Fireproofing Fluted Metal Deck-to-Beam Connections

Bill McHugh, NFCA Technical Director
Carl Fernald, Performance Contracting, Inc.
Rich Walke, CTI, Consultant to the NFCA

NFCA FREE Webinar Series

Learn – Network – Grow

September 17, 2025

Thanks Members…

- NFCA Contractors
- NFCA Associates
- NFCA Manufacturers

Thanks 2024/2025 NFCA Board of Directors

President	Steve Winston, American Coatings Corp., Ashland, VA
1st V. P.	Nikita Gordon, Gunnlaugson spray-On (2010) Ltd, Winnipeg, MB
2nd V. P.	Adam Carter, Superior Industrial Insulation Company, Cleveland, OH
Treasurer	Neal Rivers, Easley and Rivers, Pittsburgh, PA
Secretary	Bob Pool, Alfred Miller Co.
Past President	Carl Fernald, Performance Contracting, Inc.
Director	Don Armand, Donalco, Edmonton, AB
Director	Joe Colavita, Martin Bros.
Director	John Dalton, Monokote-Saint-Gobain
Director	George Fine, Rolling Plains Construction, Tulsa, OK
Director	Daniella Lopez, Nevell Group, Inc. Concord, CA
Director	Bob Pool, Alfred Miller Contracting, Lake Charles, LA
Director	Paul Steele, The Raymond Group, Orange, CA
Director	Matthew Strieter, Southern Insulation Inc., Hyattsville, MD

What Does NFCA Provide?

National Fireproofing Contractors Association

- **Fireproofing Education & Exams**
  - World-Class SFRM & IFRM Fireproofing Instruction
- **NFCA Contractor Accreditation Program for IFRM & SFRM**
  - Educated fireproofing Companies – UL QFCP
- **Week of Learning - Educational Conference**
  - Network with top Fireproofing Contractors, Manufacturers, Associates
  - A forum for suppliers and contractors to learn from one another

- **NFCA 100-400 Standards** for quality and life safety
- **NFCA Handbook of Fireproofing Knowledge**
- **NFCA Website** to find Fireproofing Leaders – www.NFCA-online.org
- **Technical expertise, Standards and Code development….**

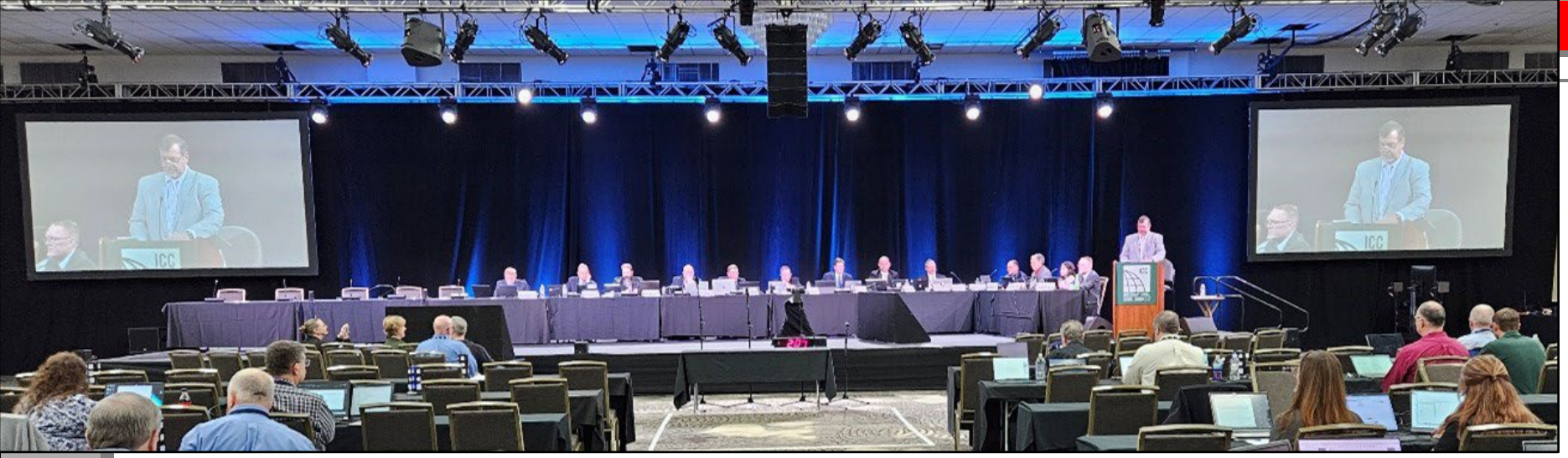
What does NFCA Do?

