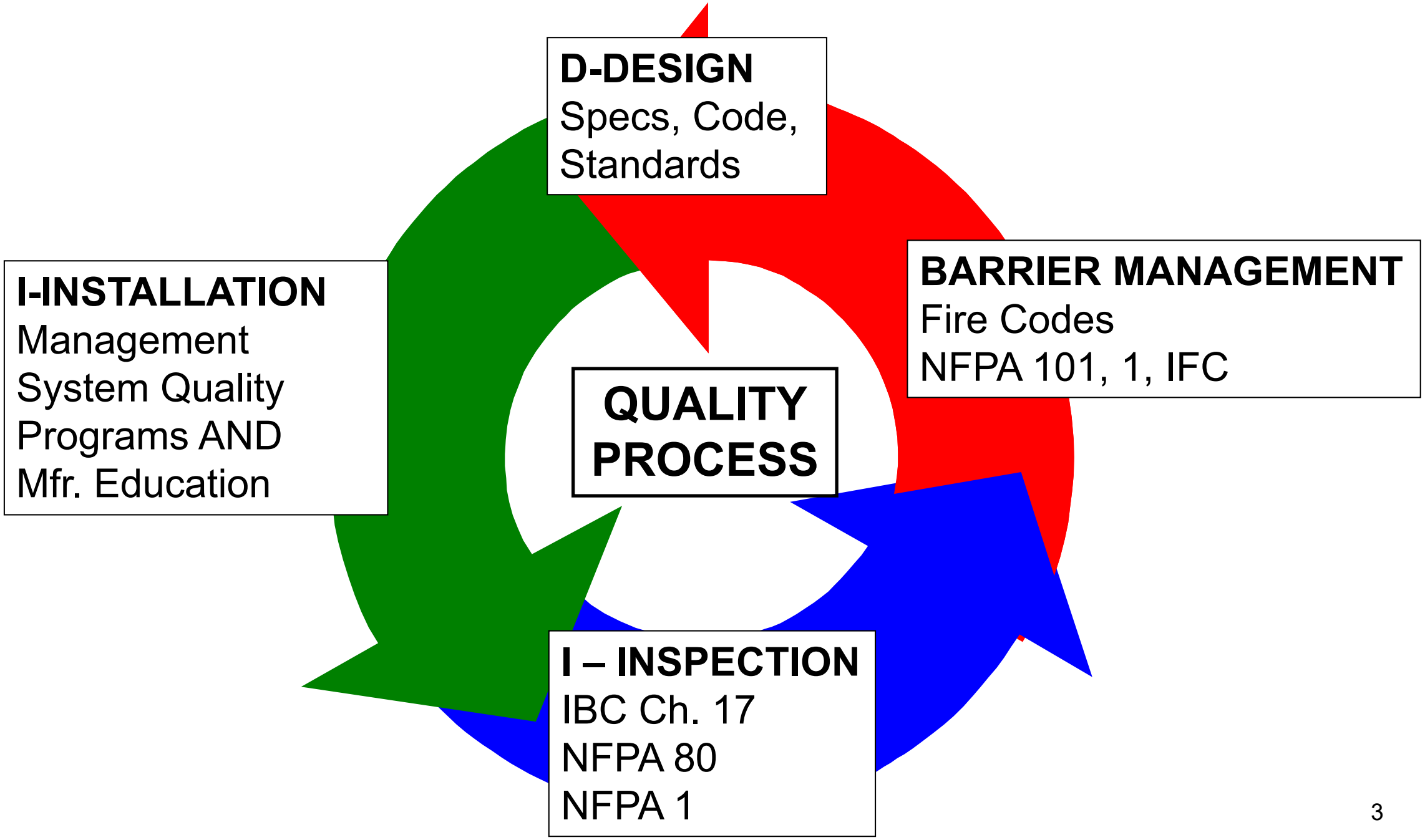

PASSIVE
FIRE PROTECTION
SYMPOSIUM
4-6 JUNE 2024 • INTERCONTINENTAL DUBAI MARINA
FCIA
NFCA®

“TOTAL FIRE PROTECTION”

- Effective Compartmentation
  - Fire Barriers, (Fire Separations – CSC) 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


D-DESIGN
Specs, Code,
Standards
BARRIER MANAGEMENT
Fire Codes
NFPA 101, 1, IFC
I-INSTALLATION
Management
System Quality
Programs AND
Mfr. Education
QUALITY
PROCESS
I – INSPECTION
IBC Ch. 17
NFPA 80
NFPA 1

Fire-Resistance-Rated Construction

Establishing
Fire-Resistance Ratings

UL Image

Standards

- USA
  - ASTM E119
  - UL 263
- International
  - BS476
  - ISO 834
  - EN1366
- Canada
  - ULC-S101

Building Components

- Columns
- Beams
- Floor/Ceilings or Roof/Ceilings
- Walls

Building & Fire Codes – Assemblies/Breaches
Similar Fire Test Time-Temperature Curves

