FCIA’s DIIM: Firestop 101 Education Program

• Design
• Installation
• Inspection
• Maintenance & Management
D-DESIGN
Specs,
Code,
Standards

I-INSTALLATION
MS Programs AND
Mfr. Education

QUALITY
PROCESS

BARRIER MANAGEMENT
Fire Codes
NFPA 101, 1, IFC
Barrier Management

I – INSPECTION
IBC Ch. 17
NFPA 80
NFPA 1
“DIIM” – Design, Install, Inspect, Maintain

- Fire Resistance & Smoke Resistant Firestopping
  - Properly *Designed* Building Codes
    - FCIA - 07-84-00 – Specification – *CCS*
    - *Tested and Listed Systems* –
      - ASTM 814, UL 1479, ASTM E 1966, UL 2079, E2307, E2837, E3037
    - Movement, (M) Smoke (L), Water (W)
  - Professional *Installation* –
    - FCIA Member, ULC Qualified Contractors, FM 4991 Approved
  - Properly *Inspected* –
    - ASTM E2174 / E2393, by IAS AC 291 Agencies, ULC, IFC, FM Exams
  - *Protection Maintained* – Annually – by FCIA Members
Building & Fire Code Requirements

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

- Minimum requirements - Construction & Maintaining Protection
Barrier Continuity SYSTEMS

• **Products Become Systems – Test Standards**
  - Fire & Smoke Barriers – Fire Separations
    - ASTM E119, UL 263
  - Firestopping –
    - ASTM E814 / UL 1479, UL 2079, E1966, E2307, E2837, E3037...test methods…”
  - Swinging/Rolling Fire Doors – UL 10B & UL 10C….NFPA 252
  - Fire Rated Glazing – UL 9, ASTM E119, UL 263
  - Fire/Smoke Dampers – UL 555, UL 555S

• **SYSTEM Testing = Suitability Statement**
1. **Floor or Wall Assembly** — Min 2-1/2 in. (64 mm) thick reinforced lightweight or normal weight (100-150pcf or 1000 - 2400 kpa/m³) concrete floors or min 3 in. (76 mm) thick reinforced lightweight or normal weight concrete walls. Wall may also be constructed of any UL Classified Concrete Blocks. Max dia. of opening 9 in. (229 mm). See Concrete Blocks (CAZT) category in the Fire Resistance Directory for names of manufacturers.

2. **Steel Sleeve** — (Optional) - Nom 9 in. (229 mm) dia. or smaller Schedule 10 (or heavier) steel sleeve cast or grouted into floor or wall assembly. Steel sleeve may be installed flush or may project max 2 in. (51 mm) beyond the floor or wall surfaces. As an alternate, nom 9 in. (229 mm) dia. or smaller sleeve fabricated from nom 0.019 in. (0.49 mm) thick galv. steel cast or grouted into floor or wall assembly flush with floor or wall surfaces.

3. **Through Penetrants** — One metallic pipe to be installed concentrically or eccentrically within opening. Penetrant to be rigidly supported on both sides of floor or wall assembly. The following types and sizes of metallic pipes may be used:
   - **A. Steel Pipe** — Nom 4 in. (102 mm) dia. or smaller Schedule 10 (or heavier) steel pipe.
   - **B. Iron Pipe** — Nom 4 in. (102 mm) dia. or smaller cast or ductile iron pipe.
   - **C. Copper Tubing** — Nom 2 in. (51 mm) dia. or smaller Type L (or heavier) copper tubing.
   - **D. Copper Pipe** — Nom 2 in. (51 mm) dia. or smaller Regular (or heavier) copper pipe.

   **F Rating** is 2 Hr for Penetrants A and B. **F Rating** is 1 Hr for Penetrants C and D.

4. **Pipe Covering** — Nom 1-1/2 in. (38 mm) thick hollow cylindrical heavy density glass fiber units jacketed on the outside with an all service jacket. Longitudinal joints sealed with metal fasteners or factory-applied self-sealing lap tape. Transverse joints secured with metal fasteners or with butt tape supplied with product. Annular space between the pipe covering and periphery of opening or sleeve shall be min 1/2 in. to max 1 in. (13 mm to 25 mm).

   See Pipe and Equipment Covering - Materials (BRGU) category in the Building Materials Directory for names of manufacturers. Any pipe covering material meeting the above specifications and bearing the UL Classification Marking with a Flame Spread Index of 25 or less and a smoke Developed Index of 50 or less may be used.

