

BOTTOM OF WALL JOINT SYSTEMS

Providing continuity of rated walls

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OBJECTIVES

- Understand general code requirements for fire resistant joint systems
- Review test standards used to achieve code compliance
- Post flashover spread of fire and smoke at bottom of wall
- Construction practices and recent questions for bottom of wall
- Review recent research program for bottom of wall joints
- Understand fire testing results and review conclusions
- Review harmful bottom of wall code change proposal for the 2027 IBC
- Where to find information on the bottom of wall research program

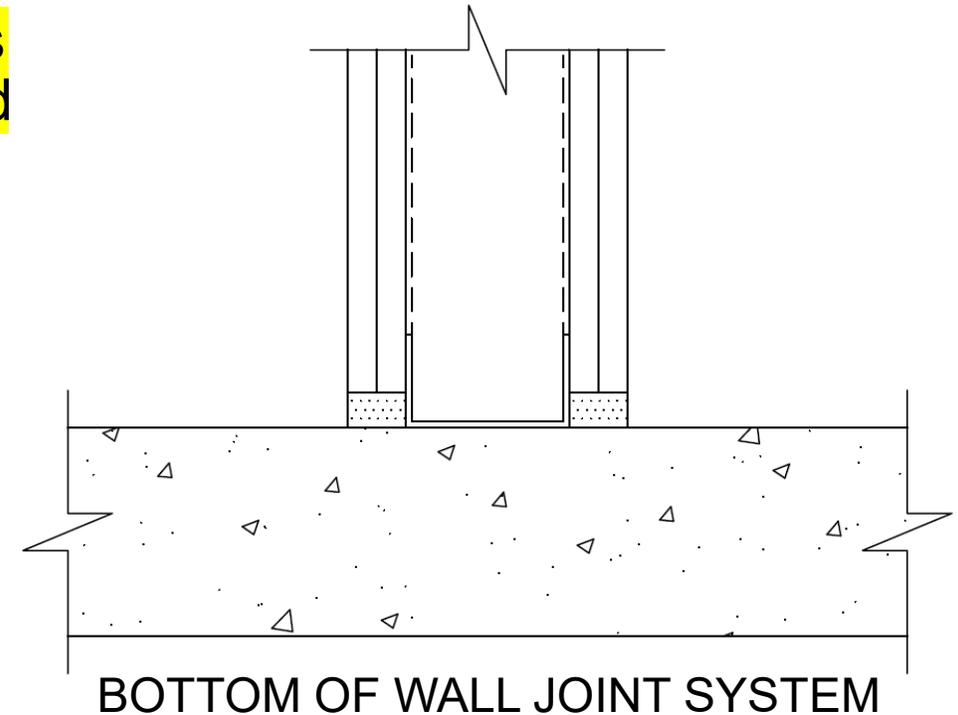
GENERAL CODE REQUIREMENTS

What is a Joint in the International Building Code (IBC)?

JOINT. The opening in or between adjacent assemblies that is created due to *building tolerances*, or is designed to allow independent movement of the *building* in any plane caused by thermal, seismic, wind or any other loading.

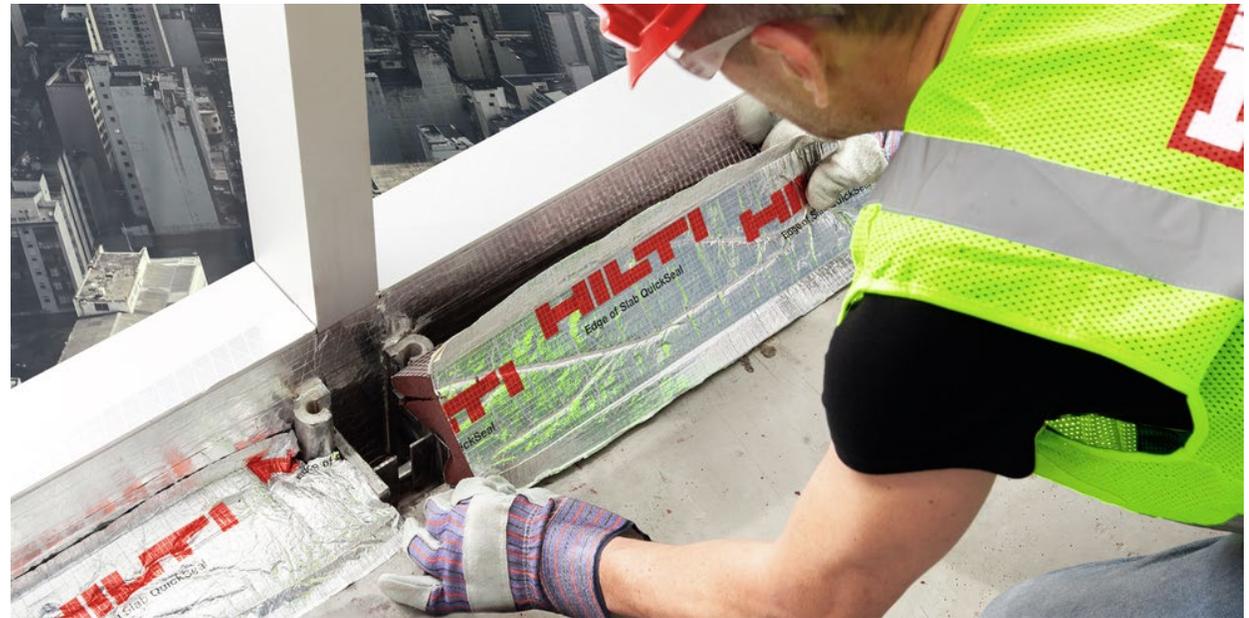
What is a Fire-Resistant Joint System in the IBC?

FIRE-RESISTANT JOINT SYSTEM. An assemblage of specific materials or products that are designed, tested and fire-resistance rated in accordance with either ASTM E1966 or UL 2079 to resist for a prescribed period of time the passage of fire through *joints* made in or between fire-resistance-rated assemblies.



