January 12, 2021 @ 1:00pm

Bob Kuserk (APA – The Engineered Wood Association)

Fire Protection of Lightweight Floor Assemblies

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- Educational programs and publications by the PHRC address a wide range of topics relevant to the home building industry and are designed to reach a diverse audience: builders, code officials, remodelers, architects, developers, engineers, planners, landscape architects, local government officials, educators, etc. to provide professional development and continuing education

Continuing Education

- At end of the program, you can register for a certificate to receive the following credits for this session:
  - 1.0 PA Dept L&I Contact Hour
  - 1.0 PDH
  - 1.0 AIA LU|HSW (PHRCWEB1121)
  - 1.0 ICC Contact Hour (0.1 CEU) (25249)
  - 1.0 NARI hour/CEU

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AIA Info

Credit(s) earned on completion of this course will be reported to AIA CES for AIA members. Certificates of Completion for both AIA members and non-AIA members are available upon request.

This course is registered with AIA CES for continuing professional education. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the AIA of any material of construction or any method or manner of handling, using, distributing, or dealing in any material or product.

Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.

Program Description

This program identifies the features and benefits of wood I-joists which explains the prevalence in the market. The program also explains UL fire testing that identified the fire performance failures or light frame floor assemblies which led to changes in the floor protection requirements of the International Residential Code® (IRC®). Those IRC® protection requirements are explained. Alternate methods of protecting I-joist assemblies per ICC-ES® Acceptance Criteria AC14 are explained along with the details of acceptable installation of specific assemblies. A statewide survey of fire marshal is reported to give attendees a sense of peer consensus on acceptable methods of protecting wood I-joist floors.

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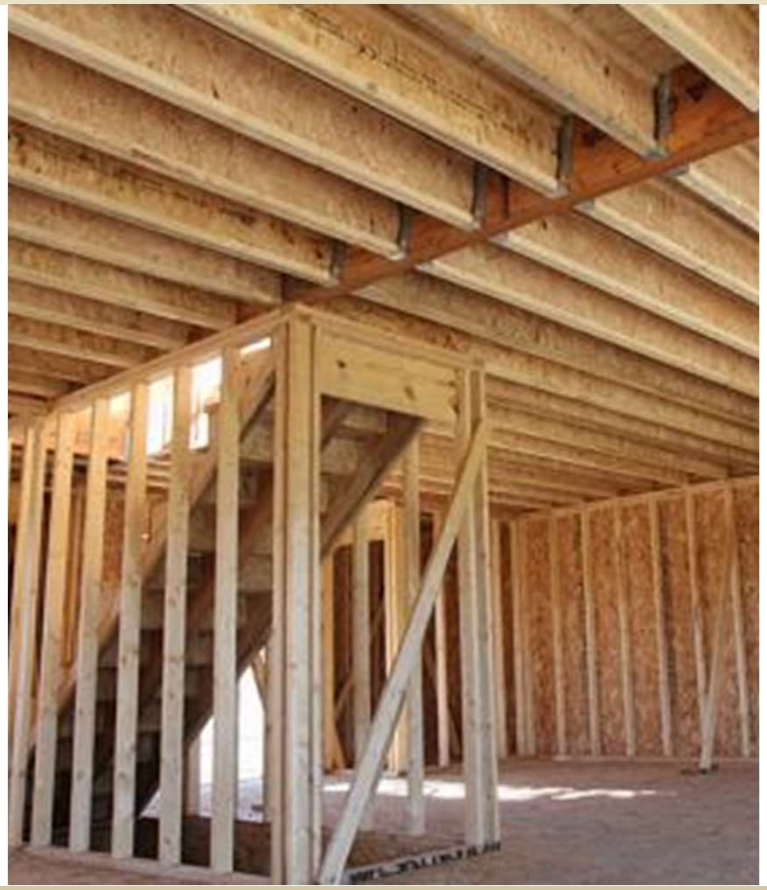
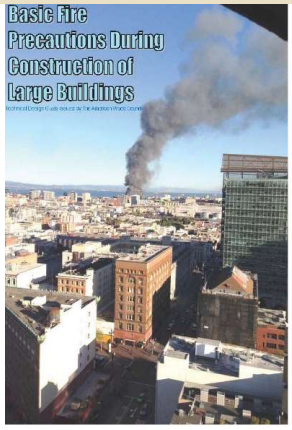
Today's Presentation

- **Residential construction and wood I-joists**
- **Wood I-joist fire protective assemblies and *International Residential Code*® (IRC®) *Pennsylvania ACT 1 2011* requirements**
- **Preventing civilian and firefighter injuries and deaths**
- **Wood products industry engagement in firefighter safety**



Today's Presentation



Does <u>not</u> cover:

- **Fires in unfinished buildings**
  - ***Basic Fire Precautions During Construction of Large Buildings***
  - ***Fire Department's Role in Prevention and Suppression of Fires During Construction of Large Buildings***
  - **For information on these topics, visit the Construction Fire Safety Coalition at:**

    www.constructionfiresafetypractices.org

Learning Objectives

At the end of this program you will be able to:

- Identify features, benefits and fire safety challenges for wood I- joist construction
- Explain results of a statewide fire marshal study on wood I-joist and protection awareness
- Identify seven methods to protect engineered wood construction to safeguard public and first responders
- Identify independent agency reports that evaluate protection equivalencies

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Module 1: Engineered Wood I-Joists

Engineered Wood I-Joists

Markets: Engineered Wood I-Joists

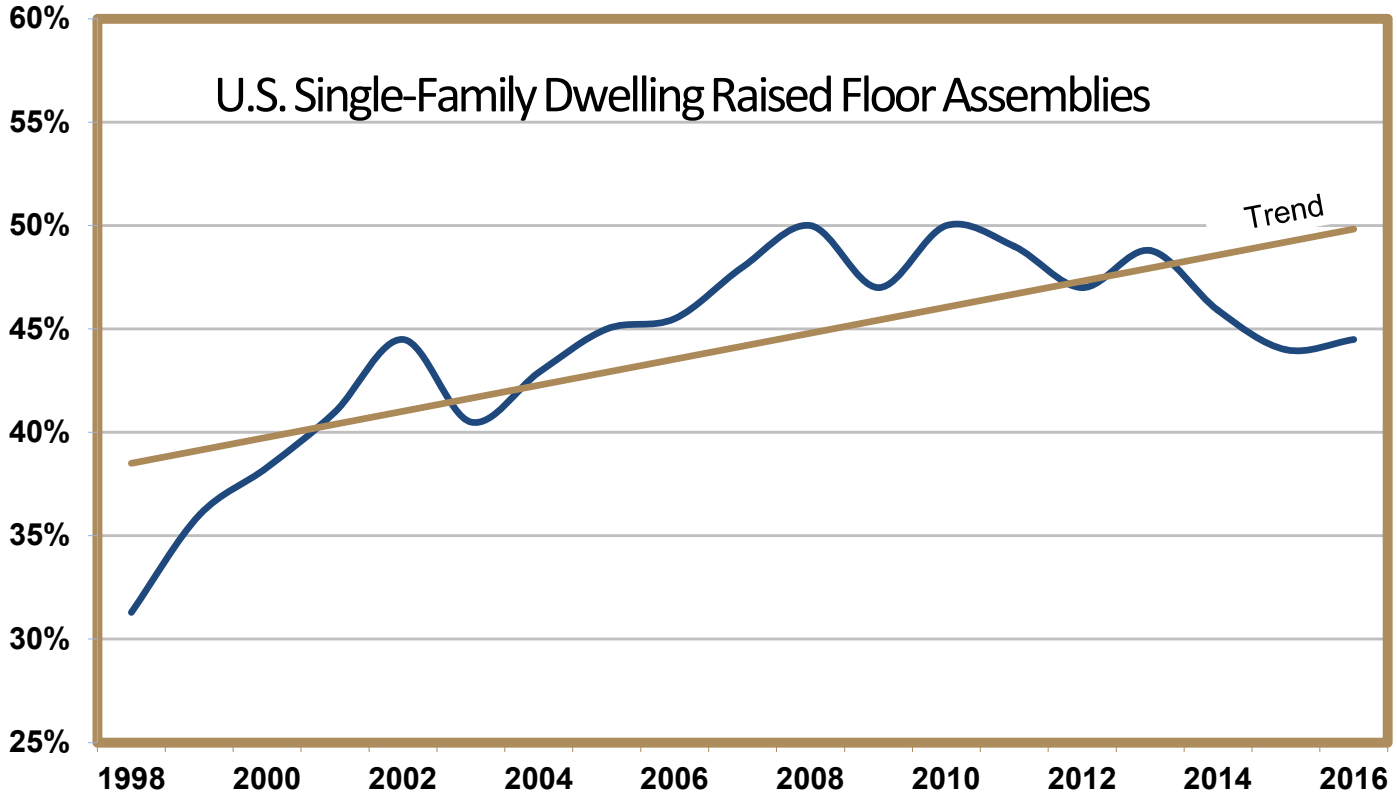
Premium product advantages:

- Builders: installation ease and consistent performance
- Homeowners: stable floors that don’t squeak
- Efficient use of timber resources
- Desired architectural design and construction attributes
- Structural performance

Markets: Wood I-Joist Popularity

- **Entered the market in 1969**
  - **Wood resource shortage in the 1970s drove development**
  - **Wood I-joists are not less expensive**
- **Successful performance increased use despite additional cost**

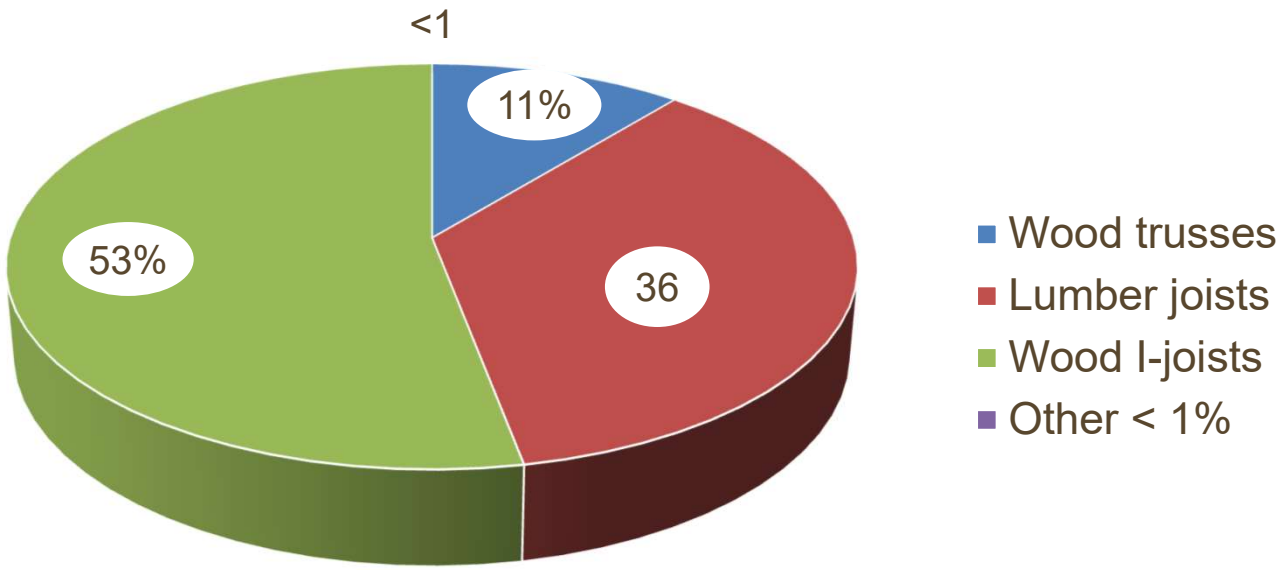
Markets: I-Joist Market Share



Sources: Builder surveys, NAHB, Home Innovation Research Lab and APA Forecast

2016 Most Common Wood Floor Assembly

(Single-family Raised Floors)