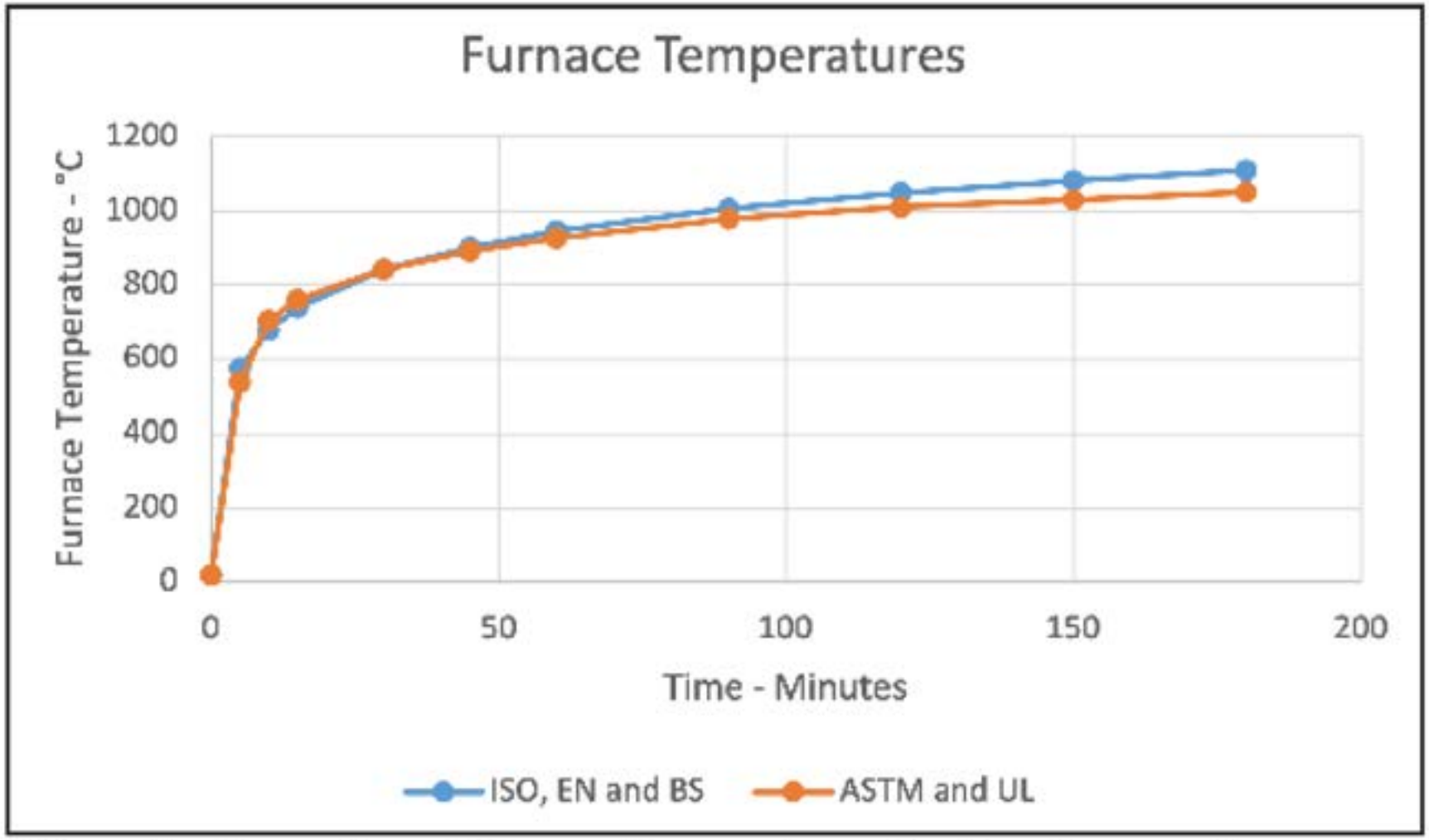


Figure 1 - Comparison of furnace temperatures, the time/temperature curve Berhinig Image

