

# FIELD CHALLENGES & SOLUTIONS FOR FIRE-RATED EXPANSION JOINTS

**Panelists:**  
**Rob Belvin (Construction Specialties),**  
**Steve Cooper (Balco),**  
**Jacob Leberer (MM Systems),**  
**Ben Stys (Inpro)**

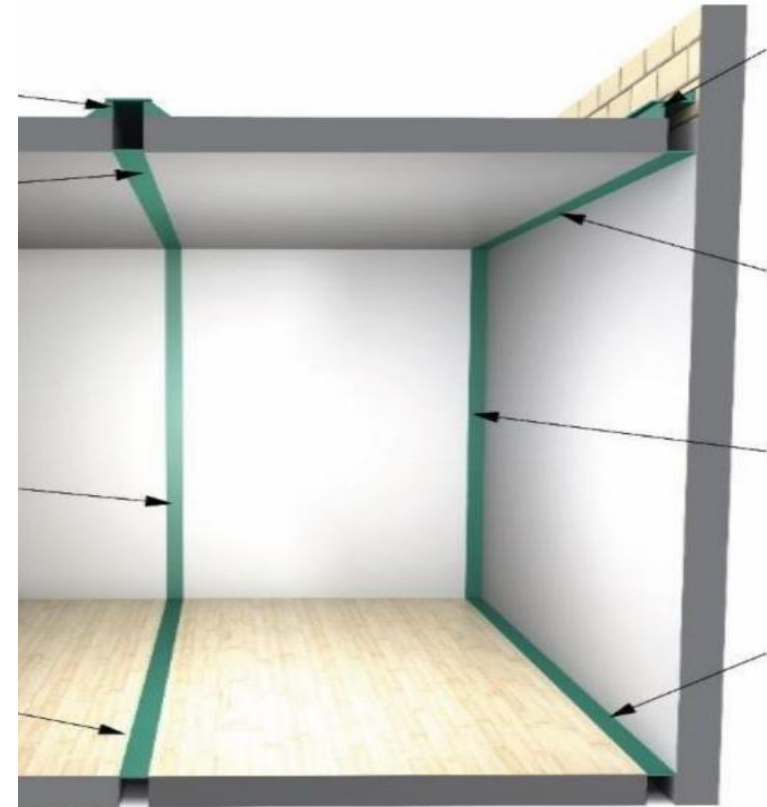
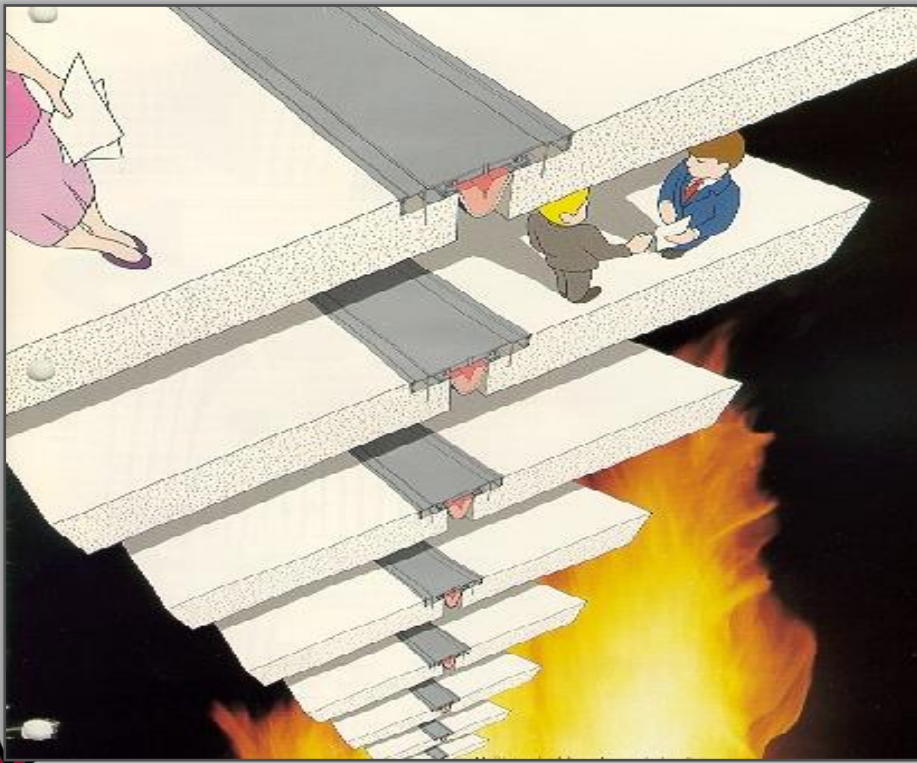


# Definition and Types of Fire Resistive Joint Assemblies



# What is a Fire Rated Expansion Joint Assembly?

A continuous assembly used to prevent fire, smoke, gases, and temperature rise from penetrating a building movement joint into adjacent spaces for a given time-period, such as 2 hours.