   **T Rating** is 3/4 Hr for nom 1-1/2 in. (38 mm) thick pipe covering for penetrants A and B. **T Rating** is 1 Hr for nom 1-1/2 in. (38 mm) thick pipe covering for Penetrants C and D. **T Rating** is 0 Hr for all Penetrants when pipe coverings less than nom 1-1/2 in. (38 mm) thick.
Building & Fire Code Requirements

- International Codes –
- NFPA 5000 – 101- Chapter 8
- National Building Code – Canada
- UAE Fire and Life Safety Code – Chapter 1, Section 21
- Other Worldwide Codes

- Minimum requirements - Construction & Maintenance
D-DESIGN
Specs, Code, Standards

I-INSTALLATION
Systems Selection
Systems Analysis
Self Inspection
FCIA, FM & UL
MACC

QUALITY
PROCESS

BARRIER MANAGEMENT
Fire Codes
NFPA 101, 1, IFC
Barrier Management

I – INSPECTION
IBC Ch. 17
NFPA 80
NFPA 1
Specs – Starts Barrier Management Process

• NEW Buildings – 07-84-00 Specs
  • www.FCIA.org
• Part I – Products…but
  • Systems
  • Product Properties
  • Manufacturers
• “Single Manufacturer to the greatest extent possible” – EJ/EFRRRA’s
Specs – Key Parts

• NEW Buildings – 07-84-00 Specs
  • www. FCIA .org
• Part II– Contractor/Installer Qualifications
  • FCIA Member in Good Standing, AND
  • FM 4991, Standard for the Approval of Firestop Contractors, OR
  • UL Qualified Firestop Contractor Program
  • AND
  • Manufacturer Accredited, Approved, Trained
Specs – Key Parts

• NEW Buildings – 07-84-00 Specs
  • www.FCIA.org

• Part II – Qualifications – Special Inspection
  • Special Inspection Agency –
    • IAS AC 291 Accredited Special Inspection Agencies
  • Special Inspector Qualifications
    • FM Firestop Exam
    • UL Firestop Exam
    • AND
    • IFC Exam
Specs – Key Parts

• NEW Buildings – 07-84-00 Specs
• Part III – Execution
  • Special Inspection
    • ASTM E 2174 - Penetrations
    • ASTM E 2393 - Joints
Specs – Don’t Forget Division 1 – ALL Divisions Documentation for Building Life Cycle

• Reference 01-78-00 Closeout Submittals
  • 01 78 29 Final Site Survey
  • 01 78 33 Bonds
  • 01 78 36 Warranties
  • 01 78 39 Project Record Documents
  • 01 78 43 Spare Parts
  • 01 78 46 Extra Stock Materials
  • 01 78 53 Sustainable Design Closeout Documentation
Building & Fire Code Requirements

• Fire-Resistance Rated Barriers – Defined Terms
  • Exterior Walls
  • Fire Walls
  • Fire Barriers
  • Fire Partitions (Not NFPA)
  • Smoke Barriers
  • Smoke Partitions
  • Archaic Assemblies
Existing Buildings

• Archaic Assemblies
  • Clay Tile Block
  • Gypsum Block
  • Plaster
  • Clay Tile/Concrete
  • Unidentified Assemblies

• Tested … Calculated … Prescriptive
Smoke Barriers & Firestopping

• Smoke Barriers differ from Smoke Partitions?
  • **Smoke Barrier** –
    • **IBC** – Hourly Rated, Quantified Firestop “L” Rating
      • < 5cfm/sf (IBC 2006)
      • < 50 cfm, 100 sf of Wall Area (IBC 2009)
    • **NFPA** – … ‘restricting the passage of smoke’…
      • Hourly Rated, Quantified Firestop L Rating Chapter 8
      • NO quantified “L” Rating … Healthcare Chapter
      • Continuous, Barrier to Barrier, … through concealed spaces
      • Not always fire-resistance-rated
  • **Smoke Partition** –
    • **IBC** – Continuous barrier, not fire rated…’retard’
    • **NFPA** – Continuous membrane that is designed to form a barrier to *limit the transfer of smoke*…
Continuity
Effective Compartmentation Features

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

SECTION A-A

1. Floor or Wall Assembly—With A B C D

2. Through Penetrating Product—Neck A B C D

3. Jacketing Material—Neck A B C D

4. Fill Void or Cavity Material—Neck A B C D

[Diagram showing firestopping components and installation]
Firestopping for Continuity
Products become SYSTEMS Based on Testing