Columns

- Sample size – Minimum 9 ft
- Most often tested unloaded

UL Image

UL Image

Conditions of Acceptance – Columns

- **1000ºF / 1200ºF**

OR

Support load if tested load bearing

UL Image

UL Image

Beams

- Sample size – Minimum 12 ft
- Load applied – Per design

UL Image

UL Image

UL Image

UL Image

UL Image

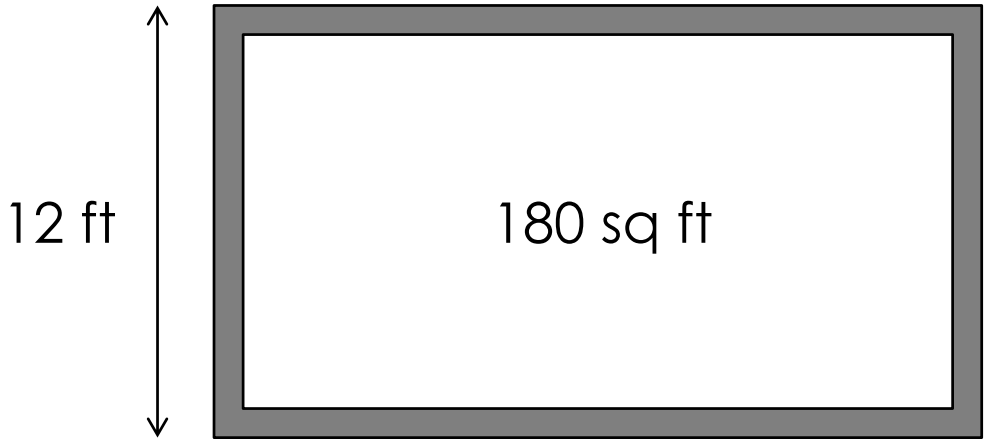
UL Image

Conditions of Acceptance – Beams

- Support load
- 1100ºF / 1300ºF

Floor/Ceiling or Roof/Ceilings

- Sample size – 180 sq ft / 12 ft
- Load applied – Per design



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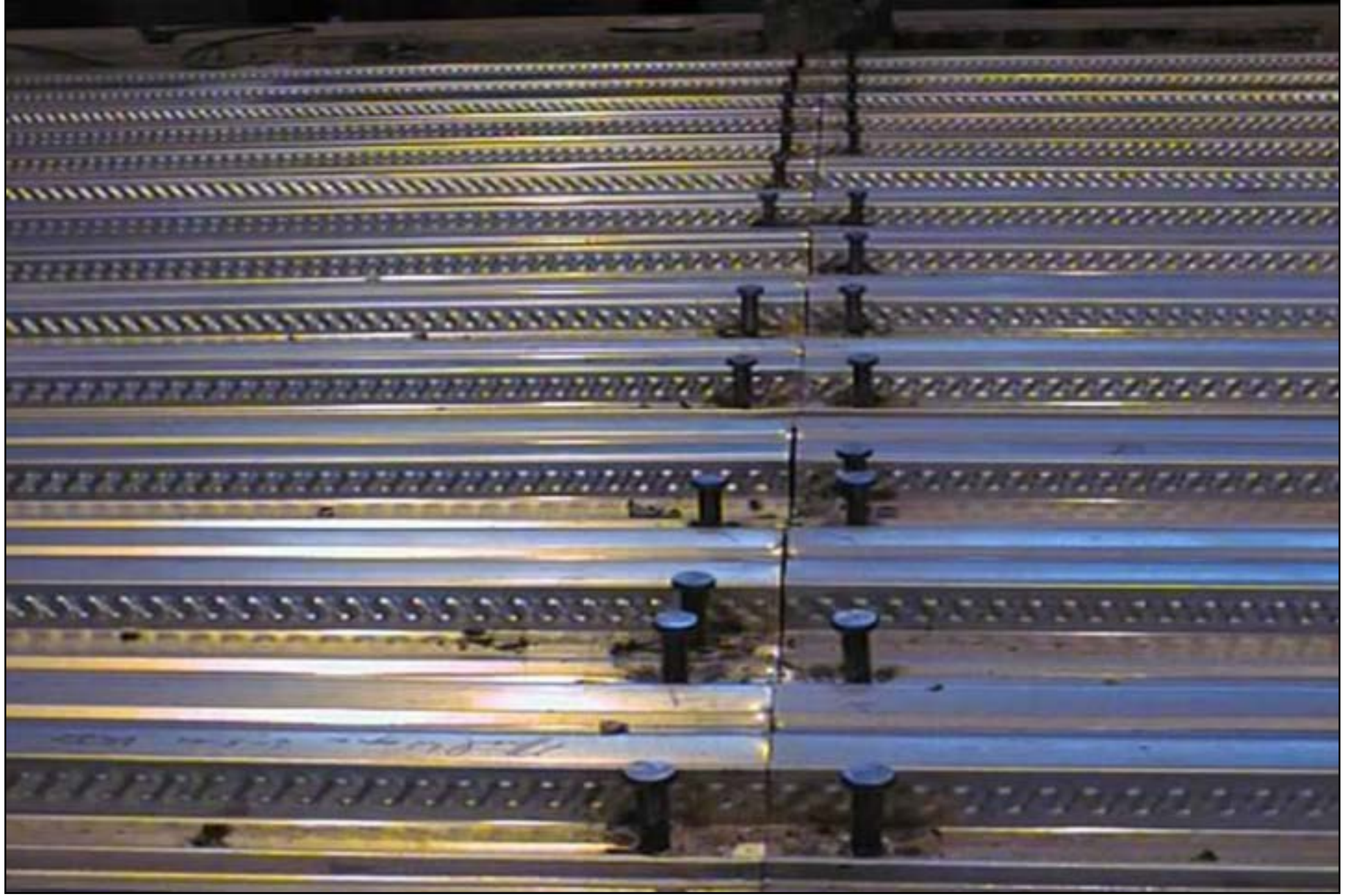

UL Image

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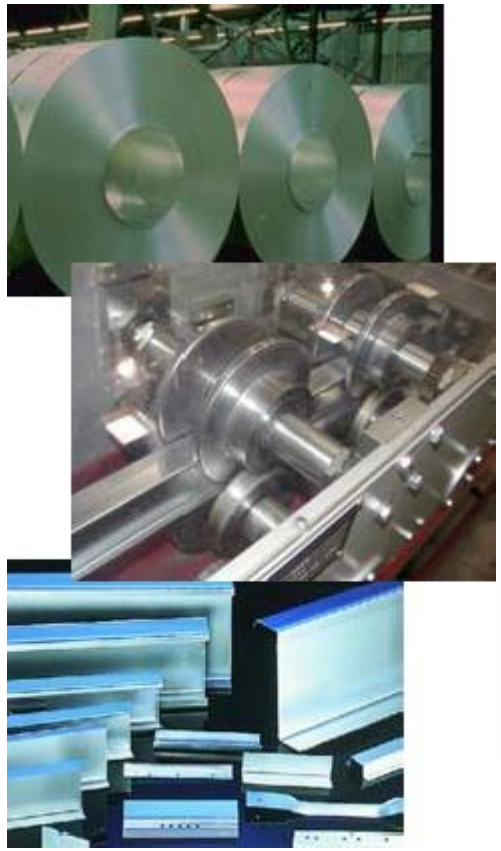
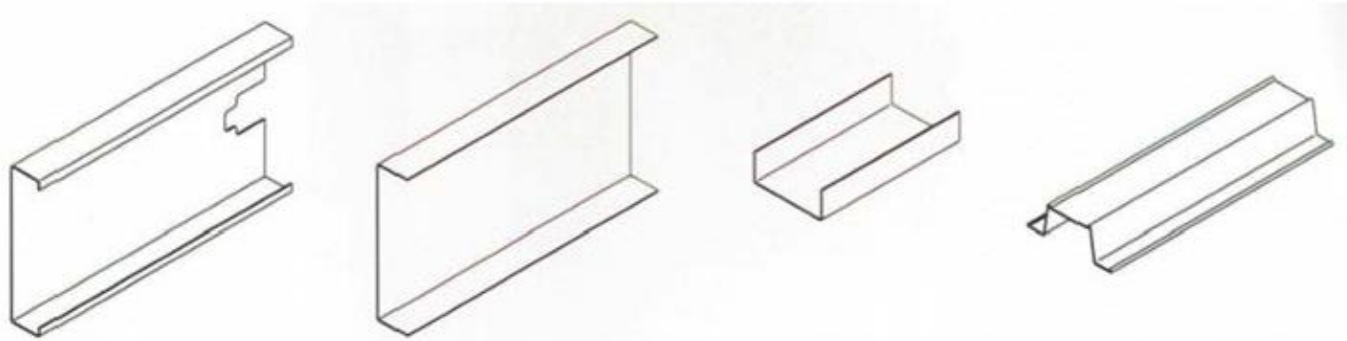
Conditions of Acceptance
Floor/Ceilings or Roof/Ceilings