# Fire Resistive Joint Types

## SMALL fire resistive expansion joints

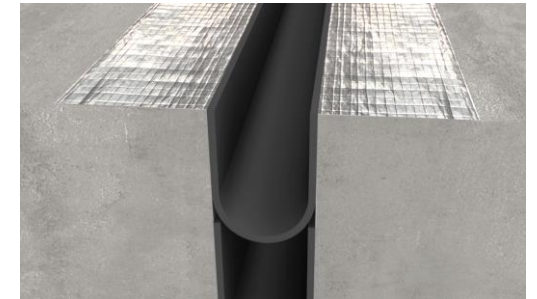
### MINERAL WOOL & SEALANT

- Oversized Mineral wool strips held in place through compression.
- Topped with intumescent fire caulk to secure the wool in place and protect from water infiltration
- \*Not to be confused with Edge of Slab, Head of Wall or Penetration solutions
- Requires metallic cover to meet code



### INTUMESCENT TEXTILES

- Intumescent material and foil scrim sheet goods
- “Draped” into throat of joint and secured in place with aluminum frames
- Requires metallic cover to meet code





# Fire Resistive Joint Types

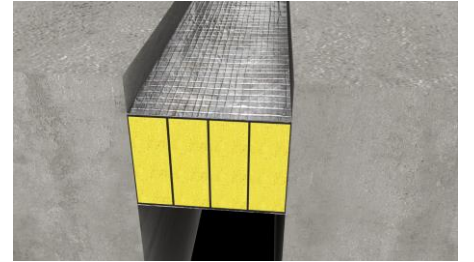
## SMALL fire resistive expansion joints

### HYBRID SYSTEMS

- Utilize combination of intumescent sheet goods, foils and/or insulating ceramic wools
- Held in place through non-invasive outward compression.
- Requires metallic cover to meet code
- Verify butt seams and transitions are addresses specific to the product. Each manufacturer achieves these via alternate means

### FIRE RATED OPEN CELL FOAMS

- Open cell foam with fire retardant materials incorporated
- Ribbed facing with colored silicone for water resistance
- Tested n concrete and gypsum walls (\*note- gypsum board required in throat of joint- cannot be adhered direct to bare studs)
- No metal cover plate required

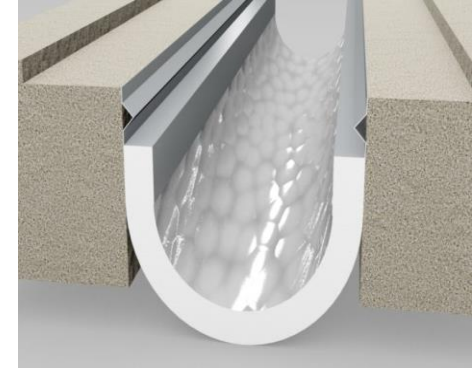
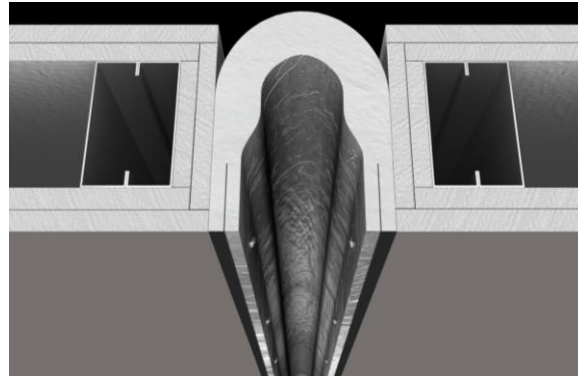
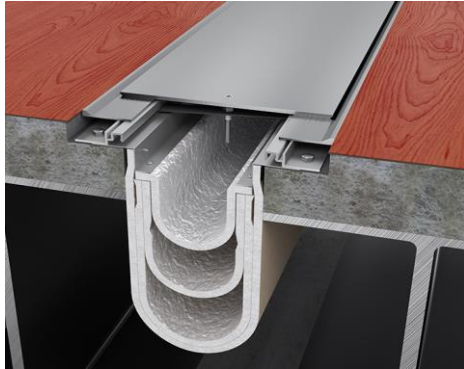


# Fire Resistive Joint Types

## LARGE fire resistive expansion joints

### TRADITIONAL FIRE BLANKET SYSTEMS

- high temperature fire-resistive blankets, stainless foil, cycling shields and edge retainers
- Tested in concrete and gypsum walls but are applicable to wide range of substrate conditions
- **Requires metallic cover to meet code and often to meet building load requirements**
- Approved alternative covers for specific conditions such as Chase-walls.
- Verify with installation instructions splices (required by testing), transitions, and directional changes.



