FCIA DIIM & Firestopping

CONSTRUCTCanada
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Presentation @ www.FCIA.org
Learning Objectives

Upon completing this program, the participant should know how to:

1. **Identify Perimeter Fire Containment, Penetration, Joint Product Design/Testing, Installation & Inspection & Management Standards & Code Requirements for Firestopping … to become a ‘System’**.
2. **Understand Requirements for Firestopping for Safety in Canada and the US**
3. **Section 07 84 00 Highlights**
4. **Discover ‘Why compartmentation and Firestopping’**.
FCIA – A Trade Association

• Total Fire Protection & Effective Compartmentation
• Codes, Testing, Products - Materials
• Firestopping for Safety – A Quality Protocol - DIIM
“DIIM”

• Firestopping for Safety – DIIM
  • Properly *Designed* and Specified Firestopping
    FCIA - 07-84-00 - Specification
  • *Tested and Listed Systems* - ASTM E 814 / UL
    1479 - UL 2079, ULC-S-115, ASTM E2307
  • Professional *Installation* – FCIA Member, FM
    4991 Approved, ULC Qualified Contractors
  • Properly *Inspected* - ASTM E 2174 / 2393
    Protocol by IAS AC 291 Accreditation Criteria
    for Inspection Agencies
  • *Maintained* (Annually - FCIA Members –
    National Fire Code of Canada, NFPA 101,
    International Fire Code)
Firestop Contractors International Association

- FCIA – Worldwide Association
- Firestop Contractors, Manufacturers, Consultants, Reps, Distributors,
- Life Safety Digest
- FCIA Website Resources - FREE
- FCIA MOP on PDF FREE to Specifiers, Architects, Governmental Bldg./Fire Officials, worldwide..
  – www.FCIA.org
“TOTAL FIRE PROTECTION”

- Effective Compartmentation
  - Fire Barriers, Fire Walls/Floors, Smoke Barriers
  - Firestopping, Fire Dampers, Swinging and Rolling Fire Doors, Fire Rated Glazing

- Detection & Alarm Systems

- Sprinkler Suppression Systems

- Education & Egress—
  - Building Owners & Managers, Building Occupants and Firefighters
Building & Fire Code Requirements

• Compartmentation Codes  CAN & US
  – Exterior Walls
  – Fire Walls
  – Fire Barriers
  – Fire Separations
  – Fire Partitions (Not NFPA)
  – Smoke Barriers
  – Smoke Partitions
Building & Fire Code Requirements

• Fire Separations - Barriers
  – Fire Area Separations
  – Mixed Use Occupancies
  – Incidental Uses
  – Hazardous Area Separations
  – Exit Enclosures
  – Shaft enclosures
  – Horizontal Exits
  – Corridor Walls - NFPA
Building & Fire Code Requirements

- Compartmentation Codes – US –
  - Exterior Walls
  - Fire Walls
  - Fire Barriers
  - Fire Separations
  - Fire Partitions (Not NFPA)
  - Smoke Barriers
  - Smoke Partitions
Code Requirements

- **Canadian National Building Code – (NBC)**
  - New and Existing Buildings – 2005 & 2010
- **US, Middle East, Caribbean, Parts of Asia**
  - International Building Code (ICC’s IBC) – Chapter 7
    - New Construction
  - International Fire Code (IFC) – Chapter 7
    - Existing Buildings, Enforced by Fire Marshal
  - NFPA 5000 – NFPA 101- Chapter 8

- **Minimum requirements for Construction & Maintenance**
Code Requirements

*National Building Code of Canada (NBC)*

The Canadian Commission on Building and Fire Codes (CCBFC):

– Volunteers appointed by NRC
– Regulators, construction industry & public interest
– 2009 Cycle Finished…published November 2010
– 2015 Cycle Starting…

Oversees the code development system
Code Requirements

• National Building Code of Canada
  – NBCC 2005
    • Adopt Entirety
  – NBCC 2005
    • Adopt With Amendments
    • Publish Provincial Code based on National Code
  – NBCC 2010
Compartmentation Codes – NBC

– *Fire separation* means a construction assembly that acts as a barrier against the spread of fire.

• Division A:1.4.1.2, NBCC 2005
  – Appendix A,
    » A *fire separation* may or may not have a fire-resistance rating.
Compartmentation Codes – NBC

- **Division A, 1.4.1.2**

- *Fire resistance rating means the time in minutes or hours that a material or assemblies of materials will withstand the passage of flame and the transmission of heat when exposed to fire under specified conditions of test and performance criteria, or as determined by extension or interpretation of information derived therefrom as prescribed in this Code.*

- **CAN/UL-S101, Standard Methods of Fire Endurance Tests of Building Construction Materials**
Compartmentation Codes – NBC

Compartmentation Codes

NBCC - 3.1.8.1.(1)(b)

Although a fire separation is not always required to have a fire-resistance rating, the fire separation should act as a barrier to the spread of smoke and fire until some response is initiated.

NEW 2010: When choosing products for fire stopping, the physical characteristics of the material used at the joints as well as the nature of the assembly and its potential movement should be taken into consideration.

If the fire-resistance rating of a fire separation is waived on the basis of the presence of an automatic sprinkler system, it is intended that the fire separation will be constructed so that it will remain in place and act as a barrier against the spread of smoke for a period of time until the sprinklers have actuated and controlled the fire.

• CAN/UL-S115 Listed Systems – NOTE: L-Rating.
Compartmentation Codes – NBC

• 3.1.8.1 – Barrier to control Smoke Spread

  Although a fire separation is not always required to have a fire resistance rating, the fire separation should act as a barrier to the spread of smoke and fire until some response is initiated. If the fire resistance rating of a fire separation is waived on the basis of the presence of an automatic sprinkler system, it is intended that the fire separation will be constructed so that it will remain in place and act as a barrier against the spread of smoke for a period of time until the sprinklers have actuated and controlled the fire."

