2012 FCIA CONFERENCE

William Ham
Sr. Vice President of Facility Operations
MGM Grand

Ronald L. Lynn
Director/Building Official
Clark County Development Services Dept.
Las Vegas Strip Facing South
BELLAGIO
VENETIAN HOTEL
TREASURE ISLAND
LUXOR
MANDALAY BAY
MIRAGE
CITY CENTER
# US Hotels & Resorts

<table>
<thead>
<tr>
<th>HOTEL</th>
<th>ROOMS</th>
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<td>MGM Grand</td>
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Source: Las Vegas Convention & Visitors Authority
## US Hotels & Resorts

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Source: Las Vegas Convention & Visitors Authority
FIRE STOPPING
WHY DO WE NEED IT?
FIRESTOPPING

In the United States in 2010:

- 482,000 fires in structures.
- 3,120 Civilian fire deaths
- 17,720 Casualties
- $9.7 Billion in property damage occurring in structural fires
FIRESTOPPING

• WORLDWIDE EVERY YEAR:
  – 100,000’S OF FIRES
  – 5,000 DEATHS WORLDWIDE
  – COST OF TENS OF BILLIONS DOLLARS WORLDWIDE
SMOKE ALSO KILLS

- Smoke travels at between 50 and 300 ft. per minute
- 67% of fire related deaths are through smoke inhalation
- 47% of survivors could not see more than 12 ft.
32 storey Windsor Tower in Madrid.
New York Telephone Exchange
NEW YORK TELEPHONE EXCHANGE

• Fire Started in cable vault
• Fire was fed by over 17,000 lbs of cable jacketing and travels vertically through unsealed floor penetrations.
• Knocked out service for 200,000 customers!
• Caused $90M in damages
• Left over 100 firemen injured.
FIRE PROTECTION BASICS

• DETECTION
• CONTAINMENT
• SUPPRESSION
FIRE PROTECTION BASICS (Cont’d)

• Every building must have these three components; today we will look at the one specific to your industry.
FIRE PROTECTION IN CONSTRUCTION

• Containment -Limiting The Spread of Fire
• Compartmentalization
• Erecting barriers to divide building space into smaller units that confine fire to its point of origin
• Intended as a last resort should suppression fail
• “Balance” reduces risk – redundant “Airbag & Seat Belt” approach avoids excessive reliance on any one element
Fire stopping is required for all penetrations in fire-resistive assemblies, but do we do it?
Firestopping is About Systems Not Just Products

• FIRESTOP SYSTEM:
• A specific construction consisting of
  • A wall or floor assembly
  • A penetrating item passing through an opening in the wall or floor assembly
  • The materials designed to prevent the spread of fire through the openings.
Plaster Board Walls

- Penetrations Can Weaken the Wall!
- Plaster Board (Calcium Sulfate) is about 40% water by weight. As the fire burns, the water is gradually evaporated and the board begins to shrink and crack and then slough off.
- Too many penetrations in a small area can accelerate the rate of failure.
- Plaster Board requires adequate support. Large unframed or unsupported areas will also fail prematurely as the board thermally degrades.
FIRE STOPPING

- Do we really need to clean-up our act?
- Yes we DO!
- We are creating a huge fire hazard with substantial economic downside – not to mention life safety issues!
- Regulations require it
• 714.1 Scope. The provisions of this section shall govern the materials and methods of construction used to protect through penetrations and membrane penetrations of horizontal assemblies and fire-resistance-rated wall assemblies.
2012 IBC

• 714.3 Fire-resistance-rated walls. Penetrations into or through fire walls, fire barriers, smoke barrier walls and fire partitions shall comply with Sections 714.3.1 through 714.3.3. Penetrations in smoke barrier walls shall also comply with Section 714.5.
2012 IBC

• **714.3.1 Through penetrations.** Through penetrations of fire-resistance-rated walls shall comply with Section 714.3.1.1 or 714.3.1.2.
• **714.3.1.1 Fire-resistance-rated assemblies.** Penetrations shall be installed as tested in an *approved* fire resistance-rated assembly.