- NFCA @ ASTM Task Groups - Fireproofing
- NFCA @ NFPA Fire Protection Features
- NFCA @ AISC, AISI, CSI/CSC
- NFCA @ National Codes, Canada – NBCC, NFCC
- NFCA @ American Institute of Steel Construction (AISC)
- Industry Articles
- NFCA @ SFPE/ASCE Meetings
- NFCA Committee ACTIONS
- NFCA International Efforts
  - Middle East
  - Mexico
  - India
  - More…

CSI NATIONAL CONFERENCE 2024

ASTM INTERNATIONAL

NFPA



National Fireproofing Contractors Association

2027 Code Development Process (CDP) IBC, NFPA
2025/2030 CDP – NBCC, NFCC

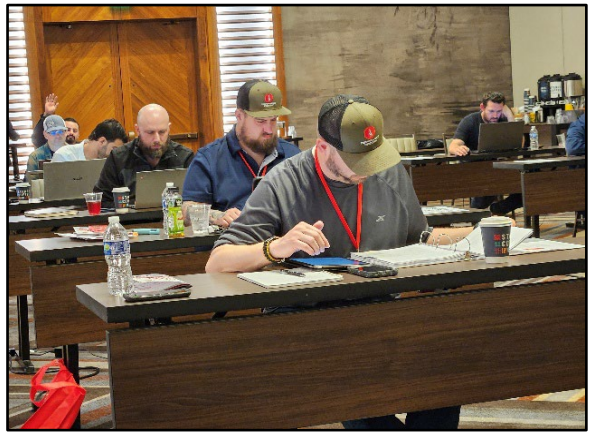
Bill McHugh, Technical Director, NFCA
Rich Walke, Consultant to the NFCA

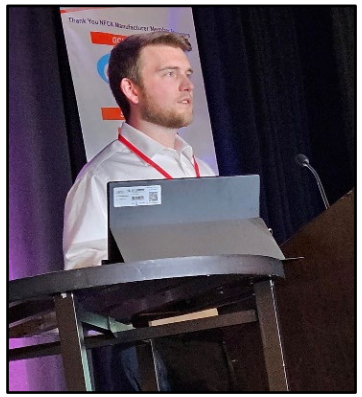
NFCA FREE Webinar Series

Learn – Network – Grow

NFCA Educational Events

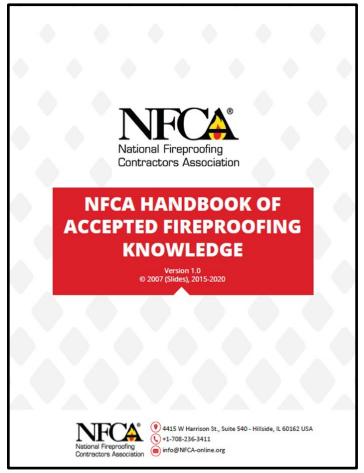
- NFCA's Week of Learning
- NFCA/FCIA Symposiums
  - Amazing Speakers
  - Committee Action





Contractor Qualifications – NFCA Contractor Accreditation Program (CAP)

- Contractor DRI's
- Inspection Agency Personnel
- Commitment to Fireproofing Installation
- NFCA Accreditation Seal - Registered mark



IFRM Accredited Contractor
NFCA®
National Fireproofing Contractors Association

SFRM Accredited Contractor
NFCA®
National Fireproofing Contractors Association

IFRM and SFRM Accredited Contractor
NFCA®
National Fireproofing Contractors Association

Contractor Qualifications – UL QFCP

- UL Qualified SFRM Fireproofing Contractors
  - NFCA Education
    - NFCA HAFK, DRI
    - UL Program Guide, Product iQ
  - NFCA SFRM Fireproofing Exam
  - Management System
  - UL Audits –
    - Office
    - Field

UL CERTIFIED
MANAGEMENT SYSTEM
QUALIFIED FIRESTOP CONTRACTOR

NFCA Educational Events

National Fireproofing Contractors Association

- NFCA/FCIA PasFiPro Canada Symposium
  - Members
  - Code Officials
- NFCA/FCIA PasFiPro Dubai, Doha
- NFCA @ Mexico LATAM/PCI