CAN/UL-S115 with “L” Rating
Compartmentation Codes – NBC

NBCC - 3.1.8.1. - General Requirements

1) Any wall, partition or floor assembly required to be a fire separation shall
   a) except as permitted by Sentence (2), be constructed as continuous element, and
   b) as required in this part, have a fire-resistance-rating as specified (see appendix A)

2) Openings in a fire separation shall be protected with closures, shafts or other means in conformance with Articles 3.1.8.4-7.
Building & Fire Code Requirements

- **Compartmentation Codes** – **Fire Separations**
  
  NBC - *the fire separation should act as a barrier to the spread of smoke and fire until some response is initiated.*
  
  - **Smoke Barrier** –
  - **IBC** – Hourly Rated, “L” Rating
    - <5cfm/sf (IBC 2006)
    - < 50 cfm, 100sf of Wall Area (IBC 2009)
  - **NFPA** – … ‘restricting the passage of smoke’…
    - *no quantified “L” Rating … YET*
    - Continuous, Barrier to Barrier, … through concealed spaces,
    - Not always fire resistance rated.
Compartmentation Codes – NBC

- 3.1.8.3 – **Continuity**
  - The continuity of a fire separation shall be maintained where it abuts another fire separation, a floor, a ceiling, a roof or an exterior wall assembly. (Appendix A, 3.1.8.3)

- 9.10.9.2 Continuous Barrier
Compartmentation Codes – NBC

• 3.1.8.3 (4) Fire Separation Continuity –
  The continuity of a fire separation where it abuts against another fire separation, a floor, a ceiling or an exterior wall assembly is maintained by filling all openings at the juncture of the assembles with a material that will ensure the integrity of the fire separation at that location.

• 9.10.9.2 Continuous Barrier
Compartmentation Codes – NBC

3.1.9.1. Fire Stopping of Service Penetrations

Except as required by Sentences (2) and (3), and permitted by sentences (4) and (5), penetrations of a fire separation or membrane forming part of an assembly required to have a fire resistance rating shall be

a) **sealed by a fire stop system** that, when subjected to the fire test method in **CAN/UL-S115, “Fire Tests of Firestop Systems,”** has an F rating not less than the fire-protection rating required for closures in the fire separation in conformance with Table 3.1.8.4., or (50pa, plastics)

b) **cast in place** (see Appendix A).

SEE ALSO 3.1.9.4, penetrations by combustible drain, waste and vent piping.
3.1.9.1.Fire Stopping of Service Penetrations

2) Penetrations of a firewall or a horizontal fire separation that is required to have a fire-resistance rating in conformance with Article 3.2.1.2 shall be sealed at the penetration by a fire stop that, when subjected to the fire test method CAN/ULC-S115, “Fire Tests of Firestop Systems”, has an FT Rating not less than the fire-resistance rating of the fire separation.
3.1.9.1. Fire Stopping of Service Penetrations

3) Penetrations of a fire separation in conformance with Article 3.6.4.2 (2) shall be sealed by a fire stop that, when subjected to the fire test method CAN/ULC-S115, “Fire Tests of Firestop Systems”, has an FT Rating not less than the fire-resistance rating of the fire separation.
Compartmentation Codes – NBC

3.1.9.1. Fire Stopping of Service Penetrations

b) *cast in place* (see Appendix A).
   – Concrete, Grout…Full Thickness of the Assembly
Compartmentation Codes – NBC

4) Sprinklers are permitted to penetrate a fire separation or a membrane forming part of an assembly required to have a fire-resistance rating without having to meet the fire stop requirements of sentences (1) to (3), provided that the annular space created by the penetration of a fire sprinkler is covered by a metal escutcheon plate in accordance with NFPA 13, “Installation of Sprinkler Systems”.
5) Unless specifically designed with a fire-stop, fire dampers are permitted to penetrate a fire separation or a membrane forming part of an assembly required to have a fire-resistance rating without having to meet the fire stop requirements of Sentences (1) to (3), provided the fire dampers is installed in conformance with NFPA 80, “Fire Doors and Other Opening Protectives”
3.1.9.4 – Combustible Piping Penetrations

4) Combustible drain, waste and vent piping is permitted to penetrate a fire separation required to have a fire-resistance rating or membrane that forms part of an assembly required to have a fire-resistance rating, provided

a. the piping is sealed at the penetration by a fire stop that has an F rating not less than the fire-resistance rating required for the fire separation when subjected to the fire test method in CAN/ULC-S115, Fire Tests of Firestop Systems”, with a pressure differential of 50 Pa between the exposed and unexposed sides, with the higher pressure on the exposed side, and

b. the piping is not located in a vertical service space.
3.1.9.4 – Combustible Piping Penetrations
NEW for 2010….

2) *Combustible* water distribution piping is permitted to penetrate a *fire separation* that is required to have a *fire-resistance rating* without being incorporated in the assembly at the time of testing as required by Article 3.1.9.2, provided, the piping is protected at the penetration with a *fire stop* in conformance with Sentence (4).
Compartmentation Codes – NBC

3.1.5.16 – Combustible Piping Penetrations
NEW for 2010....