• ‘Field Erected Construction…Tested to…’
  • Standards – ASTM E814 / UL 1479, UL 2079, ASTM E1966, ASTM E2837, ASTM E2307, FM 4990
  • F Rating – Flame
  • T Rating – Temperature
  • L Rating – Smoke
  • W Rating – Water
  • M Rating – Movement

3M Photo
Conditions of Acceptance
FT Rating

- Passage of Flame
- 325°F (180°C) Temperature Rise
- Hose Stream
L Rating (Optional)

- Air Leakage Rate at Ambient Temperature
- Air Leakage Rate at 400°F (204°C)
W Rating (Optional)

- Optional program, applicable to incidental water
- 3 Ft. WC (0.91 M WC) Pressure Head / 72 Hr Exposure
- Firestop subjected to water exposure, followed by standard fire and hose stream tests
- Firestop systems assigned a W Rating
M Rating (Optional)

• Applicable to movement of penetrating item/Assembly
• Penetrating item move perpendicular and/or in plane of barrier - ASTM E3037
• After movement, fire and hose stream test
• Firestop systems - M Rating
  • Rating within plane based on percentage of annular space
  • Rating perpendicular to barrier based on dimension
Pre-Test View – Top, Concrete Assy.
Time-Temperature Curve

- 1000°F in 5 Min
- 1700°F in 1 HR
- 2000°F in 4 HR
Positive Furnace Pressure
Post-Test View – Under Assembly
Hose Stream Test

UL Photo
Building & Fire
Worldwide Code Requirements

- Chemical, Biological, Radiation, Explosion, Germ, etc.
  - Standards?
    - C – Which Chemicals? Check with manufacturer
    - B – Which Agents? Check with manufacturer
    - E – Blast Strength? Check with manufacturer
    - G – Germ – Check with manufacturer & industrial hygienist
  - How to Regulate for Unexpected Events?
  - Due Diligence - Review Required by code?
IBC & Curtain Walls

• **ASTM E2307**
• Prevent Fire Spread – **Interior** Safing Slot
  • Interior Flame
  • Exterior Flame Plume from Window
  • Time & Temperature
  • Tested Systems….
• Leapfrog Testing (ASTM E2874)?
• More on this by
  • Rick Roos, Tony Crimi, Angie Ogino
Barrier Continuity
Products become SYSTEMS

• Fire Rated Systems Directories –
  • FM Approvals
  • Intertek
  • UL/ULC Product iQ Online Directory

Systems Selection & Analysis…Not as easy as it looks…
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
Engineering Judgments/EFRRA

International Firestop Council – Manufacturers – www.firestop.org

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.
Engineering Judgments/EFERRA

IFC EJ Guidelines for the Evaluation …

Engineering Judgments for firestop systems should:

• Not a substitute for existing designs
• Emphasizes importance of tested designs
• Should be issued only by those who know the components
• Based on sound engineering practices and knowledge of performance of the designs
• Based on interpolation of previous testing
• Issued only for a specific jobsite
• Presented in clear detail
Engineering Judgments/EFRRRA

• **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
• Inspection Agency?
D-DESIGN
Specs, Code, Standards

I-INSTALLATION
MS Programs AND Mfr. Education

QUALITY PROCESS

BARRIER MANAGEMENT
Fire Codes
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Barrier Management

I – INSPECTION
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NFPA 1
QUALITY PROCESS

D-DESIGN
Specs, Code, Standards

I-INSTALLATION
Systems Selection
Systems Analysis
Self Inspection
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How do Contractors Select/Analyze Systems & Inspection Agencies Analyze?

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

= Rated Firestop System

Manufacturers Instructions, Tested and Listed Designs
FIRESTOP SYSTEM INSTALLATION
Firestop Sealant & MW installed to Tested and Listed System Limits = Firestop System

1. Pack
2. Apply Sealant
3. Tool/Smooth Walls - BOTH SIDES
Joints and Voids

Head-of-Wall

Firestop Solutions Photo
Joints and Voids
I-Beam to Fluted Deck

Firestop Solutions Photo
Sleeved Pipes
Fire/Smoke Dampers & Firestops

• Dampers - UL 555, 555S
  • Listings - Systems
  • Installed to manufacturer’s written instructions
  • Systems – Angles…no sealants required.
• Firestop sealants – ULC-S115, UL 1479
  • Improper hole sizing or poor installation…

Consult the Damper Manufacturer & the Authority Having Jurisdiction

Greenheck Photo
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
- Tapes

STI, 3M, AD, HILTI, Nelson Photos
Barrier Continuity
I – Installation – Listed Systems
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
Installation – Who?