GENERAL CODE REQUIREMENTS

- **“Joints made in or between (assembly type) shall comply with section 715*”**
 - 705.10 (Exterior walls)
 - 706.10 (Fire walls)
 - 707.8 Joints (Fire Barriers)
 - 707.9 Voids (Fire Barriers)
 - 708.8 (Fire Partitions)
 - 709.7 (Smoke barriers)
 - 711 (Floor and Roof Assemblies)
 - 712.1.5 (Vertical Openings)
 - 713.9 (Shaft Enclosures)



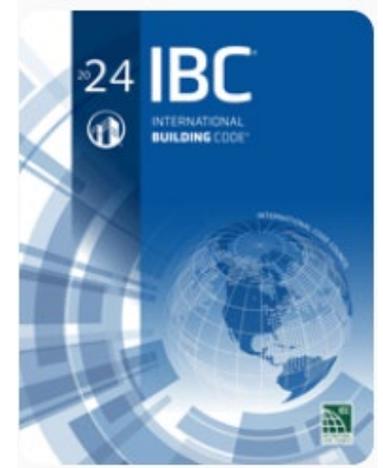
GENERAL CODE REQUIREMENTS

IBC SECTION SECTION 707—FIRE BARRIERS

707.5 Continuity. *Fire barriers* shall extend from the top of the foundation or floor/ceiling assembly below to the underside of the floor or roof sheathing, slab or deck above and shall be securely attached thereto. Such *fire barriers* shall be continuous through concealed space, such as the space above a suspended ceiling. *Joints* and voids at intersections shall comply with Sections 707.8 and 707.

707.8 Joints. *Joints made in or between fire barriers*, and *joints* made at the intersection of *fire barriers* with the underside of a fire-resistance-rated floor or roof sheathing, slab or deck above, and with other fire-resistance-rated wall assemblies shall comply with Section 715.

GENERAL CODE REQUIREMENTS



IBC SECTION 715—JOINTS AND VOIDS

715.3 Fire-resistance-rated assembly intersections. **Joists** installed in or between fire-resistance-rated walls, floor or floor/ceiling assemblies and roofs or roof/ceiling assemblies shall be protected by an *approved fire-resistant joint* system designed to resist the passage of fire for a time period not less than the required *fire-resistance rating* of the wall, floor or roof in or between which the system is installed.

Exceptions.... There are 10 exceptions to fire resistant joint systems

JOINTS AND VOIDS

EXCEPTIONS TO FIRE RESISTANT JOINT SYSTEMS

Not required in the following locations:

1. Floors within a single *dwelling unit*
2. Floors where the *joint* is protected by a shaft enclosure
3. Floors within *atriums* where the space adjacent to the *atrium* is included in the volume of the *atrium* for smoke control purposes
4. Floors within *malls*
5. Floors and ramps within parking garages or structures
6. *Mezzanine* floors
7. Walls that are permitted to have unprotected Openings
8. Roofs where openings are permitted
9. Control *joints* not exceeding a maximum width of 0.625 inch
10. The intersection of exterior curtain wall assemblies and the roof slab or roof deck.



GENERAL CODE REQUIREMENTS

715.3.1 Fire test criteria. *Fire-resistant joint systems* shall be tested in accordance with the requirements of either ASTM E1966 or UL 2079.

Nonsymmetrical wall *joint* systems shall be tested with both faces exposed to the furnace, and the assigned *fire-resistance rating* shall be the shortest duration obtained from the two tests. Where evidence is furnished to show that the wall was tested with the least fire-resistant side exposed to the furnace, subject to acceptance of the *building official*, the wall need not be subjected to tests from the opposite side.

TEST STANDARDS FOR FIRE RESISTANT JOINT SYSTEMS

Standards: ASTM E1966
UL 2079

Test Items: Building Joint Systems Including:

- floor-to-floor
- floor-to-wall
- head-of-wall
- wall-to-wall

Report: Fire rating in hours, i.e., 1, 2, 3 or 4 hours



Designation: E1966 – 24

**Standard Test Method for
Fire-Resistive Joint Systems¹**



TEST STANDARDS FOR FIRE RESISTANT JOINT SYSTEMS

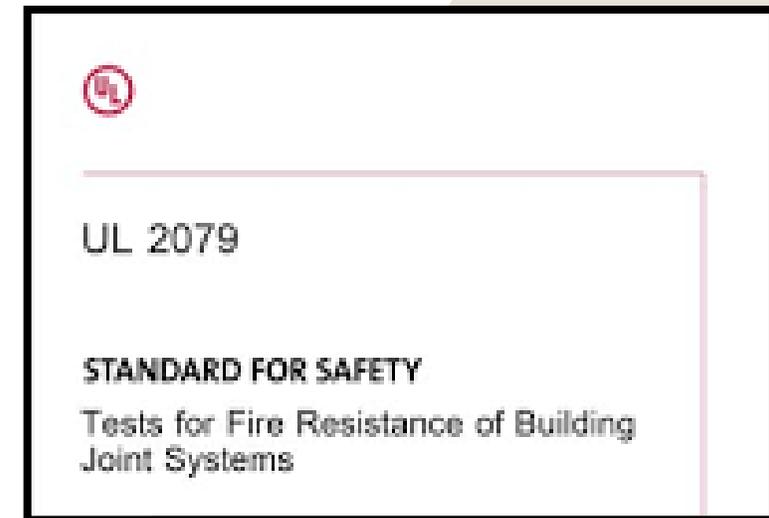
Codes Reference ASTM E1966 and/or UL 2079

- ✓ Time temperature curve (ASTM E119/UL263)
- ✓ Must meet Assembly Rating criteria
 - ✓ Passage of flame and hot gases
 - ✓ Unexposed face temperature rise above 325°F
 - ✓ Unexposed face average temperature rise above 250°F
- ✓ Hose stream
- ✓ Positive furnace pressure of 0.01 inch of water
- ✓ Dynamic Joints cycled prior to fire testing
- ✓ Optional Leakage testing L-rating for Smoke Barriers