3) Polypropylene pipes and fittings are permitted to be used for drain, waste and vent piping for the conveyance of highly corrosive materials and for piping used to distribute distilled or dialized water in laboratory and hospital facilities in a building required to be of non combustible construction provided:
Compartmentation Codes – NBC

3) Polypropylene pipes and fittings are permitted to be of non combustible construction provided:

a) The building is sprinklered throughout

b) The piping is not located in a vertical shaft, and

c) Piping that penetrates a fire separation is sealed at the penetration by a ‘fire stop’ that has an FT rating not less than the fire-resistance rating of the fire separation when subjected to the fire test method CAN/ULC-S115, “Fire Tests of Firestop Systems”, with a pressure differential of 50 PA between the exposed and unexposed sides, with higher pressure on the exposed side.
Compartmentation Codes – NBC

• Change for 2010….
• Definition of Fire Stop

‘System consisting of a material, component and means of support used to fill gaps between fire separations or between fire separations and other assemblies, or used around items that wholly or partially penetrate a fire separation’
Compartmentation Codes – NBC

Definition - Fire Block

*Material, Component or system that restricts the spread of fire within a concealed space or from a concealed space to an adjacent space.*
Compartmentation Codes – NBC

• Compartmentation Codes - Penetrations of Fire Separations

• All penetrations of a fire separations must be fire stopped per CAN/ULC-S115 standard with an F Rating and similar FRR for closures

• All penetrations of a firewall must be fire stopped per CAN-ULC-S115 standard with FT rating and similar FRR for the fire separation.
Compartmentation Codes – NBC

- Compartmentation Codes – Sprinkler penetrations

- Fire Stopping not required around sprinkler head penetrating a fire separation
Compartmentation Codes – NBC

- Fire Stopping not required around *fire dampers* penetrating a *fire separations* where installation listing specifies a clearance for operational reasons...
Compartmentation Codes – NBC

• Combustible Piping Penetrations

• Any size *combustible* pipe permitted to penetrate a *fire separation*
Compartmentation Codes – NBC

• Combustible Piping Penetrations

• Any size combustible pipe permitted to penetrate a fire separation

• Elimination of restriction on drain piping penetrating a horizontal fire separation.

• Fire Stop – Polypropylene pipes must now meet ULC-S115, ‘Fire Tests of Fire Stop Systems’ standard
  – Pressure Differential of 50Pa between the exposed, unexposed with pressure on the exposed side.
Compartmentation Codes – NBC

• Emergency Conductors

• Single Conductors >25mm in overall diameter
  – Not Grouped
  – Spaced a minimum of 300 mm apart
Compartmentation Codes – NBC

• Emergency Conductors

• Installed in service spaces containing other *combustible* material and used in connection with fire alarm systems and emergency equipment (high buildings)

• Conductors from emergency power serving
  • Fire Alarms - High buildings
  • Emergency - Lighting high buildings
  • Fire Pumps all buildings
  • Mechanical Systems - Areas of refuge and contained use
  • Elevators – High Rise
Compartmentation Codes – NBC

- Emergency Conductors
  - Conform to ULC-S139, or Located in service space with fire resistance rating of 1-2 hours
  - Room must be dedicated solely for housing of electrical equipment and conductors
    - Protection from emergency power supply to distribution equipment
    - Between transponders or annunciators indifferent fire compartments
Compartmentation Codes – NFPA

• **NFPA - Committees**
  
  – **NFPA 5000 – “Consensus Codes”**
    
    • Other international locations…North America, not much…
  
    
    • Healthcare Industry
    • Overseas
Compartmentation Codes – ICC

- ICC=International Code Council
  - USA
  - Middle East
  - Caribbean
  - Asia
Compartmentation Codes – NBC

- **ICC**=International Code Council
  - **IBC** – Building Code - New
  - **IFC** – Fire Code – Maintenance
  - Other “I-Codes”
    - **IPC, IMC, IEBC, WUIC, IPMC**
Building & Fire Code Requirements

- Chemical, Biological, Radiation, Explosion, etc.
  - Standards?
    - R - Nuclear Power Plant Standards
    - E – Blast Strength? Check with manufacturer – 2psf
    - C – Which Chemicals? Check with manufacturer
    - B – Which Agents? Check with manufacturer
    - G – Germ – Check with manufacturer & industrial hygenist

- How to Regulate for Unexpected Events?
- Due Diligence - Review Required by code?
Fire Resistance Continuity
All Occupancies

• Effective Compartmentation
  – Education
  – Office
  – Mercantile
  – Multi Family Residential
  – Industrial – Insurance influences
  – Institutional – Healthcare
Buildings are Safe Because…. 

- **Total Fire Protection Stats - North America High Rise**

- **11,025 Tall Buildings - 20 + stories**
  - **70% in NY, SF, LA, CHI, HI, Toronto…**
    - **2/3 Canada’s high rise built before 1985**

= **Compartmentation Primary in Older Structures**
  - **Chicago, NY, Toronto – Older stock of buildings**
  - **SF, LA, HON – Earthquakes**

» Source, Emporis.com
Buildings are Safe Because…. 

• *Total Fire Protection*
  
  = *Safer buildings*…

• *Compartmentation*
• *Sprinklers, Alarms,*
• *Egress Strategies*

• *NIST Reports*…
Buildings are Safe Because....

- National Institute of Standards & Technology ‘NIST Reports - World Trade Center 7 –
- Chapter 4.6, 'Factors that could have mitigated structural collapse'
  - “..improved compartmentation in tenant areas to limit the spread of fires‘

- ‘But first…DIIM’
Building & Fire Code Requirements

- **Continuous Fire Resistance**
  - Walls / Horizontal Assemblies – Continuity
    - Firestop Products Become Firestop Systems
      - Penetrations
      - Joints – Head / Bottom of Wall – Perimeter Joints
    - Fire & Smoke Damper Duct Systems
    - Fire Doors and Hardware Systems
      - Rolling & Swinging
    - Fire Rated Glazing
Continuity – Barriers, Walls & Horizontal Assemblies

- Fire Walls and Floors –
  - Continuous Fire Resistance Rated Assemblies
    - Concrete
    - Concrete Block
    - Plaster
    - Gypsum Block
    - Gypsum Board / ‘Drywall’
    - Floor/Ceiling Assemblies
    - Firestop Systems

“Tested & Listed Wall/Floor Systems”
Continuity

Effective Compartmentation Features

New UL test standards for Life Safety Dampers will take effect in July 2002
Firestopping for Continuity
I – Listed Systems
Firestopping for Continuity
I – Classified Systems
Firestopping for Continuity