Source: Home Innovations Builder Practice Survey 2016

Markets: Architectural Design

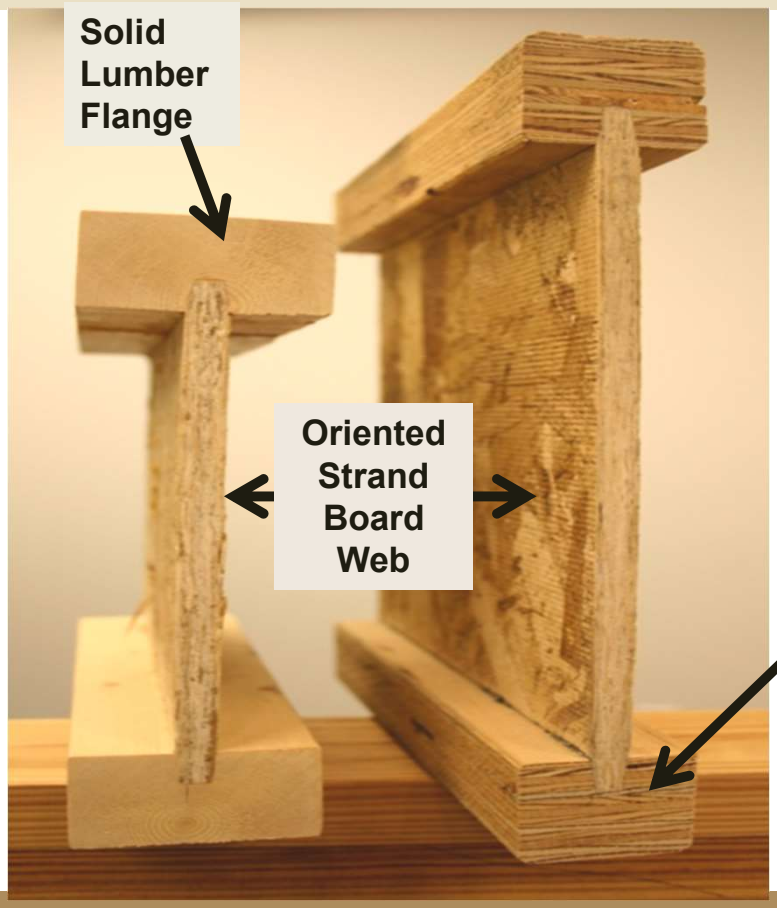
Design flexibility with greater open spaces

- **Manufactured to required length**

Allows longer spans/larger rooms

I-joists used as floor/ceiling assembly

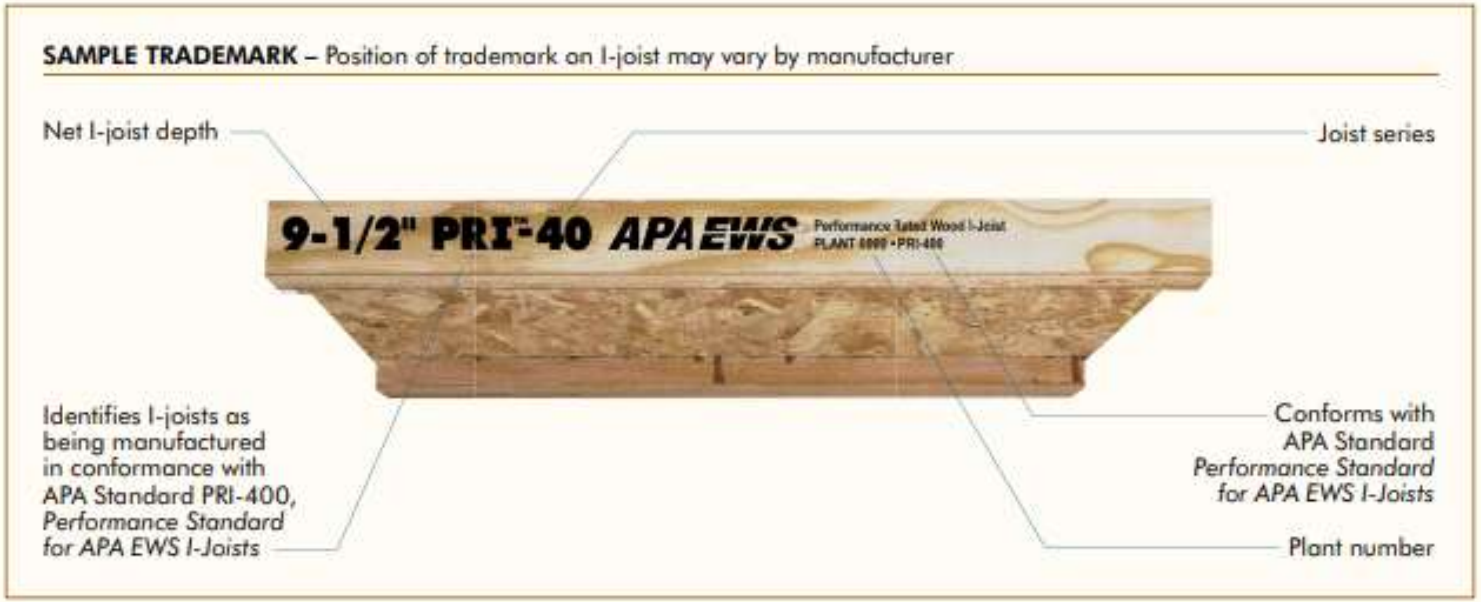
Structural Performance



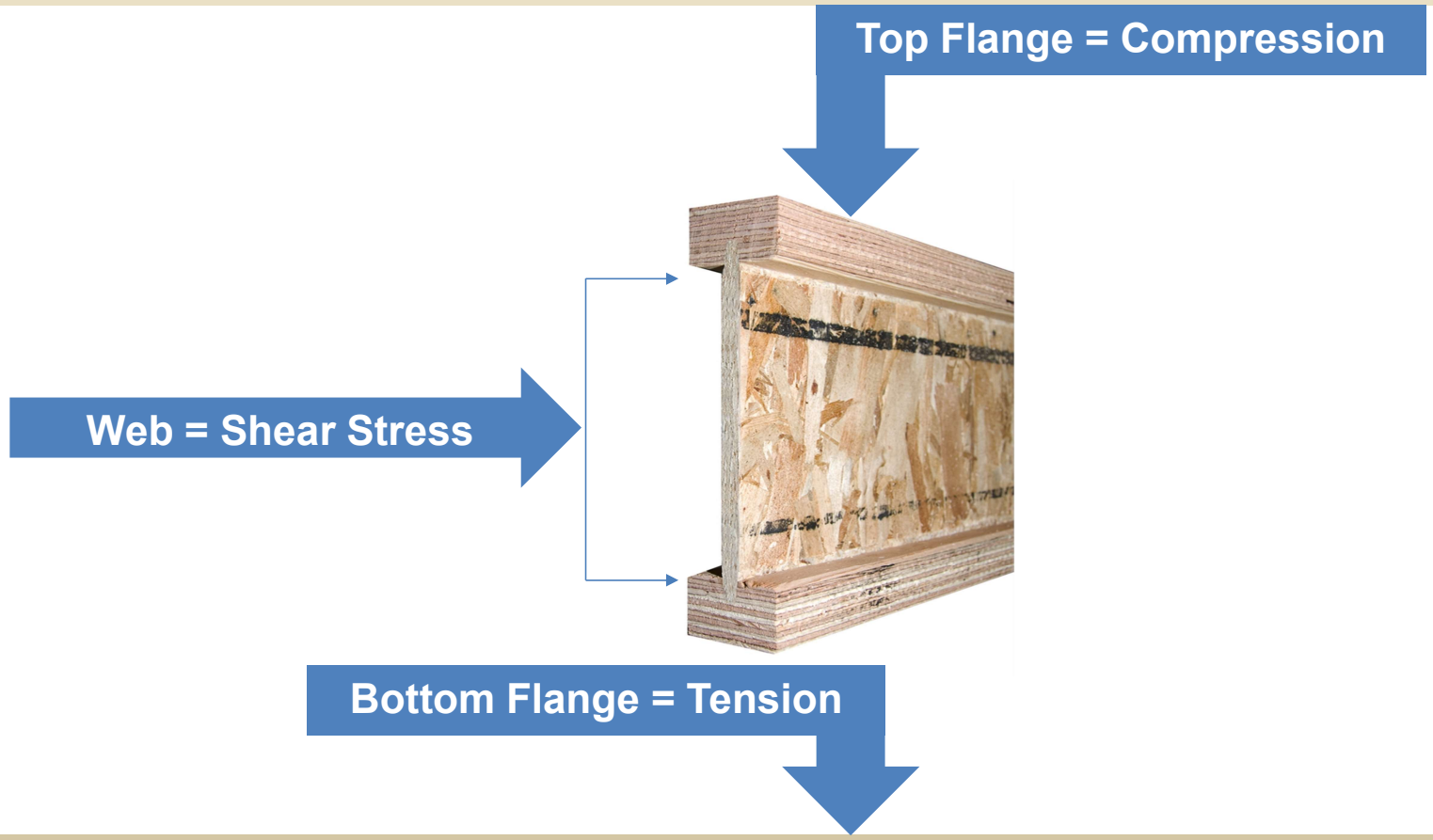
Strength and stiffness established through:

- Engineering
- Testing
- Manufacturing quality controls

Identifying APA Trademarked I-joists



Joist Performance



Users: I-joist Features and Benefits

- Reduced callbacks
- Long lengths
  - Simpler floor layouts
  - Greater design flexibility
  - Flatter, quieter floors

Users: I-joist Features and Benefits

- **Material consistency**
  - **Light weight**
  - **Easier to handle**
  - **Faster installation**
  - **Less waste**

Consumer: I-joist Features and Benefits

- **Environmentally friendly**
  - **Use less wood fiber than lumber**

Dimension lumber cross-section

Wood placed where stresses are greatest

Consumer: I-joist Features and Benefits

- Environmentally friendly
- Help meet energy code requirements
  - Ductwork located in conditioned space

Consumers: Resource Efficiency

Wood I-joists qualify as a "resource-efficient" framing material in many green building standards

IgCC
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GREEN BUILDING INITIATIVE®

UL CERTIFIED ENVIRONMENTAL PRODUCT DECLARATION

NGBS GREEN™
Home Innovation Research Labs

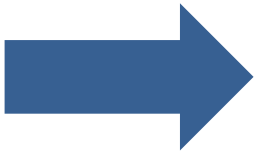
GreenPoint RATED™

Module 2: Fire Studies

Changes in Residential Construction?

Feature

- Larger homes/larger rooms
- More open floor plans
- Increased fire loads/contents
- Floor/ceiling/attic voids
- New building materials



Fire Effect

- Faster fire propagation
- Shorter time to flashover
- Shorter escape times
- Shorter time to structural collapse

Source: UL University – Structural Stability of Engineered Lumber in Fire Conditions – Underwriters Laboratories

UL Fire Tests

- **Single-family dwelling**
  - **“Legacy” vs. “Modern” contents**
- **Time to flashover**

Legacy Contents	Modern Contents
???	???

In November 2009, Underwriters Laboratories conducted a side by side comparison of two simulated living room fires. The purpose was to gain knowledge on the difference between modern and legacy furnishings. The rooms measured 12 ft by 12 ft with an 8ft ceiling and had an 8 ft wide by 7 ft tall opening on the front wall. Both rooms contained similar amounts of like furnishings.

Both rooms were ignited by placing a lit stick candle on the right side of the sofa. The fires were allowed to grow until flashover.