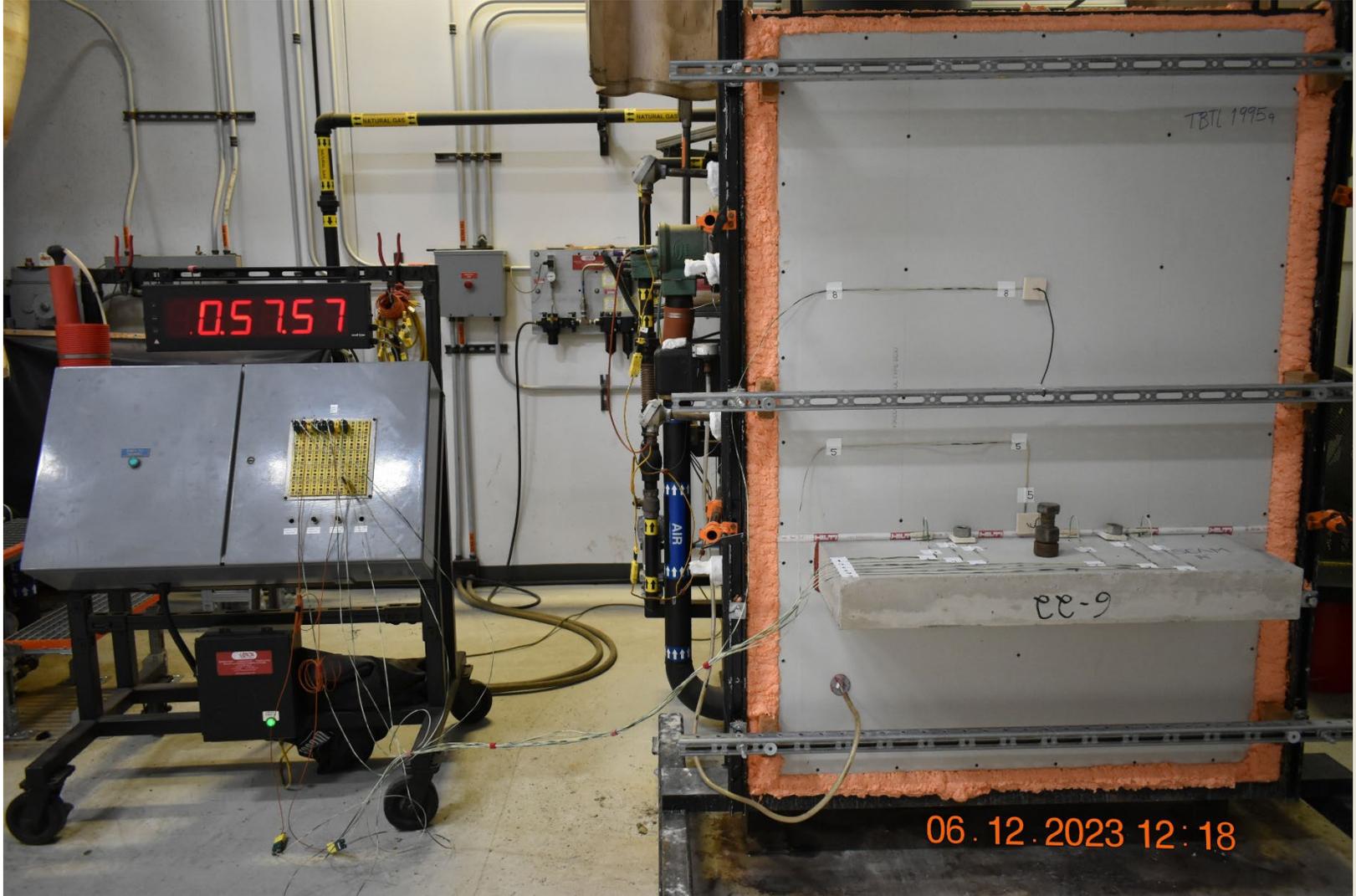


Designation: E1966 – 24

**Standard Test Method for
Fire-Resistive Joint Systems¹**



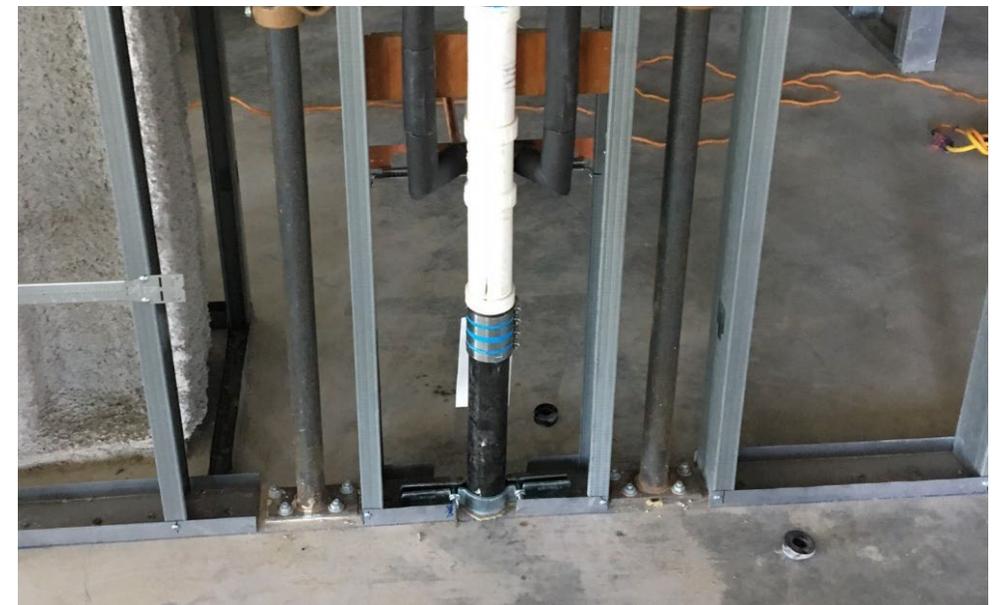
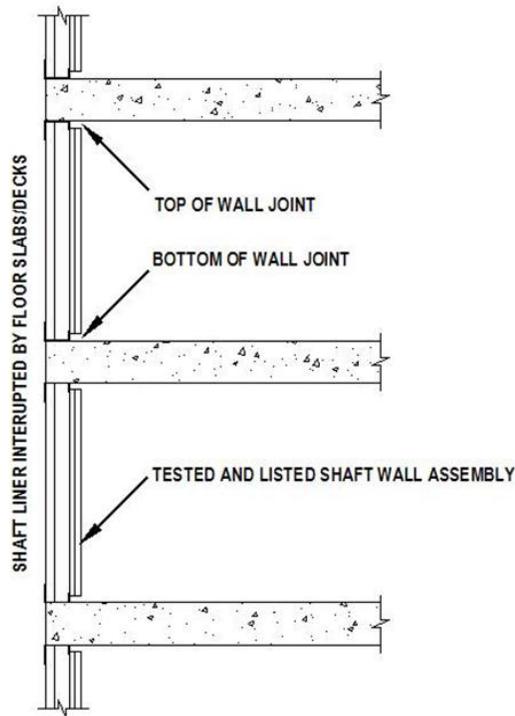
VERTICAL FURNACE USED FOR POST FLASHOVER FIRE SCENARIO



DOES CONSTRUCTION PRACTICES IMPACT FIRE PERFORMANCE AT THE BOTTOM OF WALL

Conditions impacting BoW performance

- Varying Joint Gap Size
- Joint Movement
- Discontinuous bottom track
- Baseboards providing fire performance
- Continuous Shafts
- Smoke leakage