• Firestop Products Become Firestop Systems --
  – “A Specific field erected construction, consisting of an assemblage of materials to prevent the spread of fire through openings in fire rated walls and floors using ASTM E 814 / UL 1479 / FM 4990, ULC-S-115, UL 2079, E-2307 as the test method…”
  – Testing = Suitability statement for use of a firestop product in a specific system application
Firestopping for Continuity
Firestop Products

• Sealants
  – Silicone, Latex, Intumescent

• Wrap Strips
  – “Thick, Thin, Wide, Less Wide”

• Putties

• Pillows

• Composite Sheets

• Bricks / Plugs

• Pre Fabricated Kits

• Mortar

• Spray Products

Graphics, STI, 3M, AD, HILTI, Nelson
Fire/Smoke Dampers & Firestops

- Dampers are UL 555, 555S Listed Systems
  - Installed to manufacturer’s written instructions (Systems
    - Angles…no sealants)
- Firestop sealants – ULC-S115 - UL1479 –
  - Improper hole sizing or poor installation…

Consult the Damper Manufacturer & the Authority Having Jurisdiction

Graphics - Greenheck
Fire/Smoke Dampers
Firestop Installation

- Combination Fire Smoke Dampers
- Multi-blade Fire Dampers
- Underfloor applications
- SYSTEM...AHJ

- Greenheck Graphic
Firestop Materials, Systems & Physical Properties

• Serve Building Needs
  – Smoke
  – Germs
  – Chemical Resistance – Cleaning?
  – Chemical, Biological, Radiation?

• Product Types
  – Intumescent, Latex, Silicone
  – Ablative
  – Endothermic

Graphics – 3M, STI, Nelson
D- Design
SYSTEMS SELECTION
Who’s Responsible, How to Choose???

Graphics – STI
Firestopping for Continuity
Products become Systems

• What are Firestop Systems? F, FT, FH, FTH, L, W
• ‘Field Erected Construction…Tested to…’
  – F Rating - Flame
  – T Rating – Temperature -180°C
  – H Rating – Hose
  – L Rating – Smoke – 204°C
  – W Rating – Water
Products become Systems
Hose Stream = Shock Test
Firestopping for Continuity
Products become Systems

• Firestop Systems Directories –
  – ULC/UL
  – Intertek
  – FM Approvals

*Systems Selection & Analysis...Not as easy as it looks*
1. FLOOR OR WALL ASSEMBLY:
   A. MINIMUM 4-1/2" THICK LIGHTWEIGHT OR NORMAL WEIGHT CONCRETE FLOOR.
   B. U.L. CLASSIFIED CONCRETE BLOCK WALL (MINIMUM 8" BLOCK).
2. PENETRATING ITEM TO BE ONE OF THE FOLLOWING:
   A. MAXIMUM 20" DIAMETER STEEL PIPE.
   B. MAXIMUM 6" DIAMETER COPPER PIPE.
   C. MAXIMUM 6" DIAMETER STEEL CONDUIT.
   D. MAXIMUM 4" DIAMETER EMT.
3. OPTIONAL: MAXIMUM 22" DIAMETER STEEL PIPE SLEEVE (SCHEDULE 10 OR HEAVIER).
4. MINIMUM 4" THICKNESS MINERAL WOOL (MIN. 4 PCF DENSITY) RECESSION 1/2" FROM TOP OF SLEEVE.
5. MINIMUM 1/2" DEPTH HILTI FS-ONE FIRESTOP SEALANT.
6. A GENEROUS BEAD OF HILTI FS-ONE FIRESTOP SEALANT AROUND OUTER PERIMETER OF STEEL SLEEVE.

NOTES:
1. MAXIMUM DIAMETER OF OPENING = 22".
2. ANNULAR SPACE = MINIMUM 0", MAXIMUM 1-1/2".
Gypsum Wall assembly running up to concrete over metal deck

Fire Stop Technologies, Inc.

Fire Stop Technologies, Inc.
How do Contractors Select Systems?

- Wall or Floor Construction Type, Rating
- Wall or Floor Thickness
- Penetrating Item, Coverings
- Size, Type, Thickness
- Annular Space Sizes
- Joint / Gap Sizes
- Backing Materials
- Fill Material(s)

= Rated Firestop System
Engineering Judgments/EFarra

• Field or other Variances to Test and Listed Systems?
  – Impractical
  – Annular Space / Gap too large / small
  – No System Exists

• Why???
  – Lack of Planning
  – Unique Conditions
Engineering Judgments/EFERRA

• Variances to Systems at Site? – Now What…
  – First Action in Process
    • Find another system – Same Manufacturer
    • Find another system – Different Manufacturer
    • If no system exists in either case….
  – Second Action –
    • Engineering Judgment – “EJ”
    • Equivalent Fire Resistance Rated Assembly – “EFERRA”

– Based on engineering, IFC Protocol
IFC Guidelines for Evaluating Engineering Judgment Guidelines

‘Construction industry professionals, building officials, fire officials, firestop contractors and other stakeholders need appropriate guidelines for evaluating and using such judgments.

As such, IFC developed *Recommended IFC Guidelines for Evaluating FireStop Systems in Engineering Judgments.*
1. Not be used in lieu of tested systems when available;

2. Be issued only by a firestop manufacturer’s qualified technical personnel or in concert with the manufacturer by a knowledgeable registered Professional Engineer, Fire Protection Engineer, or an independent testing agency that provides listing services for firestop systems;

3. Be based upon interpolation of previously tested firestop systems that are either sufficiently similar in nature or clearly bracket the conditions upon which the judgment is to be given. Additional knowledge and technical interpretations based upon accepted engineering principles, fire science and fire testing guidelines (e.g. ASTM E 2032 – Standard Guide for Extension of Data from Fire Endurance Tests, ULC Subject C263E – Criteria for Use in Extension of Data from Fire Endurance Tests, or ASTM E2750 – Standard Guide for Extensions of Data for Penetration Seals) may also be used as further support data;
IFC EJ Guidelines

