Fire and Smoke Separation Continuity and Firestopping

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Learning Objectives

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

1. Understand DIIM
2. Recognize Standards & Code Requirements for Firestopping … to become ‘SYSTEMS’.
3. Understand Requirements for Firestopping for Safety
4. Learn about ‘Why Barrier Management Systems and Firestopping”.

Outline

- FCIA – A Trade Association
  - Total Fire Protection & Effective Compartmentation
  - Codes, Testing, Products - Materials
  - Firestopping for Safety – A Quality Protocol - DIIM
“DIIM” – Design, Installation, Inspection, Maintenance & Management

• 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, UL Qualified Contractors
  • Properly **Inspected** - ASTM E 2174 / 2393 Protocol by IAS AC 291 Accreditation Criteria for Inspection Agencies
  • **Maintained & Managed** (Annually - FCIA Members – 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
“DIIM - DIIMM”

• Firestopping for Safety – DCIIIMM
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Building & Fire Code Requirements

- NFPA 5000 – 101- Chapter 8
- National Building Code – Canada – Chapter 3
- UAE Fire and Life Safety Code – Chapter 7
- International Codes –
  - New and Existing Buildings International Building Code – Chapter 7
  - International Fire Code – Chapter 7

- Minimum requirements - Construction & Maintenance
Building & Fire Code Requirements

• Compartmentation Codes – US –
  – Fire Resistance – Time, in minutes or hours that materials or assemblies have withstood a fire exposure as determined by tests, methods based on tests, or this code .... NFPA, Ch 8. ICC adds... “Systems”
  • Ch. 8 – NFPA – ASTM E 119, UL 263, NFPA 220
  • Ch. 7 – IBC - Fire Barrier – Hourly Rated – IBC
  • Ch. 7 IBC - Fire Wall – Fire rating, structural independence
  • Ch. 8 NFPA – NFPA 221 – High Challenge Fire Walls
  • IBC – Fire Partition – Rated, not continuous.
Building & Fire Code Requirements

• Compartmentation Codes – US
  – Smoke Barrier – **Firestopping for Continuity**
    • **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.
  – Smoke Partition
    • **IBC** – Continuous barrier, not rated...’retard’.
    • **NFPA** – Continuous membrane that is designed to form a barrier to **limit the transfer of smoke**....
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
Building & Fire
Code Requirements

• **Chemical, Biological, Radiation, Explosion, etc.**
  
  • Standards?
    – R - Nuclear Power Plant Standards
    – E – Blast Strength? Check with manufacturer
    – C – Which Chemicals? Check with manufacturer
    – B – Which Agents? Check with manufacturer
    – G – Germ – Check with manufacturer & facility 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’
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
D – Tested and Listed Systems
Continuity
Effective Compartmentation Features

New UL test standards for Life Safety Dampers will take effect in July 2002
Continuity = SYSTEMS

• Products Become Systems Through Testing
  – Fire Barriers ASTM E 119 & UL 263
  – Firestopping - ASTM E 814 / UL 1479, ULC-S-115, UL 2079, **E-2307** as the test method…”
  – Dampers - UL 555, UL 555S
  – Doors - UL 10B, 10C
  – Fire Rated Glazing UL 9
    • Testing = Suitability statement for use of a product in a specific application
    • ‘SYSTEMS’
Common to all Fire Resistance – North America
Hose Stream = Shock Test
North America = Hose Stream Shock Test
Fire Dampers

• Products Become Systems Through Testing
  – UL 555, UL 555S; NFPA SYSTEMS
  – NFPA 80 – Inspection & Operational Test
    • @ Installation
    • @ 1 Year
    • @ 4 Years; 6 for Hospitals
Fire Dampers

• Products Become Systems Through Testing
  – UL 555, UL 555S; NFPA SYSTEMS
  – NFPA 80 – Inspection & Operational Test
    • @ Installation
    • @ 1 Year
    • @ 4 Years; 6 for Healthcare
Fire Rated Glazing

