealant had cured and the sealant hadn't been properly bonded to the hole. Now the sealant is totally ineffective and the hole has lost any protection that it once had.

Ask any contractor how many times he has had to go back and re-caulk holes where the sealant was cracked or there was an opening between the concrete and the sealant, even before the walls have been closed up. Imagine what it looks like behind the wall a year later. Once in a while an inspector catches this, but those times are few and far between. He may not be thinking water tight or smoke tight. He may be thinking "This is the intumescent type caulk. If the fire ever comes it will expand and the cracks will seal themselves."

Other methods to make the openings watertight include firestop sleeves, most of which require additional accessories to make them meet the W-Rating. The W-rating is measured after the concrete cure and the annular space is protected. The space between the concrete and the sleeve is not included in this test. This shrinkage will always occur with the use of these firestop sleeves.

Much care must be exercised to read and follow the instructions (installers must be taught to do this). Often many things must be done in order for the devices to comply, such as caulking and installation of mineral wool, plugs, modules, etc.

Many of the UL systems and firestop devices have been tested to this new W-Rating test procedure. Architects are specifying a W-rating for their projects, because they want floors to be watertight or at least water resistant. Is it required by the code? Not yet. Will it be required by the code? Maybe not. Is it important to have water tight penetrations? Absolutely, if you are concerned about mold growth, water damage, and long term liability. Is the contractor concerned about this? Not likely, only if it is specified or if the solution saves him money. Typically, he isn't going to provide more protection that is required by the specifications unless he has been held liable for water damage before. He is not going to provide anything the inspectors are not looking for, either. Leaving it up to the contractor as to how a water seal is to be provided can be disastrous. He may even simply use bathtub caulk.

Depending on the Building Inspector, performing an inspection may not be enough. He is typically looking only for code required items. Inspecting for water seals must be included in the project quality control process.

The building code requirements for firestopping are based on ASTM E 814. This standard has three parts, the F-Rating (prohibits flame passage through the system), the T-Rating (prohibits flame passage through the system and requires the maximum temperature rise on the unexposed surface of the wall or floor assembly, on the penetrating item and on the fill material not to exceed 325°F (181°C) above ambient), and the hose stream exposure (passage of this requirement requires the system doesn't develop an opening, sufficient for the projection of water, through the assembly).

Some people assume this hose stream test is supposed to assure the seal is water tight. Not so. It is done after the fire test is complete. All intumescent products have expanded and closed off the openings, preventing the fire from passing through. Before the fire there may have been an opening sufficient for the passage of water or smoke.

Nowhere does this test standard address water or smoke. Recently, in the IBC 2006, smoke was addressed by adding a requirement for a L-Rating (air leakage). The L-Rating test was also developed through the same UL STP process that developed the W-Rating, and is now part of the code. That process which has included the L-Rating will most likely get the L-Rating added to the ASTM E 814 test standard. Eventually this may also happen with the W-Rating.

If a contractor is required to provide a W-Rating, special attention must be given to the UL system. Many of the UL systems require additional materials or techniques be used to provide the W-Rating, including caulking, mineral wool, modules, or mechanical plugs.

The W-Rating test procedure, at the writing of this paper, is unique to UL. Other testing agencies cannot test to the ANSI/UL 1479 because it is proprietary to UL. Therefore products which may have met earlier code requirements that were tested to ANSI/UL 1479 and ASTM E814 may not meet IBC 2006. Special attention must be given to assure that the W-Rating requirements are met.

With mechanical systems such as firestop sleeves, extra care is required to ensure all installation instructions are followed. For instance, if a smaller pipe is inserted into a sleeve, additional caulk, mineral wool, modules or both may be required to provide the W-Rating. If caulk is required, the same standards for a clean and dry surface also apply to the penetration opening and the penetrating item. The increase in steps to meet these new requirements makes the overall installation of Firestop more labor intensive and also increases the risk that a step may not be followed or omitted.

The probability of a contractor ever cleaning pipes or openings, or even drying them out is pretty slim. Therefore, choosing systems that do not require any additional materials or labor intensive cleaning steps increases the likelihood that a system will actually function as intended.

One such system is the new water/smoke tight pipe sleeve system. This system provides a W-Rating by simply inserting the pipe into the sleeve.