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

Conclusion –
Without Single Firestop Installation Contractor….

Fire & life safety risks
Why Contractor Qualifications?

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

- FM 4991 – Standard for the Approval of Firestop Contractors
- UL Qualified Firestop Contractors
- Other Industries???
- **FM 4991 / UL-ULC CONTRACTORS UNDERSTAND SYSTEMS, INVENTORY - DOCUMENTATION**
Why Contractor Qualifications?

- Built right the first time…
- **Documentation = Inventory**
- Fire-Resistance SYSTEMS Selection
- SYSTEMS Analysis & As Builts
  - F, T, L, W Rated Systems
  - Tolerances - Annular Space Sizes, Angles
  - Gap Sizes - Undercuts - Framing
  - Anchors - Spacing – Hardware
  - Closers - Activation Sensors, more…
FM 4991 & ULC QFC

- ULC Firestop Exam @ 80% min.
- Management System (MS) Written
- MS Procedures implemented
- Audit
  - Contractor Office – Records & Documents
  - Jobsite – Observation, possible destructive
- DRI – Appointed by Contractor, CEU’s
- Listed @ www.FCIA.org & www.UL.com
Management System & Audit – UL, FM 4991

- Facility Tour
- Review MS Manual
- Construction Document Requirements and Review
  - Systems Selection & Analysis
- Procurement
- Storage, Handling, Preservation and Delivery
- Labeling
- Installation, Application and Field Quality Assurance Procedures
  - Systems Installation, Self Inspection/Survey
Management System & Audit – UL, FM 4991

- Inspection, Testing and Calibration
  - Tape Measures
- Control of Nonconforming Product
- Training and Qualification of Staff
  - DRI’s, Workforce
- Corrective/Preventive Action
- Quality System Monitoring and Improvement
- Documentation and Record Keeping
  - 7 years
Master Audit Certificate of Compliance Program

A Jobsite Specific Management System Audit – Our audit provides verified processes were followed to properly installed firestop systems.

A Renewable Jobsite Specific Certificate – After completion of a successful audit, we issue a jobsite specific certificate that is renewable for the building owner.

Improved Firestop Systems Documentation – The MACC certificate in conjunction with the firestop systems documentation, builds the fire-resistance inventory required by the 2018 International Fire Code for fire and smoke protection features.
D-DESIGN
Specs, Code, Standards

I-INSTALLATION
MS Programs AND Mfr. Education

QUALITY PROCESS

BARRIER MANAGEMENT
Fire Codes
NFPA 101, 1, IFC Barrier Management

I – INSPECTION
IBC Ch. 17
NFPA 80
NFPA 1
Firestop & Inspection

• ASTM E2174 / ASTM E2393 – “Inspection Process”
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 E2174 & ASTM E2393
  • Independent 3rd Party
  • Destructive, Non Destructive
  • Specified Frequency
I – Inspection – Scope

• ASTM E2174 & ASTM E2393
  • Firestopping
• Other Scopes—Possibilities for IA’s
  • Walls, Horizontal Assemblies
  • Fire Dampers
  • Fire Rated Glazing
  • Fire Doors
• 12.3.2* Quality Assurance for Penetrations and Joints. In new buildings three stories or greater in height, a quality assurance program for the installation of devices and systems installed to protect penetration and joints shall be prepared and monitored by the RDP responsible for design. Inspections of firestop systems and fire-resistive joint systems shall be in accordance with 12.3.2.1 and 12.3.2.2.

• QAP – FM 4991, ULQFCP, ASTM Inspection

FCIA Added Emphasis
12.3.2.1 … Penetrations … shall be inspected in accordance with ASTM E2174 …

12.3.2.2 … Joint systems … shall be inspected in accordance with ASTM E2393 …

FCIA INITIATIVE WITH KOFFEL ASSOC….}

FCIA Added Emphasis
I – Inspection –
IBC Code Requirements

• Required, International Building Code – Chapter 17
Definitions – Chapter 17, IBC

[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]
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]
I – Inspection –  
Code Requirements

1705.16.1 Penetration firestops. Inspections of penetration firestop systems that are tested and listed in accordance with Sections 714.3.1.2 and 714.4.1.2 shall be conducted by an approved inspection agency in accordance with ASTM E2174.

1705.16.2 Fire-resistant joint systems. Inspection of fire resistant joint systems that are tested and listed in accordance with Sections 715.3 and 715.4 shall be conducted by an approved inspection agency in accordance with ASTM E2393.