RESEARCH PROGRAM FOR BOTTOM OF WALL

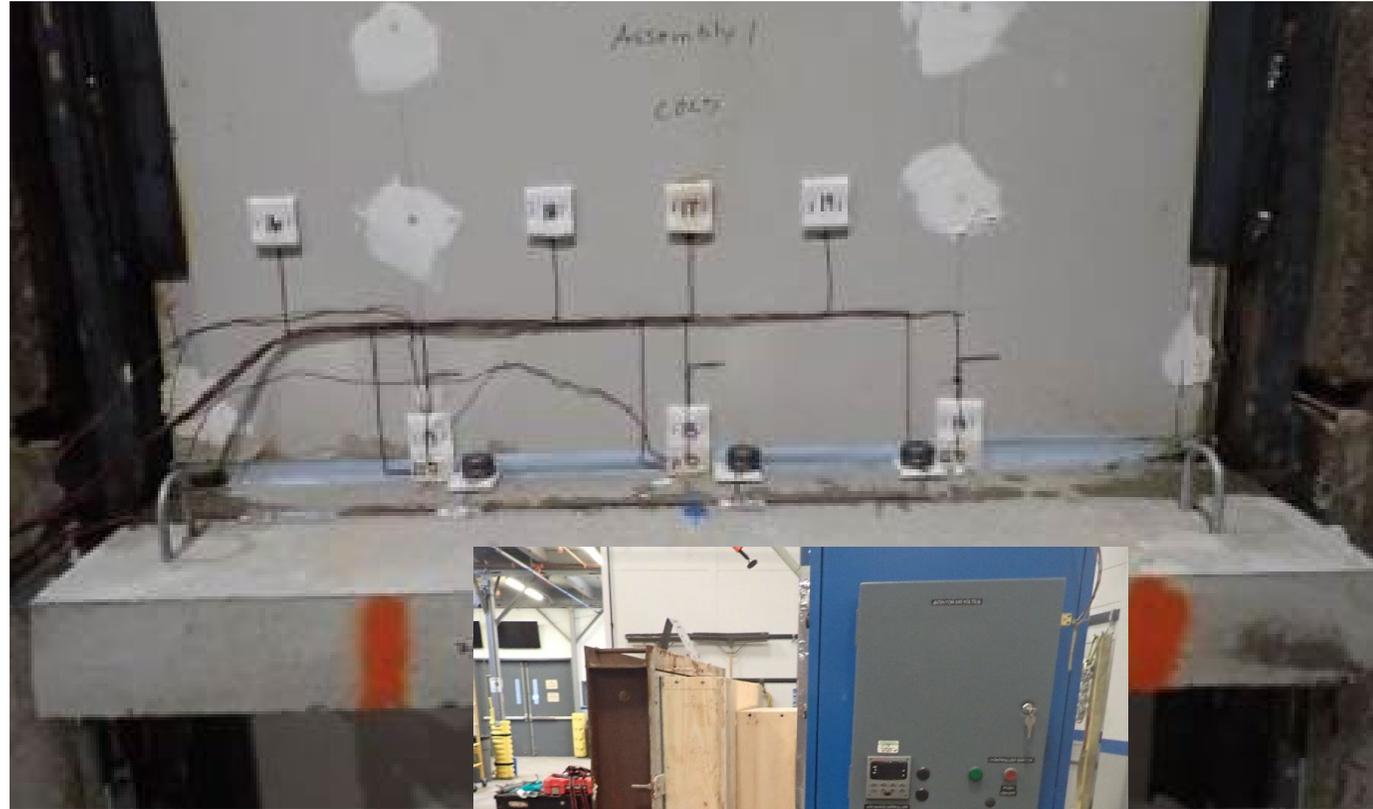
- A research program was conducted in 2025 to answer the question why bottom of wall joint protection is such an important component of passive fire protection.
- The research included post-flashover fire conditions, fire spread through the bottom of wall, fire testing, static joint conditions, gap sizes, smoke migration, vertical shaft continuity, and impact of construction practices.
- Five separate research and testing laboratories conducted a test series of nineteen bottom of wall configurations using the prescribed fire test standards UL2079 and ASTM E1966 Fire-Resistant Joint Systems.

The results illustrate that protected joint systems consistently outperformed unprotected bottom of wall joints by a wide margin.

RESEARCH PROGRAM FOR BOTTOM OF WALL

Assembly No.	Joint System Protection	Wall Assembly Rating (hr)	Stud Type	Track Type	Bottom gap width (inches)	Baseboards	Pass/Fail
1	Protected	1	Steel	Continuous	1	No	Pass
2	Protected	1	Steel	Continuous	1	No	Pass
3	Protected	1	Steel	Continuous	1	No	Pass
4	Protected	1	Steel	Continuous	1	No	Pass
5	Protected	2	Steel	Continuous	1	No	Pass
6	Protected	2	Wood	Discontinuous	1	No	Pass
7	Unprotected	1	Steel	Continuous	1/4	No	Fail
8	Unprotected	1	Steel	Continuous	1/4	No	Fail
9	Unprotected	1	Steel	Continuous	1/4	No	Fail
10	Unprotected	1	Steel	Continuous	1	No	Fail
11	Unprotected	1	Steel	Continuous	1	No	Fail
12	Unprotected	1	Steel	Continuous	1	No	Fail
13	Unprotected	2	Steel	Continuous	1	No	Fail
14	Unprotected	2	Steel	Continuous	1	PVC	Fail
15	Unprotected	2	Steel	Continuous	1	PVC	Fail
16	Unprotected	2	Steel	Continuous	1	MDF	Fail
17	Unprotected	2	Steel	Continuous	1	Wood	Fail
18	Unprotected	2	Steel	Discontinuous	1	No	Fail
19	Unprotected	2	Wood	Discontinuous	1	No	Fail