UL Fire Tests

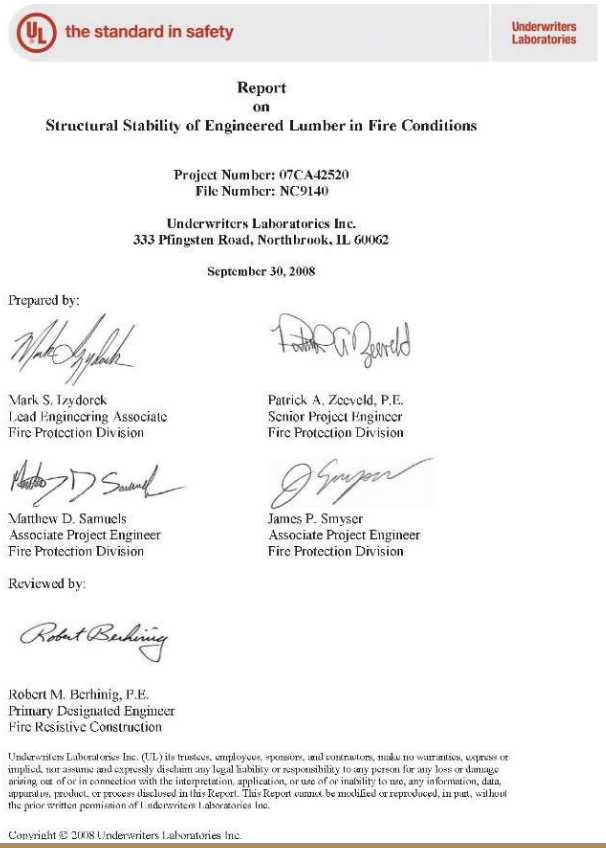
- **Single-family dwelling**
  - **“Legacy” vs. “Modern” contents**
- **Time to flashover**

Legacy Contents	Modern Contents
29:30	3:30

Wood I-Joists Under Fire Conditions

Unprotected wood I-joist fire performance:

- Primarily basement fires
- Underwriters Laboratories Report - 2008



the standard in safety | Underwriters Laboratories

Report
on
Structural Stability of Engineered Lumber in Fire Conditions

Project Number: 07CA42520
File Number: NC9140

Underwriters Laboratories Inc.
333 Pfingsten Road, Northbrook, IL 60062

September 30, 2008

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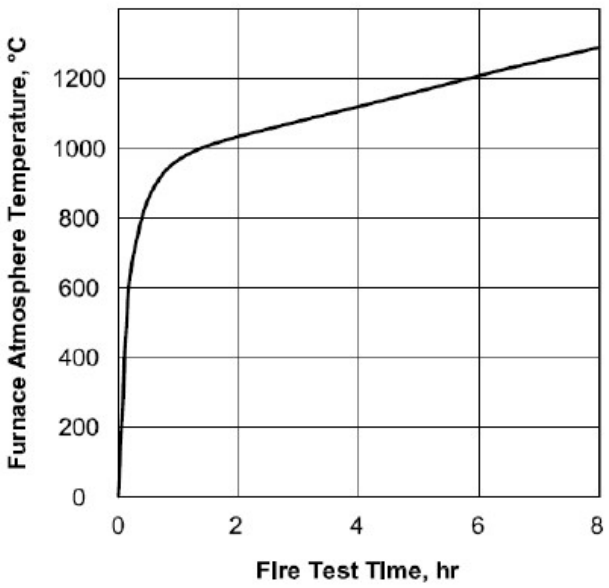
Activity

UL Collapse Times Studies



American Society for Testing and Materials (ASTM) E119
"Standard Time-Temperature Curve"

- **Test scenarios**
  - Various nominal and engineered wood floor/ceiling assemblies
  - Nine full-scale fire tests
    - Sawn wood
    - Wood trusses
    - I-joists
  - Two 300-lb mannequins
  - ASTM E-119 fire test protocol
    - Standard Time-Temperature Curve

Estimate the "collapse time" for the following assemblies . . .

Activity

UL Collapse Times Studies

Construction Material/Condition	Collapse Time
Unprotected 12-in. wood I - joists (24” O.C.)	06:03
Unprotected solid-sawn 2 x 10 (16” O/C.)	18:45
1/2 - in. GWB-protected 12-in. I-joists (24” O.C.)	26:45
1/2 - in. GWB-protected 14 - in. parallel-chord truss with glued connections (24” O.C.)	26:45
1/2 - in. GWB-protected plated parallel-chord truss	29:15
1/2 - in. GWB - protected 2 x 10 (16” O.C.)	44:45
1/2 - in. GWB-protected 2 x 6 with 2/12 pitch roof (16” O.C.)	40:00

Source: Underwriters Laboratories: “Improving Fire Safety by Understanding the Fire Performance of Engineered Floor Systems and Providing the Fire Service with Information on Tactical Decision Making (2012)”. Table 2.

Discussion

Collapse Times Studies

What data from the UL fire tests did you find useful, interesting or enlightening?

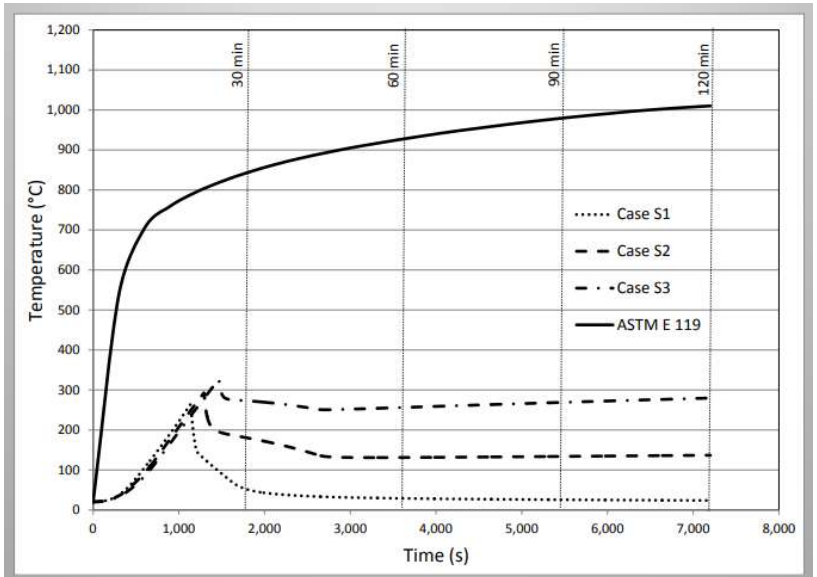


Figure 3 – ASTM E 119 Temperature-Time Curve vs. Temperature-Time Curves for Slow Fires

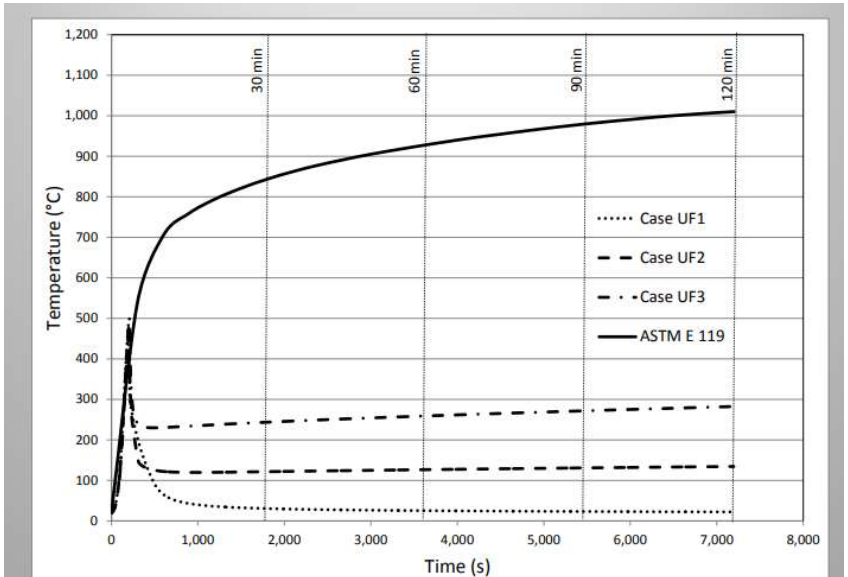


Figure 6 – ASTM E 119 Temperature-Time Curve vs. Temperature-Time Curves for Ultra-Fast Fires

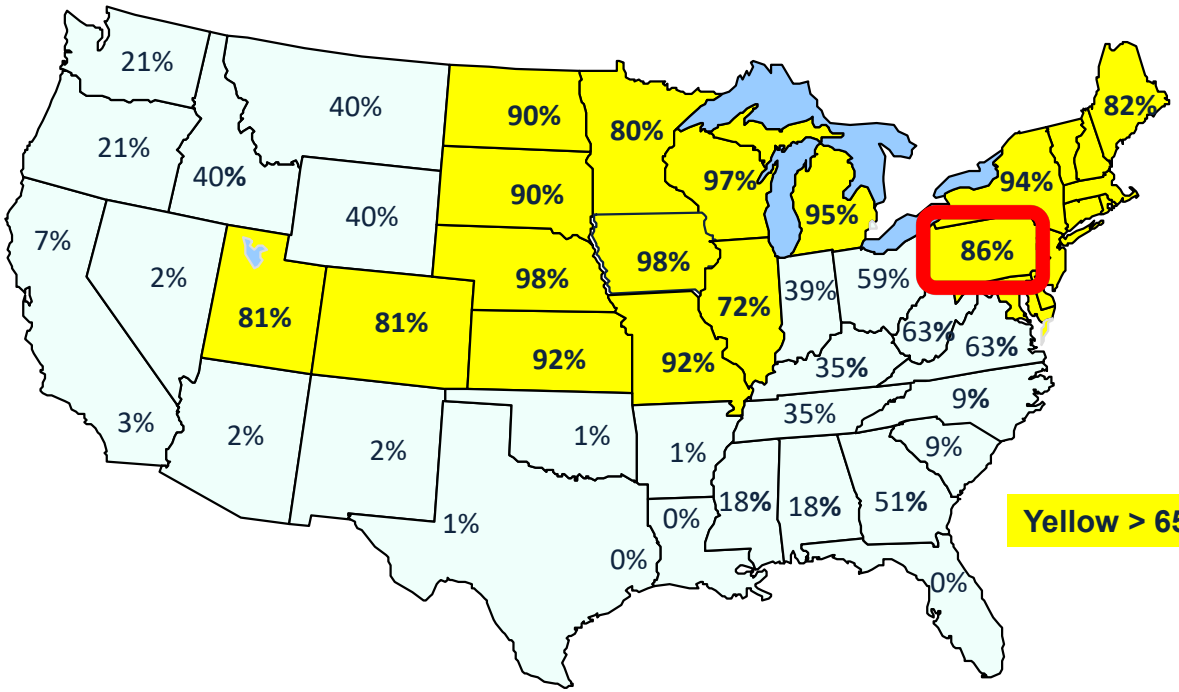
Fire Threat

Photo source: https://commons.wikimedia.org/wiki/File%3AUSMC-090227-M-9234B-441.jpg

- **Primarily a basement issue**
  - **First floor supported by "unprotected" parallel truss chord or wood I-joists**

Basements: Where are They?

Single family dwellings with basements (%)



VT – 82%
NH – 82%
MA – 95%
RI – 95%
CT – 95%
NJ – 96%
DE – 91%
MD – 91%

Yellow > 65% Basements

Source: NAHB 2016 Builder Practices Survey

UL Basement Fire Tests (2017-18)

Figure 3.6: Photograph of installed fuel package on the west side of the basement.

Source July (2018): https://ulfirefightersafety.org/docs/Understanding_and_Fighting_Basement_Fires.pdf

UL Basement Fire Tests (2017-18)

HRR Profile: Non-sprinklered Basement

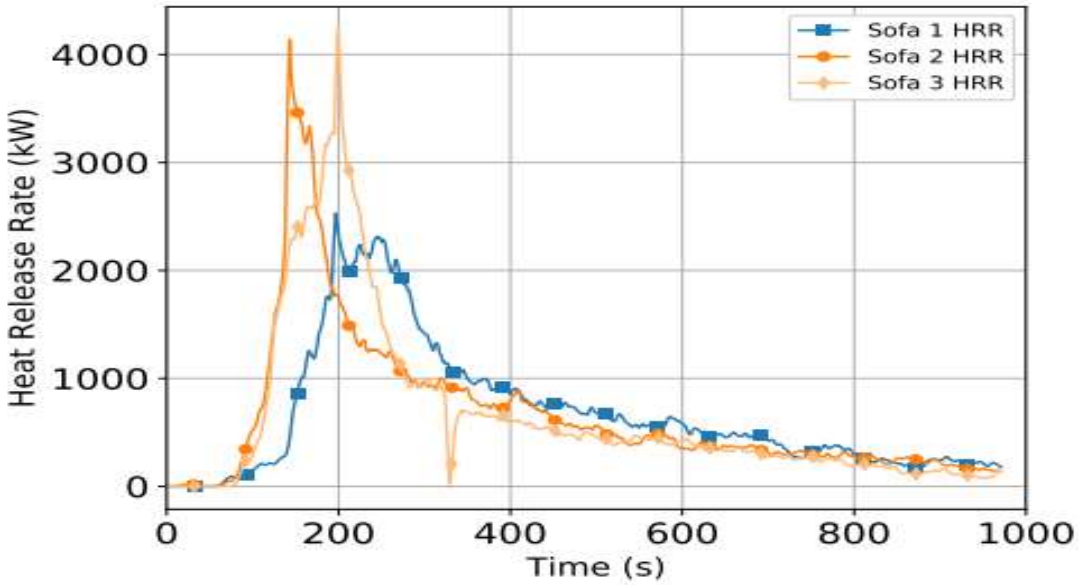


Figure 3.8: Heat release rate vs. time replicates for sofas used in experiments.

