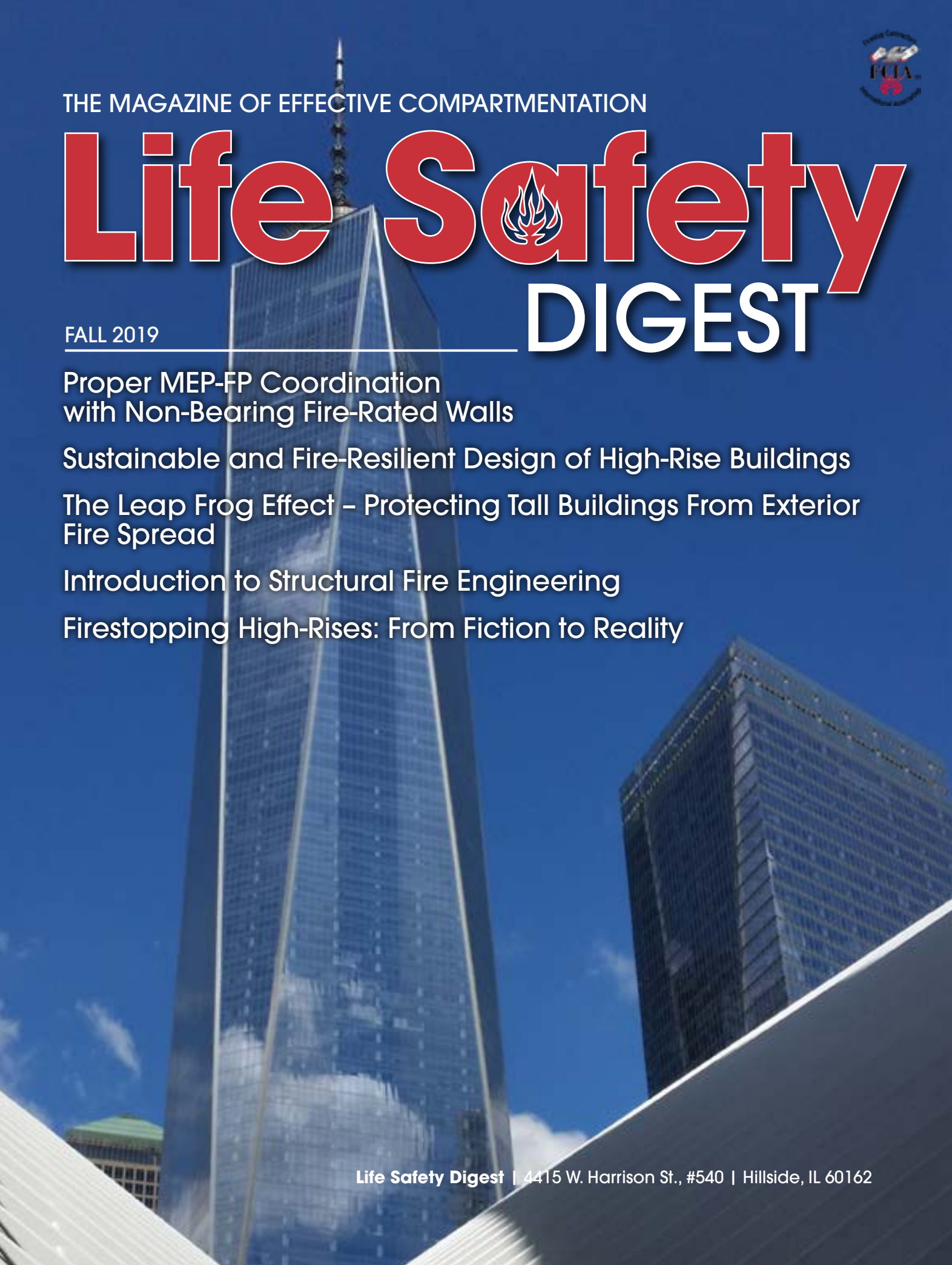

THE MAGAZINE OF EFFECTIVE COMPARTMENTATION

Life Safety DIGEST

FALL 2019

Proper MEP-FP Coordination with Non-Bearing Fire-Rated Walls

Sustainable and Fire-Resilient Design of High-Rise Buildings

The Leap Frog Effect – Protecting Tall Buildings From Exterior Fire Spread

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COVER STORY

FALL 2019

Seattle Skyline. Photo by Brian Meacham

WRITTEN BY **COREY ZUSSMAN**

PROPER MEP-FP COORDINATION WITH NON-BEARING FIRE-RATED WALLS

What's more important than life-safety? I remember my first AHJ inspection at a hospital that I worked for in Chicago. I was relatively new to the position and thought that firestopping was something that we just used to close the hole in the wall. I learned a lot that morning, gaining a better appreciation for the little details that could give occupants more time to escape - or even save a life.

We should not take for granted the passive fire-resistance-ratings of our Mechanical, Electrical, Plumbing (MEP)- Fire Protection (FP) penetrations in fire barriers, fire walls, fire partitions, smoke barriers, and smoke partitions. That's why at Pepper Construction, we are making sure that each construction discipline understands how to properly detail their penetrations in the wall, including ensuring they stay out of the fire-resistance-rated head-of-wall joint.

Firestop installation takes effort to be installed properly. MEP-FP penetrations require coordination by all parties, and many tools can be utilized to assist with this effort. The installations must meet building requirements such as specification, tested assembly, and Manufacturer requirements for the specific piping components and other systems in the building, such as the fire-resistance-rated assembly, head-of-wall, and framing members, to name a few. They must also comply with Building Owner and Building Code requirements. As such, coordination is every party's responsibility and not just the individuals installing the firestopping products. It's essential that all coordinate to review and verify that all locations are correctly installed and verified by a trained individual.