FIRE TESTING CONFIGURATIONS MANUFACTURER LABS



FIRE TESTING CONFIGURATIONS BASEBOARDS

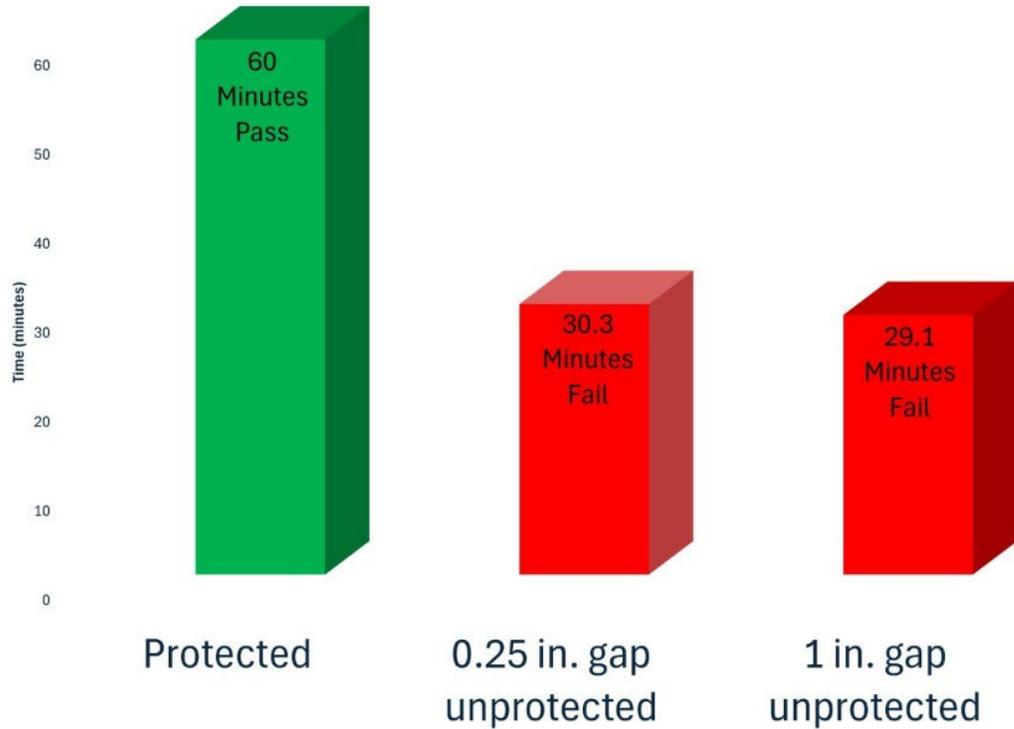


FIRE TESTING CONFIGURATIONS DISCONTINUOUS TRACK

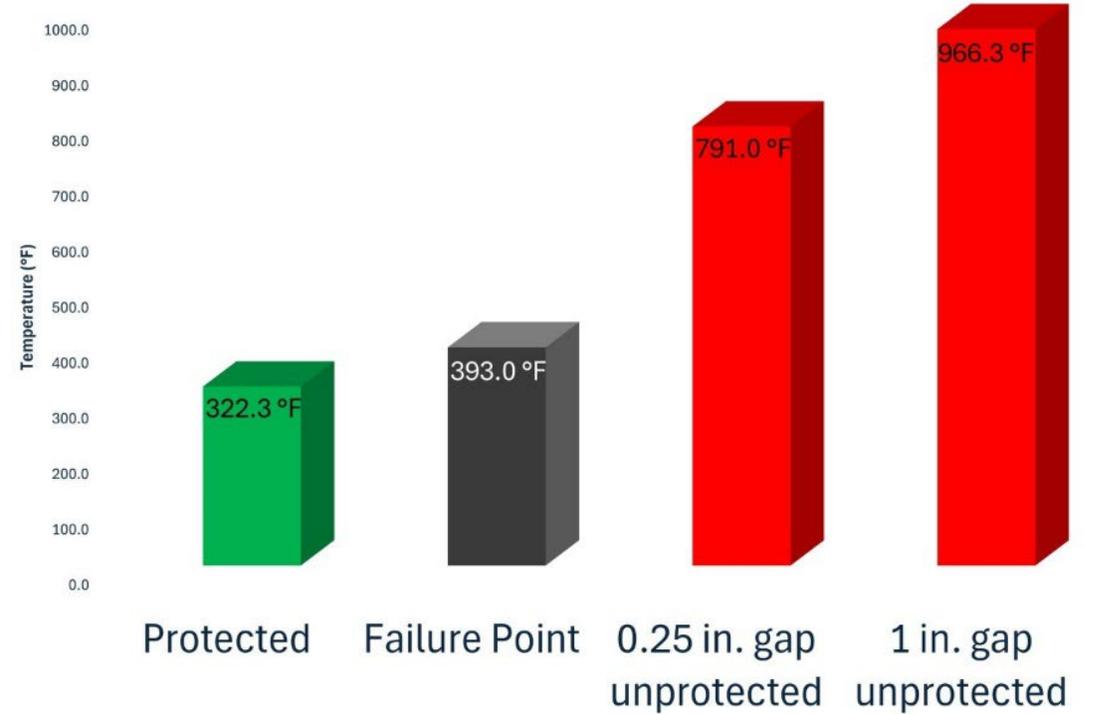


FIRE TESTING RESULTS 1 HOUR ASSEMBLIES

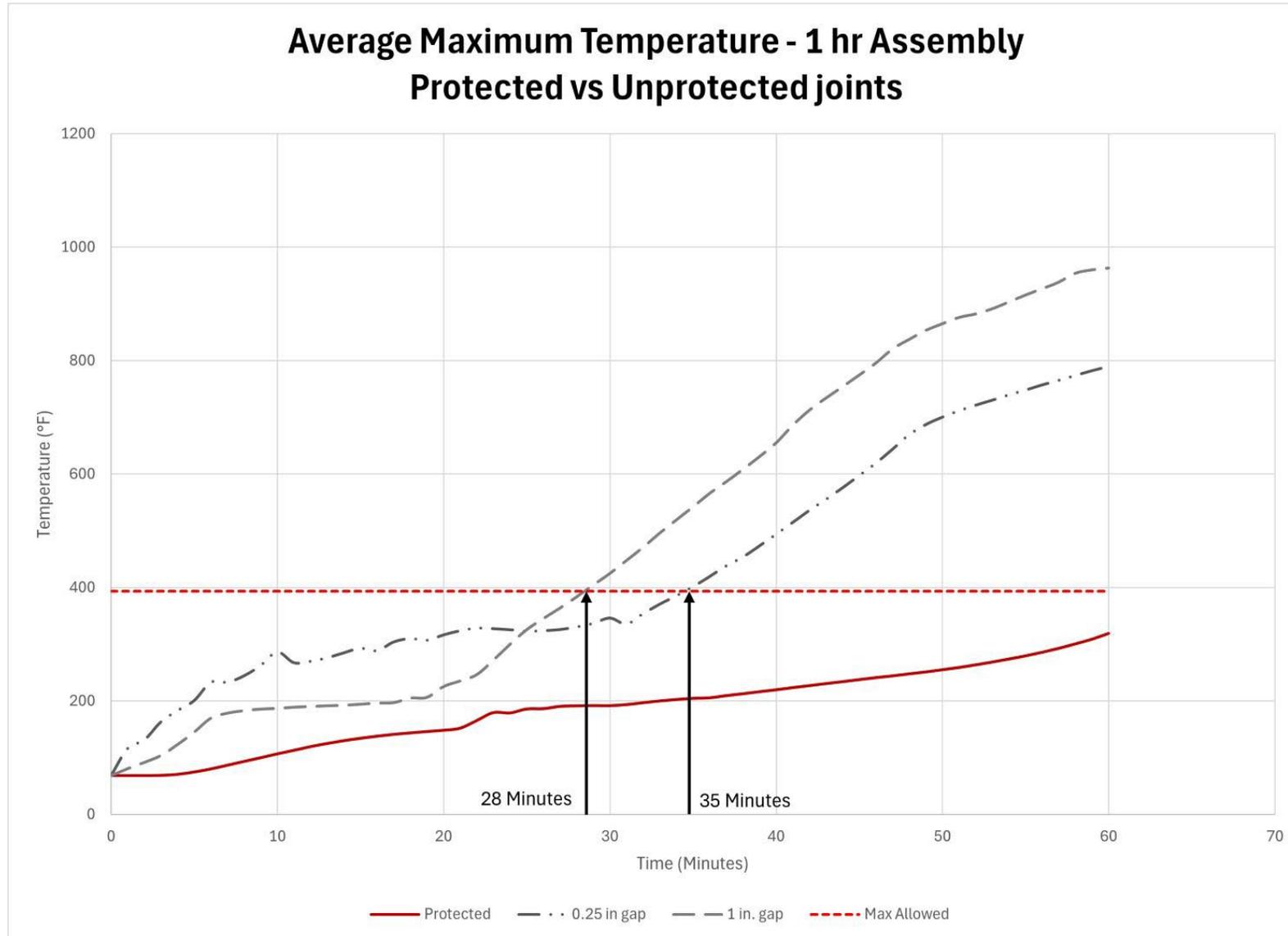
Joint Performance in 1 Hr. Assembly
Protected vs Unprotected 0.25 in. and 1 in. joint