- Support load
- Flame passage
- 250ºF / 325ºF
- Support temperatures

UL Image

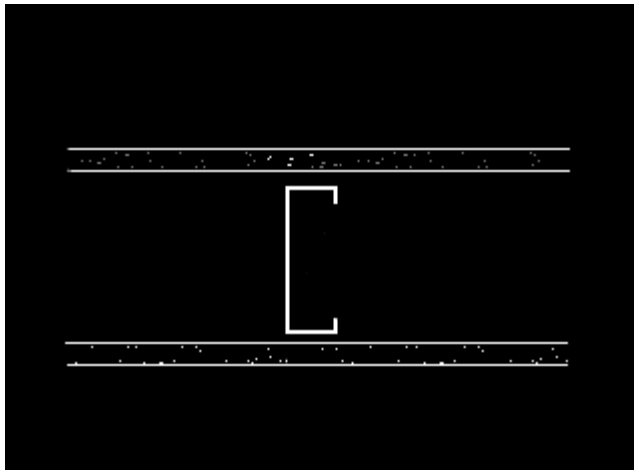


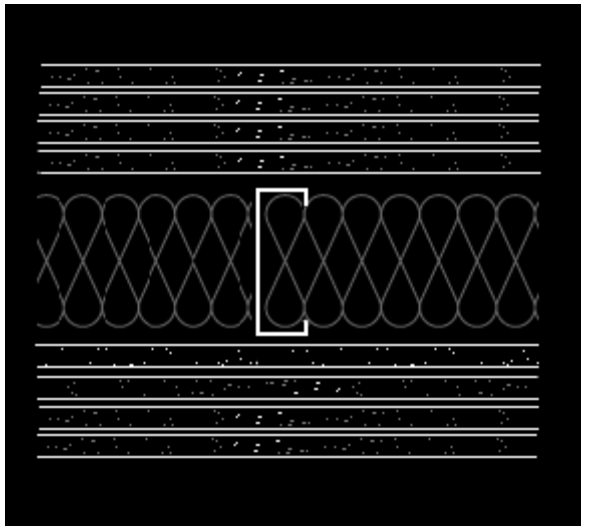
33 Mils=20ga 43 Mils=18ga 54 Mils=16ga



68 Mils=14ga 97 Mils=12ga

USG/Knauf Photo





USG/Knauf Photo

Three (3) Types of Gypsum Cores

- Regular Core
- Type X
- Type C

USG/Knauf Photo

Wall Testing Furnace

USG/Knauf Photo

Hose Stream Test

USG/Knauf Photo

Hose Stream Test – ASTM/UL Standards

- Fire-Resistance?
  - Fixing Walls and Floors
  - Firestopping
  - Fire Dampers
  - Fire Doors – Rolling/Swinging
  - Fire Rated Glazing

What is a Firestop System?

- Firestop Sealant?
- Firestop Products??
- Fire-Resistance-Rated Floors, Walls?
- Manufacturer's Product Data Sheets?
- Manufacturers Sell Sheets?
- Safety Data Sheets?
- UL Listings?
- ***Materials, plus assembly = FIRESTOP SYSTEM***
- ***Wouldn't it be cool if…..***

Barrier Continuity
Products become SYSTEMS

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

ApprovalGuide™

Systems Selection & Analysis…Not as easy as it looks…

Engineering Judgments/EFRRA

- Variances to Systems at Site?
  - **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***
      - ***"EFRRA"***
  - ***Based on Engineering, IFC Protocol***

J. Sharp – ProFirestop Image

C. Zussman – Pepper Image

EJ/EFRRA – Consider language….

- ***System Performance*** - *Engineering Judgements, Equivalent Fire-Resistance-Rated Assemblies*

- Where there is no specific third party tested and listed, classified firestop system available for a particular firestop configuration, the firestopping contractor shall obtain from the firestop manufacturer, an Engineering Judgment (EJ) or Equivalent Fire Resistance Rated Assembly (EFRRA) for submittal.

- All EJ/EFRRA's shall state that the manufacturer attests the EJ will pass applicable fire tests, when subjected to the fire test.

EJ/EFRRA's….

- **Single Source Responsibility**: *Obtain firestop systems for each kind of penetration, fire-resistive joint system, perimeter fire containment system and construction condition indicated from a single primary firestop system manufacturer,* ***to the greatest extent possible.***

- **Tested and listed, classified firestop systems are to be used**. If another manufacturer has a tested and listed system, then that system shall be used prior to an Engineering Judgment (EJ) or Equivalent Fire Resistance Rated Assembly (EFRRA).

- Materials of different manufacture than allowed by the tested and listed **system shall not be intermixed** in the same firestop system, void, breach, gap, intersection or opening.

- **Field Constructed Mockup – DON'T FORGET THIS!!**

Mockup Review BEFORE Construction….

Heckler Photo

C. Zussman Pepper Photo

Hose Stream Test

UL Photo

Firestopping for Continuity
Products become SYSTEMS Based on Testing

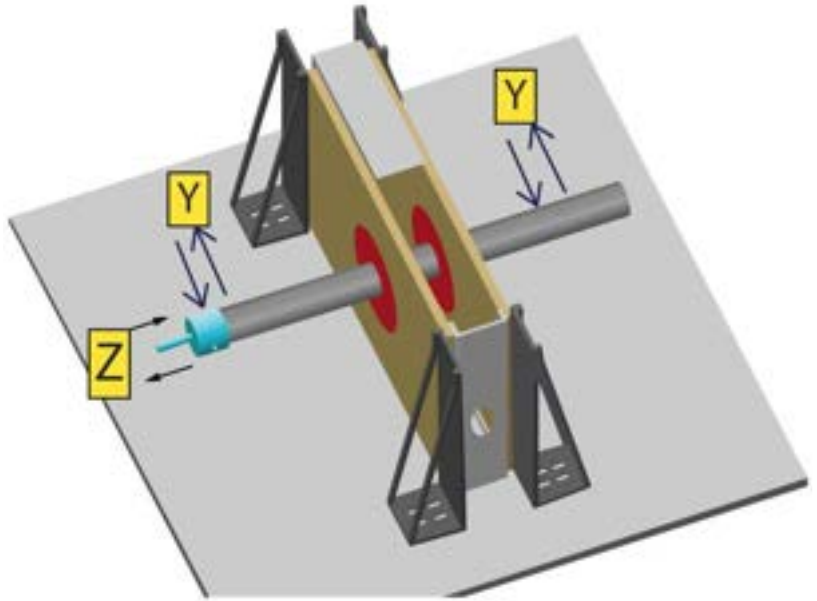
- **'Field Erected Construction…Tested to…'**
  - Standards – UL 1479, ASTM E814, FM 4990, UL 2079, ASTM E1966, ASTM E2307, ASTM E2837
  - F Rating – Flame
  - T Rating – Temperature
  - L Rating – Smoke
  - W Rating – Water
  - M Rating – Movement
  - H Hose Stream Test

3M Image

Smoke Barriers & Firestopping

- Smoke Barriers differ from Smoke Partitions?
  - **Smoke Barrier** –
    - **IBC** – Hourly Rated, Quantified Firestop "L" Rating
      - < 5 cfm/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***….