Source July (2018): https://ulfirefightersafety.org/docs/Understanding_and_Fighting_Basement_Fires.pdf

UL Basement Fire Tests (2017-18)

Temperature Profile: Non-sprinklered Basement

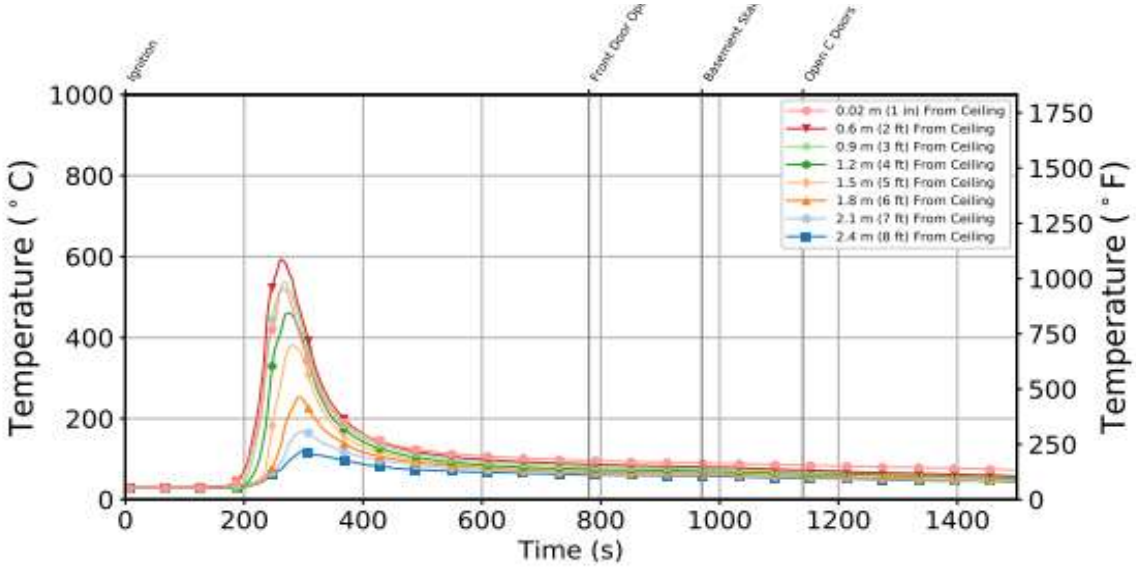
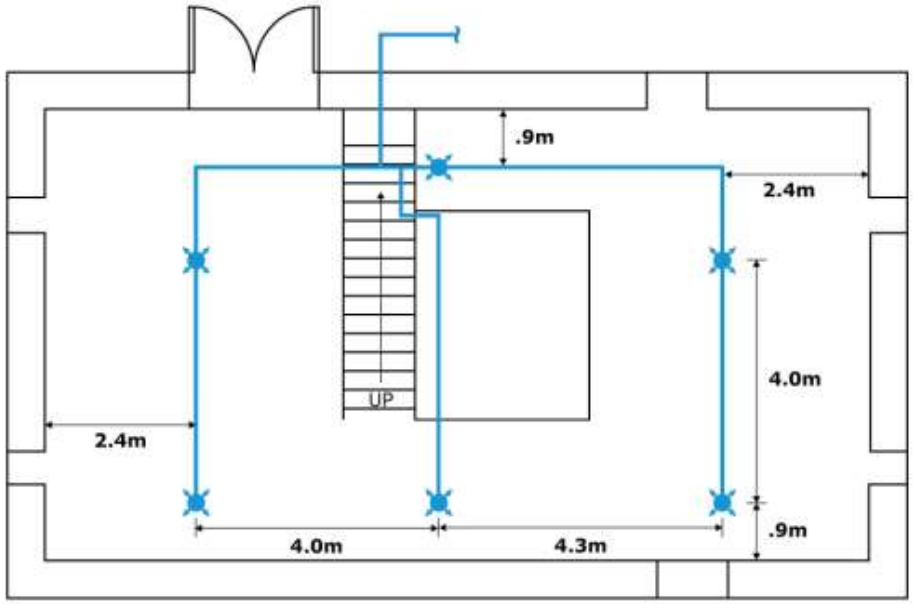


Figure 5.1: Experiment 1 - Thermocouple temperature time history from the Quadrant C thermocouple array in the basement.

Source July (2018): https://ulfirefightersafety.org/docs/Understanding_and_Fighting_Basement_Fires.pdf

UL Basement Fire Tests (2017-18)



Source July (2018): https://ulfirefightersafety.org/docs/Understanding_and_Fighting_Basement_Fires.pdf

UL Basement Fire Tests (2017-18)

Temperature Profile: Sprinklered* Basement

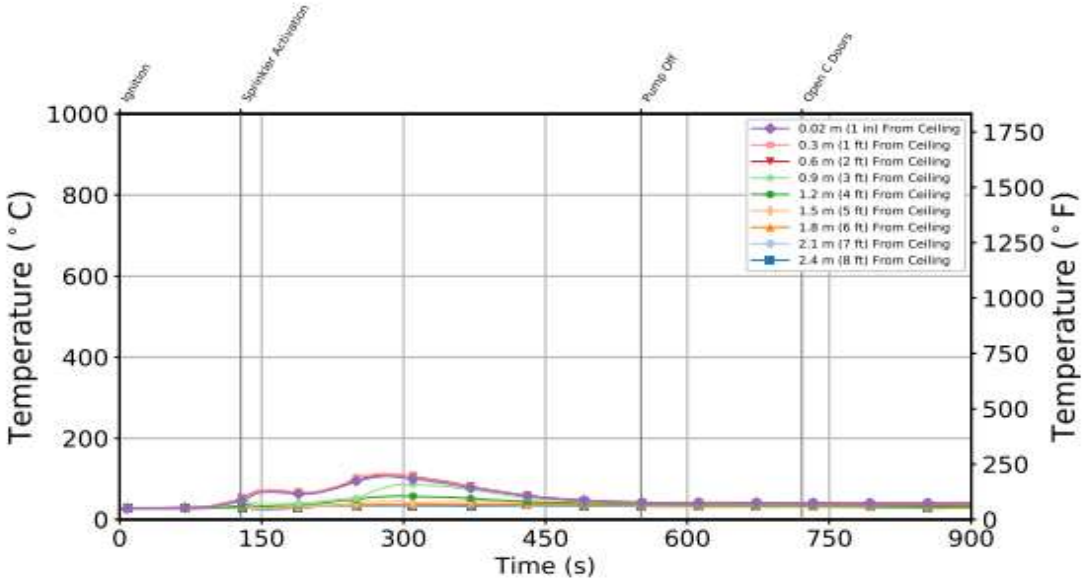


Figure 5.26: Experiment 10 - Thermocouple temperature time history from the Quadrant C thermocouple array in the basement.

*** Water supply = 300 gals.**

Source July (2018): https://ulfirefightersafety.org/docs/Understanding_and_Fighting_Basement_Fires.pdf

Experiment Outcomes

Experiment 1: Self-extinguished

Experiment 10: Residential sprinklers

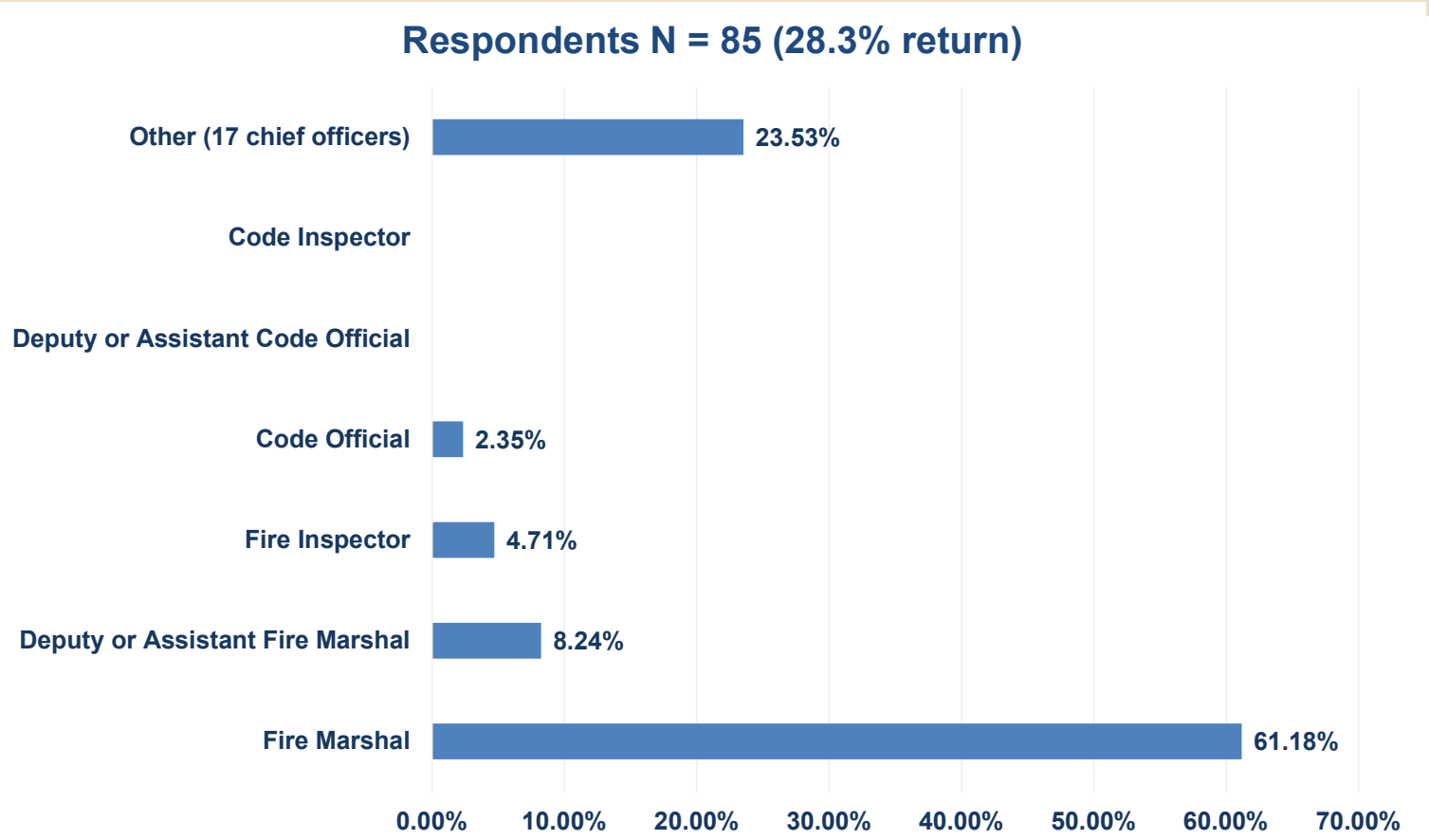
Module 3: Fire Service Survey

Colorado Fire Marshal Survey

Fire Marshals Association of Colorado was surveyed (2017) to assess its members' knowledge of:

