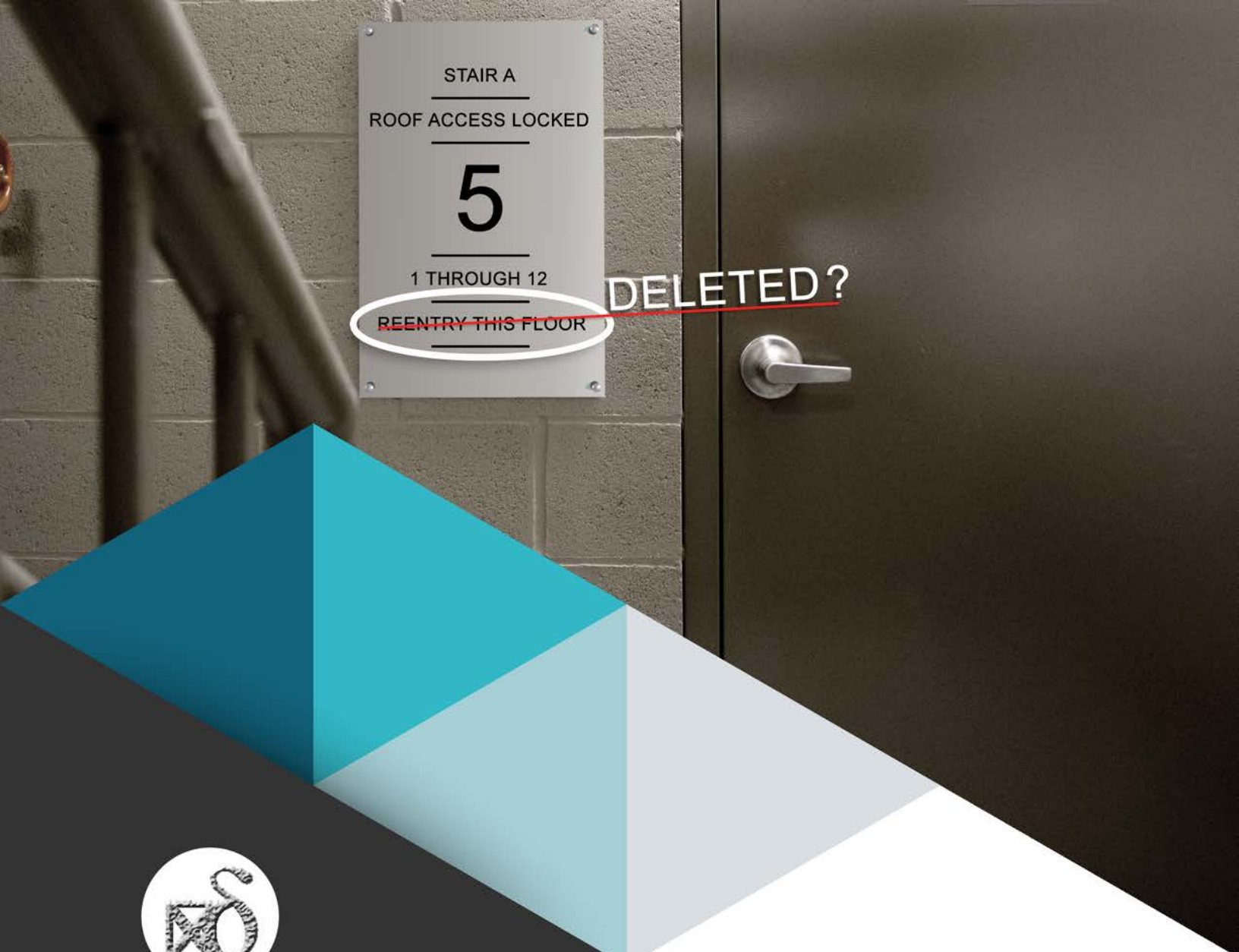

DSAL Consultants, LLC
www.Emergency-Plans.com

STAIRWELL RE-ENTRY SYSTEM
IN HIGH-RISE BUILDINGS

Written by Daniel Salazar,
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PREFACE

The purpose of the following articles is to shed light on very important high-rise building codes and fire codes that we lost and need to revive. These building and fire codes were adopted around 1985 in the 1981 code editions and subsequent codes through 2002. These codes made the greatest positive impact ever for fire safety in high-rise buildings, and today their survival is either on life support or needs to be brought back to life. Prior to the creation of these building and fire codes, fire in high-rise buildings typically resulted in many injuries, fatalities, and extensive property damage.