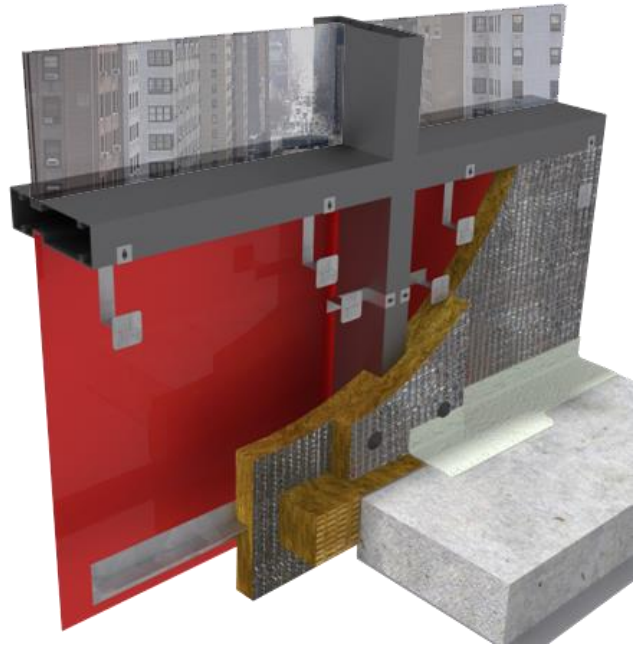
M Rating (Optional)



ASTM Image

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



OCF/Thermafiber Graphics

Building & Fire
Worldwide Code Requirements

- *Chemical, Biological, Radiation, Explosion, Germ, etc.*
  - Standards?
    - C – Which Chemicals? Check with manufacturer
    - B – Which Agents? Check with manufacturer
    - R – Nuclear Power Plant Standards? 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?
  - ***SPECIFIED …***

Mockup Review BEFORE Construction….

Heckler Photo

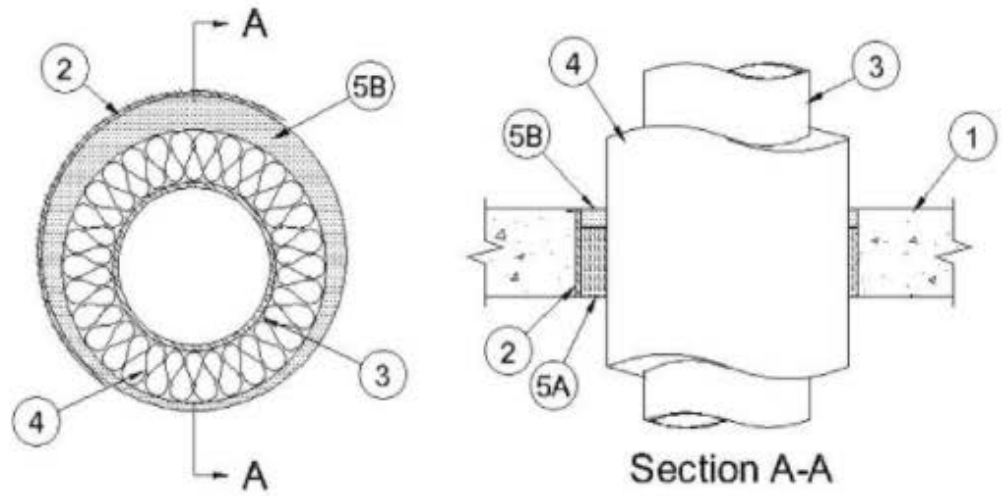
C. Zussman Pepper Photo

Systems & Materials …
Structural & Effective Compartmentation

Possible UL System Nos.: C-AJ-5138, C-AJ-5209, W-J-5091, Etc.

F Ratings — 1 and 2 Hr (See Item 3)

T Ratings — 0, 3/4 and 1 Hr (See Item 4)



1. **Floor or Wall Assembly** — Min 2-1/2 in. (64 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600 - 2400 kg/m^3) 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. (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) 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. (51mm) beyond the floor or wall surfaces. As an alternate, nom 9 in. (229 mm) diam (or smaller) sleeve fabricated from nom 0.019 in. (0.48 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 (or less) 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.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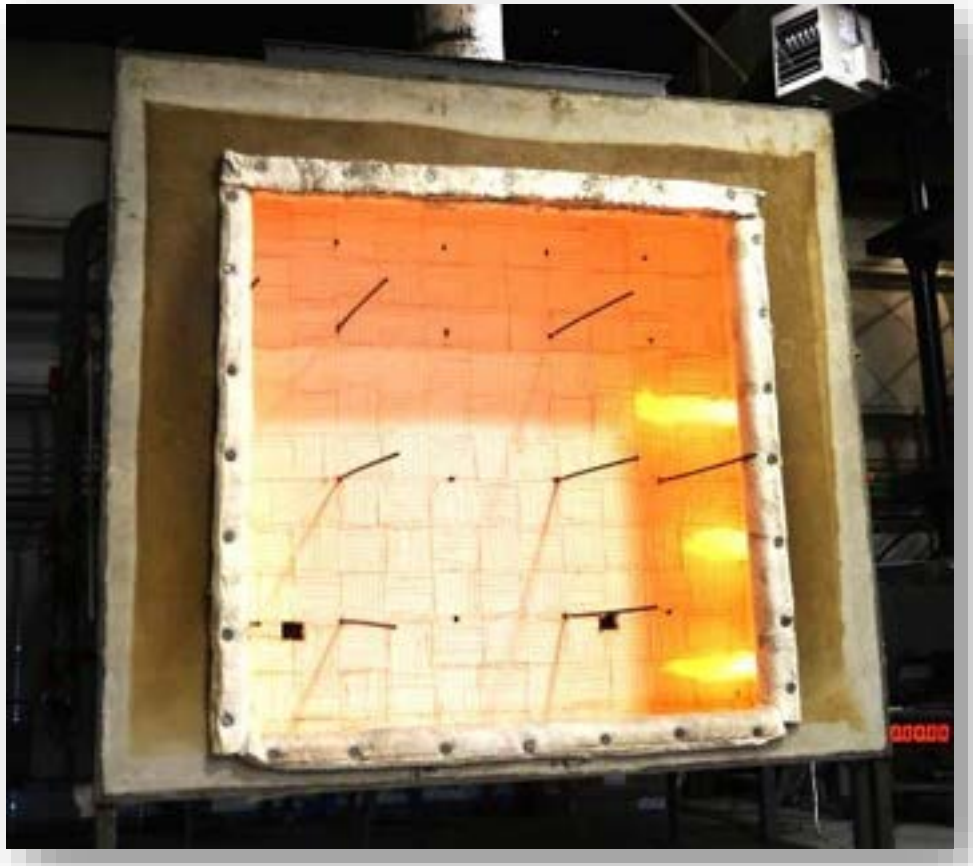
UL Test Standards