- ***International Residential Code*® floor assembly protection requirements,**
- **Colorado's implementation of these requirements, and**
- **Opinions and preferences related to assembly protection options from:**
  - **APA Systems Report 405: *Fire Protection of Floors Constructed with engineered Wood I-Joists***

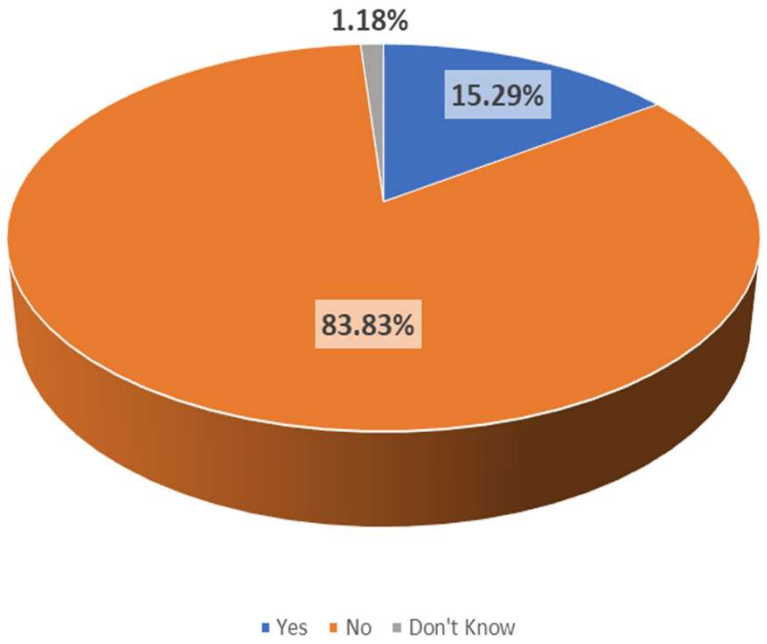
Colorado Fire Marshal Survey: Profession



Residential Sprinklers Required?

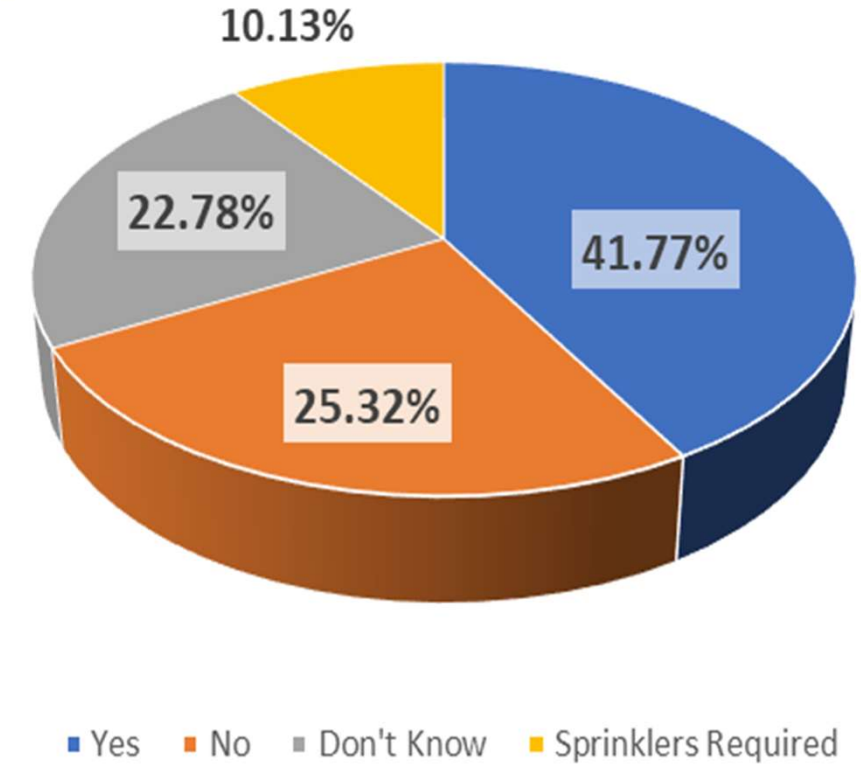
Question 5 –

Has your community adopted the* full sprinkler requirements *in the IBC® or IRC® for new one and two-family homes (full sprinkler requirements)?

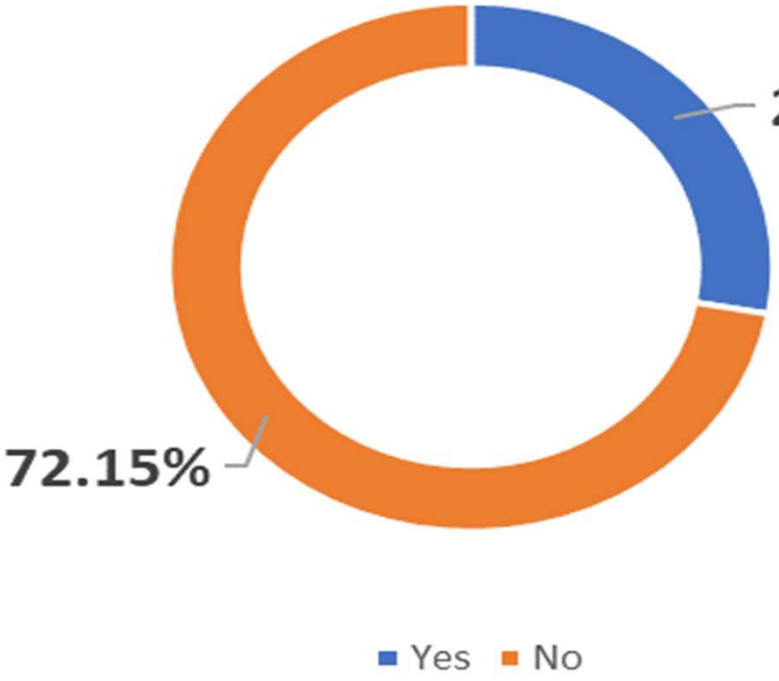


Floor Protection Assemblies Required?

Question 6 –
If you allow the construction of one and two-family homes in your community* without full sprinkler protection, *are local builders installing* protection for floor assemblies *as required in the IRC®?

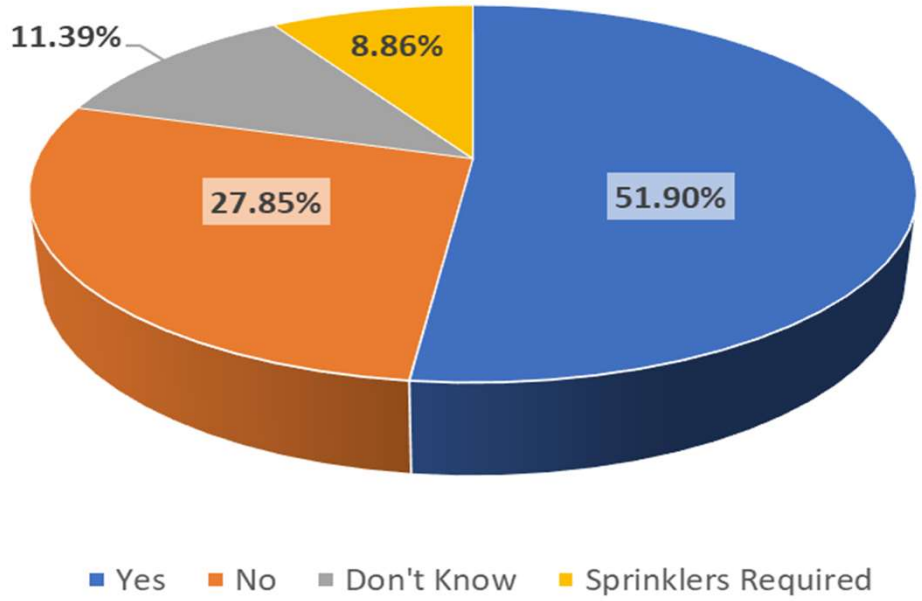


Fire Assembly Resistance?



Question 7 –
Are you aware of any resistance from local builders in complying with the requirements of the IRC® related to floor assembly protection?

Basement Sprinklers Only Option?



Question 8 –

Do you and members of your department feel that the* partial sprinkler protection *allowed under the IRC is an acceptable (or satisfactory) solution for a fire protective assembly?

Best Protection Method

Question 9 –
In your opinion, which of the following methods is the best way to provide protection for floor assemblies? (pick one, please)

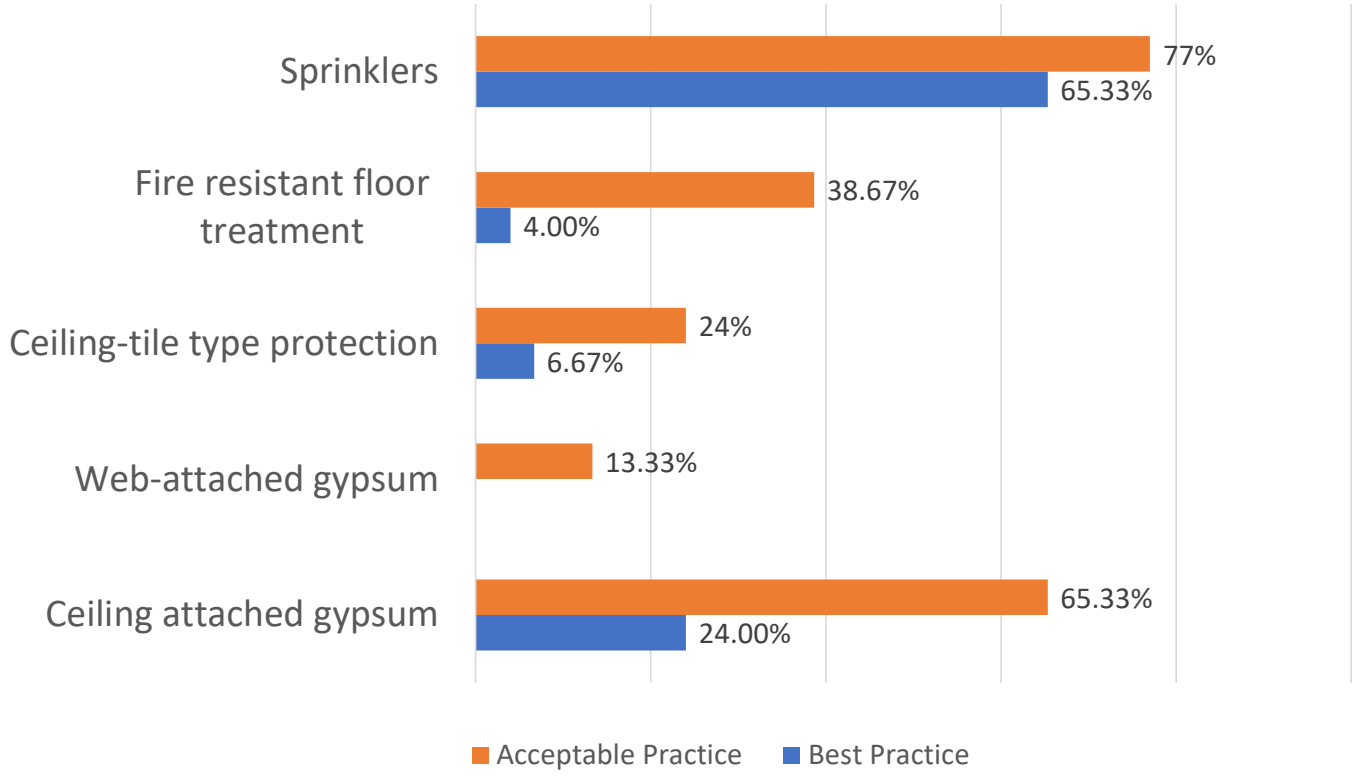
Method	N	%
Gypsum or equivalent fastened to the underside of the floor framing member	18	24.0
Gypsum or equivalent attached to the side of the web of the floor framing member	0	0
Gypsum or equivalent placed within the bottom of the floor framing member (like a ceiling tile)	5	6.67
Fire resistant treatment for the floor framing member	3	4.0
Automatic sprinkler protection	49	65.33