• Products Become Systems Through Testing
  – ASTM E 119, NFPA 257 SYSTEMS
    • Fire –
      – Protective – Doors & Sidelites
      – Resistive – Radiant heat - Walls
    • Hose Stream
    • Impact Safety
    • NFPA 80 –
Fire Rated Glazing

- Products Become Systems Through Testing, Labeling
Fire Rated Glazing

• **Labeling**
  • “W” - Glazing passes ASTM E119 – T, H
  • “D” – Glazing passed NFPA 252, Door standard
  • “O” - Glazing passes NFPA 257, Opening standard
Firestopping for Continuity
D – 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, 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
Firestopping for Continuity
Firestop Products

• **Sealants**
  – Silicone, Latex, Intumescent

FCIA Photos
Firestopping for Continuity
Firestop Products

• **Wrap Strips**
  – “Thick, Thin, Wide, Less Wide”
Firestopping for Continuity

Firestop Products

• Wrap Strip & Collars or Pre Fabricated Kits

Hamilton Benchmark, 3M Photo
Firestopping for Continuity

Firestop Products

- Putties
- Composite Sheets
Firestopping for Continuity

Firestop Products

- Pillows

Graphics, Hamilton Benchmark, Rectorseal, STI, Nelson
Firestopping for Continuity
Firestop Products

• Bricks / Blocks
Firestopping for Continuity
Firestop Products

- Firestop Mortar
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
Firestop Materials, Systems & Physical Properties

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

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

Graphics – 3M, STI, Nelson
D/I - Design
systems selection
Who’s Responsible, How to Choose???
Firestopping for Continuity
Products become Systems

• What are Firestop *Systems*?
• ‘Field Erected Construction...Tested to...’
  – **F Rating - Flame**
  – **T Rating** – Temperature
  – **H Rating** – Hose
  – **L Rating** – Smoke
  – **W Rating** – Water

Graphics – 3M
Firestopping for Continuity
Products become Systems

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  – **L Rating** – Smoke
  – **W Rating** – Water

Graphics – 3M
Products become Systems
Hose Stream = Shock Test
Firestopping for Continuity Products become Systems

- Firestop Systems Directories –
  - UL
  - Intertek
  - FM Approvals

*Systems Selection & Analysis...Not as easy as it looks...*
U.L. SYSTEM NO. CAJ1155
METAL PIPE THROUGH A SLEEVE IN CONCRETE FLOOR OR WALL

F RATING = 3-HR.
T RATING = 0-HR.
L RATING AT AMBIENT = LESS THAN 1 CFM/SQ. FT.
L RATING AT 400°F = 4 CFM/SQ. FT.

TOP VIEW

SECTION A-A

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
Gypsum Wall assembly running up to concrete over metal deck
How do Contractors Select and Inspection Agencies Analyze 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
1. Centered

2. Off-Centered

3. Point Contact

4. Continuous Point Contact
Engineering Judgments/EFARRA

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

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

• 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 – “EFRRRA”
  – Based on engineering, IFC Protocol
IFC Guidelines for Evaluating Engineering Judgments

‘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.

www.firestop.org
Engineering Judgments for firestop systems should:

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

e• Firestop System – annular space dimensions, floor/wall construction, design number, 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,
f• 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.
I - 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
Properly Tooled/Smoothed Firestop Sealants

- UL SYSTEM
  W-L-5278
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
How do we identify “Bad Firestopping”
“Show Me the SYSTEM”
Firestopping for Safety
Unlisted, Untested Firestop Systems
Joint Compound
Incomplete is ineffective
How to deal with Firestopping & Fire/Smoke Dampers ...