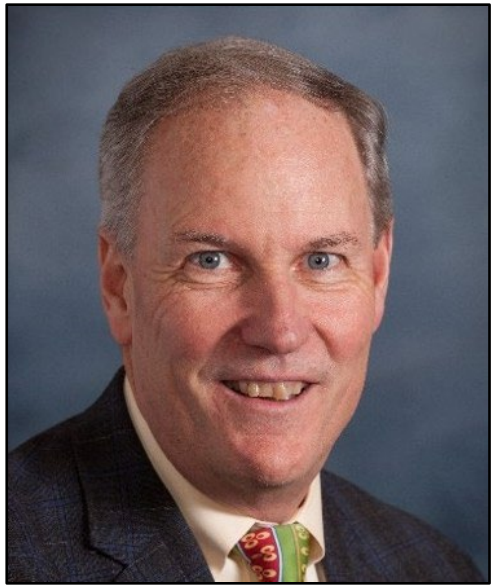
NFCA – "Associate – Advocate" Fire & Life Safety

- Webinars, FSBI - Fire Safe Build India
- CSI – Construction Specifications Institute
- CSC – Construction Specifications Canada
- NFPA Expo & Committees
- ICC Expo & Hearings
- Dubai, UAE & Doha, Qatar
  & Riyadh, Saudi Arabia,
  Australia, New Zealand…
- ***Accreditation, Education, More…***

Today's Presentation

National Fireproofing Contractors Association

"Fireproofing Fluted Metal Deck-to-Beam Connections"