[IBC 1705.17.1 & .2]
Firestop Inspection in Codes
ASTM E2174 - ASTM E2393

• NFPA 1 - Ch. 12
• NFPA 101 / 5000 - Chapter 8 – Annex
• 2012 – 2018 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
Firestop Inspection in Codes

- **Table 1604.5 – Risk III** – Buildings and other structures that represent a substantial hazard to human life in the event of failure, include but are not limited to:
  - Public *Assembly*, *Occupant Load > 300*
  - Bldgs. Containing *Elem.,2nd’ary’, day care, > 250*
  - I-2, > 50, no surgery, emergency
  - I-3
  - Occupancy load > 5,000
  - **Power-gen, H2O treatment**, wastewater treatment, public utilities, not in IV
  - Buildings not in IV, with toxic or explosives [IBC 1604.5]
Firestop Inspection in Codes

- **Table 1604.5 – Risk IV** – *Buildings and other structures designated as essential facilities, including but not limited to:*
  - Group I-2 *occupancies having surgery or emergency* treatment facilities.
  - Fire, *rescue, ambulance/police stations*, emergency vehicle garages.
  - Designated earthquake, hurricane or other *emergency shelters*.
  - Designated emergency prep, communications and operations centers and other *facilities required for emergency response*.
  - Power-generating stations and other public utility facilities required as emergency backup facilities for Risk Category IV structures.
  - [IBC 1604.5]
Firestop Inspection in Codes

• Table 1604.5 – Risk IV – Buildings and other structures designated as essential facilities, including but not limited to:
  • Buildings and other structures containing quantities of highly toxic materials that:
    • Exceed maximum allowable quantities per control area as given in Table 307.1(2) or per outdoor control area in accordance with the International Fire Code, and are sufficient to pose a threat to the public if released.
    • Aviation control towers, air traffic control centers and emergency aircraft hangars.
    • Buildings and other structures having critical national defense functions.
    • Water storage facilities and pump structures required to maintain water pressure for fire suppression.
    • [IBC 1604.5]
Firestop Systems Inspection Introduction
ASTM E2174 - ASTM E2393

• “Standard Practice for On-Site Inspection of Installed Fire Stops – Penetrations - Joints”
  • Standard Inspection Procedure
  • Special Inspection Agency Companies & Other Firms
  • Hired by & Report to Building Owner, Architect, Owners Rep, …other than GC.
    = Authorizing Authority
Firestop Inspection Firm & Individual Qualifications – ASTM E2174 - ASTM E2393

• Inspection Firm & Inspectors are:
  • ‘Independent of, and Divested from’
    • Installing firm, Distributor, Manufacturer, Competitor, Supplier…
  • ‘Not a Competitor’
    • …of the Installer, contractor, manufacturer, or supplier ….
• Other than the contractor…
• Submit notarized independence statements
Firestop Inspection Firm & Individual Qualifications – ASTM E2174 - ASTM E2393

• 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 Agency *Company* Qualification –
• IAS AC 291 – w / Individual *Competencies*
Firestop Inspection Firm & Individual Qualifications – IAS AC 291

• Inspection Firm shall have staff.
  • PASS UL or FM Firestop Exam, IFC Exam
  • 1 year Quality Assurance
    Or…
  • PASS UL/FM Firestop Exam, IFC Firestop Exam, and PE, FPE, Registered Architect, or
  • PASS UL/FM Firestop Exam, IFC Firestop Exam, and Education by Certified Agency
Firestop Inspection Firm and Individual Qualifications – IAS AC 291

- **Specify IAS AC 291 –**
  - Quantified Qualifications
  - Helps AHJ with “Approved Agency”
  - Not in ASTM Standards, Code

- **Specify Individual Certifications**
  - 3rd Party, Independent Exams verify Knowledge
    - FM Firestop Exam,
      - OR
    - UL Firestop Exam,
      - AND
    - IFC Exam
Professional Installations
Firestop Inspection Process

• Inspection Agency & Inspector
  • Independent
  • Hired after systems submitted, etc.
  • Hired by building owner and manager or representative
  • Scope of work directed by AA
  • AHJ approval

Affinity Firestop Photo
Firestop Inspection Process
ASTM E2174 - ASTM E2393

• Pre-Construction Meeting
  • Review Documents
  • Identify Conflicts
  • Review Materials
    Systems
    • ASTM E814 or UL1479, FM 4990, ASTM E1966, UL 2079, ASTM E2307, ASTM E 2837, ASTM E 3037