- Dampers are UL 555, 555S Listed **Systems**
  - Installed to manufacturer’s written instructions (Systems – Angles...no sealants)

- Firestop sealants – UL 1479 –
  - 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
- Max. size 72” W x 96” H
- SYSTEM…AHJ

- Greenheck Graphic
Installing Incorrectly May Void the Fire / Smoke Damper Manufacturer’s Warranty
Barriers With Combustible Penetrants

- Plastic Pipe
- Plastic-Jacketed cables
- Certain pipe insulation

Graphics - STI
Firestop Joint Systems Definition –

- UL 2079, ASTM E 1966, ULC-S-115
  - “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 – UL 2079**
  
  – 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

TOP OF WALL JOINT - 1 HR. OR 2 HR. GYPSUM WALL ASSEMBLY
ASSEMBLY RATING = 1 HR. OR 2 HR. (DEPENDING ON RATING OF WALL AND FLOOR ASSEMBLY)
CLASS II MOVEMENT CAPABILITIES - 50% COMPRESSION OR EXTENSION

[Diagram of Gypsum Wall assembly]
UL SYSTEM
HW-D-0042
Firestop Applications

Floor to Wall

Top of Wall

Graphics – Firestop Solutions

Fire Stop Technologies, Inc.
Joints and Seams
Head of Wall
Joints and Seams

I-Beam to Fluted Deck
Penetrations in Head of Wall & Bar Joist Penetrations
Gypsum Wallboard Compound, Diluted Firestop Spray = Unacceptable
Results of Improperly Installed Mineral Wool = Voids in Firestop
Well Done Installations

FCIA Photo
Well Done Installations
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 curtainwall 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.”
Tamweel Towers, Dubai
Perimeter Fire Protection

*Gulf News: A discarded cigarette*
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

Graphics – OPL, 3M
I- Installation
Who’s Responsible, How to Specify/Choose?

Graphics – STI
Sometimes, Not well……..

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

**Conclusion** –

*Without Single Firestopping Trade....*

*fire & life safety risks*
Why?
3 Current 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. NO QUALIFICATIONS
   Bought Firestop Product
   at Hardware Store, etc.

[Logos of Home Depot and Lowe's]
2. Manufacturer Trained Individuals
   • 1 hour program
   • ½ day program
   • 2 day education
   • Workers, Estimators, Sales
Firestop Contractor Qualifications

3. UL/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**
   - **Individual Knowledge Requirement Too**
Firestop Contractor Qualifications

- **Firestop Contractor Qualification Questions**
  - Association Member?
  - Insurance – Classification?
    - Specialty Firestop Contractor?
    - Plumber, other trade??
  - Workforce – Educated as Firestop/Containment Workers?
  - 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 Audit of Firestop Contractor Management System

- 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. Firestopping 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
3. **DRI** – Stays a DRI if ....

- Company Appoints ....
- DRI Keeps CEU’s – 6 FM, 10 UL, ea. 3 yrs.
- DRI is 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 AND 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
What Contractor Qualifications?

• Rolling & Swinging Fire Doors – None
  – Rolling Door Workers

• Fire Dampers – NEMI Union Contractor Program

• Fire Rated Walls - ?

• Fire Rated Glazing – ?
Why Contractor Qualifications?

• Built right the first time...
• Documentation
• SYSTEMS Selection, Analysis
  – F, T, H, L, W
  – Tolerances - Annular Space Sizes
  – Gap Sizes - Undercuts - Framing
  – Anchors - Spacing – Hardware
  – Closers - Activation Sensors, more...
• Correct Cost – I & I
Wednesday, February 10, 2010

Mr. Randy Perry
Adler Firestopping Ltd.
#3, 5015 Hay 60
Acheson, AB T7X 1M9
Canada

Re: Qualified Firestop Applicator

As the firestop manufacturer with more UL and ULC Classified Firestop System Coverage than any other, we are intimately familiar with UL and ULC’s QFC Program. We recognize the program as one of two 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 UL (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:

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

Underwriters' Laboratories of Canada
Qualified Firestop Contractor Program

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FIRESTOP CONTRACTORS INTERNATIONAL ASSOCIATION

This certifies that

Adler Firestopping, Ltd.
Edmonton, Alberta

is a Firestop Contractor Voting Member of the
Firestop Contractors International Association

and pledges to further the mission of FCIA.