Engineering Judgments for firestop systems should:

4. Be based upon full knowledge of the elements of the construction to be protected, the understanding of the probable behavior of that construction and the recommended firestop system protecting it were they to be subjected to the appropriate Firestop Standard Fire Test method for the rating indicated on the Engineering Judgment;

5. Be limited only to specific conditions and configurations upon which the engineering judgment was rendered and should be based upon reasonable performance expectations for the recommended firestop system under those conditions;

6. Be accepted only for a single, specific job and project location and should not be transferred to any other job or project location without thorough and appropriate review of all aspects of the next job or location’s circumstances.
IFC EJ Guidelines - Basic Presentation Requirements

Proper EJ’s should:

1. Be presented in appropriately descriptive written form with or without detail drawings where appropriate;

2. Clearly indicate that the recommended firestop system is an EJ;

3. Include clear directions for the installation of the recommended firestop system;

4. Include dates of issue and authorization signature as well as the issuer’s name, address and telephone number;

5. Reference tested system(s) upon which design (EJ) is based on;

6. Identify the job name, project location and firm EJ is issued to along with the non-standard conditions and rating supported by the EJ;
7. Have proper justification (i.e. UL, Intertek or other independent laboratory system(s) and opinions);

8. Provide complete descriptions of critical elements for the firestop configuration. These should include, but not be limited to the following:

a. Basic, Common
   - Type(s) of assembly used or being penetrated;
   - Rating supported by the EJ.

b. Through Penetrations
   - Penetrating item(s) (type, size, etc.);
   - Annular space requirements, (minimum, maximum, actual, nominal, etc.)
   - Opening size;
   - Firestop product(s) to be used, type and amount (thickness if applicable);
   - Accessory items(s) (i.e. anchors, backing material, etc.)

c. Joints
   - Joint Width (installed width, nominal)
   - Movement Capability;
   - Movement Class (thermal wind sway, seismic);
   - Accessory item(s) (i.e. insulation type, thickness and compression, etc.)
IFC EJ Presentation Guidelines – What’s Seen?

d•Duct Enclosure Systems – SEE www.Firestop.org

e• Firestop System – annular space dimensions, floor/wall construction, design
classification, components, installed thickness.

f. Perimeter Fire Barrier Systems –
   - Type(s) of assembly used or being penetrated;
   - Hourly Rating required
   - Closest Listed System upon which the EJ is based
   - Joint Width
   - Static or Dynamic
   - Safing Insulation Types), thickness and compression, etc.

   - Five Basic Principles
     1. Mechanical Attachment of the Spandrel Insulation
     2. Protection of the Mullions
     3. Compression Fitting and Orientation of the Safing Insulation
     4. Installation of a Reinforcement Member(s), stiffener, at the safe-off area
        behind the spandrel insulation.
     5. Firestop Coating, type, thickness,
IFC EJ Presentation Guidelines – What’s Seen?

- **Continuity Head-of-Wall Joints**
  - Joint Width, (installed width, nominal)
  - Movement Capability
  - Movement Class – (thermal, wind sway, seismic)
  - Accessory Item(s) (i.e. insulation type, thickness, compression, etc.)

**IFC recommends that these guidelines be considered when evaluating whether any firestop system engineering judgment meets minimal requirements. Questions concerning the EJ request should be addressed to the initiator of the judgment.**
INSTALL FIRESTOP SYSTEM
Firestop Sealant, MW installation to Tested and Listed System Limits = Firestop System

1. Pack
2. Apply Sealant
3. Tool/Smooth

Walls - BOTH SIDES

STI Graphic
Properly Tooled/Smoothed Firestop Sealants
Sleeved Pipes
Correct Collar or Sealant Must Be Selected for Combustible Penetrations

- Intumescent sealant expands and fills the void that opens as the combustibles burn away
- Collar expands to crush the pipe
Intumescent Wrap Strips and Steel Collars

• **Key Points - Restricting Collars**
  – Fastening Tabs – 90 degree bends for expansion
  – Directional Tabs
  – Bands

STI Graphic
Unlisted, Untested Firestop Systems
Firestopping for Safety
Unlisted, Untested Firestop Systems
Joint Compound
Incomplete is ineffective
Great Stuff

Graphics – Firestop Solutions
Installing an Incorrect System
May Void the Fire / Smoke Damper Manufacturer’s Warranty
Barriers With Combustible Penetrants

- Plastic Pipe
- Plastic-Jacketed cables
- Certain pipe insulation
Firestop Joint Systems Definition

- ULC-S-115, UL 2079, ASTM E 1966,
  - “A joint system is a specific construction consisting of adjacent wall and floor assemblies, and the materials designed to prevent the spread of fire through a linear opening between the wall and / or floor assemblies”
Firestopping for Safety

- **Firestop Joint Systems Definition – ULC S 115**
  - Min. Positive Pressure – .01 Water, 12” below assy.
  - Movement Cycling
    - Class I – min. 500 cycles, min. 1 cycle / minute
    - Class II- min. 500 cycles, min. 10 cycles / minute
    - Class III-min 100 cycles, min. 30 cycles / minute
  - Fire Tested at Maximum Joint Width
  - No Load Bearing Characteristics, unless noted
  - Assembly, L or W Ratings
Gypsum Wall assembly running up to concrete over metal deck

HILTI Photos

Fire Stop Technologies, Inc.
Firestop Applications

Floor to Wall

Top of Wall

Fire Stop Technologies, Inc.

Graphics – Firestop Solutions
Joints and Seams

Head of Wall
Joints and Seams

I-Beam to Fluted Deck
Penetrations in Head of Wall
Unacceptable
Results of Improperly Installed Mineral Wool
Firestop Perimeter Fire Containment Systems

• Firestop Perimeter Systems
  Definition – ASTM E 2307
  – “A Perimeter Fire Containment System is a specific field erected construction consisting of a floor with a fire resistance rating, and an exterior curtain wall with no hourly resistance rating, and the fill material installed between the floor and the curtain wall to prevent the vertical spread of fire in a building.”
Energy & Fire Codes Converge

• Safer Buildings - Tamweel Apartment Tower...