# Codes Testing Listings



# Example and Purpose

Expansion joint movement requirements exceed typical firestop capabilities



Common Mineral wool and intumescent spray application at exterior perimeter of slab, top of wall...



**Limitations**> Most perimeter joint firestop sealants and systems achieve an average of 12%+- movement, falling well short of Expansion Joint cycling requirements which range from 25% to 100% plus and minus



# Code Requirements for Firestopping and Expansion Control

- International Building Code Chapter 7
  - New Construction
- International Fire Code Chapter 7
  - Existing Buildings (Maintenance)
- NFPA 101 Chapter 8 General requirements
  - Chapters 18, 19 - Health Care

Joint Type	Building Code	Test Standard	Architectural Specification	Inspection Standard
HW and BW	IBC 715 and IFC 704	UL2079, ASTM E1966	078443	ASTM E2393
FF, FW, WW, WC	IBC 715 and IFC 704	UL2079, ASTM E1966	078443, <b>079513</b>	ASTM E2393
CW, Perimeter	IBC 715 and IFC 704	ASTM E2307	078443	ASTM E2393
Penetrations	IBC 714 and IFC 704	UL1479, ASTM E814	078413	ASTM E2174



# IBC 2021 Third Party Inspections

## **1705.18.1 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 E 2174. 10% check requirement.

## **1705.18.2 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 E 2393**. 5% check requirement.

# NFPA 1 version 2021

**12.3.2\* Quality Assurance for Penetrations and Joints.** A quality assurance program for the installation of devices and systems installed to protect penetrations 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. [5000:40.9]

**12.3.2.1** Inspection of firestop systems of the types tested in accordance with ASTM E814, *Standard Test Method for Fire Tests of Penetration Firestop Systems*, or UL 1479, *Fire Tests of Penetration Firestops*, shall be conducted in accordance with ASTM E2174, *Standard Practice for On-Site Inspection of Installed Firestops*. [5000:40.9.1]

**12.3.2.2** Inspection of fire-resistive joint systems of the types tested in accordance with ASTM E1966, *Standard Test Method for Fire-Resistive Joint Systems*, or UL 2079, *Tests for Fire Resistance of Building Joint Systems*, shall be conducted in accordance with ASTM E2393, *Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers*. [5000:40.9.2]



- Quality Assurance Documents
- **Inspection criteria:**
  - ASTM E2393 inspection of Joints
  - ASTM E1966 or UL2079 test standards



# Third Party Testing Cycling Requirements

Types of architectural joint systems  
per ASTM E1399 - 4.1

4.1.1 Metallic systems,

4.1.2 Compression seals,

4.1.2.1 With frames, and

4.1.2.2 Without frames,

4.1.3 Strip seals,

4.1.4 Preformed sealant systems –with frames

4.1.4.2 Without frames,

4.1.5 Preformed foams and sponges,

4.1.5.1 Self-Expanding, and

4.1.5.2 Nonexpanding,

**Direction of Movement to joint  
direction:**

X = Perpendicular

Y = Parallel

Z = Vertical

**Definitions:**

$W_{NOM}$  = Nominal Joint Width

$W_{MIN}$  = Minimum Joint Width

$W_{MAX}$  = Maximum Joint Width

M = Movement Capacity ( $W_{max} - W_{min}$ )

$W_{NOM} - W_{MIN} - W_{MAX} - W_{NOM}$  Finish = 1 Full cycle

## Cycling Movement Chart UL2079

Class I 500 cycles 1 c/min.

Class II 500 cycles 10 c/min.

Class III 100 cycles 30 c/min.

Class IV 100 cycles 30 c/min.  
400 cycles 10 c/min.