Oftentimes, firestopping appears to be an afterthought during the bidding process that must then be dealt with, rather than properly budgeted for and coordinated with all the construction disciplines ahead of time. It seems that the work is passed off to the lowest paid individual who might not be properly trained to install the complex firestop systems, creating a potential life-safety hazard for the Building Owner and the occupants.

A one-hour Manufacturer-led review of the products and installation is not adequate training. Instead, the design to restore the hourly-ratings of the fire-resistance-rated assemblies should be discussed before bidding, and only properly trained individuals should work with the tested and listed assemblies and rated barriers, both horizontal and vertical.

SO, HOW DO WE CHANGE THIS?

No preconceived ideas. The team must be open to understanding the requirements, which may be new to the team, for the exact products that are being installed to become systems or the adjacent systems, as well as the specific building components.

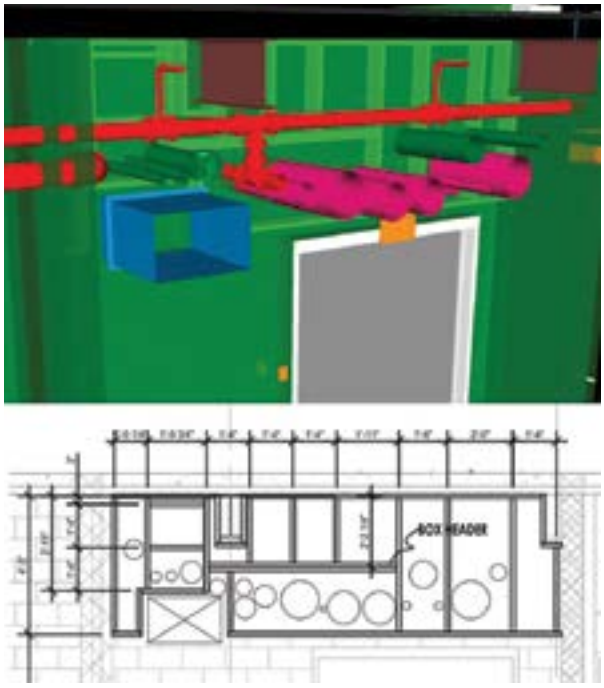
- Tested assemblies should be submitted and reviewed ahead of time.
- A pre-installation meeting should be held.
- A mock-wall installation should be considered.
- First-work-in-place protocol should be established.
- Assemblies should be specific to the project and not just a Manufacturer's sample assembly book and material data sheets.
- Finally, thought must be given to the installations and the other components of the building, such as the head-of-wall / "no fly zone" requirements for each location.