Maximum Temperature Reached - 1 hr Assembly
Protected vs Unprotected joint

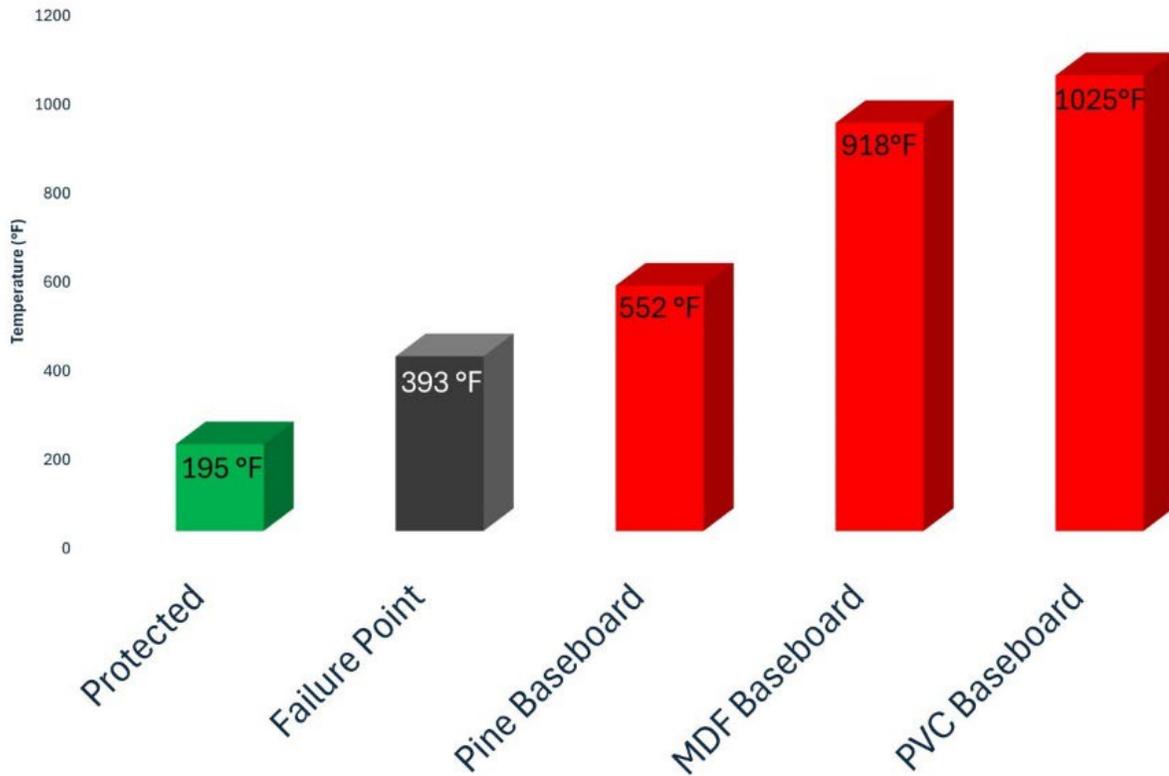


FIRE TESTING RESULTS 1 HOUR ASSEMBLIES

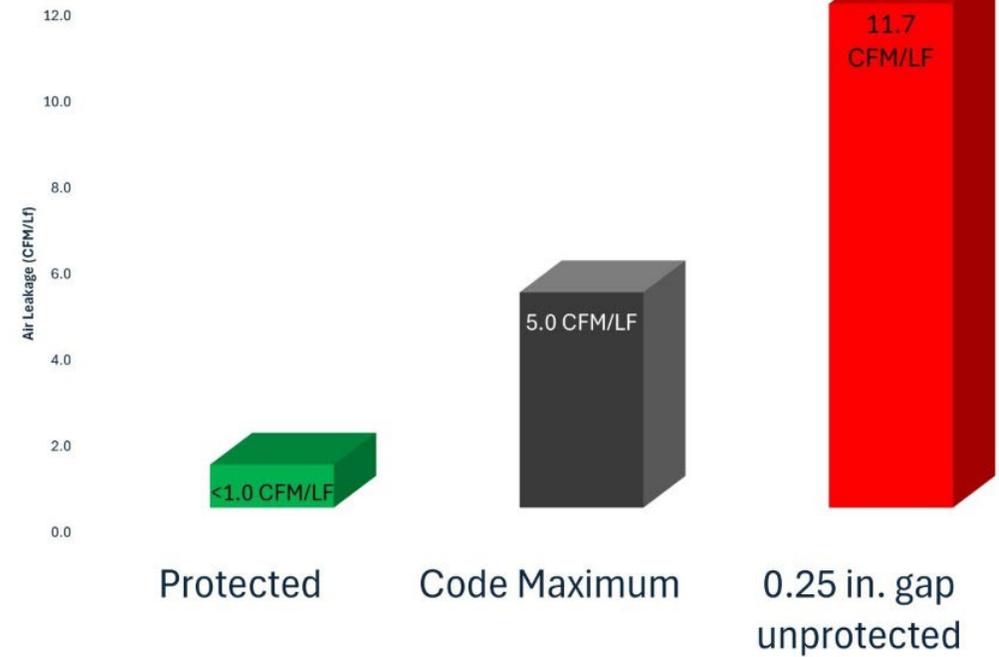


FIRE TESTING RESULTS BASEBOARDS + LEAKAGE