Underwriters Laboratories

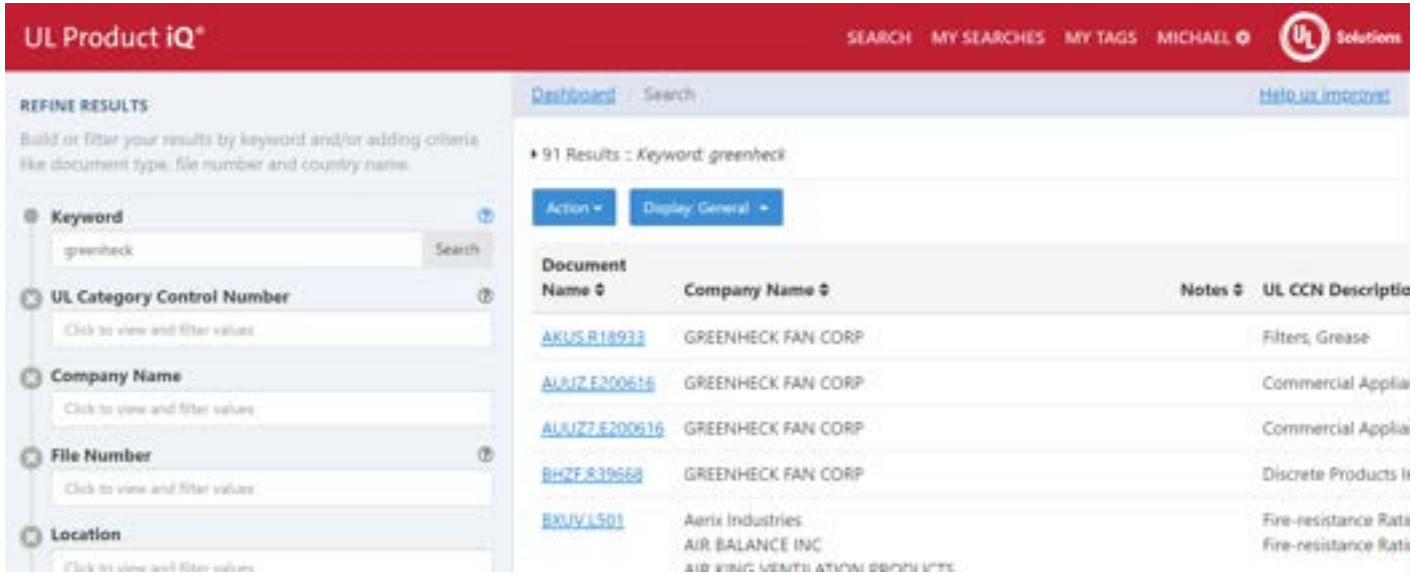
Testing, Evaluation and Certification

- **UL 555** - standard for Fire dampers
- **UL 555S** - standard for Smoke dampers
- **UL 555C** - standard for Ceiling Radiation dampers

UL's "Follow-Up Service" ensures that dampers are built as they were tested



Underwriters Laboratories (UL) Directory



All UL life safety products are listed in the UL Directories

www.UL.com

Required Elements of an “Approved” Life-Safety Damper Installation

1. **Rated Barrier**
2. Listed Product
3. Installation Requirements

Out-of-Wall

Fire and Fire Smoke Dampers

Greenheck Slide

Fire Dampers: Types

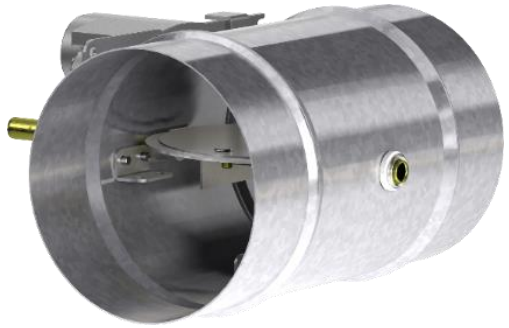
Curtain Fire Damper

True Round Fire Damper

Multi-blade Fire Damper

Smoke Dampers

"A device within the air distribution system to **control the movement of smoke**." (NFPA 80)



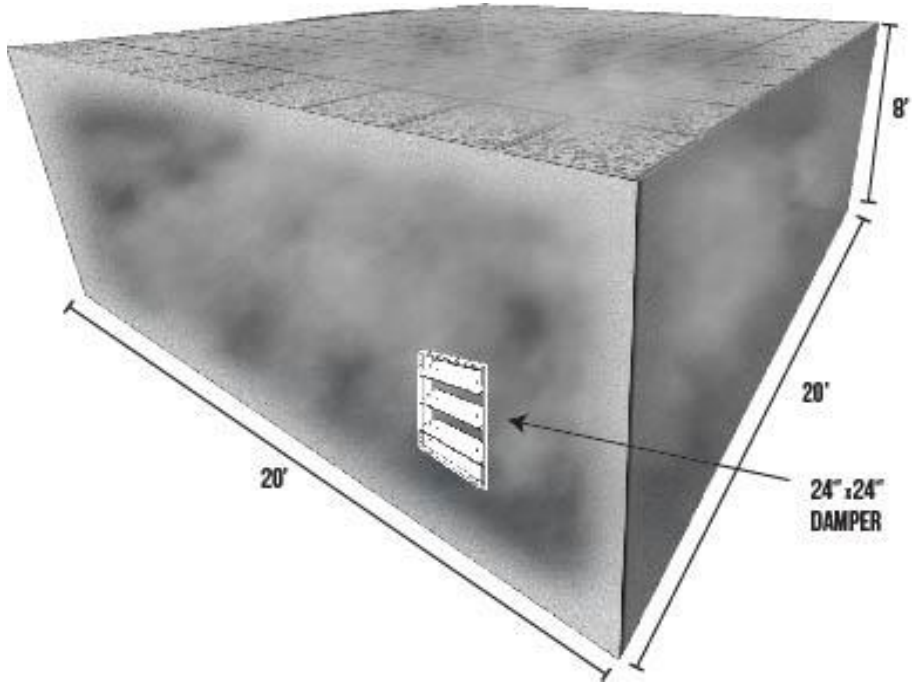
UL Rating Qualifications

- Leakage Class – I, II (or III*)
- Velocity – 2000, 3000, or 4000 fpm
- Pressure – 4, 6, or 8 in-w.g.
- Operational Temperature – 250 ^{o}F or 350 ^{o}F
- Fail Position – Open or Closed

Smoke Dampers: Leakage Class

- UL 555S Classifications
  - Class I (8 cfm/sq. ft. @ 4 in. w.g.)
  - Class II (20 cfm/sq. ft. @ 4 in. w.g.)
  - Class III* (80 cfm/sq. ft. @ 4 in. w.g.)