• SYSTEMS
Firestop Inspection Process
ASTM E2174 - ASTM E2393

• Inspection Documents
  • 07-84-00 Specifications and Drawings
  • Manufacturer Product Data Sheets and Installation Instructions
  • Safety Data Sheets
  • Listed Systems and EJ’s/EFRR’s
Firestop Inspection Process
ASTM E2174 - ASTM E2393

• Pre-Construction Meeting
  • Mock Up Review
  • Observation or Destructive Review (Testing)
  • Inspection Type Methodology
    • Frequency of reviews
    • Description of reviews
    • Specification and drawings
• Meeting(s) are required
  • During and Post Inspection
Firestop Inspection Process
ASTM E2174 - ASTM E2393

• Inspection Schedule
  • Notifies Inspector
  • Inspections within 2 days
  • Inspector verifies installation
    • Is in accordance with Documents
    • Meets Manufacturers Installation Instructions

Affinity Firestop Photo
Firestop Inspection Process
ASTM E2174 - ASTM E2393

• Observation Reviews
  • During construction
  • Witnessed randomly of the installed systems on each floor
  • E2174 - 10%, each type of Service Penetration Firestop System
    • Type = By System, By Contractor
  • E2393 - 5% of Total Lineal Feet for each type of Fire Resistance Rated Joint System
    • Type = By System, By Contractor
Firestop Inspection Process
ASTM E2174 - ASTM E2393

• Destructive Reviews (Testing)
  • Performed Post-Construction
  • **E2174** - Minimum 2% , no less than 1, each **type** per 930 m² (10,000 SF) of floor area
    • **Type = By System, By Contractor**
  • **E2393** - Minimum 1 / 152 LM (500 LF) of Joint Area, by **type**, mandatory; Exception mechanical joints
    • **Type = By System, By Contractor**
Firestop Special Inspection
ASTM E2174 - ASTM E2393

• Inspection Documents
  • Identify System, Materials
• Identification Systems (Labels)
  • Firestop Contractor Installed
  • Speeds System Evaluation
Firestop Inspection Process
ASTM E2174 - ASTM E2393

• Variances / Deviations
• ASTM E2174 & ASTM E2393
  • FS Contractor is notified of any deficiencies within **one day**
• IBC 1704.2.4
  • Work is in conformance to the documents
  • Otherwise it is **immediately** brought to the attention of the FS Contractor
  • If not corrected, AHJ and AA will be informed to take action
Firestop Inspection Process
ASTM E2174 - ASTM E2393

• Both Methods
  • If any type does not comply
    • Repair
    • Replace
    • 1 additional inspection
  • If 10% variance per firestop type
    • Inspection stops
    • Installer inspects, repairs
    • Inspector re-inspects
• Document all Deficiencies

[Image: Affinity Firestop Photo]
Firestop Inspection Process
ASTM E2174 - ASTM E2393

• Inspectors shall
  • Not supervise or direct FS Contractors
    • Systems Selection = Supervision
  • Commence reviews at the start of FS installation
  • Review installation based on manufacturers and system requirements
Firestop Inspection Process
ASTM E2174 - ASTM E2393

• Equipment –
  • Tapes
  • Tablets w/Systems
  • Borescope to explore areas that are concealed or partially
  • NOT MICROMETERS
Firestop Evaluation & Repairs

• Installation Evaluations basis…
  • Manufacturers Installation instructions
  • Acceptable methods to review installed systems
  • Listed SYSTEM requirements for installations
  • *IFC Document on Sealant Thickness Measurement, Shrinkage*
Firestop Repairs

• Instruction requirements by manufacturer
• Listed systems
• Patch/Infilling
  • Adhesion to Old Sealant
  • F, T, L, M, W Ratings
  • As recommended by MFR
Firestop Inspection Forms & Variance Notices

• Minimum one FS system for each type;
  • *(By Type of System, By Contractor)*
  • ASTM E2174 and ASTM E2393 require reports to be submitted to AA one day after review
• IBC requires IMMEDIATE NOTICE
• Numbered – Controlled
• Required – During/post construction methods
Firestop Inspection Final Report
ASTM E2174 - ASTM E2393

• Project name and location
• Project team contact info
• Firestops reviewed (inspected)
  • Type and quantity
  • Verification method
  • Percentage of total deficiencies
• All documents submitted to AA
Firestop Repairs

• Repairs & Patching
  • Manufacturer Repair Instructions
    • Tested & Listed System Design
    • Adhesion
    • Movement
    • Air Leakage
    • Water Resistance Ratings
  • As recommended by MFR
Fire Codes Require Maintenance

- NFPA 101
- NFPA 1
- International Fire Code

- Minimum Requirements Stated
- Frequency

4.6.12.1 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.
• **4.6.12.2** No existing life safety feature shall be removed or reduced where such feature is a requirement for new construction.