‘Tamweel Tower fire started by cigarette butt, say Dubai Police.‘

thenational.ae
Firestop Perimeter Fire Containment Systems

Graphic – Intertek
Proper Installation of Mineral Wool

- Compressed mineral wool must be inserted perpendicular to the joint to allow for movement between the slab and wall.
Firestop Installed at Perimeter of Floors at Curtainwall
Firestop Products Become Systems when Installed to SYSTEM
I- Installation
Who’s Responsible, How to Choose???
Installation – Who?

• Firestopping wrong, missing
• Systems Documentation?
• As Built Documentation??

Conclusion –

Without Single Firestopping Trade…
fire & life safety risks
3 Firestop Installation Methods

• Each Trade
  – “He/She who pokes hole, fills hole”

• Multiple Contracts
  – Firestop Contractors, Trades

• Single Source Firestop Contractor
  – *FCIA Member in Good Standing*
  – *FM 4991, UL, ULC Qualified*
Why Contractor Qualifications?

- **Firestopping** Ratings - F, T, H, L W
- **Zero Tolerances?**
  - Annular Space Sizes, Gap Sizes
- **Product Properties**
  - Movement
  - Compatibility
  - Storage, Application, Curing Temps
- **SYSTEMS DOCUMENTATION**
Firestop Contractor Qualifications

1. **Bought at Hardware Store, etc.**
   - Contractor or Individual?

2. **Manufacturer Trained Individuals**
   - 1 hour program
   - ½ day program
   - 2 day education

3. **ULC Qualified, FM 4991 Approved Companies**
   - 3rd Party Verified *Company* Management System
   - *Individuals* Pass 3rd Party Exam
   - *Individual* Knowledge – FCIA MOP
   - All Manufacturers Products Covered
   - *Company gets Approved or Qualified, not Individual*
Firestop Contractor Qualifications?

- **Manufacturer Educated**
  - **Short Class – 25 - 60 minutes**
    - Some Training
    - Worker educated
    - Short test
    - Administered by salesperson
  - **Worker Education at Shop**
  - **Manufacturer HQ Education**
    - 1-2 Days Education
    - Test – Teach to the Test?
    - Not 3<sup>rd</sup> Party
Firestop Contractor Qualifications

- **Association Member**
- **Insurance – Classification?**
  - Specialty Firestop Contractor?
  - Plumber, other trade??
- **Workforce – Educated as Firestop/Containment Workers**
- **Bonding Capability**
- **Project References & Experience**
- **Management System reviewed by….**
  - FM 4991, UL or ULC?
Firestop Contractor Qualifications

FM & UL/ULC – 4 Components

1. Office Facility Quality Management System Audit

2. Field – Jobsite Audit

3. Employ a person
   - UL/FM Firestop Exam @ 80% or better
   - DRI if employed by Approved/Qualified Firm,
     • Designated Responsible Individual (DRI)

4. Annual Audit

- Controlled Management Processes
- Project Successful Proven Contractor
- Education, Training, Accountability
1. FM, UL/ULC Company Audit of Management System (MS)

- Employee Training & Education
- Systems Selection
- Communicate systems to Field
- Material Controls
- Systems installation “protocol”
- Labeling
- Record keeping - Variance Procedures
- Non-Conformances
- Documentation
- Project closeout
2. Company MS Jobsite Audit by ULC, FM or UL

- Verification of firestop systems Processes
- Verify Management System Works
- Verify Company “communication”
  - Office to field, field to office
- “Culture of Quality…”

» Adler Photo
3. DRI – Company Appoints DRI if ….

• Pass Rigorous Firestop Examination
  – FCIA Firestop Manual of Practice
  – Firestop Systems Selection & Protocol
  – Management System Knowledge
• Keep CEU’s – 6 FM, 10 UL, ea. 3 yrs.
• Retested every 3 years (FM Only)
• One DRI per Approved Contractor Location
4. Annual Audit

FM 4991 UL / ULC

Contractor Company Personnel

- Continued satisfactory performance
  - Quality Manual Implementation
- Documented - Archived record keeping
- Employee Training Documentation
- Jobsite Visit
- DRI CEU Verification
- Find @www.FCIA.org
UL-ULC/FM 4991 Contractor

Company Benefits

Quantified Differentiation …

– Focus on the Company & Individual
– Investment in Company Procedures
– Investment in People Education
– Investment in FCIA Manual of Practice

• Project Successful Proven Contractor
• Education, Training, Accountability
  = Reduced Risk – Life, Property, Business
Wednesday, February 10, 2010

Mr. Randy Perry
Adler Firestopping Ltd.
#23, 5316 60 Ave
Acheson, AB T7X 1M9
Canada

Re: Qualified Firestop Applicator

As the firestop manufacturer with more UL and ULC Certified Firestop System Coverage than any other, we are intimately familiar with UL and ULC’s QFC Program. We recognize the program as one of the best-in-class, third-party, quality assurance methods available to building project decision-makers to help ensure applicator quality. As such, we fully endorse the program and those applicators that have invested heavily to earn their way to become a member in this elite group of professionals.

It is our understanding that Adler Firestopping Ltd. is a ULC (Underwriters Laboratories of Canada) Qualified Firestop Contractor (QFC) in good standing. This can be verified at the bottom of the page at the following link:
http://www.ulc.ca/pdfs/pages/offering/industries/building-materials/qualified-contractor-program/guidelines/firestop

Moreover, Randy Perry has successfully attended our intensive, two-day FT Level II program, taken the exam, earned a passing score and is within the two-year expiry period before renewal will be required. A copy of his certificate can be made available upon request.