“Amount of time” to fill a room with Smoke based on Leakage Class



- Class I = **100 minutes**
- Class II = **40 minutes**
- Class III = **10 minutes**

Greenheck Slide

Combination Fire/Smoke Dampers

"A device that meets **both the fire damper and smoke damper requirements**." (NFPA80)

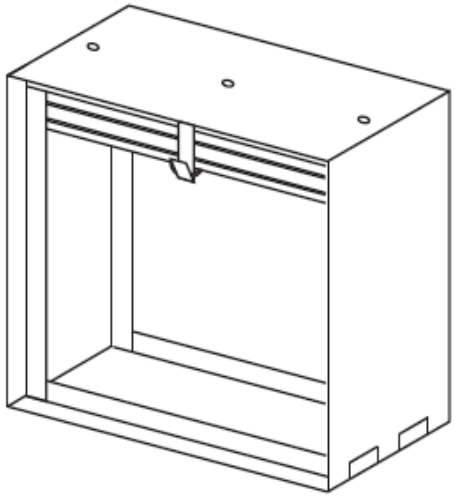
Greenheck Slide

Purpose of Fire / Smoke Damper

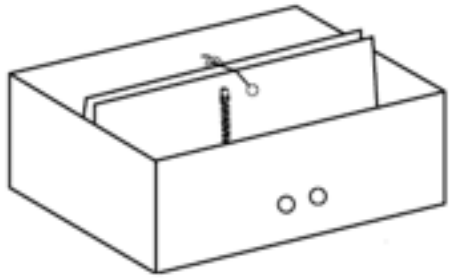
- Provide the same level of protection as individual fire and smoke dampers
- Fire rating – UL555 certified
- Leakage rating – UL555S certified
  - Always supplied with factory mounted actuator
- Always dynamically rated

Fire Damper vs. Ceiling Damper?

- Limits spread of flame (UL555)
- Rated walls/floors/partitions



- Limits Heat
- Approved floor/ceiling or roof/ceiling assemblies only



Fire-Rated Glazing

Key Purposes of Fire-Rated Glass

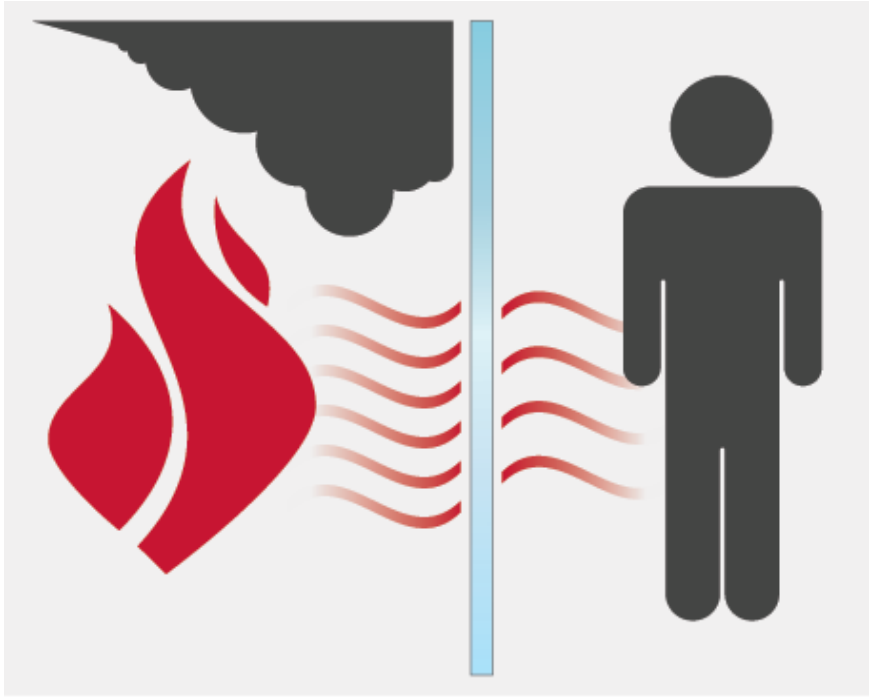
- Compartmentation
- Prevents fire from spreading
- Allows visibility into a space

Types of Fire-Rated Glazing

FIRE PROTECTIVE

- Stop flames & smoke
- “Openings”
- “Thin” glazing
- Traditional fire-rated material (wired glass, glass ceramic, hollow metal steel frames, etc.)
- Fire Windows: 45-90 Minutes
- Fire Doors: 20 minutes – 3 hrs
- May not exceed 25% of the area of a common wall
- May not exceed 156 ft^2
- May not exceed manufacturers tested sizes

NOTE: All products rated more than 20 min. have to pass hose stream test.