• **4.6.12.3** Existing life safety features obvious to the public, if not required by the Code, shall be either maintained or removed.

• **4.6.12.4** 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.

• **4.6.12.5** 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.
12.2* Construction.

12.2.2 Fire safety construction features for new and existing occupancies shall comply with this Code and the referenced edition of NFPA 101.

12.3 Fire-Resistive Materials and Construction.

12.3.1 The design and construction of fire walls and fire barrier walls that are required to separate buildings or subdivide a building to prevent the spread of fire shall comply with Section 12.3 and NFPA 221.

FCIA Added Emphasis
12.3.2* Quality Assurance for Penetrations and Joints. In new buildings three stories or greater in height, a quality assurance program for the installation of devices and systems installed to protect penetration and joints shall be prepared and monitored by the RDP responsible for design. Inspections of firestop systems and fire-resistive joint systems shall be in accordance with 12.3.2.1 and 12.3.2.2.

QAP – FM 4991, ULQFCP, ASTM Inspection

FCIA Added Emphasis
12.3.2.1 ... Penetrations ... shall be inspected in accordance with ASTM E2174 ...

12.3.2.2 ... Joint systems ... shall be inspected in accordance with ASTM E2393 ...

FCIA INITIATIVE WITH KOFFEL ASSOC....

FCIA Added Emphasis
12.3.3* Maintenance of Fire-Resistive Construction, Draft-Stop Partitions, and Roof Coverings.

12.3.3.1 Required fire-resistive construction, including fire barriers, fire walls, exterior walls due to location on property, fire-resistive requirements based on type of construction, draftstop partitions, and roof coverings, **shall be maintained and shall be properly repaired, restored, or replaced where damaged, altered, breached, penetrated, removed, or improperly installed.**

FCIA Added Emphasis
12.3.3.2 Where required, fire-rated gypsum wallboard walls or ceilings that are damaged to the extent that through openings exist, the damaged gypsum wallboard shall be replaced or returned to the required level of fire-resistance using a listed repair system or using materials and methods equivalent to the original construction.

12.3.3.3 Where readily accessible, required fire-resistance-rated assemblies in high-rise buildings shall be visually inspected for integrity at least once every 3 years.

FCIA Added Emphasis
• 12.3.3.3.1 The person responsible for conducting the visual inspection shall demonstrate appropriate technical knowledge and experience in fire-resistance-rated design and construction acceptable to the AHJ.

• 12.3.3.3.2 A written report prepared by the person responsible for conducting the visual inspection shall be submitted to the AHJ documenting the results of the visual inspection.

FCIA Added Emphasis
SECTION 703
FIRE-RESISTANCE-RATED CONSTRUCTION

- **703.1 Maintenance.** The required fire-resistance rating of fire-resistance-rated construction, including, but not limited to walls, firestops, shaft enclosures, partitions, *smoke barriers*, floors, fire-resistive coatings and sprayed fire-resistant materials applied to structural members and fire-resistant 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. *Records of inspections and repairs shall be maintained.* …
SECTION 701
GENERAL

• **701.1 Scope.** The provisions of this chapter shall govern the inspection and maintenance of the materials, systems and assemblies used for structural fire-resistance, fire-resistance-rated construction separation of adjacent spaces and construction installed to resist the passage of smoke to safeguard against the spread of fire and smoke within a building and the spread of fire to or from buildings. New buildings shall comply with the IBC.

FCIA Added Emphasis
SECTION 701
GENERAL

• 701.2 Fire-resistance-rated construction. The fire-resistance rating of the following fire-resistance-rated construction shall be maintained:

1. Structural members
2. Exterior walls
3. Fire walls, fire barriers, fire partitions
4. Horizontal assemblies
5. Shaft enclosures
SECTION 701
GENERAL

• **701.3 Smoke barriers.** The *fire-resistance rating* and smoke-resistant characteristics of smoke barriers shall be maintained.

• **701.4 Smoke partitions.** The smoke-resistant characteristics of smoke partitions shall be maintained.
SECTION 701
GENERAL

701.5 Maintaining protection. Materials, systems and devices used to repair or protect breaches and openings in fire-resistance-rated construction and construction installed to resist the passage of smoke shall be maintained in accordance with Sections 703 through 707.
SECTION 701
GENERAL

• 701.6 Owner’s responsibility. The owner shall maintain an inventory of all required fire-resistance-rated construction, construction installed to resist the passage of smoke and the construction included in Sections 703 through 707. Such construction shall be visually inspected by the owner annually and properly repaired, restored or replaced where damaged, altered, breached or penetrated.