Robert N. LeClair, Jr., President, FCIA
Don Murphy, Vice President
Don Saborido, Secretary
Scott Rankin, Treasurer
Randall Boscome, Director
Mike Dominguez, Director
Aadan Gibson, Director

Certification #1911
Issued: 2/1/2010
Expires: 2/1/2011

Company Name: Adler Firestopping Ltd.
File number: NC19757
Address: Edmonson Office, #23, 5015 Hay 60, Acheson, AB T7X 1M9 CANADA
Telephone #: (780)-962-9495
Fax #: (780)-962-9794
Email Address: randy@adlerfirestopping.com

This company has demonstrated that it complies with UL’s Qualified Firestop Contractor Program Requirements for Canada. Under this program, the Contractor has demonstrated knowledge of selection and installation of firestop systems as evidenced by the successful performance in a written examination by a “Designated Responsible Individual” (DRI). The Contractor has also established a Management System specifically focused on the proper selection and installation of ULC Listed Firestop Systems.

This certificate is not transferable and expires one (1) year after the issue date. This certificate may be displayed, copied and shared with others but must be used in its entirety. Only those companies listed in ULC’s Online Certification Directory for the Qualified Firestop Contractor Program at www.ulic.ca/contractor are considered eligible for this program and use this Certificate and the ULC marking (shown here) in its advertising and promotional material in accordance with the marking guidelines provided with this Certificate.

Underwriters Laboratories of Canada reserves the right to void this certificate at any time. This certificate does not indicate compliance with any ULC Product Certification Program. For additional information regarding the Qualified Firestop Contractor Program, please visit www.ulic.ca/contractor.
I – Inspection
Systems Analysis
QUALITY PROCESS

- Installation
- Inspection
- Maintenance
Duct w/Pink FBGL

ST23-8a

ST23-8e

Firestop Installation & Inspection
Firestop Installation & Inspection

Firestop Installation & Inspection

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

• Contractor Self Inspection
  – Verify Management System validity
  – Required for FM & UL, ULC Contractors
  – *As much to stay accurate...*
I – Inspection – Options

- **ASTM E 2174 & ASTM E 2393 –**
  - Independent 3rd Party
  - Destructive, Non Destructive
  - Specified Frequency
I – Inspection – Options

• Manufacturer Inspection
  – Does not exist...
  – Manufacturer Survey, maybe
  – No Manufacturer Warranty other than...
    • 1 year from date of shipment, limited to the materials only...
Firestop Systems Inspection

- FCIA & Industry Developed...
- 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
• National Building Code of Canada
Inspection Firm & Individual Qualifications

- Inspector Firm & Inspectors
  - ‘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
Inspection Firm & Individual Qualifications
ASTM E 2174 - ASTM E 2393

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

• Inspector Firm shall have at least one Person on 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, Codes
Inspection Process
ASTM E 2174 - ASTM E 2393

• Pre Construction Meeting
  – Review Documents – Identify Conflicts
  – Review Materials – SYSTEMS
    • ASTM E 814 or UL 1479- ASTM E 1966, UL 2079, ASTM E 2307 Systems
    • 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 Built
- 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
QUALITY PROCESS

INSPECTION

INSTALLATION

MAINTENANCE
07-84-00 Specifications
(FREE @ FCIA.org)

MasterFormat - 07 84 00 - Firestopping

• **Part I** – FCIA Member, FM 4991 Approved or UL 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 for Suitability**
  Part 1 – DIIM References
  – Penetrations - 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/ULC 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)
Maintenance & Management

• **Maintenance**
  – Code Required...by Fire Code
  – How??