Acceptable Protection Method

Question 10 –
In your opinion, which of the following methods are acceptable ways to provide protection for floor assemblies? (choose as many as you like)

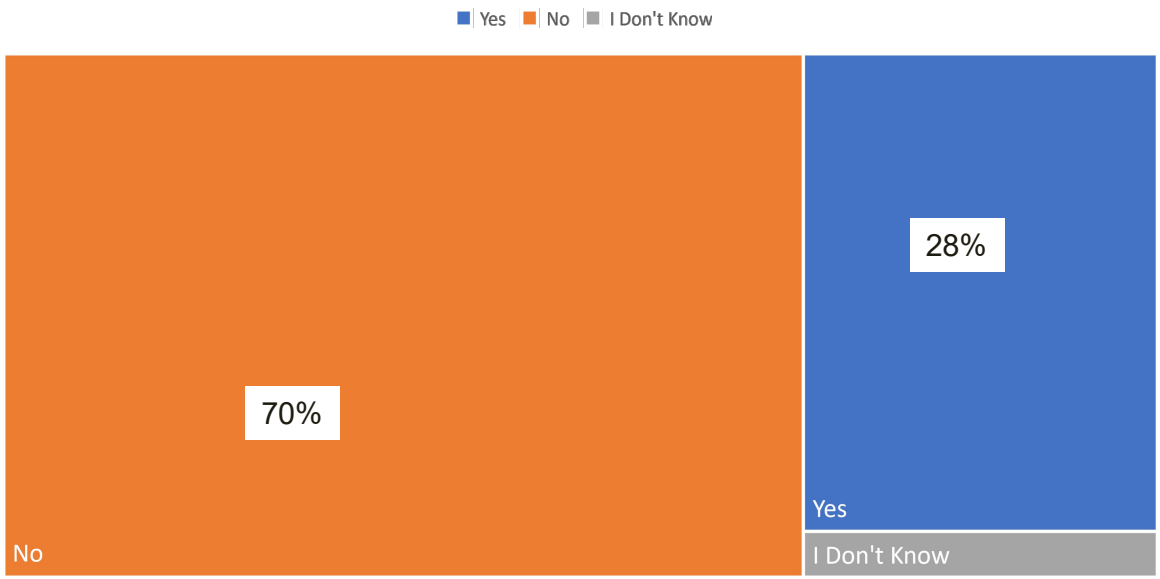
Method	N	%
Gypsum or equivalent fastened to the underside of the floor framing member	49	65.33
Gypsum or equivalent attached to the side of the web of the floor framing member	10	13.33
Gypsum or equivalent placed within the bottom of the floor framing member (like a ceiling tile)	18	24.00
Fire resistant treatment for the floor framing member	29	38.67
Automatic sprinkler protection	58	77.33

Best vs. Acceptable Method



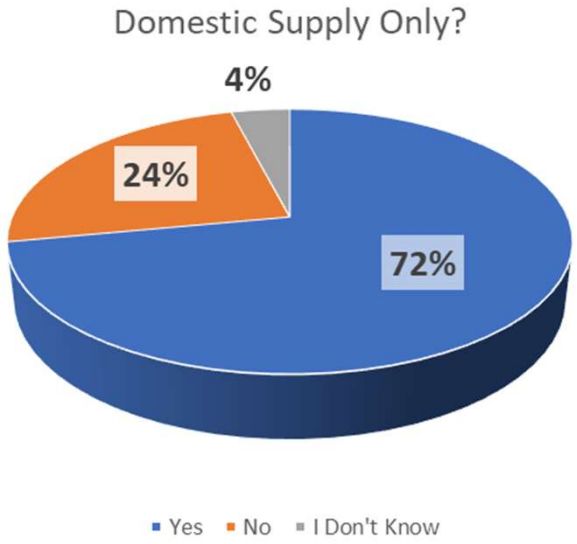
Colorado Fire Marshal Survey

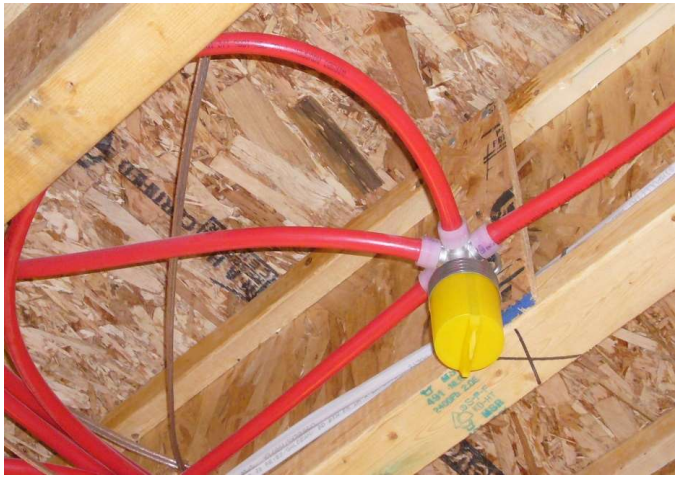
Question 11 –
Do you think that providing partial sprinkler protection of a basement only of a new home in your area is acceptable?



Colorado Fire Marshal Survey

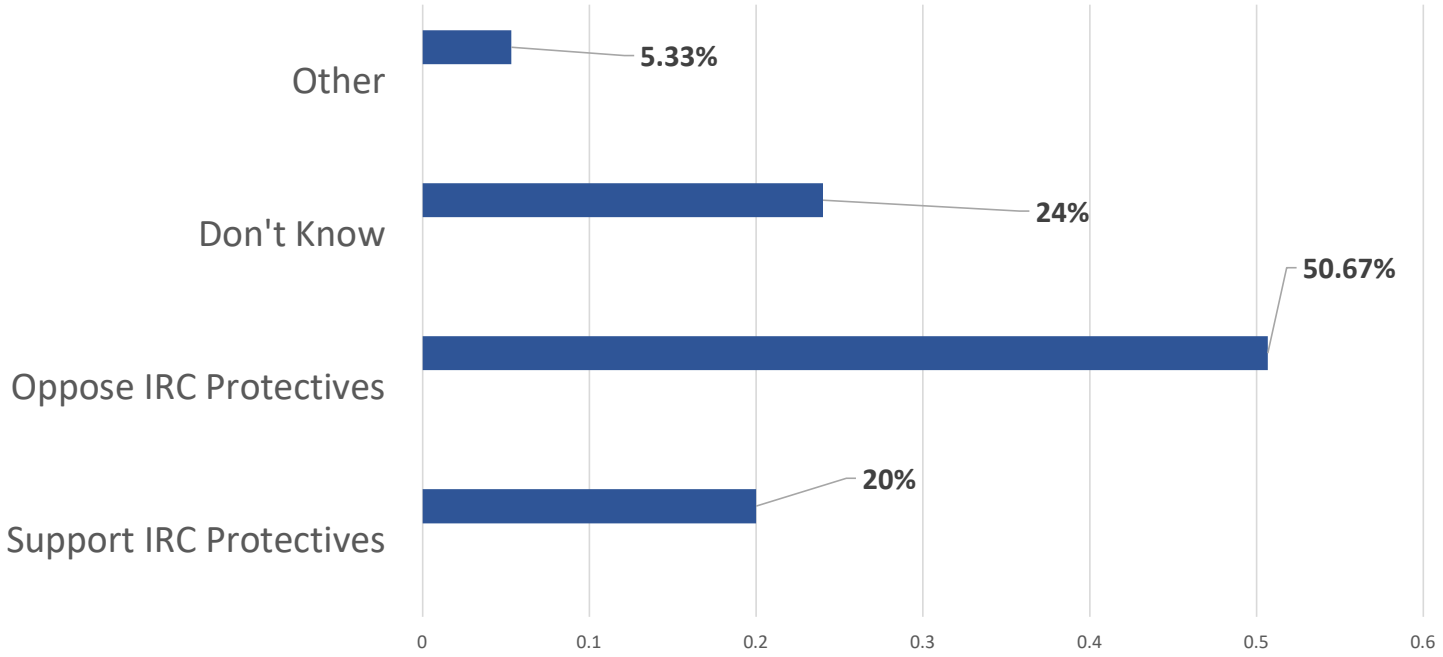
Question 12 –
Do you think that it is acceptable to provide sprinkler protection in a small area such as a basement with water supplied from the domestic water system (a combined water supply)?





Builders' Attitudes

Question 13 –
In your opinion, do you think that homebuilders would :



Module 4: Building Codes

Codes: Firefighter Protection

One firefighter or civilian fatality or injury is too many

- **Issue related to number of structural support designs – not just wood I-joists**
  - **Cold-steel-formed framing**
  - **Open-web trusses**
- **Building codes address features to protect first responders and the public**
  - **Code development process open to all interested persons**

Codes: Firefighter Protection

APA's past recommendations and positions:

- Recommended I-joist framing system protection well before code requirements
- Testified in support of adding protection into code
- Published series of I-joist floor system options to make protection effective and affordable
- Considered fire service concerns and safety when developing solutions and code provisions

Fire Protective Membrane Requirements

International Residential Code® (IRC®)

2012

2015

2018

Firefighter Protection

2010 ICC Final Action Agenda

IRC® RB 87-09/10 Public Comment 1:

- **Broad support: Firefighters, Fire Chiefs, Home Builders and the Wood Products Industry**
  - **Sean DeCrane, representing the International Association of Fire Fighters (IAFF),**
  - **Azarang (Ozzie) Mirkhah, representing Fire & Life Safety Section of the International Association of Fire Chiefs (IAFC),**
  - **National Association of Home Builders (NAHB),**
  - **American Wood Council (for the wood products industry)**

Fire Protective Membrane Requirements

(2012/2015 International Residential Code®)

2012 IRC® §R501.3

Floor assemblies, not required elsewhere in this code to be fire-resistance rated, shall be provided with a 1/2-inch (12.7 mm) gypsum wallboard membrane, 5/8-inch (16 mm) wood structural panel membrane, or equivalent on the underside of the floor framing member.

2015 IRC® §R302.13

Penetrations or opening for ducts, vents, electrical outlets, lighting devices, luminaires, wires, speakers, drainage, piping and similar openings of penetrations shall be permitted.

2018 IRC® §R302.13

… fuel-fired or electric-powered heating appliances

Fire Protective Membrane Requirements (PA Act 1 of 2011, HB 377)

PENNSYLVANIA CONSTRUCTION CODE – UNIFORM CONSTRUCTION CODE REVIEW AND ADVISORY COUNCIL, REVISED OR SUCCESSOR CODES AND EXEMPTIONS

Act of Apr. 25, 2011, P.L. 1, No. 1 **Cl. 35**

Session of 2011
No. 2011-1

HB 377

(h) Fire protection of floors.--

(1) Except as set forth in paragraph (2), a floor assembly not required in the International Residential Code, or its successor building code, to be fire-resistance rated shall be provided with a 1/2-inch gypsum wallboard membrane, 5/8-inch wood structural panel membrane, or equivalent, on the underside of the floor framing member.

(2) Paragraph (1) shall not apply to any of the following:

(i) A floor assembly located directly over a space protected by an automatic sprinkler system in accordance with section P2904, NFPA13D or other equivalent sprinkler system approved by a municipal code official.

(ii) A floor assembly located directly over a crawl space not intended for storage or fuel-fired appliances.

(iii) A portion of a floor assembly which complies with all of the following:

(A) The aggregate area of the unprotected portions shall not exceed 80 square feet per story.

(B) Fire blocking in accordance with section R302.11.1 shall be installed along the perimeter of the unprotected portion to separate the unprotected portion from the remainder of the floor assembly.

(iv) A wood floor assembly using dimension lumber or structural composite lumber equal to or greater than two-inch by ten-inch nominal dimension or a floor assembly approved by a municipal code official demonstrating equivalent fire performance.