Fire departments bravely did their best with the rescue and fire-fighting, but vertical distance to upper floors was and still is a very dangerous situation. Many factors, "delays" being the greatest in a high-rise fire, increased the possibility for a superheated environment making fire unapproachable. Fire departments worldwide thought they needed to evacuate thousands of high-rise occupants at every high-rise fire, and they struggled with not having enough manpower for this mass evacuation procedure. The panic and chaos resulted in mass casualties. Many times fire fatalities included firefighters.

After adopting non-combustible high-rise building construction, there was still a lack of completely understanding high-rise building features. This is why all high-rise buildings were still required to evacuate all occupants in the entire building upon the activation of any fire alarm initiating-device, or upon the discovery of fire or smoke prior to 1986. Fire departments even adopted helicopter rescue as a hopeful high-rise rescue procedure. But this proved to be a failed solution because the column of superheated smoke in and around a high-rise fire were the same elements that made helicopter rescue impossible. Most would think that we could never go back to bad response procedures of past days. We may not revert to something as extreme as helicopter rescue attempts, but **I do think we are back on the path of creating panic situations.**

I created "Staged Evacuation" in 1985 as the response procedure to fire alarms and fire in high-rise buildings. The procedure was studied and adopted by the National Fire Protection Association (N.F.P.A.) in 1986, and they gave it the term "Traditional Response to Fire Alarms and Fire in High-rise Buildings." I then began training Fire Marshal's Offices with high-rise buildings in the U.S., the U.K., and Japan for their own training and procedures adoption. This procedure is still standing the test of time and daily application since then. I mention the "Staged Evacuation" response procedure because this "High-Rise Building Enclosed Fire-Rated Stairwell Re-Entry System" article is an integral part of the "Staged Evacuation" response procedure. I will explain my research in the "High-Rise Staged Evacuation" article.

Prior to 1985 and the creation of "Staged Evacuation", the activation of any fire alarm initiating-device sounded the fire alarm on all floors in a high-rise building simultaneously. Since alarms sounded on every floor simultaneously, ALL occupants on every floor in the entire building were instructed to evacuate the

high-rise building through the stairwells-- even false alarms and practice fire drills required the same response from all occupants in the building. Fire alarm systems were new to high-rise buildings and with it came a lot of false alarms and malfunctions to fix. Because of all the false alarms, many occupants would ignore the fire alarm if they didn't see or smell any evidence of fire on their floor. **What they didn't know was that the people who had died in high-rise fires were like them; people that didn't initially see or smell any evidence of fire on their floor. The fire had started on a different floor and both fire and smoke spread before they eventually responded to a much hotter smoke filled environment unfortunately to their demise** *(see Fire Alarm Pull Station Article).*

Fires in high-rises really were difficult for occupants and firefighters. With the simultaneous sounding of fire alarms on all floors of the high-rise, thousands of building occupants crowded the elevators and stairwells in a panic to escape the potential fire. When there was a fire, elevators that served the fire-floor would go to the fire-floor where elevator occupants would die *(see Elevator Article).* Panic-driven trampling injuries and fatalities were not uncommon, some of them occurred even when there wasn't a fire or any danger to the occupants inside the fire-rated enclosed stairwells.

Occupants on the fire-floor who saw the fire, smelled smoke, or heard someone yelling "fire" would all immediately escape. High-rise fire fatalities usually do not include occupants that were on the fire floor. The majority of high-rise fire injuries and fatalities consisted of:

- People who used an elevator that served the fire-floor during a fire
- People who ignored the initial fire alarms until the fire and smoke increased to reached their floor with tragic affect
- People that had no building re-entry from stairwells
- People who attempted to go to the roof, only to discover the fires' heat and smoke had risen to the roof and now have no other place to escape

Facts were documented, but no one was researching the facts from the perspective of influencing building codes and fire codes to affect these problems. It may be the standard again soon if we do not interject vital information to revive a few safety features.