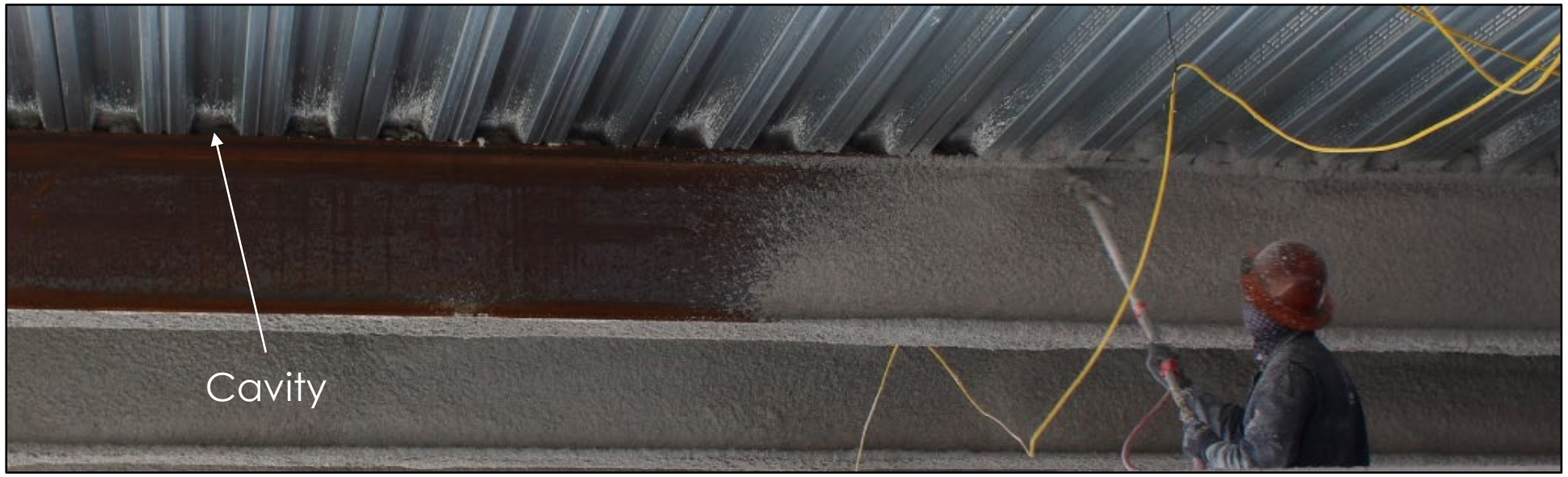
Bill McHugh

Carl Fernald

Rich Walke

Info@NFCA-Online.org

Terminology

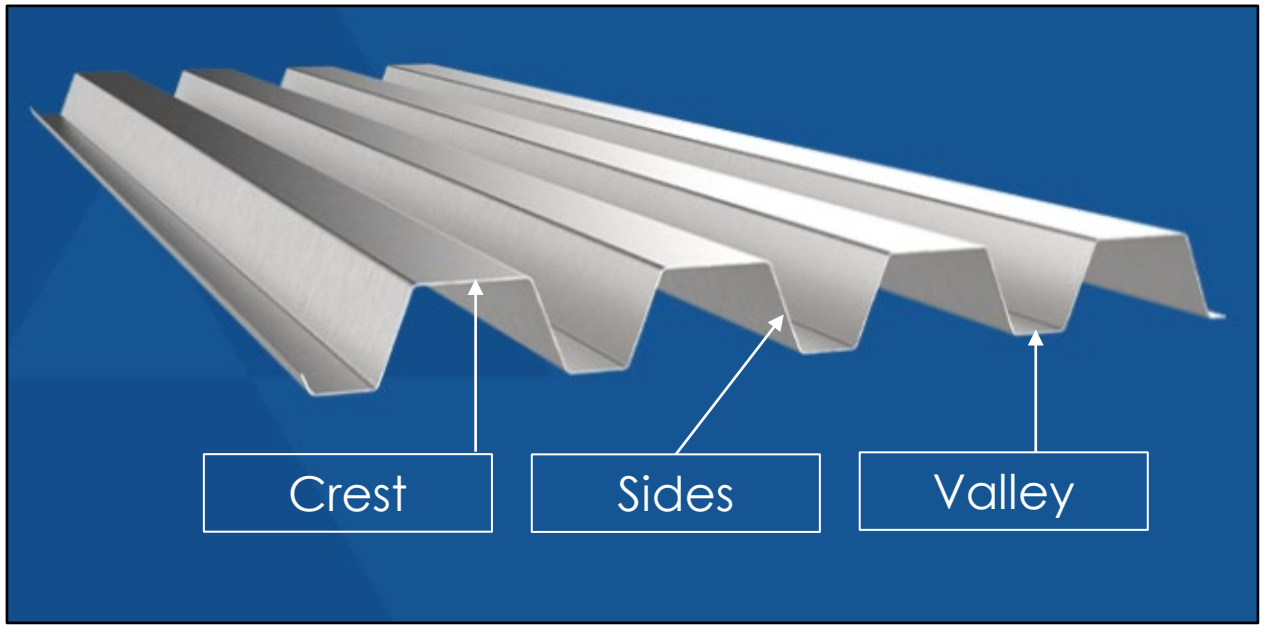


What are we referring to when we say “protecting flutes”?

- Protecting the cavities between the crests of a fluted steel deck and the top of the beam or joist

Terminology Cont.

The cavity in question is that located beneath the crests of the steel deck and above the beam



The word “flute’ is not defined by Merriam-Webster as it pertains to steel deck. However, industry terminology would suggest it is the cavity created by the wave-like profile of the deck

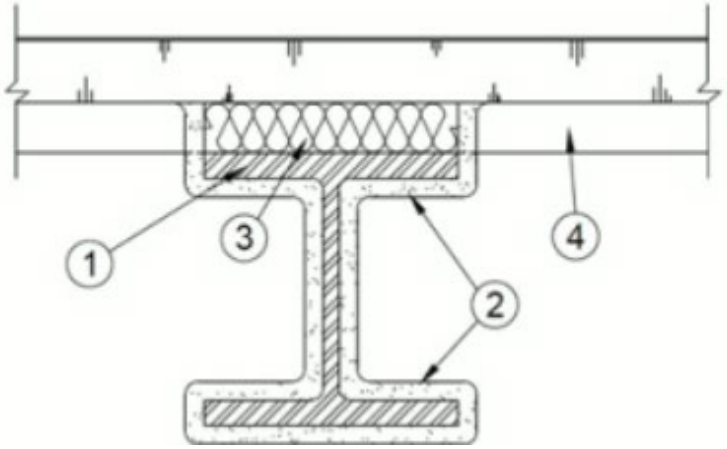
Terminology Cont.

- Multiple words and phrases are used to describe these cavities:
  - Flutes – As used by UL in the BXUV Guide Info
  - Cavities – As used by UL in the BXUV Guide Info
  - Crest areas – As used by UL in many designs
  - **Flute cavities**
  - Voids
  - Gaps

- ***Should the industry define this condition better?***

Why Protect the Cavities?

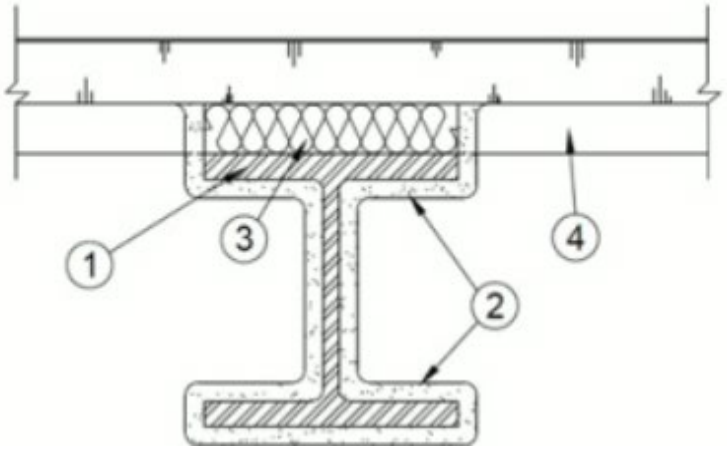
- If left unprotected, convective heat transfer into the top flange of the beam and into the steel deck could jeopardize the structural integrity of the beam, and the floor or roof assembly. From the perspective of testing in accordance with ASTM E119 or UL 263, it would also shorten the time to the temperature-end-point of the beam and deck



UL Drawing

Why Protect the Cavities?