# Example and Purpose



***UL 2079 combines (3) testing methodologies >  
Material / Movement / Fire Resistance***

- **ASTM E119 Adjacent Building Elements**  
Standard Test Methods for Fire Tests of Building Construction and Materials
- **ASTM E1966 Specific to Expansion Joints**  
Standard Test Method for Fire-Resistive Joint Systems
- **ASTM E1399 Specific to Building Expansion/ Contraction**  
Standard Test Method for Cyclic Movement and Measuring the Minimum and Maximum Joint Widths of Architectural Joint Systems

Intertek and other nationally recognized laboratories use AST and/or UL standards for testing

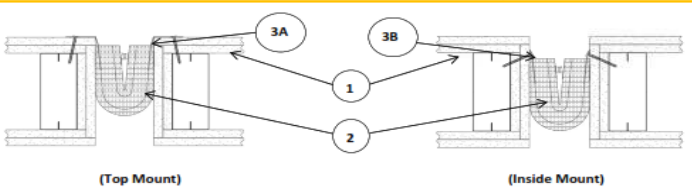


# Product Listing Data

**intertek**  
Total Quality. Assured.

Division 07 – Thermal and Moisture Protection  
07 95 00 Expansion Control  
07 95 13 Expansion Joint Cover Assemblies

InPro Corporation  
Design No. INC/EJCA 120-08  
Wall Joint System  
Fireline F520 (Nominal Joint 4 thru 20 in.)  
UL 2079, CAN/ULC S115-11  
Rating: 2 Hour  
ASTM E1399  
Cycling – Class IV  
80% Movement (50% Horizontal Movement also Acceptable)



(Top Mount) (Inside Mount)

Blanket Layers	Nominal Joint Size	80% Max. Opening
4	4 to 20 in.	7-1/4 to 36 in.

**Table 1. Joint Sizes**

**1. SUPPORTING CONSTRUCTION:** Construct a 2 hour rated gypsum wall assembly made with two layers of 5/8 in. thick gypsum board, fastened to minimum 25 GA steel studs or minimum 2x4 wood studs in accordance with the corresponding listed design. Install steel box studs or wood double studs on both sides of the joint. Gypsum board must be installed in the throat of the joint opening as shown in Figure 1.

**2. WALL JOINT SYSTEM:** Install a 20 in. nominal joint width, pre-fabricated system composed of a rigid metallic architectural joint system and a flexible U-shaped fire barrier. Attach mechanical components to the supporting construction (Item 1). Max. joint opening is 36 in.

**A. CERTIFIED MANUFACTURER:** InPro Corporation

**CERTIFIED PRODUCT:** Fireline F520 Top Mount Wall Joint System Series

**CERTIFIED MODEL:** F520-2TM-20WL and F520-2IM-20WL; 20 in. nominal joint, rated for a max. opening of 36 in.

**F520 Part Number Example/Explanation:**  
**F520** (Brand/Product Name);  
**2** (Hourly Rating);  
**TM or IM** (Flange Type - Top Mount or Inside Mount);  
**20** (Nominal Joint Width);  
**WL** (Condition – Wall to Wall)

The top mount wall joint system is attached to the gypsum wall surface of the supporting construction (Item 1) on each

Date Revised: July 9, 2019 Page 1 of 2 Project No. G102902653

- \*Maximum joint width listed (products are tested at the joint's widest expansion extents replicating a worst case scenario)
- Product's distinct movement capabilities
- Requirements of surrounding construction in accordance with listed designs
- Denotes any alternative applications where product can be utilized (ie- chasewall detailing/ alternate pre-approved cover plate types)
- Verifies an audit of the Manufacturer's facility, processes Quarterly
- Inspection and validation of Quality Control measures through ISO 9001:2008