Along with "Staged Evacuation", fire safety codes that were created to address high-rise occupants life safety from the specified time period were based on:

- Architectural engineering experience
- Old and current high-rise building construction features
- High-rise firefighting procedures of some of the largest and greatest fire departments
- Extensive research of previous high-rise fires
- High-rise fire models

These new codes supported the stabilization and standardization of "Staged Evacuation" as the response to high-rise fire procedures. This new response procedure was created and distributed by the fire department to high-rise building owners & managers for their required adoption and implementation for their building occupants. The response procedures would then meld for a smooth transition with firefighter procedures upon their arrival. For the first time, reliable life safety responses for fire in high-rise buildings

became an achievable reality for both the building occupants and arriving firefighters.

I believe today's code problems are upon us because the code writers, who possessed the researched knowledge and understanding firsthand, have left the code making circles. Without their detailed research, understanding existing codes are misapplied and new codes have revived old hazards. This problem has put us on a pathway to future injuries and fatalities *(see other code articles)*. Some may think this is far-fetched, but consider the fact how most organizations lose valuable knowledge when an experienced employee leaves the company before passing along valuable information to their replacement/untrained employees. Replacement employees usually spend a lot of time learning how to do their new position efficiently, and unfortunately some of the experience information is lost. Aren't the new employees likely to make mistakes while learning? We would all hope not, but consider that it wasn't that long ago those high-rise fires were a big problem because fire departments didn't know what to do. They didn't know what to do because they didn't understand the problems. Could we be headed in that direction again? Mistakes for lack of understanding concerning your life safety in high-rise fires are troubling because the information is available.

I have shared insights to my own personal high-rise property office managers and hotel manager clientele one on one since 1986. This article is not an advertisement but rather a tool and a resource to educate on the needs of fire safety and fire codes. My motive has always been to help the high-rise community. I am now realizing the need to publicize in articles to prevent the recurrence of fire hazards which have been addressed in the past, and hopefully reverse some dangerous changes to current and upcoming codes. I know that I need to equip and encourage property managers, upper organizational management, building department officials and fire department officials who will be the future building code and fire code influencers and writers. Revealing fire safety problems of our past and the understanding of intended application of the addressed codes should help us avoid recreating old problems, and well as, give clearer direction for new codes that will affect future high-rise occupants immediately and long after I am no longer available.

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A PIVOTAL HIGH-RISE FIRE

On November 21, 1980, a fire started in the Deli on the 1st floor of a high-rise hotel, the door to the stairwell next to the deli was secured in the open position. Superheated smoke from the fire spread upward through the unprotected stairwell next to the deli. Once the fire alarm initiating-device activated, it sounded alarms on all floors throughout the hotel. Many guests on upper floors attempted to evacuate through this same stairwell. Upon entering the stairwell from the corridors, the self-closing doors locked upon shutting. Building and fire codes of that day allowed self-closing stairwell doors to lock upon shutting to prevent entry into the building corridor, or entry to any other floor levels from the stairwells for security purposes. Hotel guests in the stairwells could not go down through the superheated smoke to exit the building in that stairwell, and they could not go back in the building on any floors because there was no building re-entry from the stairwells either. There were a total of 85 guest and hotel employee casualties, and about 600 injuries in that high-rise fire.

You should know that almost all fire safety codes originate to prevent re-occurrence after fire fatalities and injuries have already occurred. There were other factors documented in fire reports and personal interviews of this hotel fire which led to other high-rise building code and fire code revisions that I will address in other articles. In this article, I will only address the facts relevant to building re-entry during a fire in a high-rise building.

HIGH-RISE FIRE-RATED ENCLOSED STAIRWELLS

Let me establish some facts about high-rise fire-rated enclosed stairwells. It should be noted that during the time of this high-rise building fire, building codes and fire codes in the U.S. for new high-rise building construction required fire-rated enclosed stairwells with two-hour fire-rated walls and 90-minute fire-rated self-closing and self-latching doors from the top of the fire-protected shaft all the way down to the bottom of the fire-protected shaft. Self-closing and self-latching fire-rated enclosed stairwell doors, when maintained, are designed to keep fire and smoke out of the fire-rated enclosed stairwell. The fire protection rating clock doesn't even start to count down until the stairwell wall or door catches on fire. A stairwell wall

or door catching on fire is almost impossible if 100% sprinkler system protection exists, and extremely unlikely even in high-rises without 100% sprinkler protection. Of the thousands of high-rise building fires worldwide that I have studied since 1985 where building construction was completed, I have never seen a fire-rated enclosed stairwell wall or door that caught on fire. Additionally, today most but not all high-rise building fire-rated enclosed stairwells have a stairwell pressurization system to create a positive pressure inside the fire-rated enclosed stairwell automatically upon fire alarm activation to keep smoke out of the stairwell if someone opens a stairwell door to the fire floor. Fire-rated enclosed stairwells are a safe place of refuge inside the high-rise building for the event of fire, as well as, a fire-protected and smoke-proof exit way from a high-rise fire! There is always access to more than one fire-rated enclosed stairwell on every floor in a high-rise building, in case the fire or smoke is between you and one of the fire-rated enclosed stairwells.