- ASTM E119 and UL 263 are test method standards, thereby allowing the test sponsor to determine the construction, even to the detriment of the performance of the assembly
- Result is there are various approaches for protecting or not protecting the flute cavities in the hundreds of UL designs



UL Drawing

UL's Position on Filling Flutes

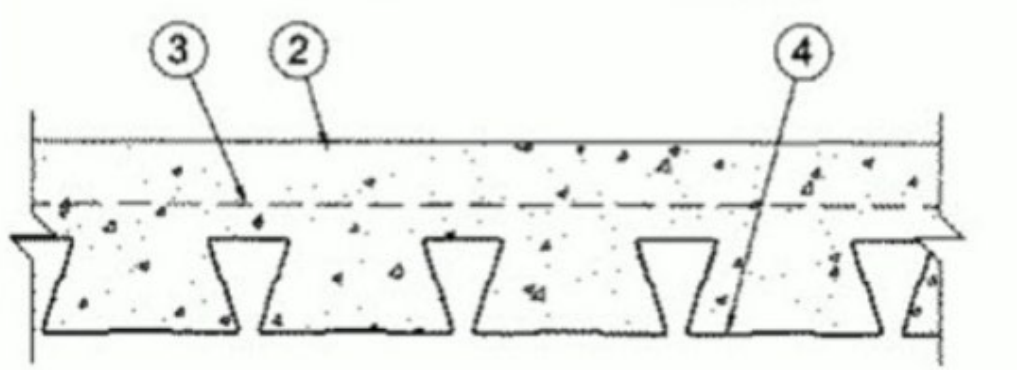
1. UL's BXUV Guide Info states "Cavities, if any, between the upper-beam flange and the steel floor or roof units should be filled with the fire-resistive coating material applied to the beam as guided below, unless specified otherwise in the individual design."

UL's Position on Filling Flutes Cont.

2. Most designs specifying beams and joists are silent on the protection of the cavities, thereby defaulting to the Guide Info
3. Multiple UL designs, such as D983, D997 and E902, state "Crest areas above the beam shall be filled …"
4. Multiple UL designs, such as D739 and D957, state "… the area between the steel deck and the top flange of the beam shall be filled."

UL's Position on Filling Flutes Cont.

5. Multiple UL designs, such as D904, D917, D928, D942, D947, D961, D963, D964, D984 and D991 state "Crest areas above the beam need not be filled …"
   - These designs utilize dovetail type deck which has very small cavities, which makes heat transfer minimal and filling the cavities difficult



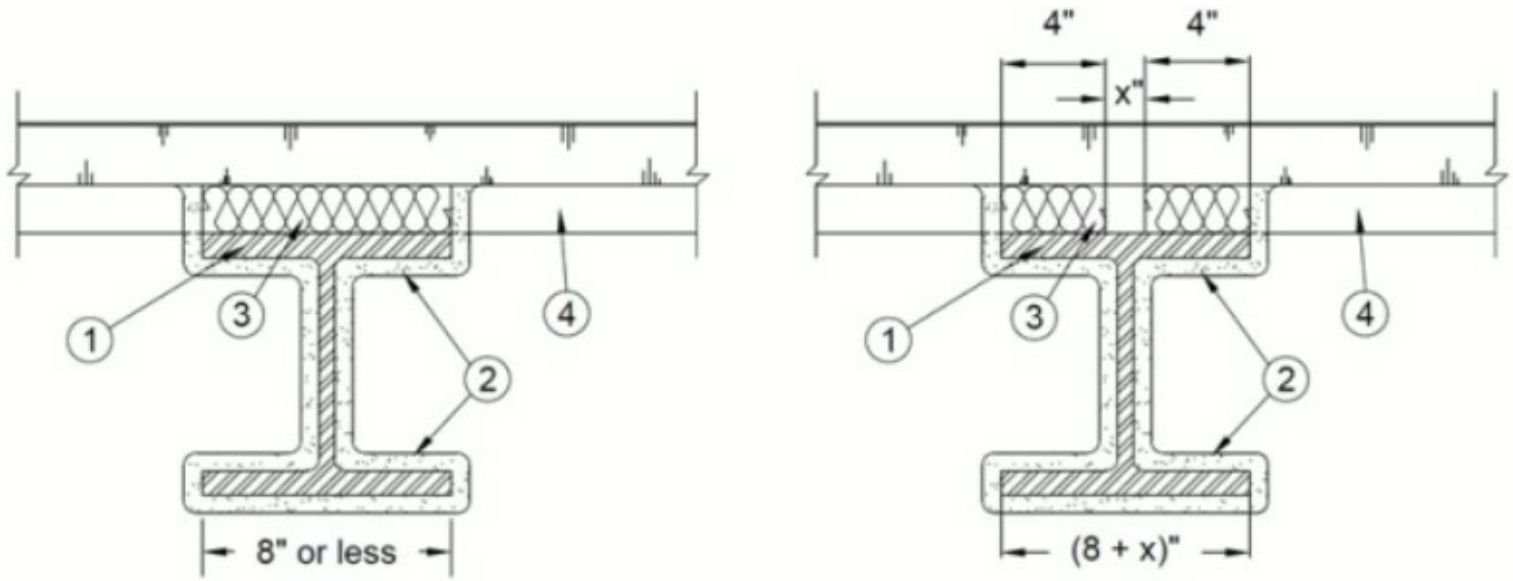
UL's Position on Filling Flutes Cont.