# Detailing Splices Transitions



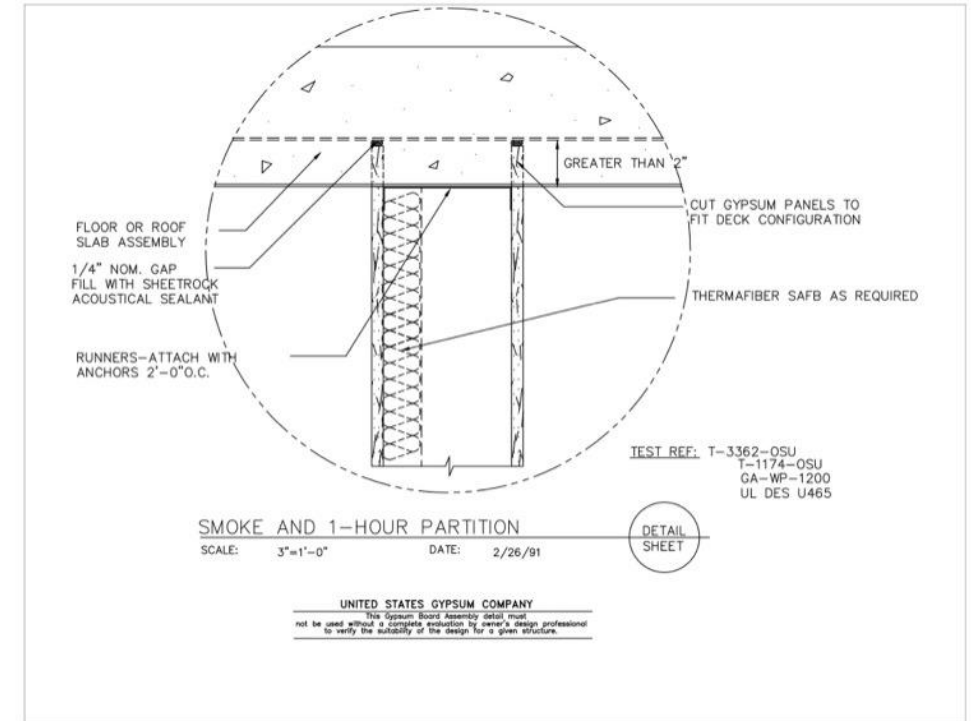
# Barriers vs Partitions

## SECTION 709 SMOKE BARRIERS

709.1 General. Vertical and horizontal smoke barriers shall comply with this section.

709.2 Materials. Smoke barriers shall be of materials permitted by the building type of construction.

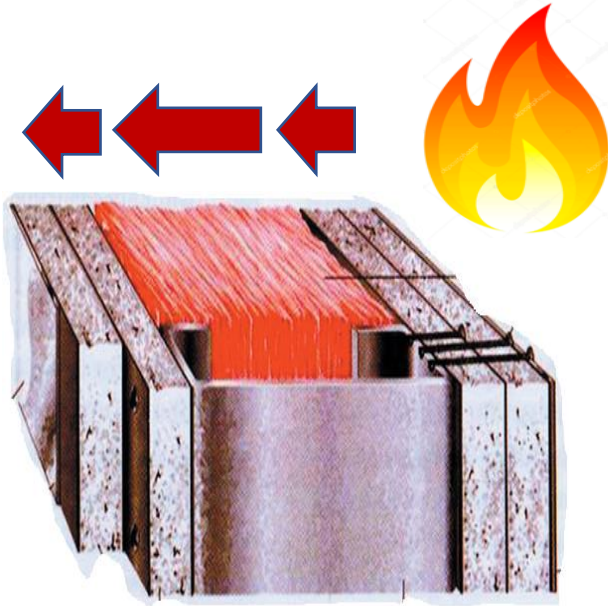
709.3 Fire-resistance rating. **A 1-hour fire-resistance rating is required for smoke barriers.** Smoke partitions are not fire rated.



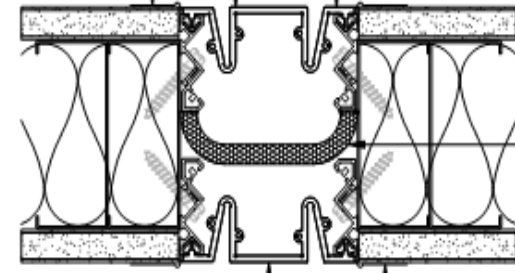


# Detail Verification

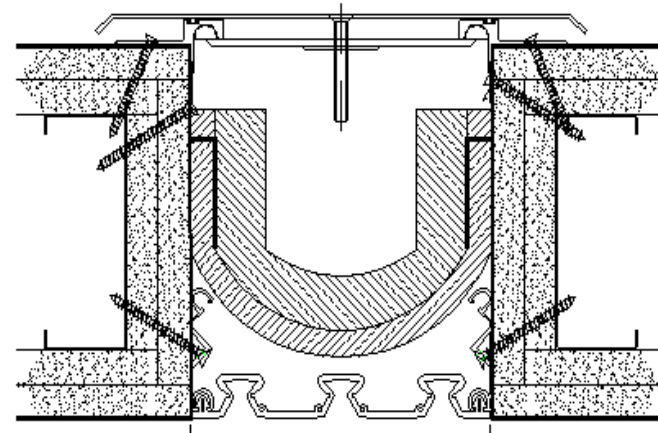
Verify construction with manufacturer details