• **714.3.1.2 Through-penetration firestop system.** *Through penetrations* shall be protected by an approved penetration firestop system installed as tested in accordance with ASTM E 814 or UL 1479, with a minimum positive pressure differential of 0.01 inch (2.49 Pa) of water and shall have an F rating of not less than the required *fire-resistance rating* of the wall penetrated.
2012 IBC

• **714.4 Horizontal assemblies.** Penetrations of a floor, floor/ceiling assembly or the ceiling membrane of a roof/ceiling assembly not required to be enclosed in a shaft by Section 712.1 shall be protected in accordance with Sections 714.4.1 through 714.4.2.2.
2012 IBC

• 714.4.1 Fire-resistance-rated assemblies. Penetrations of the fire-resistance-rated floor, floor/ceiling assembly or the ceiling membrane of a roof/ceiling assembly shall comply with Sections 714.4.1.1 through 714.4.1.4. Penetrations in horizontal smoke barriers shall also comply with 714.5.
Nortown Casitas, North York (now Toronto), Ontario, Canada, April 1995: Set-up for subsequent code infraction in plastic pipe wall penetrations: Improper hole sizing. Firestops (in the walls) the plumber considered to be the drywall’s responsibility. Floor openings are properly done in this case, with intumescent pipe collars and firestop mortar. The intumescent will expand and choke off the melting pipes. Drywall mud does not work as a plastic pipe firestop in the wall.
2012 IBC

• 714.4.1.1.1 Installation. *Through penetrations* shall be installed as tested in the *approved* fire-resistance-rated assembly.
2012 IBC

• **714.4.1.1.2 Through-penetration firestop system.** Through penetrations shall be protected by an approved *through-penetration firestop system* installed and tested in accordance with ASTM E 814 or UL 1479, with a minimum positive pressure differential of 0.01 inch of water (2.49 Pa). The system shall have an F rating/T rating of not less than 1 hour but not less than the required rating of the floor penetrated.
• **714.4.1.2 Membrane penetrations.** Penetrations of membranes that are part of a *horizontal assembly* shall comply with Section 714.4.1.1.1 or 714.4.1.1.2. Where floor/ceiling assemblies are required to have a *fire-resistance rating*, recessed fixtures shall be installed such that the required *fire resistance* will not be reduced.
• **714.5 Penetrations in smoke barriers.** Penetrations in *smoke barriers* shall be protected by an approved *through-penetration firestop system* installed and tested in accordance with the requirements of UL 1479 for air leakage.
• **1705.14 Mastic and intumescent fire-resistant coatings.** *Special inspections* for mastic and intumescent fire-resistant coatings applied to structural elements and decks shall be in accordance with AWCI 12-B. *Special inspections* shall be based on the fire-resistance design as designated in the *approved construction documents.*
2012 IBC

• 1705.15 Exterior insulation and finish systems (EIFS).
2012 IBC

• **1705.16 Fire-resistant penetrations and joints.** In high-rise buildings or in buildings assigned to *Risk Category* III or IV in accordance with Section 1604.5, special inspections for through-penetrations, membrane penetration firestops, fire-resistant joint systems, and perimeter fire barrier systems that are tested and listed in accordance with Sections 714.3.1.2, 714.4.1.2, 715.3 and 715.4 shall be in accordance with Section 1705.16.1 or 1705.16.2.
2012 IBC

• **1705.16.1 Penetration firestops.** Inspections of penetration firestop systems that are tested and listed in accordance with Sections 714.3.1.2 and 714.4.1.2 shall be conducted by an approved inspection agency in accordance with ASTM E 2174.
2012 IBC

• 1705.16.2 Fire-resistant joint systems. Inspections of fire-resistant joint systems that are tested and listed in accordance with Sections 715.3 and 715.4 shall be conducted by an approved inspection agency in accordance with ASTM E 2393.
FIRESTOPPING CASE STUDY

PALMS RESORT, HOTEL and CASINO
4321 W. Flamingo Road
Firestopping

• These penetrations occur in a 2-hour fire rated wall.
• They have been sealed with an intumescent fire caulk rated for this application.
• The proper method is to maintain an annular space completely around the penetrating material.
• These penetrations are not sealed to full depth but the material has been smeared on the wall surface.
• A correction notice was issued for this and was resolved once the material was properly installed.
Firestopping

• This is the proper method to seal a penetrating item in a rated wall.
Firestopping

• Most of this area has been sealed properly; however, you will notice gaps at the multiple conduit penetrations on the upper left corner.
• This received a Correction Notice and was ultimately resolved when additional material was properly installed.
Firestopping