6. At least one UL design, D993, using a dovetail type deck, states "Crest areas above the beam shall be filled …".
7. Most UL designs protected with IFRM require cavities to be filled with min 6 pcf mineral wool
8. Most UL designs protected with board products require cavities to be filled with min 4 pcf mineral wool

UL Guide Info

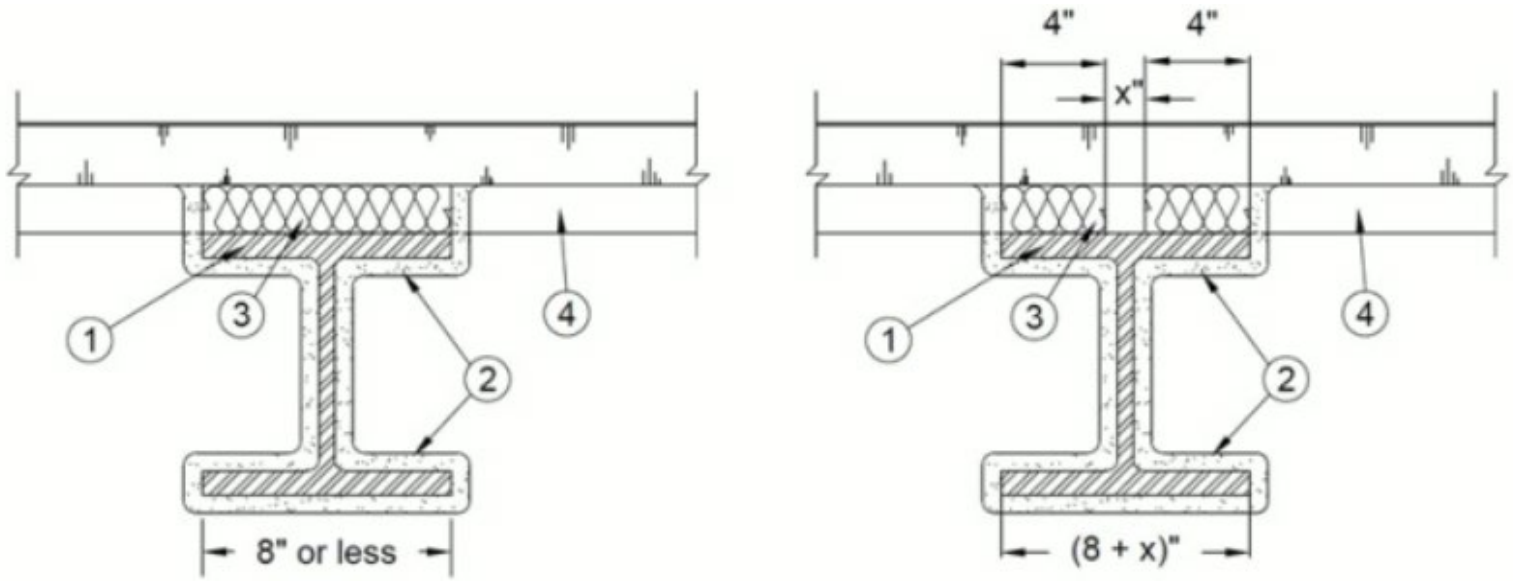
- In addition to requiring protection of the cavities unless otherwise state in the design, the UL BXUV Guide Information provides alternative methods of protecting the cavities.
- Alternatives:
    1. When the beam's flange width is greater than 8 in., fill the cavity with the required fireproofing to a minimum depth of 4 in. from each side.