*Full assembly required- in this typical 2 Hour partition example> (4) layers of 5/8" Type X gypsum with proper overlaps, hardware spacing and stud gauge are all required*

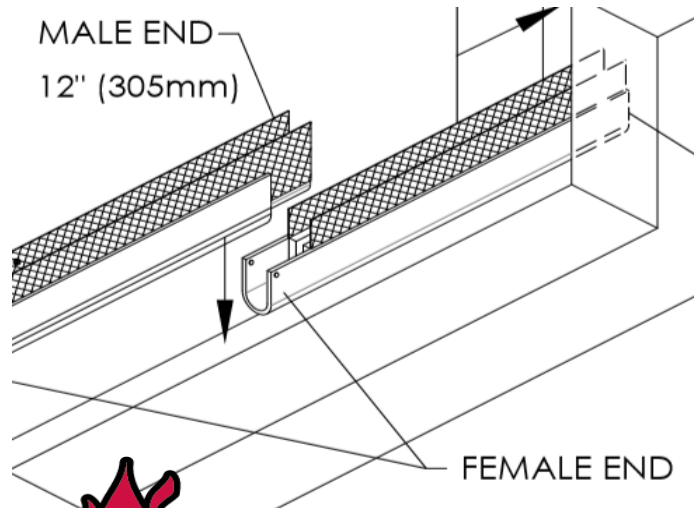
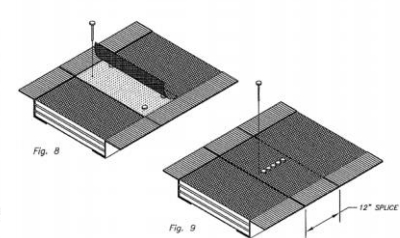
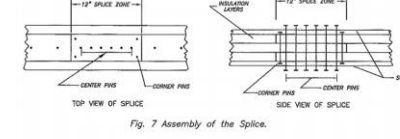
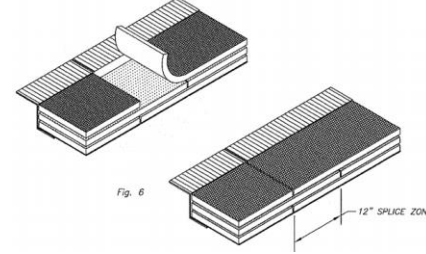
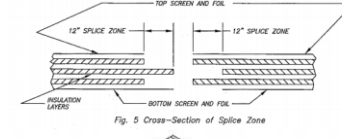
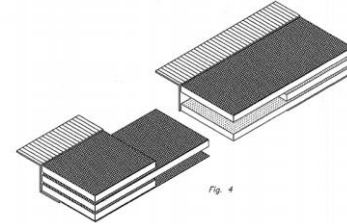
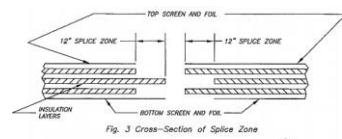
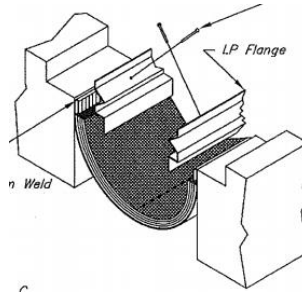


*Some Fire resistive joints are tested without gypsum returns in the throat of the joint, while others require the partition to be encapsulated- verify on the Manufacturer's Listings*