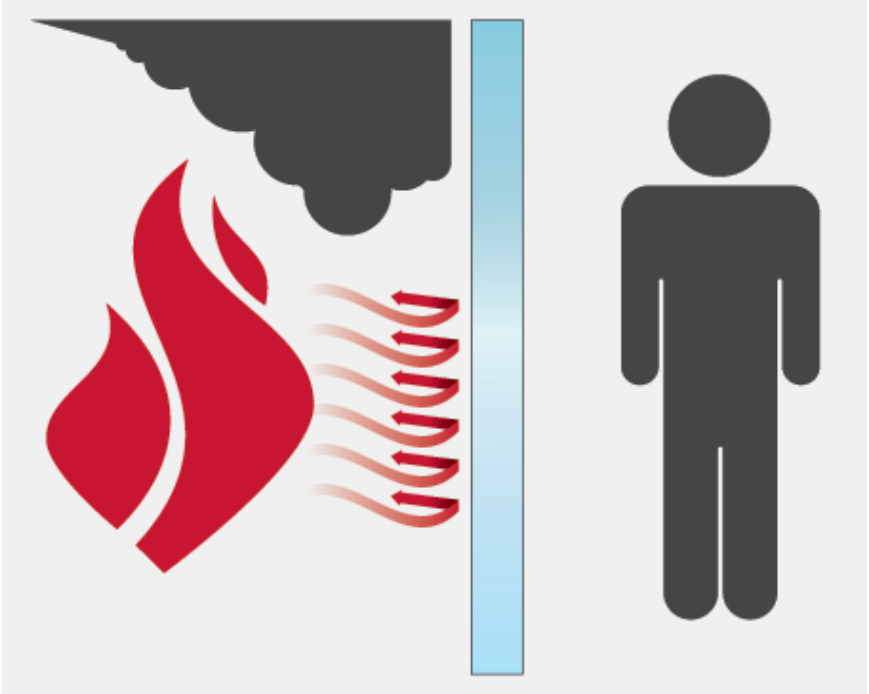


TGP Slide

Types of Fire-Rated Glazing

FIRE RESISTIVE

- Stop flames, smoke, **AND** radiant heat (Both glass and frames)
- “Thick” glazing
- Subjected to Furnace and Hose Stream test, as well as impact
- Classified as a “wall” rather than an opening (window)
- Both glass and frames must block passage of radiant heat
- Classified as Wall Construction, and may be used in multi story spans or floor to ceiling sizes



Fire Test

Click on video to play

Hose Stream Test

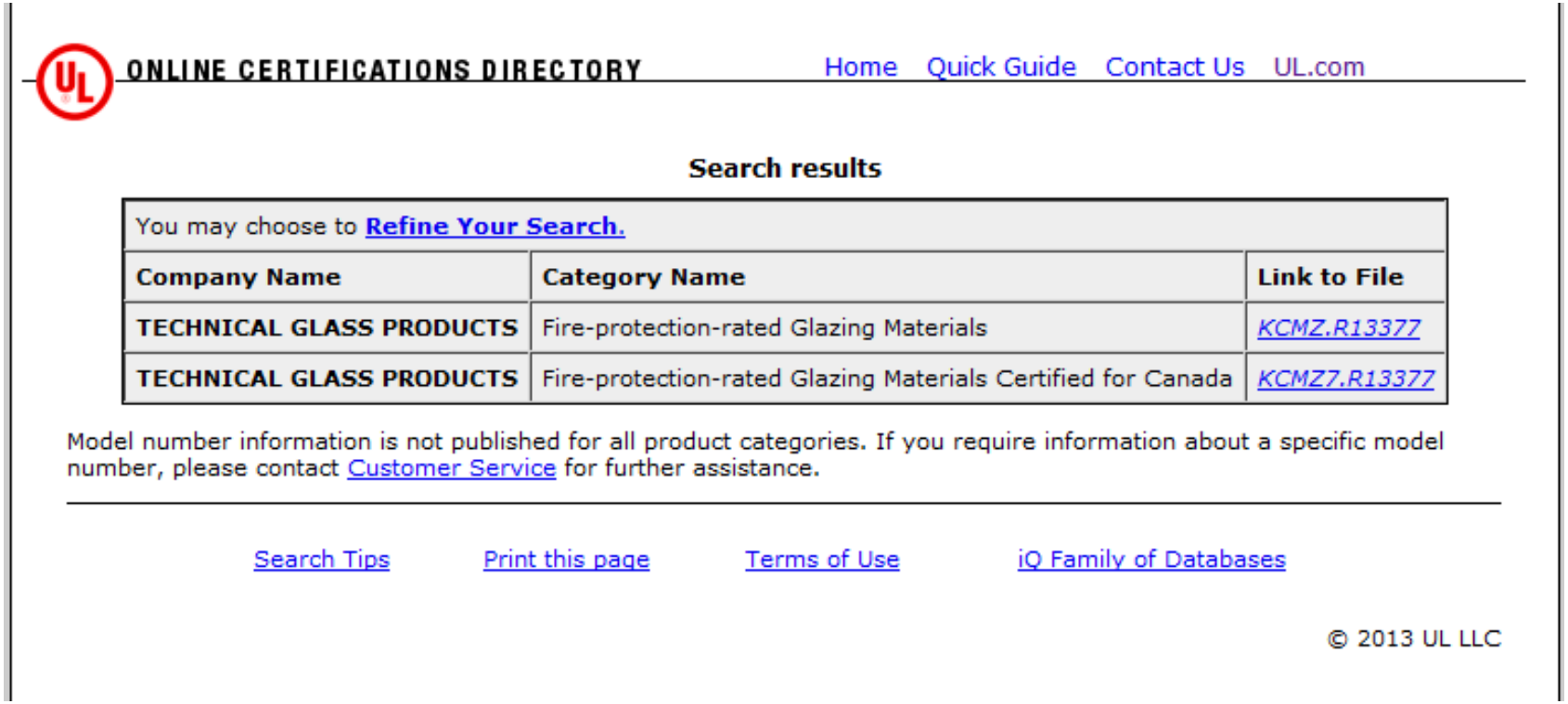
Click on video to play

Impact Safety Test

Click on video to play

Labeling Requirements

Search results



ONLINE CERTIFICATIONS DIRECTORY

Home Quick Guide Contact Us UL.com

Search results

You may choose to **Refine Your Search.**

Company Name	Category Name	Link to File
TECHNICAL GLASS PRODUCTS	Fire-protection-rated Glazing Materials	KCMZ.R13377
TECHNICAL GLASS PRODUCTS	Fire-protection-rated Glazing Materials Certified for Canada	KCMZ7.R13377

Model number information is not published for all product categories. If you require information about a specific model number, please contact Customer Service for further assistance.

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- Info@FCIA.org for FREE Webinars
- Info@FCIA.org FREE Life Safety Digest
- Info@FCIA.org FREE MOP

Sign up @ www.FCIA.org

FCIA 2024 DUBAI MEMBER MEETING & SYMPOSIUM

Passive Fire Protection Standards

Presented by:

Bill McHugh

Abhishek Chhabra

FCIA & NFCA

Bill@FCIA.org – AbhishekC@FCIA.org

FCIA
Firestop Contractors International Association