UL Guide Info Cont.



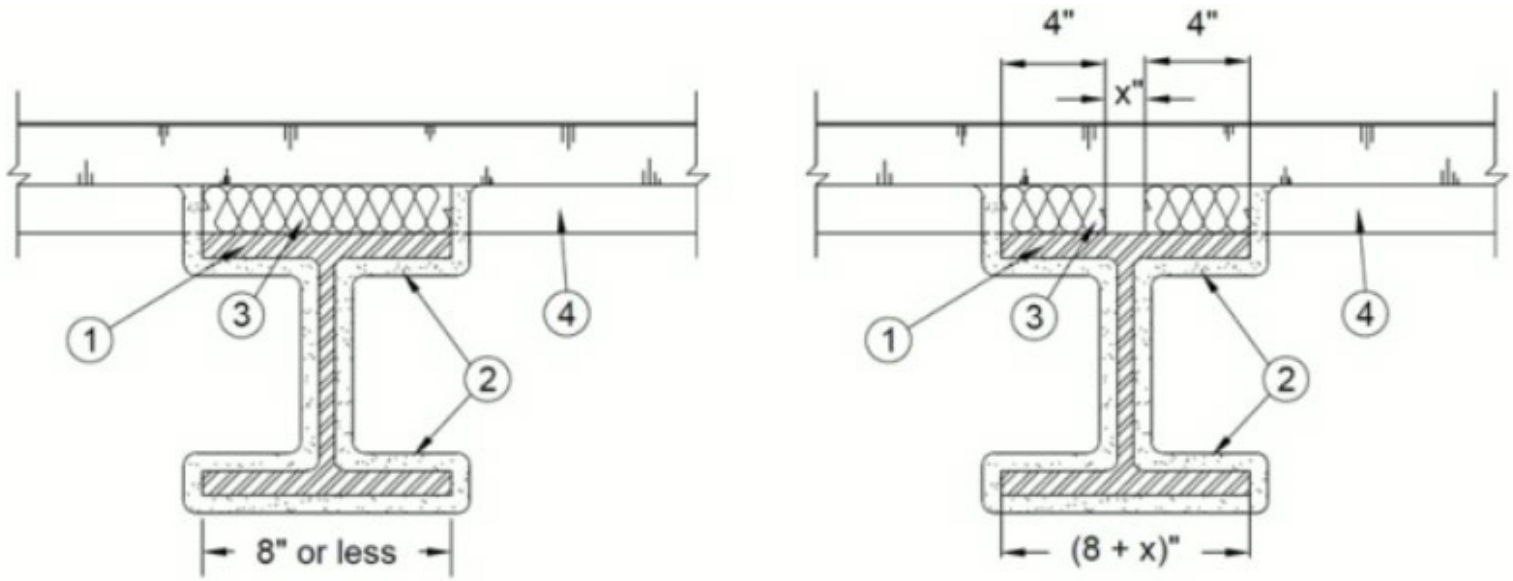
2. When the beam's flange width is less than 8 in., fill the cavity with minimum 6 pcf mineral wool, flush with the flange tips. Exposed ends of mineral wool sprayed with fireproofing to the same thickness and density as required on the beam.

UL Guide Info Cont.



3. When the beam's flange width is greater than 8 in., fill the cavity with minimum 6 pcf mineral wool to a minimum depth of 4 in. from each side, flush with the flange tips. Exposed ends of mineral wool sprayed with fireproofing to the same thickness and density as required on the beam.

UL Guide Info Cont.



- Alternatives involving filling flutes with mineral wool would apply to both SFRM and IFRM
- Filling the flutes with IFRM would not be a realistic solution

UL's Position on Filling Flutes Cont.

- In summary, there are multiple approaches to protecting the cavities depending on the type of protection and how the assembly was tested
- Always refer to the design in question. If silent on the protection of the flutes, follow the UL Guide Info.

Flute Cavities Parallel with Beam

- The UL Designs and BXUV Guide Information provide no guidance on protecting cavities above beams which are parallel with the beams or joists
- Lacking guidance, best practice could be one of the following:
  1. Where location of beam relative to cavities permits, protect deck to required deck thickness, and the top of the beam's top flange to the beam thickness
  2. Fill the entire cavity with fireproofing to the same thickness and density as required on the beam

NOTE: This is a discussion point only, and not a recommendation

IBC's Position on Protecting Flute Cavities

- The International Building Code (IBC) does not address the filling of flute cavities.
- The IBC requires assemblies to be tested in accordance with ASTM E119 or UL 263. A design criteria from a NRTL is evidence of such testing. As such, the design criteria must be followed.
- Section **703.2.1.4 Supplemental Features** requires justification for features or variations not incorporated into the tested assembly.