• **How to keep Track – Barrier Management Initiatives**
  Paper
  Software
  Labeling
Maintenance & Management
Maintenance & Management
Maintenance & Management

Greenheck Photo
SECTION 4.6.12 Maintenance and Testing.

4.6.12.1 Whenever or wherever any device, equipment, system, condition, arrangement, level of protection, or any other feature is required for compliance with the provisions of this Code, such device, equipment, system, condition, arrangement, level of protection, 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]
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-resistant 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-resistant 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]
• 4.6.12.2 **Existing life safety features obvious to the public, if not required by the Code, shall be either maintained or removed.**

• 4.6.12.3 **Equipment requiring periodic testing or operation to ensure its maintenance shall be tested or operated as specified elsewhere in this Code, or as directed by the authority having jurisdiction.**

• 4.6.12.4 **Maintenance and testing shall be under the supervision of a responsible person who shall ensure** that testing, and maintenance **are made at specified intervals** in accordance with applicable NFPA standards or as directed by the Authority Having Jurisdiction.
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.

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.

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.
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.
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*
M–Barrier Management Systems

“When you’re up to you’re a__ in alligators, it’s hard to remember you’re there to drain the swamp.”
Barrier Management Begins when new construction ends...
M–Barrier Management Systems

• NEW Buildings – Specifications Set Stage
  – SYSTEMS Expectations
  – As Built SYSTEMS
  – Testing
  – Installation
  – Inspection

• AS BUILT DOCUMENTATION IN SPECIFICATIONS
M–Barrier Management Systems

• Now it’s your building....
WHAT NEEDS TO BE MAINTAINED?

- Fire Resistive Wall Construction
- Fire Doors
- Fire Dampers
- Firestop Systems:
  - Joint Systems
- Hot and Cold Water Piping
- Laboratory Waste
- Medigas Piping
- Pneumatic Tubing
- Sprinkler Piping
- Rigid Electrical Conduits
- Cable Trays
- BX Cables
- Low Voltage Cables
- and More....
  - Low Voltage!!!
M–Barrier Management Systems

- Barrier Management
  - TJC # 1 & 2 Violations
  - Constant issues
  - Control?
  - Staff?
  - Attitude?
Barrier Management HUB

• A HUB must control all Action
  – C-Suite Execs
  – Construction – In House & Outside
  – I-T Department – In House & Outside

• The HUB is The Facility Engineer...Specifier?
Why Barrier Hub is Facility Engineer

• Answers to...
  – The Joint Commission
  – CMS Inspectors
  – Building Official, Fire Marshal
  – Other AHJ’s
  – C-Suite
  – Staff
  – Building Occupants
M–Barrier Management Systems

• Barrier Management Policy - Tool
• Facility Director Communicates...
  – In House Construction & I-T Crews
  – Outside Contractors
Barrier Management
Policy = Tool

• Facility Director Communicates...
  – Rules of Engagement in Contracts
    • Internal Contracts
    • External Contracts
  – Pre Construction Meetings
  – Barrier Warnings - Markings
  – Violation Consequences
  – Ongoing Management
  – Staff Education & Incentives
Barrier Management Policy Tool

– Rules of Engagement in Contracts

• Internal Contracts
  – In House Departments similar to Outside Contractors

• External Contracts
  – AIA Contract
  – Marked Fire - Smoke Barrier Actions
  – Barrier Permits
  – Documentation
  – Report
M–Barrier Management Systems

• Methods to Control
  – Paper, Pictures & Files
  – Electronic Pictures & Files
    • ‘Custom’
    • ‘Packages’
M–Barrier Management Systems

• Common Elements
  – Life Safety Drawings
  – Existing Conditions Documented
  – Ongoing Survey Records
  – Deficiency Reports
  – Systems Documentation Control, Retrieval
M–Barrier Management Systems

• Electronic Best Practice Elements
  – Action Oriented
    • Projects - Specifications
    • Ongoing Surveys – FCIA RPPS 2010-1
  – Action Reminders
  – In Process Status
  – Record Retrieval
Sample Permit – Area
### Sample Project