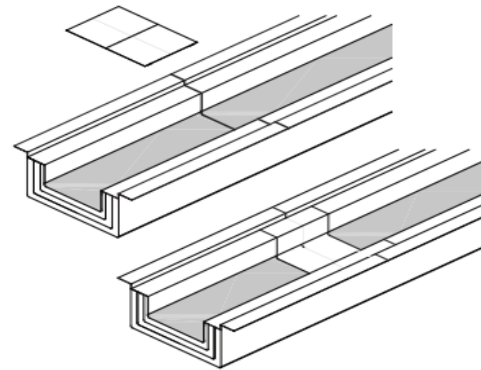


# Test Standards require Field Splices

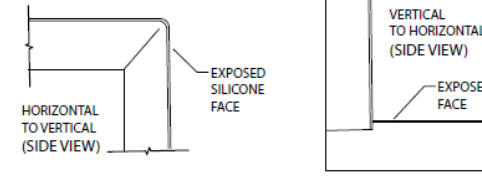
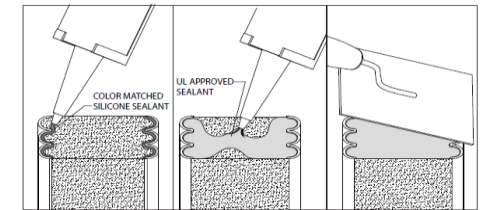
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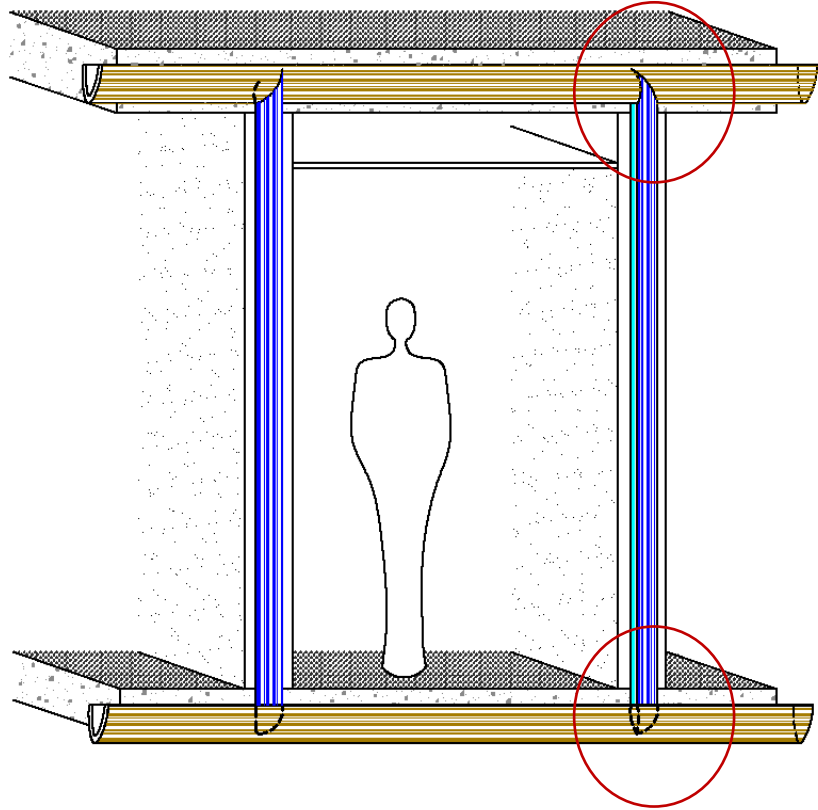
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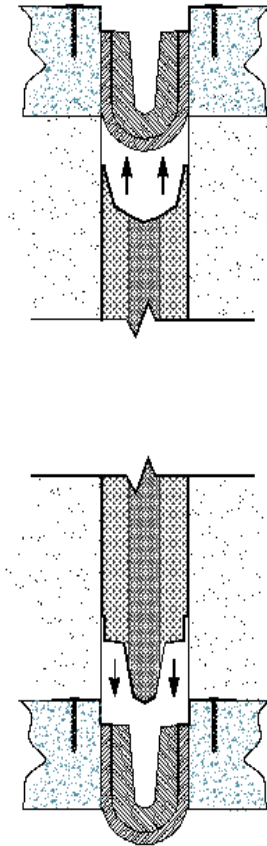
D.



