FCIA Middle East Symposium

- Design
- Installation
- Inspection
- Maintenance & Management
QUALITY PROCESS

D-DESIGN
Specs, Code, Standards

I-INSTALLATION
MS Programs AND Mfr. Education

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

I – INSPECTION
IBC Ch. 17
NFPA 80
NFPA 1
Fire-Resistance Rated, Smoke Resistant Assemblies

• Exterior Walls
• Fire Walls
• Fire Barriers
• Fire Partitions (Not NFPA)
• Smoke Barriers
• Smoke Partitions
• Archaic Assemblies
Fire-Resistance Rated, Smoke Resistant Assemblies

- **Archaic Assemblies**
  - Clay Tile Block
  - Gypsum Block
  - Plaster
  - Clay Tile/Concrete
  - Unidentified Assemblies
“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
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 (100-150 pcf or 1600 - 2400 kpi/m²) 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 diam of opening 9 in. (23 cm).

   See Concrete Blocks (CAZT) category in the Fire Resistance Directory for names of manufacturers.

2. **Steel Sleeve** — (Optional) — Nom 9 in. (229 mm) diam (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) diam (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) diam (or smaller) Schedule 10 (or heavier) steel pipe.

   B. **Iron Pipe** — Nom 4 in. (102 mm) diam (or smaller) cast or ductile iron pipe.

   C. **Copper Tubing** — Nom 2 in. (51 mm) diam (or smaller) Type L (or heavier) copper tubing.

   D. **Copper Pipe** — Nom 2 in. (51 mm) diam (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 - (BREE) 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

• 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
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
Time-Temperature Curve

Temperature (°F):
- 2000°F at 4 HR
- 1700°F at 1 HR
- 1000°F at 5 Min

Time (Hr):
- 0 to 4
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
  - Angie Ogino

OCF/Thermafiber Graphics
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/EFRRRA

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/EFARRA

- **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 – “EFARRA”

- Based on engineering, IFC Protocol
- Inspection Agency?
QUALITY PROCESS

D-DESIGN
Specs, Code, Standards

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

BARRIER MANAGEMENT
Fire Codes
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Barrier Management

I – INSPECTION
IBC Ch. 17
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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
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

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

**Conclusion –**

*Without Single Firestop Installation Contractor….*

*Fire & life safety risks*
Why? Contractor Qualifications Specified

• FM 4991 –
  • Standard for the Approval of Firestop Contractors
• UL Qualified Firestop Contractors
• **FM 4991 / UL QUALIFIED CONTRACTORS & SYSTEMS, INVENTORY - DOCUMENTATION**
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**
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.
Specs – Requires Approved/Qualified Contractor

- 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/EFERRA’s
Specs – Key Requirements

• 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
FM 4991 & UL QFCP History & Now…
- 1998/1999 – We should have a quantified way to set specialist contractors apart.
- 1999 – Interviewed three firms, chose FM Approvals
- 2000 – 52 FM Firestop Exams Administered
- **2001 - FM 4991 Published & Launched**
- 2002 – 2006 –
  - FCIA @ Master Specifications = Add FM 4991
  - FCIA @ Specifier Presentations = Add FM 4991
- 2007 – UL QFCP Launched
- **2008 – UL QFCP Launched**
  - FCIA @ Master Specifications = Add UL QFCP
  - FCIA @ Specifier Presentations = Add UL QFCP
- 2018 – **UL’s Master Certificate of Compliance Launched**
- Future – IBC? NBC?
Search within Division 07 00 00 for the keywords/phrases below [if any]:

- FM4991
- FM 4991
- FMG 4991
- FM Approvals 4991
- FM Global 4991
- FM Global Approved
- Approval of Firestop Contractors
- UL Qualified Firestop Contractor
- ULC Qualified Firestop Contractor
- UL Contractor
- ULC Contractor
- UL Firestop Contractor
- ULC Firestop Contractor
- Qualified Firestop Contractor
Results: FM/UL Contractors

BY PROJECT SIZE

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<th>Project Size</th>
<th>2016-2019 YTD</th>
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<tr>
<td>&lt;$1m</td>
<td>27%</td>
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<tr>
<td>$1-5m</td>
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<td>$5-10m</td>
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<td>$50-100m</td>
<td>61%</td>
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<tr>
<td>&gt;$100m</td>
<td>62%</td>
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</tbody>
</table>

AVERAGE 2016-2019YTD
Projects over $10m by Building Type

AVERAGE 2016-2019YTD
Results: FM/UL Contractors

Projects over $10m by Owner Type

AVERAGE 2016-2019YTD

- Private: 48%
- Municipal: 49%
- State: 61%
- Federal: 66%
- Military: 83%
Next steps

Follow up – Additional analysis?

New search words - single-source responsibility & inventory

Expand research to UAE, other areas

How can we use the data to guide FCIA agenda? Marketing materials?
D-DESIGN
Specs, Code, Standards

I-INSTALLATION
MS Programs AND Mfr. Education

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QUALITY PROCESS

I – INSPECTION
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NFPA 1
Professional Installations
Firestop Repairs

• Repairs & Patching
  • Manufacturer Repair Instructions
    • Tested & Listed System Design
    • Adhesion
    • Movement
    • Air Leakage
    • Water Resistance Ratings
  • As recommended by MFR
D-DESIGN
Specs,
Code,
Standards

I-INSTALLATION
MS Programs AND
Mfr. Education

QUALITY
PROCESS

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- Annular Space – Joint – Breach Sizes
- Backing Materials
- Fill Material(s)

= Rated Firestop System
Firestop & Inspection

• ASTM E2174 / ASTM E2393 – “Inspection Process”
Questions??
FCIA Middle East Symposium

• Design
• Installation
• Inspection
• Maintenance & Management