Inspecting Materials Protecting Flute Cavities

- The IBC requires SFRM to be *inspected* for thickness and density in accordance with ASTM E605. Although not required by code, AWCI Technical Manual 12-A provides an alternate method of *inspecting* SFRM for thickness and density.

Inspecting Materials
Protecting Flute Cavities Cont.

- ASTM E605 does not address the filling of the flute cavities or how to determine the thickness of materials protecting the flute cavities
- Section 5.3.4.2.2 of AWCI Technical Manual 12-A requires the flute cavities to be filled, unless not required by the design criteria. Where the design criteria references plugging, the applicable code shall be consulted. AWCI Technical Manual 12-A does not provide any specific method of determining the thickness. Keep in mind AWCI Technical Manual 12-A is not referenced in the IBC.

Inspecting Materials
Protecting Flute Cavities Cont.

- Likewise, the International Building Code (IBC) requires IFRM to be *inspected* for thickness in accordance with AWCI Technical Manual 12-B.
  - Section 6.4.1.8 of AWCI Technical Manual 12-B requires the flute cavities to be protect based on the design criteria, but does not provide any specific method of determining the thickness

Determining Thickness of Fireproofing and Mineral Wool

- Lacking guidance from the standards, the design professional, contractor, special inspector and code official will need to agree upon the most appropriate method of determining the thickness of the fireproofing and/or mineral wool filling or plugging the flute cavities

NOTE: This is a discussion point only, and not a recommendation…yet.

Suggested Methods of Inspecting Fireproofing and Mineral Wool

- Cavities filled with SFRM fireproofing:
  - Visual inspection during application
  - Projecting thickness gauge, screwdriver or similar object through fireproofing noting changes in resistance
- Cavities filled with or plugged with mineral wool:
  - Dimensional measurement prior to application
  - Projecting thickness gauge, screwdriver or similar object through mineral wool noting changes in resistance

NOTE: This is a discussion point only, and not a recommendation…yet.

Suggested Methods of Inspecting Fireproofing and Mineral Wool Cont.

- SFRM fireproofing applied over mineral wool filling or plugging cavities:
  - Physical measurement of thickness relative to some fixed point
  - Projecting thickness gauge, screwdriver or similar object through fireproofing, noting changes in resistance

NOTE: This is a discussion point only, and not a recommendation…yet.

Suggested Methods of Inspecting Fireproofing and Mineral Wool Cont.

- IFRM fireproofing applied over mineral wool filling or plugging cavities:
  - Physical measurement of thickness relative to some fixed point
  - Projecting thickness gauge, screwdriver or similar object through fireproofing, noting changes in resistance

NOTE: This is a discussion point only, and not a recommendation…yet.

Flutes, Cavities, Voids – Conclusions

- Fireproofing Industry Consensus Needed because…
  - Inspections not consistent
  - Expectations not clear
  - Listings not always list protection method
  - Guide Info will need updating after Industry Consensus

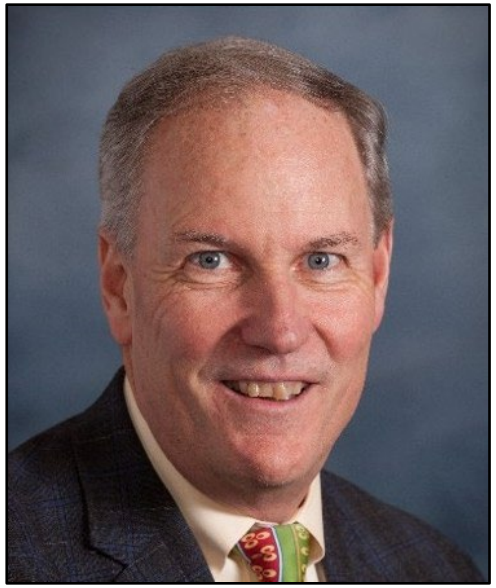
NOTE: CONSENSUS NEEDED

This is a discussion point only and not a recommendation…yet.

Today's Presentation

National Fireproofing Contractors Association

"Fireproofing Fluted Metal Deck-to-Beam Connections"



Bill McHugh

Carl Fernald

Rich Walke

Info@NFCA-Online.org

National Fireproofing Contractors Association

Thanks for Attending!!!

National Fireproofing Contractors Association

National Fireproofing Contractors Association
800 Roosevelt Road – Building C, Suite 312
Glen Ellyn, IL 60137
(708) 236-3411 – Info@NFCA-online.org
www.NFCA-online.org