Regards,

John Hurley
Regional Manager, Western US and Canada
I – Inspection
Systems Analysis
Firestop Installation & Inspection

Duct w/Pink FBGL

ST23-8a

ST23-8e
Firestop Installation & Inspection

- ASTM E 2174/ ASTM E 2393 – "Inspection Process"
Firestop Installation & Inspection

- ASTM E 2174/ASTM E 2393 -
I – Inspection – Options

• Contractor Self Inspection
  – Verify Management System validity
  – Not 2%, 10%
  – Required for FM & UL, ULC Contractors

• Manufacturer Inspection
  – Does not exist … Survey, maybe

• ASTM E 2174 & ASTM E 2393 –
  – Independent 3rd Party
  – Destructive, Non Destructive
  – Specified Frequency
Firestop Systems Inspection
ASTM E 2174 - ASTM E 2393

• “Standard Practice for On-Site Inspection of Installed Fire Stops – Penetrations - Joints”
  – Standard Inspection Procedure
  – Special Inspection Agency Companies
  – Other Qualified Firms
  – Report to Building Owner, Fire Marshals & Code Officials
Inspection in Codes
ASTM E 2174 - ASTM E 2393

• NFPA 101 / 5000 - Chapter 8 - Annex
• 2012 International Building Code
  – CH 17 – Special Inspections
    • Buildings 75’ & higher above Fire Department Access
    • Occupancy Type III, IV, Chapter 16 Table 1604.5
• Abu Dhabi International Building Code
Inspection Firm & Individual Qualifications

ASTM E 2174 - ASTM E 2393

- ‘Independent of, and Divested from’ Installing firm, Distributor, Manufacturer, Competitor, Supplier…

- ‘Not a Competitor’ of the Installer, contractor, manufacturer, or supplier ….

- Submit notarized statements of …
Inspection Firm & Individual Qualifications

ASTM E 2174 - ASTM E 2393

• Inspector Personnel meet at least one criteria…..
  – 2 years experience (Construction, Field), education, and credentials acceptable to AHJ
  – Accredited by AHJ
  – Meet ASTM E699

• NEW Inspector Personnel / Firm Qualification – IAS AC 291 – NFPA 101/5000?
Firm and Individual Qualifications
IAS AC 291

• Inspector Firm shall have at least one staff:
  – PASS UL or FM Firestop Exam
  – 1 year Quality Assurance
  
  Or...

  – PASS UL/FM Firestop Exam, and PE, FPE, Registered Architect, or
  – PASS UL/FM Firestop Exam, and Education by Certified Agency

Specify IAS, not part of ASTM Standards
Inspection Process
ASTM E 2174 - ASTM E 2393

• Pre Construction Meeting
  – Review Documents – Identify Conflicts
  – Review Materials – SYSTEMS
    • ULC S 115, ASTM E 2307 Systems - ASTM E 814 or UL 1479- ASTM E 1966, UL 2079
  – Inspection Documents”
    • Manufacturer Product Data Sheets
    • Tested and Listed Systems & EJ’s
Inspection Process
ASTM E 2174 - ASTM E 2393

• Pre-Construction Meeting
  – Mock Ups
  – Destructive Testing
  – Installation Measurements
  – Discuss Inspection Method

• Meeting Required
  – During/Post Inspection Methods
Inspection Methods
ASTM E 2174 - ASTM E 2393

• During Construction
  – Random witness, Each Floor
  • 10%, each type of Penetration Firestop, no less than one per floor
  • 5% of Total Lineal Feet of Fire Resistance Rated Joint System, each type
Inspection Methods
ASTM E 2174 - ASTM E 2393

• Post Construction - Destructive Testing
  – Minimum 2% , no less than 1, each type per 10,000 SF of floor area
  – Minimum 1 / 500 LF of Joint Area, mandatory
  – If 10% variance per firestop type
    – Inspection stops
    – Installer inspects, repairs
    – Inspector reinspects
Inspection Methods
ASTM E 2174 - ASTM E 2393

• Both Methods…
  – If 10% variance per firestop type
    – Inspection stops
    – Installer inspects, repairs
    – Inspector reinspects
  – Inspector Shall not Supervise Workers…
  – Inspect @ Firestop Installation Start
Inspection Forms
ASTM E 2174 - ASTM E 2393

• One for each type of firestop
• Submit 1 day after Inspection to Authorizing Agency
• Numbered – Controlled
• Required – During/Post Construction Methods
Inspection Final Report
ASTM E 2174 - ASTM E 2393

- Name, address, location – project, installer, inspector
- Type and quantity of firestops inspected
- Verification method
- Percentage Deviation
- Copies of all documents sent to Authorizing Agency
Firestopping & Compartmentation for Safety

- Copies of all documents sent to Authorizing Agency
- Product Data Sheets
- ‘SYSTEMS’, Fire Rated Assemblies = As Builts
- Inspection Docs
- Warranty Docs
- Maintenance Requirements
- Letters of Compliance
- FCIA Member in Good Standing Certificate
Firestopping & Compartmentation for Safety
Why Specify?
ASTM E 2174 - ASTM E 2393

- DIIM – ‘II’ of Quality Process
  - Install, Inspect

- Verify Field Installations

- Specify Accredited Inspection Agencies
  - IAS AC 291 – Accreditation Criteria for Special Inspection Agencies
07-84-00 Specifications
(FREE @ FCIA.org)

MasterFormat - 07 84 00 - Firestopping

- **Part I** – FCIA Member, FM 4991 Approved or ULC Qualified Firestop Installer/Contractor - Valid DRI, Test Standards

- **Part II** – **Products** – Testing, Properties
  - Pipes, cables, ducts, cable trays, MEP&C Systems -
  - Fire Resistance Rated Joints –
    - Head of Wall, Wall to Wall, Wall to Floor
  - Perimeter Fire Containment Joints
    - Floor Slab edge/Exterior Wall