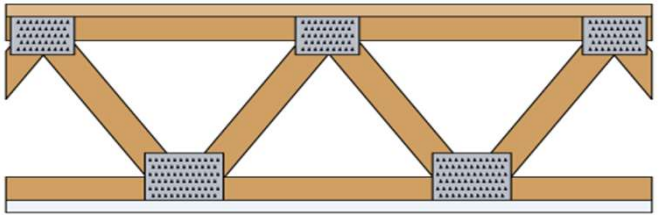
Fire Protective Membrane Requirements

(2018 IRC® § R302.13)

Protect light-weight floor systems in unfinished basements by attaching a membrane to the bottom of joists:

- **1/2-inch gypsum wallboard (GWB),**
- **5/8-inch wood structural panel (plywood, oriented-strand board [OSB] or composites), or**
- **Equivalent.**

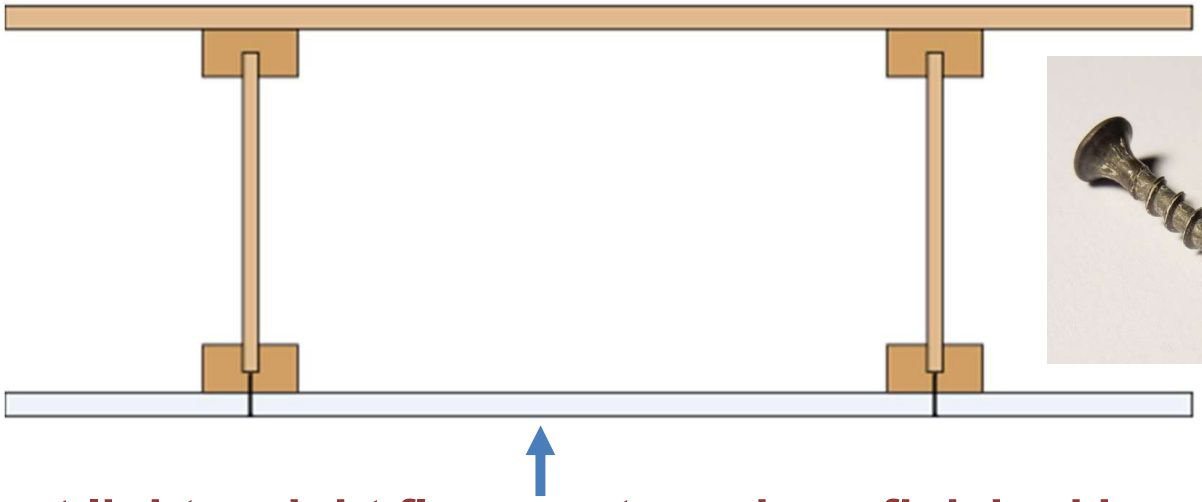
Cold-Formed Steel



Floor Trusses

Fire Protective Membrane Requirements

(2018 IRC® § R302.13)



Protect light-weight floor systems in unfinished basements by attaching a membrane to the bottom of joists.

1 1/4-inch Type W drywall screws up to 12 inches on center

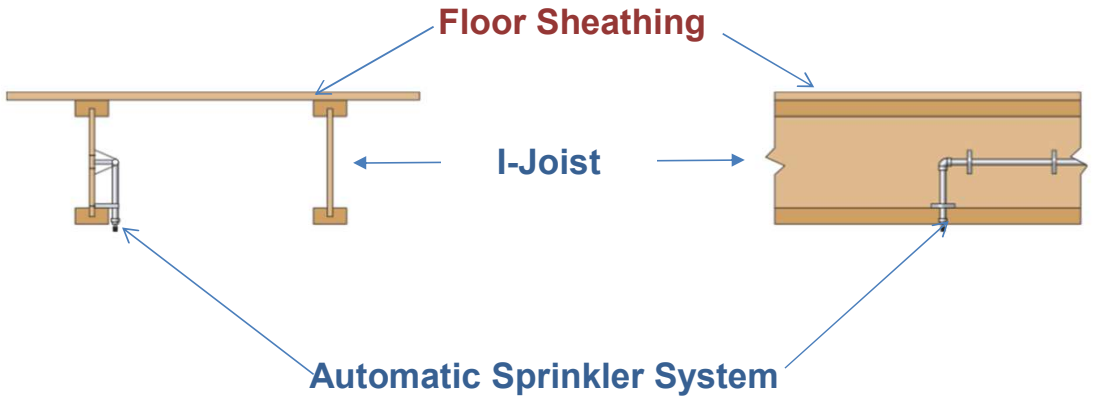
Fire Protective Membrane Requirements

(2018 IRC® § R302.13)

Exceptions –

Gypsum board or wood structural panel not required

1. Over space protected by an automatic sprinkler system



Fire Protective Membrane Requirements

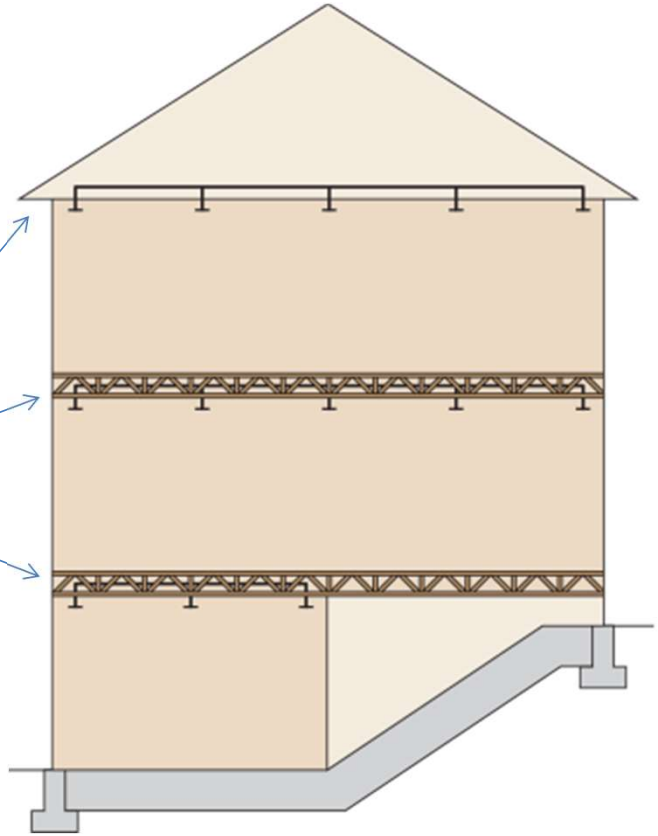
(2018 IRC® § R[NY]313.2)

Exceptions –

Gypsum board or wood structural panel not required

Over space protected by an automatic sprinkler system

Sprinklers in all areas of dwelling



Fire Protective Membrane Requirements

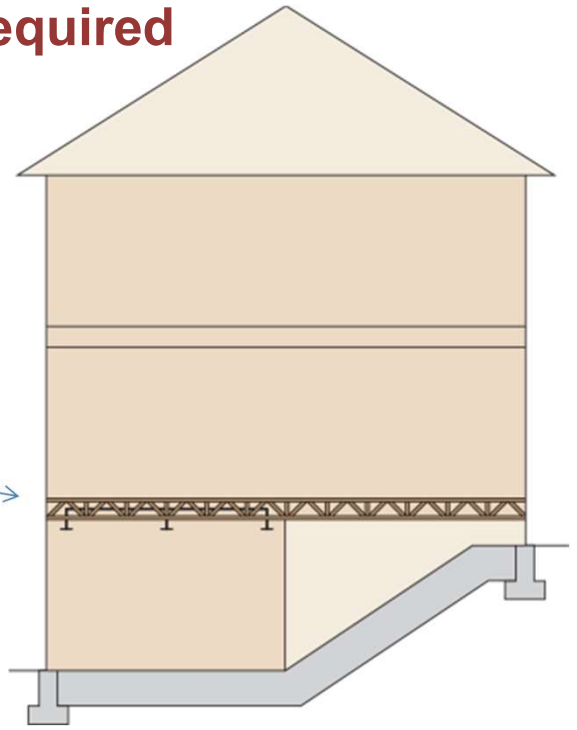
(2018 IRC® § R302.13)

Exceptions –

Gypsum board or wood structural panel not required

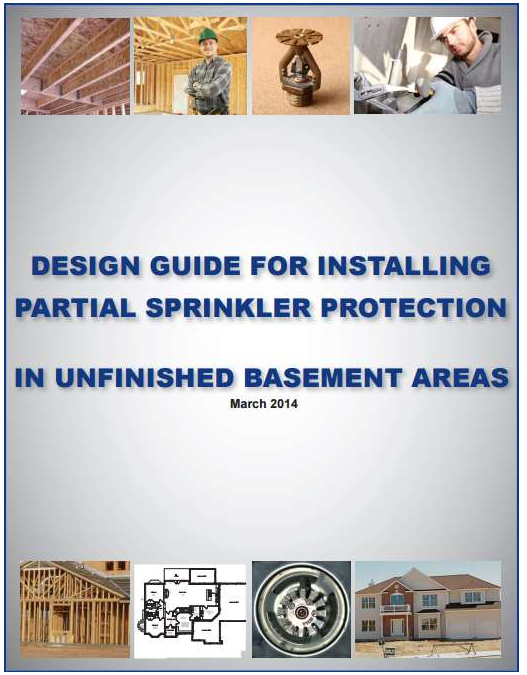
Over space protected by an automatic sprinkler system

Partial sprinkler option (unfinished basement)



Fire Protective Membrane Requirements

(2018 IRC® § R302.13)



http://www.awc.org

Fire Protective Membrane Requirements

(2018 IRC® § R302.13)

Exceptions –

Gypsum board or wood structural panel not required

2. **Floor assemblies located directly over a crawl space not intended for storage or for the installation of fuel-fired or electric-powered heating appliances.**

Fire Protective Membrane Requirements

(2018 IRC® § R302.13)

Exceptions –

Gypsum board or wood structural panel not required

3. Small portions of floor assemblies less than or equal 80 sq. ft.

- **Requires code-approved fire blocking to separate unprotected portion from the remainder of the floor assembly.**
- **Allows for construction of congested areas where gypsum or wood structural panel installation may be difficult.**

Fire Protective Membrane Requirements

(2018 IRC® § R302.13)

Exceptions –

Gypsum board or wood structural panel not required

4. **Wood floor assemblies using dimension lumber or structural composite lumber equal to or greater than 2-inch by 10-inch nominal dimension, *or other approved floor assemblies demonstrating equivalent fire performance.***

Fire Protective Membrane Requirements

(2018 IRC® § R302.13)

In summary:

- **Any floor assembly must be protected if it doesn't use dimension lumber or structural composite lumber equal to 2-inch by 10-inch or greater**
- **The area under floors must be protected with automatic sprinklers or a membrane**
  - **Automatic sprinklers**
  - **Membrane**
    - **1/2 - inch gypsum wallboard or 5/8 - inch wood structural panel**

Fire Protective Membrane Requirements

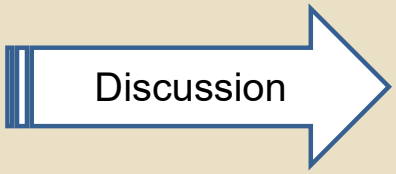
(2018 IRC® § R302.13)

In summary:

- **Crawl-space areas that do not contain fuel-fired or electric appliances such as furnaces and hot water heaters are excepted**

- **Small areas, less than 80 square feet maximum, do not require protection but do require fire blocking**

Module 5: Test Criteria & Reports



Test Criteria and Reports

How do we know a product or assembly is "equivalent"?

Who is responsible for "approving" the product or assembly for installation?