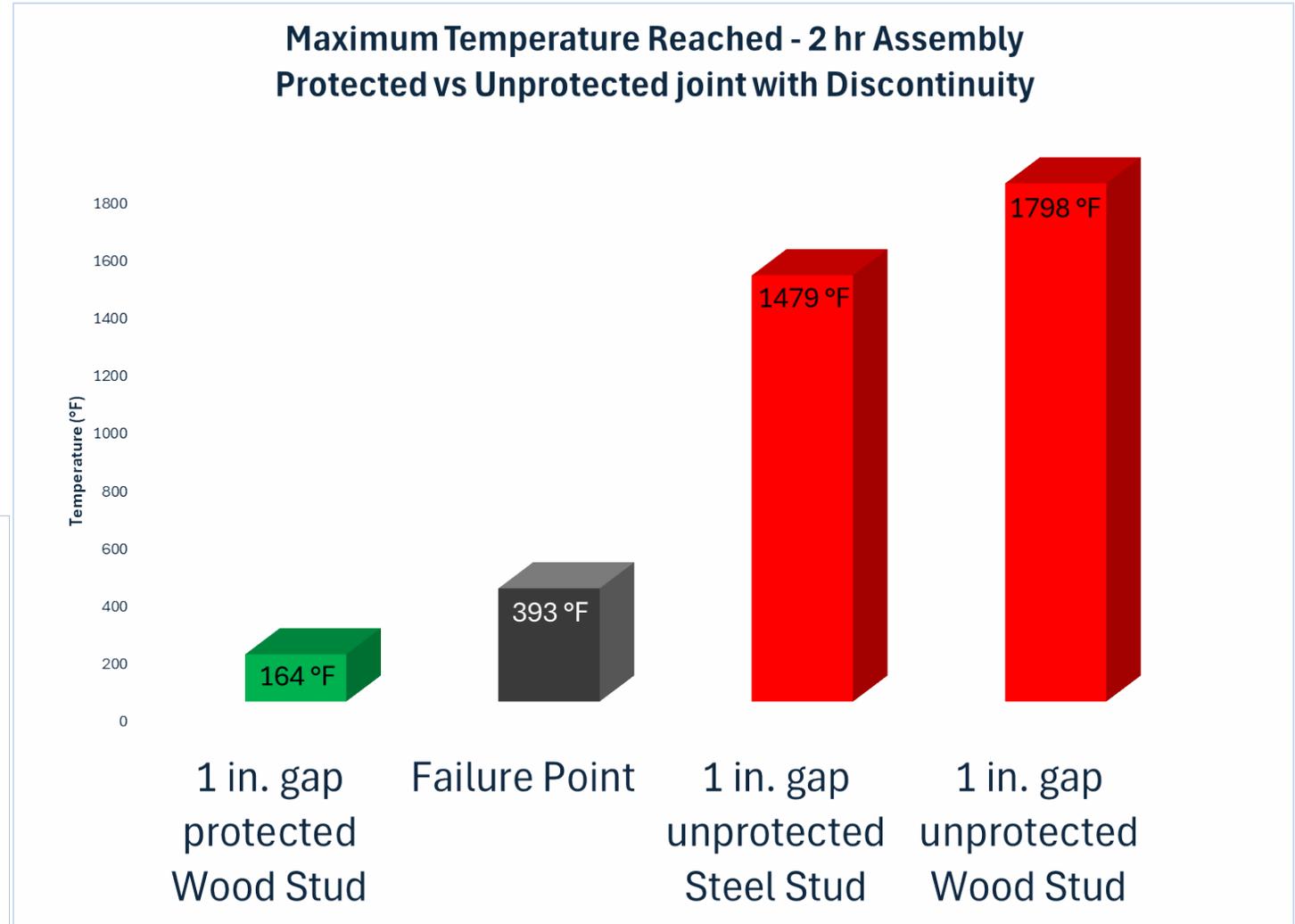
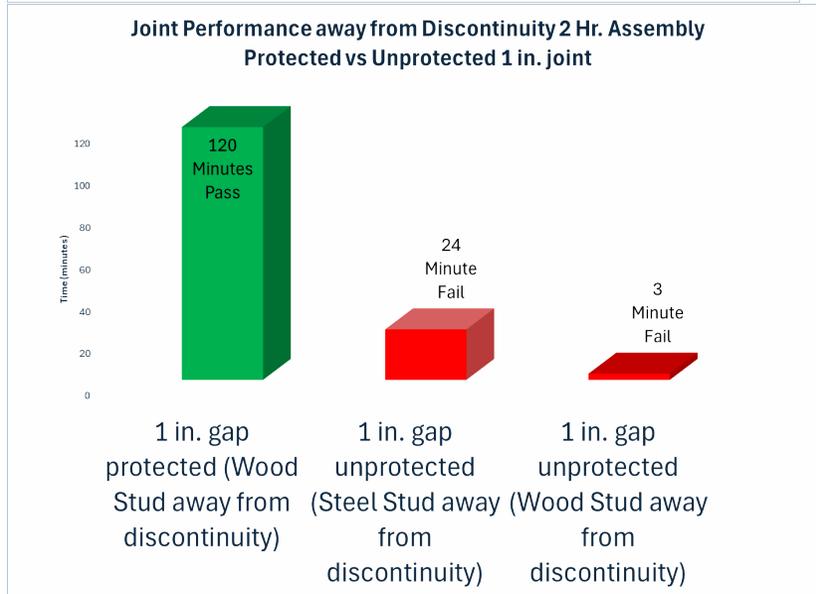
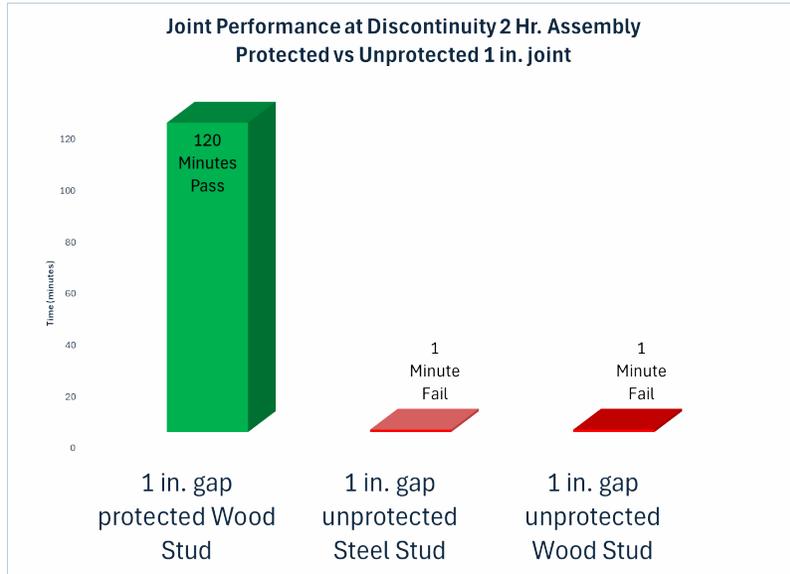
Maximum Temperature Reached - 2 hr Assembly
Protected vs Unprotected with Various Baseboards