HIGH-RISE FIRE-RATED ENCLOSED STAIRWELL BUILDING RE-ENTRY

After the aforementioned high-rise hotel fire, new **building codes and fire codes were created for the occupants of high-rise buildings to prevent entrapment inside the stairwells when the stairwell door self-closed and locked during fire emergencies.**

National and International Building and Fire Codes are usually published around every four years. Local jurisdictions will then take about a year to make their own amendments, and it may take another year to get through the final legal adoption before going to print. The point is that you may not see the adopted 1981 local jurisdiction code until a couple of years after a subsequent 1985 National and International code is published. Meaning, a local jurisdiction amended code that is finally adopted may be inserted into the year of a code that is 4-8 years older then when the original code was adopted. In this instance for some jurisdictions, the building Re-Entry code was not adopted until 1986, which was after the newer 1985 code was initially published. Therefore, the Re-Entry code was inserted into the 1981 code because the 1985 code had not yet been adopted. This is essential if you are going to verify the facts.

New re-entry codes retroactively required designated building re-entry on at least every fifth (5th) floor from inside the fire-rated enclosed stairwells upon activation of any fire alarm system initiating-device for use during fire emergencies. Designated building re-entry could be on all floors, if desired, and can be closer than every 5th floor, but can't be further apart than 5 floors during fire emergencies. Designated building re-entry doors at least every 5th floor could remain permanently unlocked, or electronically locked under non-fire alarm conditions, as long as, at least every 5th floor unlocks when under fire alarm/fire conditions. The designated building re-entry doors were also required to unlock upon a building power failure.

Physically-able occupants could re-enter the building and stage on a safe designated re-entry floor at least three floors below the lowest fire-affected floor without needing to evacuate the building completely. Mobility-impaired occupants would be staging at the safe place of refuge inside the high-rise building fire-rated enclosed stairwells until rescue-trained firefighters assisted in evacuation to the designated building re-entry floor with the other occupants from the fire floor.

EMERGENCY PHONES/INTERCOMS

A two-way emergency phone/intercom was also required inside the fire-rated enclosed stairwell by the designated building re-entry door. This phone/intercom gave the ability to communicate directly with firefighters on-site in the fire command room, or with the on-site security station 24/7 to relay information to firefighters.

Physically-able occupants from the fire-floor, who are now at their designated building re-entry floor, could inform firefighters of unknown, pertinent details. Details about:

- the fire
- the staged relocation floor of the physically-able occupants from the fire floor
- the existence & number of known mobility-impaired persons needing vertical evacuation assistance
- the mobility-impaired persons staged location stairwell identification and floor number.

This information is essential for rescue, and firefighting manpower & equipment needs before deployment if it's available. Mobility-impaired persons from the fire-floor can communicate the same information as well, if their staging location area is a building re-entry floor with a two-way emergency phone/intercom.

The high-rise building re-entry signage and two-way communication emergency phones/intercoms, inside the stairwells, were not intended for occupant non-fire situations, and they are not for firefighters access into the building. As for firefighter building access, there are other codes to address this need. It is not to say that emergency phones/intercoms cannot be used for non-emergency purposes as long as changes to accommodate this additional desire doesn't take away from the original intended purpose. It's intended purpose is life safety during fire alarm and fire emergency conditions which requires communication with the Fire Command Room or on-site security. Some jurisdictions have re-purposed the two-way emergency phone/intercoms' intended use. Rather than communicating with the Fire Command Room or on-site 24/7 security for emergency operations during a fire, the emergency phone/intercom now communicates with off site security monitoring companies to provide building entry when someone is locked in a stairwell during non-emergency conditions. I hope this gets changed back in your jurisdiction before we have injuries or fatalities.