• FCIA Initiative with Koffel Assoc. – ‘Inventory’…

FCIA Added Emphasis
• 701.6 Owner’s responsibility Cont. **Records of inspections and repairs shall be maintained.** Where concealed, such elements shall not be required to be visually inspected by the owner unless the concealed space is accessible by the removal or movement of a panel, access door, ceiling tile or similar movable entry to the space.
SECTION 701
GENERAL

• **701.7 Unsafe Conditions.** Where any components in this chapter are not maintained and do not function as intended or do not have the fire-resistance or the resistance to the passage of smoke required by the code under which building was constructed, remodeled or altered, such component(s) or portions thereof shall be deemed an unsafe condition in accordance with Section 111.1.1.

FCIA Added Emphasis
SECTION 701
GENERAL

• 701.7 Unsafe Conditions Cont. Components or portions thereof determined to be unsafe shall be repaired or replaced to conform to the code under which building was constructed, remodeled or altered, as deemed appropriate by the fire code official. Where the condition of components is such that any building, structure or portion thereof presents an imminent danger to the occupants of the building, structure or portion thereof, the fire code official shall act in accordance with Section 111.2.

FCIA Added Emphasis
SECTION 703
PENETRATIONS

• 703.1 Maintaining protection. Materials and firestop systems used to protect membrane and through penetrations in fire-resistance-rated construction and construction installed to resist the passage of smoke shall be maintained.

FCIA Added Emphasis
SECTION 703 PENETRATIONS

• 703.1 Maintaining protection cont. The materials and firestop systems shall be securely attached to or bonded to the construction being penetrated with no openings visible through or into the cavity of the construction. Where the system design number is known, the system shall be inspected to the listing criteria and manufacturer’s installation instructions.

• FCIA Initiative…”Where the system design number is known”…

FCIA Added Emphasis
SECTION 704
JOINTS AND VOIDS

• 704.1 Maintaining protection. Where required when the building was originally constructed, materials and systems used to protect joints and voids in the following locations shall be maintained. The materials and systems shall be securely attached to or bonded to the adjacent construction, without openings visible through the construction.

FCIA Added Emphasis
SECTION 704
JOINTS AND VOIDS

• 704.1 Maintaining protection cont.

  • Subparagraphs 1 through 7 detail the types of joints and voids required to be maintained. This list corresponds to joints and voids which are required to be protected by the 2018 IBC.

  • Unprotected joints and voids do not need to be protected where such joints and voids were not required to be protected when the building was originally constructed.

FCIA Added Emphasis
2018 International Fire Code
Owner’s Responsibility

- 701.6 Owner's responsibility. The **owner shall maintain an inventory of all required** fire-resistance-rated and smoke resistant construction, and the construction included in Sections 703 through 707 and such construction shall be visually inspected by the **owner annually and properly repaired, restored or replaced where damaged, altered, breached or penetrated.**

- FCIA Initiative with Koffel Associates
2018 International Fire Code
Fire-Resistance Inventory Explained

• **Life Safety Drawings**
• Designs, Systems and Assemblies – **Listings**
• **Manufacturers Installation and Maintenance Instructions**
• **How?**
  • Paper & Files
  • Spreadsheets
  • Software
M–Barrier Management Systems

• Visual Building Survey/Inspection....
  • Does the Firestop/Fire-Resistive Joint look like the assembly?
    • Annular Space
    • Visible Breaches, unless listing allows
    • Joint Width
    • Penetrating Item Types, Coverings, #Quantity
    • Penetrations in Joints & Not in System/Listing....
    • Much more....

• Competent Personnel
How do Contractors Select/Analyze Systems & Inspection Agencies Analyze?

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

= Rated Firestop System
M–Barrier Management Systems
Building Owner’s Policy Topics

- Create a Budget to Meet Code Requirements
- Inventory – What Info?
  - Life Safety Drawings
  - Manufacturers Instructions
  - Tested and Listed Systems (Listings)
- Implement Fire Resistance Management
  - In House Policy
  - Outside Contractor Policy
- Monitor Process
- Annual Visual Inspection & Keep Records
- Show Fire Marshal….Insurance Company
Questions??
FCIA’s DIIM: Firestop 101
Education Program

• Design
• Installation
• Inspection
• Maintenance & Management