**Gleeson Powers Graphic**

#### Demo Hospital

**Permit No.: 2011-005**

**Area:** 3C1/3L1  
**LSR ID:** LST-B1-03-007

**Survey ID:**  
**Compliance Status:** Non-compliant  
**LSR Group:**

---

**Life Safety Details**

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<th>LSR ID</th>
<th>Status</th>
<th>Latest Photo</th>
<th>Detail Description</th>
<th>Life Safety Type</th>
<th>Life Safety Sub Type</th>
<th>Letters</th>
<th>Numbers</th>
<th>LSR Count</th>
<th>Notes</th>
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<td><img src="image1.png" alt="Image" /></td>
<td><strong>Firestopping Through Wall Penetration - Firestop</strong></td>
<td>Firestopping</td>
<td>Through Wall Penetration</td>
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<td>Through Wall Penetration</td>
<td>WL</td>
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[Add New Life Safety Detail Entry]  
[Edit Selected Life Safety Detail Entry]

---

[Edit]  
[Save]  
[Save & Add Another]  
[Save & Close]  
[Delete Record]  
[Cancel]
**Corrective Action Report**

**Life Safety Type:** Firestopping  
**Life Safety Sub Type:** Through Wall Penetration - Firestop Systems

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<th>Penetration Type:</th>
<th>EVT or Conduit</th>
<th>Penetration Size:</th>
<th>Max 1&quot;</th>
<th>Annular Space:</th>
<th>MIN: 0 to .50&quot;, MAX:</th>
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**Date Completed:** May 02, 2011  
**Deficiency Description:** No firestopping

**Survey Notes:**

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<th>Suggested CA Notes:</th>
<th>Install UL Listed Firestopping System at penetration/joint</th>
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**Correction Action Photo**

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**Survey Photo**

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Barrier Management Policy Tool

• Pre Construction Meetings - Education
  – Barrier Markings Mean...
  – Actions when at Barriers Required...
    • Permit required – Above Ceiling, Barrier Hole...
    • Infection Control Rules
    • Facility Rules
Barrier Management Policy Tool

– Barrier Warnings on ASSEMBLIES
Barrier Management
Policy Tool

• Violation Consequences
  – In House –
    • 2 strikes & work reassignment to cleaning...
    • Others...
  – Outside Contractors
    • 2 strikes & not allowed to work above ceilings
    • Others...
Barrier Management Policy Tool

• Incentives
  – Find Violators....
  • Staff Awards
Barrier Management Policy Tool

- Ongoing Management
  - Engineering Staff Reviews
  - User Staff Reviews
  - Inside Construction
  - Outside Contractor
Barrier Management Policy Tool

• Education – Building Staff – Simple??
  – Fire Doors & Hardware – Simple things...
    • Close & Latch
    • Holes in Door
  – Ladder = ?? Permit Sticker?
  – Fire Rated Walls - Holes
    • Accidental
    • Workers
“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
Conclusions

Fire, Smoke Barriers are all SYSTEMS Disciplines.

New UL test standards for Life Safety Dampers will take effect in July 2002.
Conclusions

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

• **Barrier Management Systems**
Learning Objectives

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

1. Understand DIIM
2. Recognize Standards & Code Requirements for Firestopping ... to become ‘SYSTEMS’.
3. Understand Requirements for Firestopping for Safety
Fire and Smoke Separation Continuity and Firestopping

• FREE Subscription to Life Safety Digest
• FREE Specifications
• FREE Resources
• FREE MOP to Specifiers with Design Firms, AHJ’s

• @ www.FCIA.org
• @ bill@fcia.org
Questions?
Fire and Smoke Separation Continuity and Firestopping

Bill McHugh, FCIA

CONSTRUCT 2014
CSI Convention

Sept. 11. 2014