There are two likely scenarios in every high-rise fire where building re-entry would be properly utilized. The first is when physically-able building occupants, from a fire-affected floor above the 7th floor, utilizes the fire-rated enclosed stairwell to access the designated building re-entry floor (at least three floors below the lowest fire-affected floor) to temporarily stage on that safe floor for firefighter assistance or direction. Another likely occasion is when firefighters inevitably commandeer the stairwell they are utilizing for rescue and fire suppression operations, and they instruct the occupants in that stairwell to re-enter the building for staging or to continue their building evacuation descent through an other stairwell. Firefighters will commandeer the stairwell they are in at every high-rise fire and where they encounter occupants in their stairwell.

BUILDING RE-ENTRY SIGN VERBIAGE

So what's the life safety problem? This brings us to the required sign verbiage for the designated building re-entry floors referred to as "Stairwell Re-Entry" signs that are required inside the stairwells by the stairwell door. This is also where some confusion has risen. I believe we can clear the confusion if we remember what the purpose of building re-entry is, as well as, who it is for and for which occasions.

Building re-entry was originally only intended to be for the occupants of a high-rise building during fire conditions. Remember that high-rise hotel fire? Original building re-entry codes required "Re-Entry This Floor" signage located inside the stairwell on the designated re-entry floor. To direct building occupants during fire conditions, the proper location of the re-entry sign inside the stairwell should be on the wall next to the stairwell door entering the building, thus making it readily visible when the door is in the open or closed position.

Fire codes have long required directional exit signs for escaping a fire. If the direction of exit way during fire conditions can go through a building re-entry floor for safe staging or to access another stairwell as exampled earlier, then the "Re-entry This Floor" building signage should be specified on the building re-entry floor to indicate the exit way. Floors that are not building re-entry floors should have signage specifying "No Re-entry, Nearest Re-entry on the nearest designated floor below and above that floor".

Signage in a stairwell that does not specify that the door you are standing in front of is a building re-entry door, is like not having exit signs on a floor directing occupants and guest to the exits.

Another example is like a highway that only has signs that tell you how far in distance an exit is to your desired highway exit, but there isn't ever an exit sign designating the exit you are approaching is the exit you desire. Surely, you see the need for the exit designation. In the case of a high-rise fire, (re-entry signage at the applicable stairwell door) you can make the desired exit way to safety if there is a sign on the building re-entry floor. Occupants from the fire floor can re-enter the building at least three floors below the lowest fire-affected floor to safely stage, or they can re-enter the building to continue their building evacuation descent through another stairwell when instructed by firefighters who have commandeered their stairwell. In some jurisdictions, the "Re-Entry This Floor" signage code designating that the stairwell door is a re-entry floor for exit during fires has been re-purposed and even removed from the codes.

QUESTION:

Do your high-rise building occupants know that the re-entry floors are the ones that don't have any "Re-Entry This Floor" signage designation by the door inside the stairwell? The door IN FRONT OF THEM could be the building re-entry to safety during the fire, but there is no sign to help inform them. Conversely, codes require a sign that says "No Re-Entry" on a floor that you cannot enter because it is locked during a fire. There may be directions to another floor but there is no sign to instruct you when you get to that floor. Meanwhile, confusion and panic nears because you realize that this is a fire life emergency. Unfortunately, this is where we are in some jurisdictions. If this what you have in your jurisdiction, please use whatever influence you have to address this fire safety hazard.

Another potential issue is one of medical in nature. Let's consider an occupant walks past the place of safety on the re-entry floor simply because there wasn't a re-entry sign. This occupant accidentally trips down the stairs or has some other type of medical emergency in the stairwell that could have been avoided if they had known re-entry to safety was on a floor they already passed. If a "No Re-Entry, Nearest Re-entry on Floor ___ and ___" sign falls or is removed, this door might appear to open to a building re-entry floor be cause it doesn't indicate that it isn't a "No Re-entry Floor". Thus causing confusion and possible panic when the door does not open during a fire condition.

During life threatening emergencies, anything that doesn't happen the way we think it is supposed to happen can quickly lead to panic, and panic could lead to injuries and even fatalities. Signs are already required to be installed on every floor inside the stairwell indicating:

- Stairwell identification
- Floor number
- "No Re-Entry, Nearest Re-Entry ___ and ___"
- Top Floor and Exit Floor, etc.

This is why previous building and fire codes had "Re-entry This Floor" signage on the re-entry floor!