Mock-up models set the tone for acceptability.
Zussman/Pepper Photo

Once the Firestop Installation Contractor is let, a process to restore the hourly fire-resistance-rating to the assembly once a breach is made should be identified per construction discipline:

1. Review fire-resistance-rated wall/horizontal-floor assembly locations
2. Identify the materials being used to penetrate the membrane of either wall or floor
3. Identify the "no fly zone" at the head-of-wall
    a. If this is not clearly identified in the project drawings or specifications, an RFI should be written requesting the "no fly zone" for each location.
4. Plan/design the firestop systems to be used
5. Installation of firestop systems by a qualified team
6. Inspection of the installation by a qualified Special Inspection Agency
7. Owner to maintain the systems

Planning the systems ahead of time will better prepare the construction discipline installing the penetrating items and firestop products and the General Contractor or Construction Manager for proper coordination with other disciplines. It will also help guide the Building Information Modeling that is likely happening on your project.

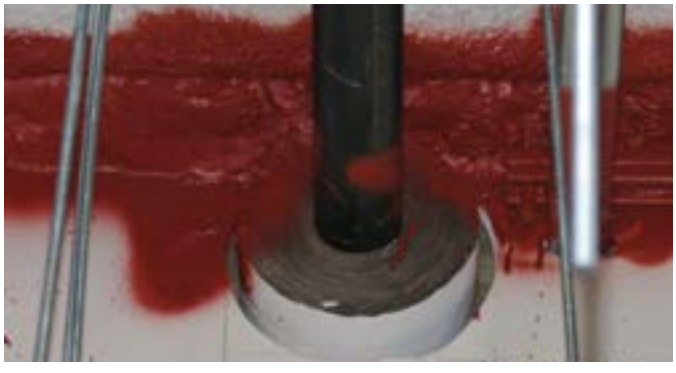


Planning where penetrations are to occur speeds the process. Zussman/Pepper Images

HEAD OF WALL AND NO FLY ZONE

Along with the penetrations, it is equally important to understand and coordinate the head-of-wall for the fire-resistance-rated wall assemblies. I tend to get blank stares when I talk about the head-of-wall and the "no fly zone". The head-of-wall will determine the "no fly zone" for the MEP-FP trades.

The "no fly zone" is the area from the bottom of the deck above to the point at which the MEP-FP item could be located. In general, MEP-FP items should not go through the head-of-wall joint unless specifically tested and if the system design allows for the required movement of the system. Many tested MEP-FP items going through the head-of-wall have very limited movement ability - typically far less than what is needed for the system.



"No Fly Zone". Zussman/Pepper Photo

MEP Penetrations through head-of-wall joints should be avoided unless systems allow for fire-resistance and movement expected. Zussman/Pepper Photo

When I start talking about "no fly zones", I observe six stages to the Contractor's reaction:

The 6 Stages of Head-of-Wall Firestopping:

1. Shock
2. Denial
3. Anger
4. Bargaining
5. Depression
6. Acceptance

It's best to get through all six stages before the letting of the contract, otherwise the process might be a surprise and create a longer process of understanding, or worse, incorrect installation. Once the Contractor understands, typically the MEP-FP installation is lowered from the bottom of the deck to below the "no fly zone."

Once the Contractors reach acceptance, the head-of-wall for non-bearing walls needs to be determined. Load bearing walls are static and do not have a head-of-wall joint.

When possible, ask four questions up-front, during bidding to properly identify the requirements of the system for the restoration of the fire-resistance-rated wall assemblies.

1. **What is the structural live-load deflection?**
   It is critical to determine the correct value for the up and down movement of the structure based on the live-load, not wind pressure. The code maximum is generally L/360, where L equals the distance in inches between the columns. Most buildings are designed stiffer than code maximums, but this is a good guide if a deflection cannot be determined.