- Proper installations
Firestopping

• Proper application of fire rated sealant.
• In addition to the wall penetrating items, we have an open-ended conduit penetrating a rated wall that is properly sealed with the same listed sealant.
Firestopping

• Flammable expandable polystyrene foam used as fire stopping is not permitted by code.
• Note the pipe running parallel to the plane of the wall.
  – There is currently not a listed product to firestop this condition.
  – The only fix is to relocate the pipe, either totally within or outside of the wall, or to build a rated assembly around the pipe.
Firestopping

- 2-hour rated floor slab with multiple penetrating items.
- On the left is a floor sink with non-complying polystyrene foam and insulation sealing the annular space.
- Under the 2006 IBC this is required to be protected with an assembly having both an F and T rating.
  - Currently there is no listed product that complies therefore an engineer's judgment is required to protect this.
- In the middle is a 3 inch pipe penetration that appears to be sealed properly under the Uniform codes.
- To the right is an 1.5” pipe penetration that is protected with an intumescent firestopping compound.
Firestopping

• Again we have pipes penetrating full length in the plane of the wall.
Firestopping

• Cut out in 2-hour rated wall.
• The opening is too large to repair with firestopping sealant alone.
• A permit was required to repair this.
• The opening will need to be cut back to adjacent framing members and blocked and secured on all edges.
• The joints on the second layer are required to be staggered from the first.
• The cable penetration will than need to be firestopped with an approved compound.
Firestopping

• Again, these large openings are required to have proper drywall repair and the penetrations sealed with a listed compound.

• The higher pipe penetrations are properly sealed.
Firestopping

• The large pipe on the bottom, left hand side received an acceptable drywall repair.

• When the repair was installed, the proper annular space was not maintained to install firestopping compound
Firestopping

• Proper drywall repair and firestopping of penetrations.
Firestopping

• Again, polystyrene used as firestop.

• Not acceptable.
Firestopping

• Floor sinks in 2-hour slab not protected as required by the IBC.
• The one on the left has polystyrene.
Firestopping

• Proper way to seal around duct penetrating a rated wall.

• This Duct application would require fire/smoke dampers.
KEVIN’S UGLY SLIDES

WHO IS RESPONSIBLE?
Cover for unknown enclosure imbedded in a rated corridor wall. Rating of wall is to be maintained.
Basement corridor by old laundry room. PVC conduit penetrating floor/ceiling.
col D-36-D34: floor/ceiling patch with combustible.
Spa, front entry above ceiling, rated wall openings
Notice C-2066

09.12.2011 04:26
3rd floor area B. Mechanics area: floor ceiling patch with combustible wood.
Room 2405: shaft wall penetration/damage under sink.
Cable tray installation above ceiling: no covers. Low/high voltage combined no barrier: opening through rated wall.
Mech rm A14: rated wall (2 ply) damage
Notice C-2162
CASE HISTORY OF AN ALTERNATE FLOOR SINK ASSEMBLIES
FLOOR SINK DETAIL

WITH S/S 3/4" GRATE

JR SMITH CO. 3008-13 (OR EQUAL)

WWW.JRSMITH.COM

NOT TO SCALE
Floor sink
1A. MIN. 4-1/2" CONCRETE FLOOR ASSEMBLY
1B. FLUTED METAL DECK ASSEMBLY
2. 10"X 10" FLOOR SINK
3. CP 25WB+ CAULK
4. (2) LAYER E-5A-4 MIN 24" BELOW THE FLOOR
5. MIN. 1/8"x 2" WIDE BAR STOCK MECHANICALLY FASTENED 6" O.C.
   W/ANCHOR HAVING 75 POUND PULL OUT VALUE
6. MIN. 3" DEPTH OF MIN. 4 PCF MINERAL WOOL COMPRESSED 50%
7. MIN. 1/2" WIDE METAL STRAPS
I WANT TO EXPRESS MY APPRECIATION FOR THE ASSISTANCE OF THE FOLLOWING PEOPLE:

• Eddy McVeigh for firestopping considerations
• Kevin McOsker for the Palms case history and problem slides;
• ICC for code references;
• NFPA for fire statistics;
• Doug Evans for review of the slides; and
• Gabrielle Schilling for administrative support.
THANK YOU!