It is very important to reiterate that **re-entry into a high-rise building from the fire-rated enclosed stairwell is:**

1. for the building occupant's and/or guests' protection, and
2. for application during fire conditions
3. not for non-alarm or non-fire conditions, and
4. not for firefighter access into the building.

There are other fire codes specific for firefighter building access. Therefore, stairwell re-entry sign verbiage inside the stairwell was intended for occupants' building re-entry **only for a response to fire application.**

The need for building re-entry during fire emergencies may occur during these scenarios.
Obviously, high-rise building occupants ON THE FIRE AND SMOKE-FILLED FLOOR should evacuate the floor immediately, but please see the "Staged Evacuation" article that explains procedures for other responses for occupants of other floors. Getting fire-floor occupants inside the fire-rated enclosed stairwell will put at least a 90-minute, fire-rated door protection between them and the fire or smoke. The physically-able occupants can descend to the nearest building re-entry floor, at least three (3) floors below the lowest fire-affected floor, to find safety. The mobility-impaired occupants accompanied with a Fire Warden or building employee can wait for firefighter rescue from that temporary staging safe place of refuge location inside the fire-rated enclosed stairwell. Yes, this safe place of refuge may even be on the same floor of the fire with only a 90-minute fire-rated door between them and the fire. Firefighters should arrive and perform rescue operations to the nearest re-entry floor, at least three floors below the lowest fire-affected floor, or completely out of the building, if needed, long before exposure to the fire or smoke.
If smoke somehow ever enters a fire-rated enclosed stairwell, occupants and guest are not trapped. They can escape that stairwell by re-entering the building on a re-entry floor within a few floors distance to find another fire-rated enclosed stairwell.

LET'S RE-ESTABLISH INTENT!

SEVEN POINTS OF BUILDING RE-ENTRY FROM FIRE-RATED ENCLOSED STAIRWELLS.

1. During non-alarm or non-fire conditions, any or all stairwell doors may be locked from the stairwell side to prevent building re-entry.
2. Building re-entry and building re-entry signage is specifically for:
   a. for the building occupants' and/or guests' protection, and
   b. for application during fire conditions.
   Note: Building re-entry is for fire emergency conditions only.
3. The designated re-entry floors must be at least every 5th floor and not further apart.
4. If building re-entry doors are electronically locked during non-alarm conditions, all designated building re-entry floors must unlock upon activation of the fire alarm system.
5. Any additional stairwell doors or all stairwell doors may unlock upon the activation of the fire alarm system, or may be permanently unlocked without designation as a building re-entry floor. This application of building re-entry is for floors that are not required to be a building re-entry floor.
6. All electronically locked stairwell-to-building re-entry doors must have the ability to unlock either upon activation of the fire alarm system or a power failure.
7. All electronically-locked floors have a different remote unlocking switch for firefighter access. Key-locked, stairwell-to-building doors must have a key on location to allow firefighters access onto the key-locked floor.

These points should clearly indicate that during a fire building re-entry allows **egress** for the occupants and guests of a high-rise building to a safe floor below the fire-floor (a safe place of refuge in the building). Building re-entry also allows **egress** from one fire-rated enclosed stairwell to another fire-rated enclosed stairwell when firefighters commandeer the same stairwell and instruct occupants and guest to continue their egress through another stairwell. **Egress** in building and fire codes is part of the exit way during a fire, and signage should always reflect the direction of egress. Occupant floors are required to have exit signs visible on a floor to show all exit options available from a particular location. In a fire-rated enclosed stairwell, the exit options continue down or re-enter a designated building re-entry floor to follow a passageway to another fire-rated enclosed stairwell. Building designated re-entry floors should follow the same "exit way during fire emergencies" mindset by requiring "RE-ENTRY THIS FLOOR" signage inside the fire-rated enclosed stairwell on the building re-entry floor. Going back to the hotel fire facts above, U.S. building codes and fire codes, including the N.F.P.A. Life Safety Code 101, immediately adopted the verbiage "RE-ENTRY THIS FLOOR" on the designated building re-entry floor signage inside the stairwell after this high-rise fire.
This code should be re-adopted in jurisdictions that have removed it.

Providing alternate methods above the minimum fire code requirements of your jurisdiction usually requires approval by your fire code enforcing jurisdiction. Help with letters and procedures for securing your "Alternate Methods" approval for "Re-Entry This Floor" signage is available at:
www.Emergency-Plans.com.