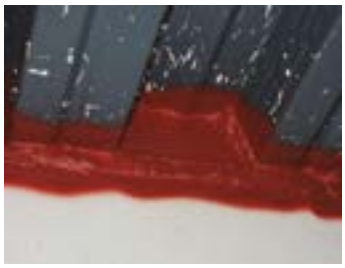
2. **Is there spray fireproofing on the beams and deck?**
   If there is, it will bring down the head of wall using z-clips on the top track, which will also increase the "no fly-zone."

Spray fireproofing (SFRM) on deck. Fire Stop Technologies Photo

3. **What type and size of head track are being installed?** Slotted track, deep leg, intumescent, mechanical type, etc. The size of the head track correlates with the deflection due to the requirement of the stud to be within the top track. The calculation for the head track on floors that are not on grade is 2x deflection + 1 inch. On grade, the head track must be a minimum 1x deflection + 1 inch (always a minimum 1" into the track).

4. **What is the type of firestopping for the head-of-wall?** Is it a sealant, spray, intumescent, mechanical, etc.? Sealants are the most restrictive and will likely only be good for static conditions unless the movement is less than ¼". Spray movement ability will vary considerably and needs to be carefully reviewed. Movement ability is approximately between 15-50% for spray and generally 80-100% for intumescent. Mechanical type is the most restrictive for height. This type will create the deepest "no fly zone." The system could have a depth of 8-15" or more depending on the deflection.

The live-load deflection generally applies to both directions (up and down), unless you are on the ground floor or basement level. Also, note that the deflection of the floor above is down on the floor below.



Firestop spray system at head of wall. Zussman/Pepper Photo

Even older buildings are subject to deflection. It is good practice to ask for the deflection and "no fly zone" as soon as possible to properly begin to coordinate your MEP-FP systems.

CALCULATING THE "NO FLY ZONE"

The "no fly zone" is calculated with the deflection requirement of the assembly (hold down of the drywall), plus spray fireproofing, plus the overlapping requirement of the firestopping (if a firestop system rather than mechanical type), plus the annular space and sealant installation of a penetration firestop system or a flange depth in HVAC.

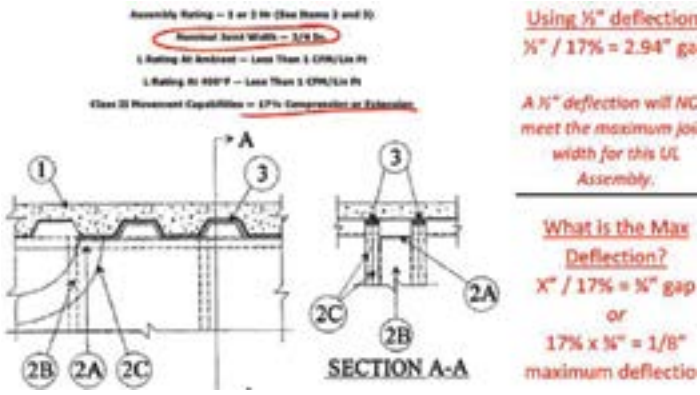
For example:

1. Building deflection: 1" deflection on the 2nd floor
2. 1" of spray fireproofing on the beams and deck
3. Head track type is deep leg
4. Firestopping is a spray joint

The assembly has 1" spray fireproofing. The system could have a drywall hold down of 2" (based on 50% movement of the spray type system (1"/50%=2")), plus ½" overlap onto the drywall, plus a 2" flange on the HVAC and ½" annular space. The "no fly zone" would be at least:

1" (spray fireproofing)
+ 2"(drywall hold-down)
+ 1/2"(overlap)
+ 2"(HVAC clip)
+ 1/2" (annular space)

6" no fly zone from the steel or deck for the HVAC.



Visual deflection calculation. Zussman/Pepper Image

THE INSTALLATION PROCESS

The installer must follow the "no fly zone" under all obstructions, including the beams, joists, angles, etc. For example, the MEP-FP cannot be directly under a beam going through a fire-resistance-rated assembly; it must be under the "no fly zone" for the beam.

So, how do we go from reacting to firestopping installation to proactively discussing the installation with the entire team?

Talk to the installers about the different installations and requirements of the system and the building. Make sure that the "no-fly zone" is given before the design of the HVAC-FP systems. As a team, go over the basic installation requirements for the systems, get the Manufacturers involved and make sure that the installers understand and know how to read the tested and listed assembly instructions and install the products.

