Barrier Management Symposium

ASHE Region 3
Wellmont Bristol RMC
Bristol, TN
Nov. 16-17, 2015
Contacts

Firestop Contractors International Association
Hillside, IL – +1-708-202-1108 - office
Bill McHugh – bill @ fcia.org
Learning Objectives

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

2. Focus on Perimeter Fire Containment for Curtainwalls
3. Understand Requirements for Firestopping for Safety in the US and Canada
4. Section 07 84 00++ Highlights
5. Learn about ‘Why compartmentation and Firestopping”.

Outline

• 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
  - 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
QUALITY PROCESS

INSTALLATION

DESIGN

INSPECTION

MAINTENANCE
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”

• Firestopping for Safety – DCIIMM
  • 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, PASS FM or UL Exam
  • *Maintained & Managed* - Annually - NFPA 101,
    International Fire Code, UAE Fire and Life Safety
    Code of Practice, National Fire Code of Canada
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Building & Fire Code Requirements

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

• Minimum requirements - Construction
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”
Building & Fire Code Requirements

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

• Compartmentation Codes – US –
  – Continuity
  – Openings & Penetrations
  – Robustness
Building & Fire Code Requirements

• Fire 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

• Smoke Barriers
  – Healthcare
  – Other Occupancies

• NFPA 101 - no quantified L Rating for Firestops
• IBC – Quantified L Rating for Firestops
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 - Continuity

• *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’
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
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, E-2837** 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 – 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
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???
Firestopping for Continuity
Products become Systems

• What are Firestop Systems?
• ‘Field Erected Construction…Tested to…’
  – F Rating - Flame
  – T Rating – Temperature
  – H Rating – Hose (Always)
  – 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:
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
1. Centered

2. Off-Centered

3. Point Contact

4. Continuous Point Contact
Engineering Judgments/EFRRRA

• Field or other Variances to Tested and Listed Systems?
  – Impractical / Impossible
  – No System Exists – Any Manufacturer

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

- **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 – “EForra”*

- **Based on engineering, IFC Protocol**
IFC Guidelines for Evaluating Engineering Judgment

‘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.’
IFC EJ Guidelines - 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.
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 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.)
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 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,
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
Unlisted, Untested Firestop Systems
Firestopping for Safety
Unlisted, Untested Firestop Systems
Joint Compound
Incomplete is ineffective
Great Stuff

Graphics – Firestop Solutions
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 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

- 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

HILTI Graphic
Gypsum Wall assembly running up to concrete over metal deck
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 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.”

Graphic - Superl
Tamweel Towers, Dubai
Perimeter Fire Protection

*Gulf News: A discarded cigarette*
Energy & Fire Codes Converge

• Exterior Insulation

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

The Torch, Etc. 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 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\textsuperscript{rd} 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 Proce
- 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…”
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 Avenue
Acheson, AB T7X 1M9
Canada

Re: Qualified Firestop Contractor

As the firestop manufacturer with more UL and ULC Listed 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 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
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 –
Code Requirements

[A] 104.4 Inspections. The building official shall make all of the required inspections, or the building official shall have the authority to accept reports of inspection by approved agencies or individuals. Reports of such inspections shall be in writing and be certified by a responsible officer of such approved agency or by the responsible individual. The building official is authorized to engage such expert opinion as deemed necessary to report upon unusual technical issues that arise, subject to the approval of the appointing authority.
[A] 110.3 Required inspections. The building official, upon notification, shall make the inspections set forth in Sections 110.3.1 through 110.3.10.

[A] 110.3.6 Fire- and smoke-resistant penetrations. Protection of joints and penetrations in fire-resistance rated assemblies, smoke barriers and smoke partitions shall not be concealed from view until inspected and approved.
[A] 110.4 Inspection agencies. The building official is authorized to accept reports of approved inspection agencies, provided such agencies satisfy the requirements as to qualifications and reliability. [IBC 110.4]

[A] 110.6 Approval required. Work shall not be done beyond the point indicated in each successive inspection without first obtaining the approval of the building official….More. [IBC 110.6]
I – Inspection –

Code Requirements

Definitions

[A] APPROVED AGENCY. An established and recognized agency regularly engaged in conducting tests or furnishing inspection services, when such agency has been approved. [IBC 202. Definitions]

[A] APPROVED. Acceptable to the building official or authority having jurisdiction. [IBC 202 Definitions]
I – Inspection –
Code Requirements

SPECIAL INSPECTOR. A qualified person employed or retained by an approved agency and approved by the building official as having the competence necessary to inspect a particular type of construction requiring special inspection. [IBC 202. Definitions]
1704.2.1 Special inspector qualifications. The special inspector shall provide written documentation to the building official demonstrating his or her competence and relevant experience or training. Experience or training shall be considered relevant when the documented experience or training is related in complexity to the same type of special inspection activities for projects of similar complexity and material qualities. These qualifications are in addition to qualifications specified in other sections of this code. The registered design professional in responsible charge and engineers of record involved in the design of the project are permitted to act as the approved agency and their personnel are permitted to act as the special inspector for the work designed by them, provided they qualify as special inspectors.
SECTION 1703 APPROVALS

1703.1 Approved agency. An approved agency shall provide all information as necessary for the building official to determine that the agency meets the applicable requirements.
I – Inspection –
Code Requirements

1703.1.1 Independence. An approved agency shall be objective, competent and independent from the contractor responsible for the work being inspected. The agency shall also disclose possible conflicts of interest so that objectivity can be confirmed. [IBC 1703.1.2]

1703.1.2 Equipment. An approved agency shall have adequate equipment to perform required tests. The equipment shall be periodically calibrated. [IBC 1703.1.2]
1703.1.3 Personnel. An approved agency shall employ experienced personnel educated in conducting, supervising and evaluating tests and/or inspections. [IBC 1703.1.3]
I – Inspection –
Code Requirements

1704.2 Special inspections. Where application is made for construction as described in this section, the owner or the registered design professional in responsible charge acting as the owner’s agent shall employ one or more approved agencies to perform inspections during construction on the types of work listed under Section 1705. These inspections are in addition to the inspections identified in Section 110. [IBC 1704.2]
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

• 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

• 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

  • 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

Adler Photo
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
1704.2.4 Report requirement. Special inspectors shall keep records of inspections. The special inspector shall furnish inspection reports to the building official, and to the registered design professional in responsible charge. Reports shall indicate that work inspected was or was not completed in conformance to approved construction documents. Discrepancies shall be brought to the immediate attention of the contractor for correction. If they are not corrected, the discrepancies shall be brought to the attention of the building official and to the registered design professional in responsible charge prior to the completion of that phase of the work. A final report documenting required special inspections and correction of any discrepancies noted in the inspections shall be submitted at a point in time agreed upon prior to the start of work by the applicant and the building official.
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

INSTALLATION

DESIGN

INSPECTION

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 – 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 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 - Later)
Firestop Maintenance

• Maintenance
  – Code Required
  – How??

• How to keep Track – Barrier Management Initiatives
  Paper
  Software
  Labeling
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.
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*
“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 @ Barrier Management Symposium

- Free Subscription to Life Safety Digest
  - Business Card
- Specifications @ FCIA.org,
Continuity
Effective Compartmentation = SYSTEM

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

Firestop Contractors International Association
Hillside, IL – +1-708-202-1108 - office
Bill McHugh – bill @ fcia.org