- **Part III, Execution, Quality Assurance** (DIV 1 Reference)
  - ASTM E 2174 & ASTM E 2393 Inspection
  - IAS AC 291 Special Inspection Agency –
    - Individual on staff passed FM or UL Firestop Exam
07-84-00 Specifications

- **Systems Testing – Part 1 – DIIM References**
  - Penetrations – **ULC S 115, ASTM E 814 & UL 1479**
  - Joints - **ASTM E 1966, UL 2079, S115**
  - Perimeter - **ASTM E 2307**
  - FM 4991 Standard for the Approval of Firestop Contractors
  - UL Qualified Firestop Contractor Program
  - **ASTM E 2174 & ASTM E 2393 - Inspections**
  - IAS AC 291 Accredited Special Inspection Agency
07-84-00 Specifications

- **Single Source Product??**
- **YES, BUT.....**
  - ‘...to the greatest extent possible.’
  - Number of Systems v. EJ’s
  - IFC Protocol for EJ’s
    - *No EJ if Tested/Listed System Available*
07-84-00 Specifications

• Part 1 - Systems
  – “T” Ratings - = F & T??
  – “H” Ratings – Hose Stream
  – “L” Ratings = Smoke Resistance
  – “W” Ratings – Floors, Walls

• Materials & Physical Property Requirements
  – Chemicals, Movement, Exposure
M – Maintenance (& Management)
Firestop Maintenance

• Maintenance
  – Code Required
  – How??

• How to keep Track – Barrier Management Initiatives
  Paper
  Software
  Labeling
National Fire Code of Canada

- Division B – Part 2, Building and Occupant Fire Safety
  2.2.1.2 – Damage to Fire Separations – where fire separations are damaged so as to affect their integrity, they shall be repaired so that the integrity of the fire separation is maintained…

- City of Calgary – Best Practices (1997)

- FCIA Manual of Practice – Appendix, Maintenance
  FCIA recommends Barrier Management for Effective Compartmentation and Structural Protection

- Best Practice Guide - NRC

Includes Fire Dampers, Fire Doors…and Continuity
SECTION 4.5.8 Maintenance, Inspection, and Testing.

4.5.8.1 Whenever or wherever any device, equipment, system, condition, arrangement, level of protection, fire-resistive construction, or any other feature is required for compliance with the provisions of this Code, such device, equipment, system, condition, arrangement, level of protection, fire-resistive construction, or other feature shall thereafter be continuously maintained in accordance with applicable NFPA requirements or requirements developed as part of a performance-based design, or as directed by the AHJ. [101:4.6.12.1]
4.5.8.2 No existing life safety feature shall be removed or reduced where such feature is a requirement for new construction. [101:4.6.12.2]

4.5.8.3* Existing life safety features obvious to the public, if not required by the Code, shall be either maintained or removed. [101:4.6.12.3]

4.5.8.4 Any device, equipment, system, condition, arrangement, level of protection, fire-resistive construction, or any other feature requiring periodic testing, inspection, or operation to ensure its maintenance shall be tested, inspected, or operated as specified elsewhere in this Code or as directed by the AHJ. [101:4.6.12.4]

4.5.8.5 Maintenance, inspection, and testing shall be performed under the supervision of a responsible person who shall ensure that testing, inspection, and maintenance are made at specified intervals in accordance with applicable NFPA standards or as directed by the AHJ. [101:4.6.12.5]
SECTION 703
FIRE-RESISTANCE-RATED CONSTRUCTION

703.1 Maintenance. The required fire resistance rating of fire-resistance rated construction (including walls, fire stops, shaft enclosures, partitions, smoke barriers, floors, fire resistive coatings and sprayed fire resistant materials applied to structural members and fire resistive joint systems) shall be maintained. Such elements shall be visually inspected by the owner annually and properly repaired, restored or replaced when damaged, altered, breached or penetrated.

Openings made therein for the passage of pipes, electrical conduit, wires, ducts, air transfer openings, and holes made for any reason shall be protected with approved methods capable of resisting the passage of smoke and fire.
Chapter 1, SECTION 21
Firestopping

21.15.2 The required fire resistance rating of installed firestop systems shall be visually inspected by the owner or owner’s inspection agency annually. Damaged, altered or breached firestop systems shall be properly repaired, restored or replaced to comply with applicable codes as per the guidelines of Civil defense.

21.15.3 Any new Openings made therein for the passage of through penetrants, shall be protected with approved firestop system to comply with applicable codes as per the guidelines of Civil defense.
“TOTAL FIRE PROTECTION”

• Effective Compartmentation
  – Fire Barriers, Fire Walls/Floors, Smoke Barriers
  – Firestopping, Fire Dampers, Swinging and Rolling Fire Doors, Fire Rated Glazing

• Detection & Alarm Systems

• Sprinkler Suppression Systems

• Education & Egress–
  – Building Owners & Managers, Building Occupants and Firefighters
Proper ‘DCIIM’ Means Reliable Systems…

• Properly **Designed** - A/E - Consultant
  – Tested and Listed Systems, FCIA Member Mfr’s., Compartments per IBC, NFPA Codes, SUBMITTALS….Specified (CCS, CDT, RSW)

• Properly **Coordinated & Installed**
  – FCIA Member, FM 4991, or UL Qualified Contractors

• Properly **Inspected**
  – ASTM E 2174 & ASTM E 2393, by IAS Qualified Inspectors at IAS AC 291 Accredited Inspection Firms

• Properly **Maintained & Managed** –
  – FCIA Member, FM 4991, or UL Qualified, IAS Accredited Firms
FCIA DIIM & Firestopping
FCIA Symposia

- Free Subscription to Life Safety Digest
  - Business Card

- Specifications @ FCIA.org,
Effective Compartmentation is a SYSTEM
Contacts

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Bill McHugh – bill @ fcia.org
FCIA DIIM & Firestopping

CONSTRUCTCanada
3 December 2014