The Manufacturers, testing agencies, and verification team should be visiting the individual companies and training centers installing these products to go over the process from beginning to completion. Installers should ask the right questions before work begins:

1. What is the deflection?
2. Do we have spray fireproofing on the beams or deck?
3. What is the "no fly zone?"
4. Which Manufacturers should be used based on specifications or Owner requirements?
5. When will the pre-installation meeting take place to go over the project and installation?
6. Are we installing a firestopping mock-up?
7. What are the "first work-in-place" procedures to ensure the entire team understands at the very beginning of the installation?

THE BENEFITS OF TECHNOLOGY

The current state of HVAC-FP firestopping systems and where they'll be headed soon is very exciting. Augmented reality (mixing live interaction with the future construction of the project) allows installers to see the building walls and the "no fly zone" in front of them while walking around, providing a better understanding of the difficulties of installation, sequencing needs due to obstructions, and the general flow of construction.

Augmented reality and BIM help with planning locations of penetrations below the head-of-wall. Zussman/Pepper Photo

Technology will also allow for better review of the wall for bond beams or door king studs when managing the design of the HVAC-FP systems. It can identify sleeve size and location ahead of a concrete pour, which facilitates better coordination for the concrete Contractor and verifies the proper size and location of materials ahead of time with the entire team. The use of augmented reality is still in its infancy and is just beginning to show the benefits for better firestopping coordination.

A successful project clearly identifies the fire-resistance-rated wall assemblies and identifies critical building elements that are not easily seen on the architectural and MEP-FP drawings. With better coordination through Building Information Modeling (BIM), the installer could easily coordinate and navigate through a wall of studs before the installation of either takes place. Moving the HVAC-FP or building studs before anything is installed is a time saver for the entire team.

When the tested and listed firestopping systems are reviewed in the pre-installation meeting with the team, the framing Contractor should be aware of any special framing requirements for the systems being used, such as:

- Added boxouts for rows of conduit
- Sequencing issues for the framer regarding the need to firestop the penetration when it goes from an interior of a fire-resistance-rated wall through to an adjacent non-rated wall (the fire plane turns with the wall-rating).
- MEP-FP item penetrates through a shaft wall and the need to firestop within the shaft wall cavity prior to closing up the wall system.

I have worked with many MEP-FP Contractors and Specialty Firestop Contractors over the years. When the Contractor gets more involved and informs the team of their requirements early in the process, the project's passive life-safety components and the entire project team as a whole, benefit greatly.

Corey is a registered Architect in several states, practicing for more than 29 years. He specializes in building envelope, restoration, preservation, life-safety, and interior finishes. Corey is currently the Director of Quality Assurance for Pepper Construction Company in Chicago, where he has promoted a formal quality program for more than seven years. He can be reached at czussman@pepperconstruction.com

SIDEBAR

In Chicago, specifications for FM 4991 Approved and or UL Qualified Firestop Contractors appear a lot in super high-rise construction, healthcare and other occupancies. FCIA has heard that almost 75% of the super high-rise buildings are using FM 4991 Approved or UL Qualified Firestop Contractors on these projects. Special inspection does take place in Chicago, but is not mandated by the Municipal Building Code of Chicago.

When utilizing a FCIA Member, FM 4991 and/or UL Qualified Firestop Contractor, the process Mr. Zussman describes gets easier. One single firestop installation contractor to deal with, one workforce, consistent product and systems selection, all result in an easier process to manage for the construction team.

Finally, the "Inventory of Firestopping" is something firestop installation contractors do routinely, and means it's just about automatic – setting up the building owner and managers process for maintaining the systems installed.

FCIA has noticed that the 'DIIM' of Firestopping solves many of the issues mentioned in this article. Through a clear 07-84-00 Firestopping Specification, a FCIA Member, FM 4991 Approved and or UL Qualified Firestop Contractor, Inspection by IAS AC 291 Special Accredited Inspection Agencies who employ Inspectors who have passed the FM or UL Firestop Exam and IFC's Firestop Exam, the construction is built right so the building owner can maintain it right.