# Transitions – Per manufacture's instructions

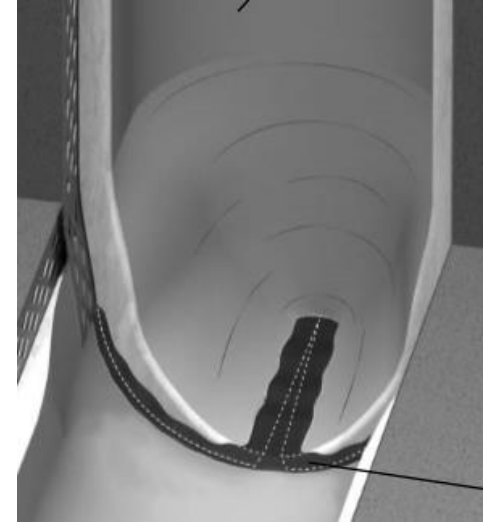


Section through Rated  
Corridor



Head of Wall/  
Underside of  
Deck above

Nested at  
Base of Wall



# **Field Conditions**

## **The Good**

## **The Bad**

## **and**

## **The Ugly**



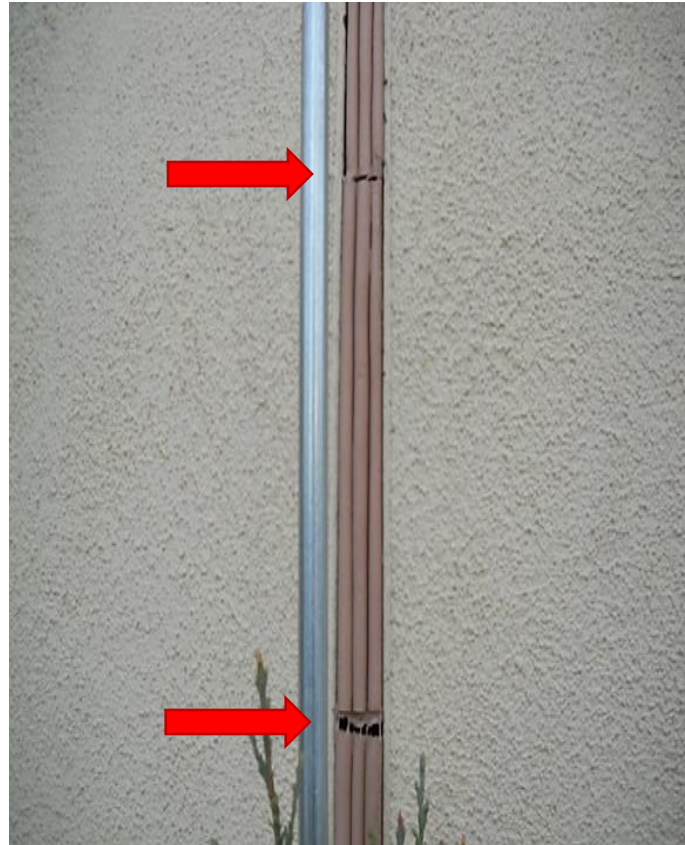
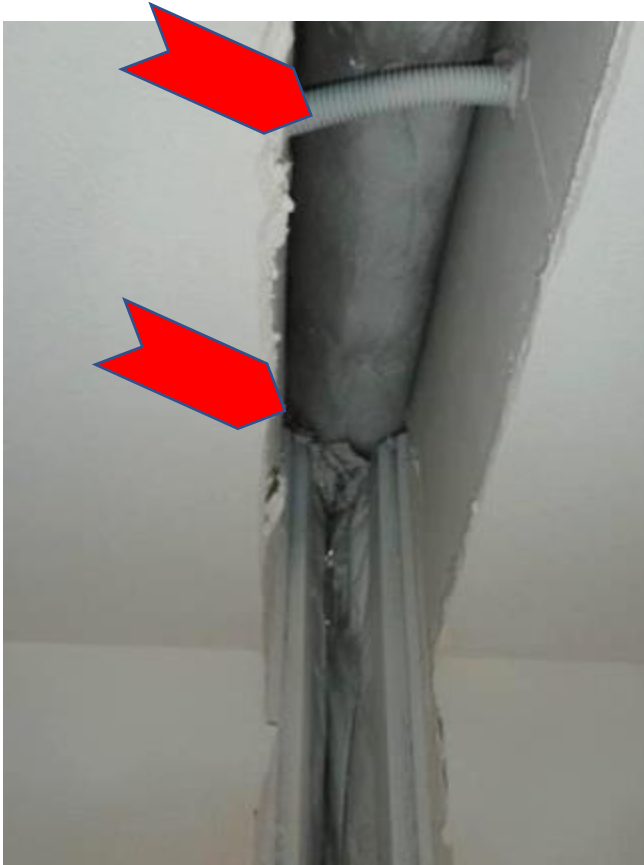


# The Good



Properly nested horizontal to vertical transitions

# The Bad



**Incomplete protection**

# The Ugly

Sometimes we get a little help from our friends





# FIELD CHALLENGES & SOLUTIONS FOR FIRE-RATED EXPANSION JOINTS

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# Questions, and hopefully answers...

1. Can a 2-hour rated barrier system be used in a 1 hour rated construction?
2. Can you use two 2-hour barriers to make a 4-hour assembly?
3. How often should these systems be inspected as part of a regular maintenance routine?
4. What are the recommended field measuring and preparation steps to follow?
5. What do we do about non-conforming construction related to listings?
6. What if there is a drainage area required at the expansion joint?
7. What is the recommended method to handle different joint sizes connecting?
8. What happens if two manufacturer's products meet at the installation point?
9. Can a fire barrier be re-used if it gets wet in the field or in staging?



**Don't miss the manufacturer's  
"Demo – Round Robin Expansion Joints"**