Air Leakage - CFM/LF
Protected vs Unprotected joint



FIRE TESTING RESULTS DISCONTINUOUS TRACK



FIRE TESTING RESULTS



RESEARCH CONCLUSIONS

1. Bottom of wall joints can be fire tested using fire-resistant joint system test standards ASTM E1966 and UL 2079 simulating post flashover fire conditions.
2. In all cases the static **unprotected bottom of wall joints failed** to achieve the required fire rating.
3. In all cases the static **protected fire-resistant joint systems complied** with the requirements of UL2079 and ASTM E1966 for the 1 hour or 2 hour duration targeted.
4. Unprotected joints were up to 5 times hotter than protected joints.
5. The use of **baseboards** without a protected joint **provides no appreciable fire resistance.**

RESEARCH CONCLUSIONS

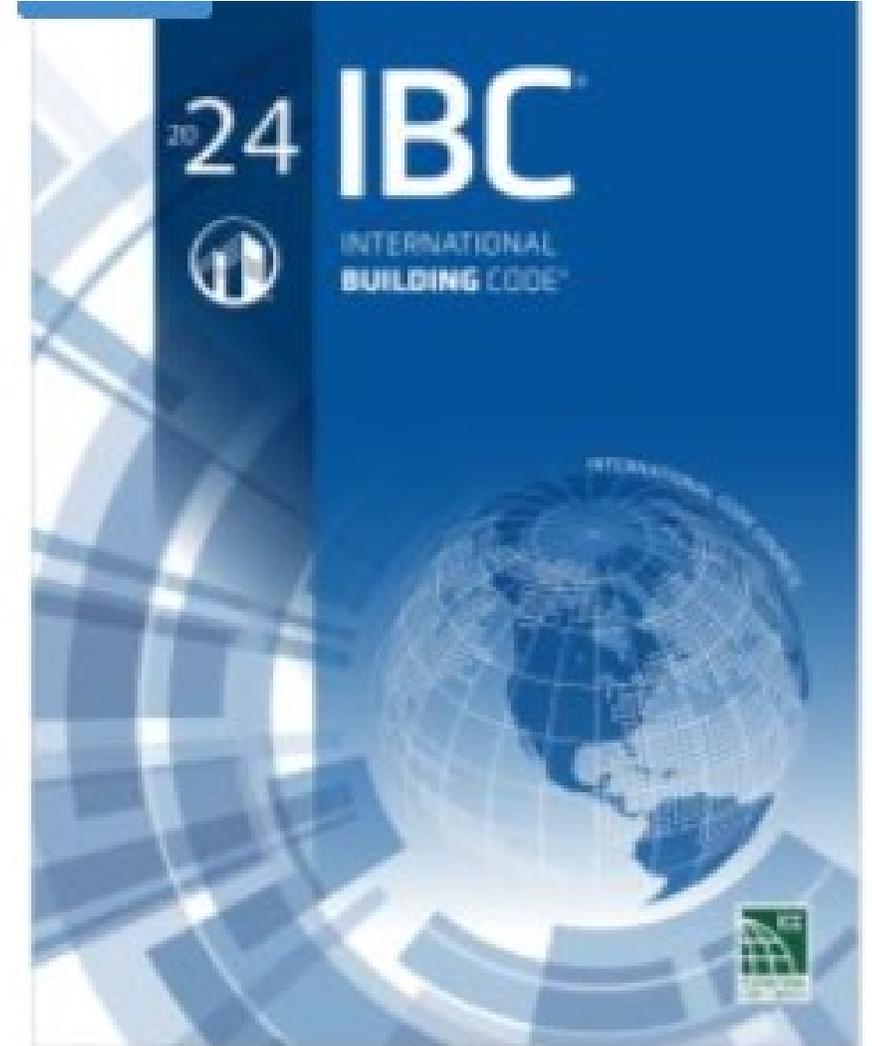
- 6. Unprotected joints with a discontinuous bottom track led to flaming on the unexposed side of the assembly and extremely high temperatures.**
- 7. Unprotected joints led to severe premature deterioration of the gypsum board and studs.**
- 8. Wood bottom plate performed worse than steel track and was entirely consumed during testing.**
- 9. Unprotected joints provide minimal resistance to smoke migration and would not comply with IBC leakage rating requirements.**
- 10. Protected joints performed well even with a discontinuous bottom track.**

BOTTOM OF WALL - ICC CODE DEVELOPMENT CYCLE

2027 Code Cycle Started in 2024

- Group A 2024
 - Primary cycle for firestop – 2 committee action hearings
 - CAH #1 Disapproved by a vote of 12-0
 - **CAH #2 Approved Oct 2024 by a vote of 7-3**
- Groups A & B final 2026
 - Public Comment Hearing – **Bottom of Wall to be heard APR 19-28**
- Publish late 2026
- Typical Code Adoptions 2028 and later

Bottom of Wall to be heard April 19-20



FS53 ICC BOTTOM OF WALL CODE CHANGE PROPOSAL

IBC 715.3 Fire-resistance-rated assembly intersections. Joints installed in or between fire-resistance-rated walls, floor or floor/ceiling assemblies and roofs or roof/ceiling assemblies shall be protected by an approved fire-resistant joint system designed to resist the passage of fire for a time period not less than the required fire-resistance rating of the wall, floor or roof in or between which the system is installed.

Exception: Fire-resistant joint systems shall not be required for joints in the following locations:

1. Floors within a single dwelling unit.
2. Floors where the joints protected by a shaft enclosure in accordance with Section 713.
3. Floors within atriums where the space adjacent to the atrium is included in the volume of the atrium for smoke control purposes.

4. 11. Between the bottom of a fire-resistance-rated wall and a floor or floor/ceiling assembly where the connection is not designed for movement.

5. Floors and ramps within parking garages or structures constructed in accordance with Sections 103.5 and 406.6.

6. Noncombustible exterior walls.

7. Vertical joints in exterior walls.

8. Fire-resistance-rated exterior walls.

9. Control joints not exceeding a maximum width of 0.625 inch (15.9 mm) and tested in accordance with ASTM E119 or UL 263.

10. The intersection of exterior curtain wall assemblies and the roof slab or roof deck.

11. Between the bottom of a fire-resistance-rated wall and a floor or floor/ceiling assembly where the connection is not designed for movement.

INTERNATIONAL FIRESTOP COUNCIL RESOURCE PAGE



Available resource page at: <http://firestop.org/bow>

1. White Paper “Closing the Gap: The Critical Role of Bottom-of-Wall Joint Protection
2. Bottom-of-Wall Joint Protection Full Test Report
3. Statement from UL Solutions
4. Public Comment for FS53-24