Test Criteria and Reports

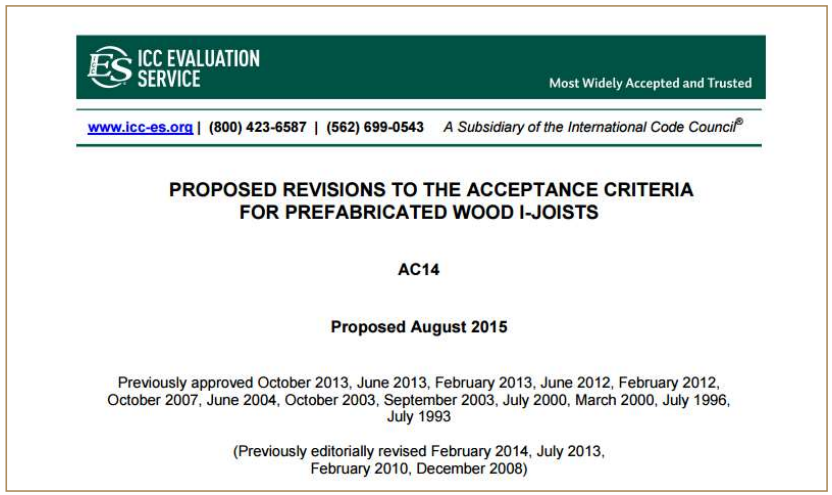
- **Fire protection materials go through rigorous, third-party tests**
  - **Test standards (criteria) developed through consensus process**
    - **Manufacturers, code officials, fire service, design professionals**
    - **Standards development organizations accredited by ANSI or other organizations to assure integrity**
    - **Tests are performed by OSHA-approved "nationally recognized testing laboratories"**
    - **Tests adopted and referenced in codes**

Fire Protective Membrane Requirements

(ICC-Evaluation Service® Acceptance Criteria – AC14)

AC-14 – Equivalent Fire Performance Established

- Establishes 2x10 benchmark
- ASTM E119 –Standard Time-Temperature Test
- Loaded joist with holes
- Durability and quality requirements of any factory installed protections



ICC EVALUATION SERVICE

Most Widely Accepted and Trusted

www.icc-es.org | (800) 423-6587 | (562) 699-0543 *A Subsidiary of the International Code Council®*

PROPOSED REVISIONS TO THE ACCEPTANCE CRITERIA FOR PREFABRICATED WOOD I-JOISTS

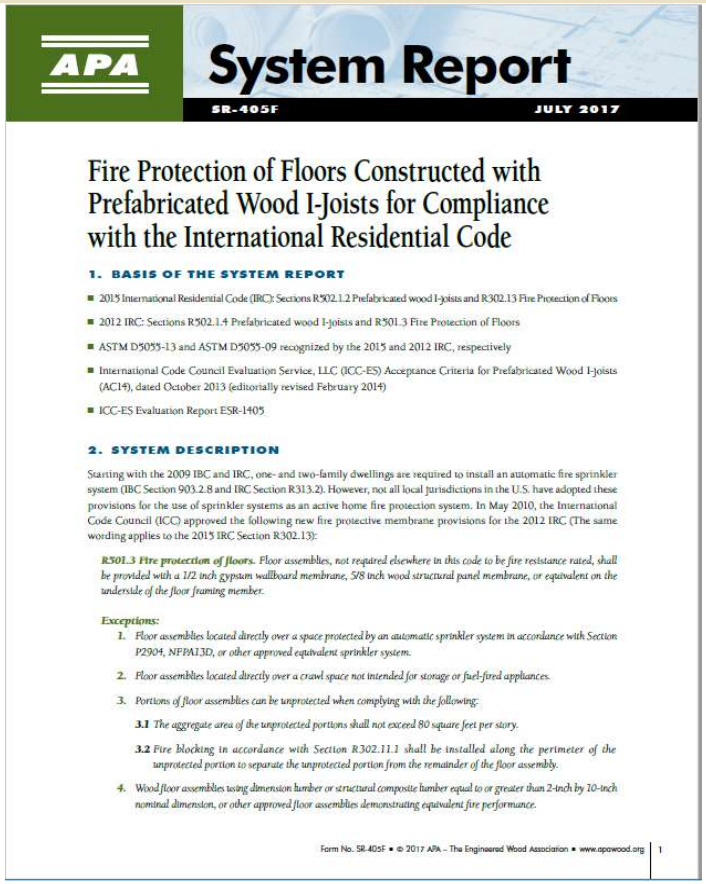
AC14

Proposed August 2015

Previously approved October 2013, June 2013, February 2013, June 2012, February 2012, October 2007, June 2004, October 2003, September 2003, July 2000, March 2000, July 1996, July 1993

(Previously editorially revised February 2014, July 2013, February 2010, December 2008)

Fire Protective Membrane Requirements



APA **System Report**

SR-405F JULY 2017

Fire Protection of Floors Constructed with Prefabricated Wood I-Joists for Compliance with the International Residential Code

1. BASIS OF THE SYSTEM REPORT

- 2015 International Residential Code (IRC): Sections R502.1.2 Prefabricated wood I-joists and R302.13 Fire Protection of Floors
- 2012 IRC: Sections R502.1.4 Prefabricated wood I-joists and R501.3 Fire Protection of Floors
- ASTM D5055-13 and ASTM D5055-09 recognized by the 2015 and 2012 IRC, respectively
- International Code Council Evaluation Service, LLC (ICC-ES) Acceptance Criteria for Prefabricated Wood I-Joists (AC14), dated October 2013 (editorially revised February 2014)
- ICC-ES Evaluation Report ESR-1405

2. SYSTEM DESCRIPTION

Starting with the 2009 IBC and IRC, one- and two-family dwellings are required to install an automatic fire sprinkler system (IBC Section 903.2.8 and IRC Section R313.2). However, not all local jurisdictions in the U.S. have adopted these provisions for the use of sprinkler systems as an active home fire protection system. In May 2010, the International Code Council (ICC) approved the following new fire protective membrane provisions for the 2012 IRC (The same wording applies to the 2015 IRC Section R302.13):

R501.3 Fire protection of floors. *Floor assemblies, not required elsewhere in this code to be fire resistance rated, shall be provided with a 1/2 inch gypsum wallboard membrane, 5/8 inch wood structural panel membrane, or equivalent on the underside of the floor framing member.*

Exceptions:

1. *Floor assemblies located directly over a space protected by an automatic sprinkler system in accordance with Section P2904, NFPA13D, or other approved equivalent sprinkler system.*
2. *Floor assemblies located directly over a crawl space not intended for storage or fuel-fired appliances.*
3. *Portions of floor assemblies can be unprotected when complying with the following:*
   - **3.1** *The aggregate area of the unprotected portions shall not exceed 80 square feet per story.*
   - **3.2** *Fire blocking in accordance with Section R302.11.1 shall be installed along the perimeter of the unprotected portion to separate the unprotected portion from the remainder of the floor assembly.*
4. *Wood floor assemblies using dimension lumber or structural composite lumber equal to or greater than 2-inch by 10-inch nominal dimension, or other approved floor assemblies demonstrating equivalent fire performance.*

- **ESR-1405**

APA's ICC-ES® report for I-joist assemblies with equivalent fire performance

- **APA Systems Report SR-405**

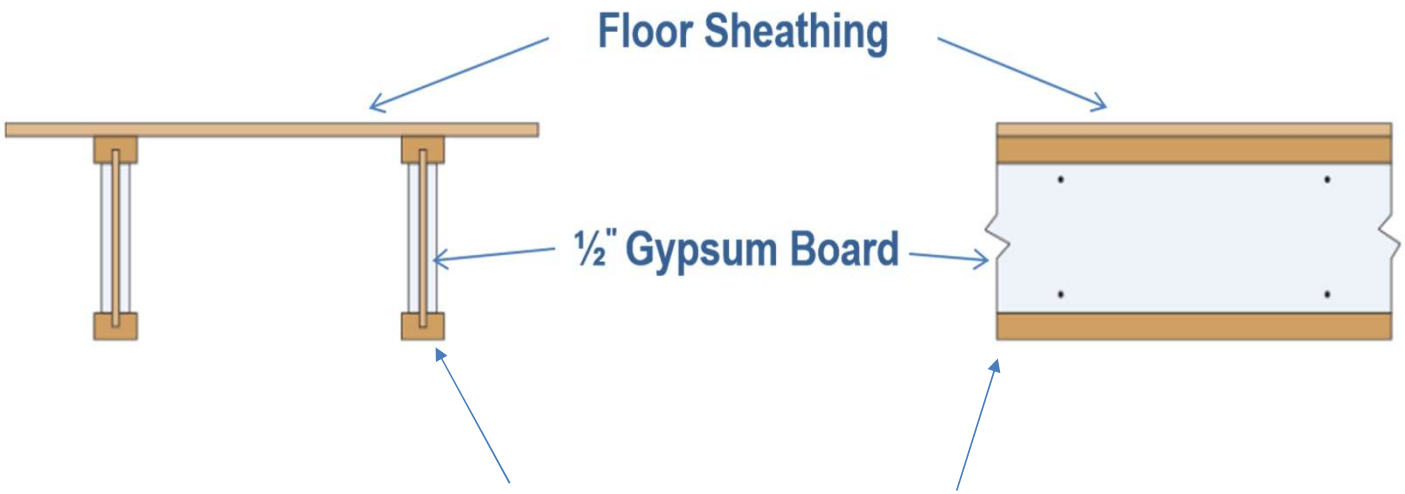
Prescriptive assemblies for fire protection of wood I-joist floors

(Available at: www.apawood.org)

Fire Protective Membrane Requirements

(ESR-1405 and APA SR-405)

Web attachment of Gypsum Board (FP-02)

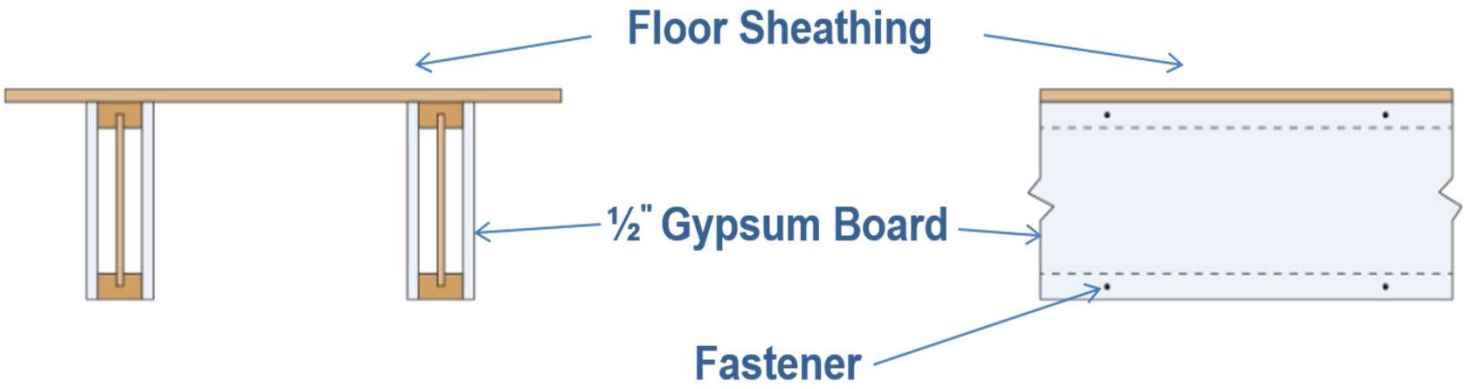


Minimum flange size:
1 - 1/2 inches x 2 inches

Fire Protective Membrane Requirements

(ESR-1405 and APA SR-405)

Flange Attachment of Gypsum Board (FP-03)

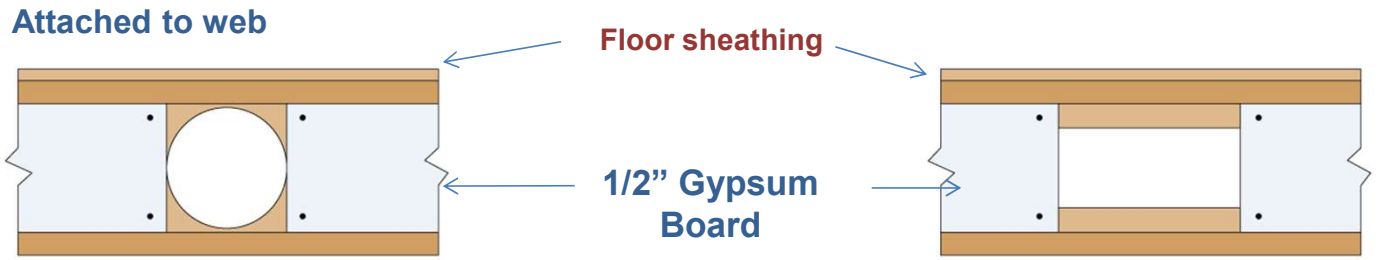


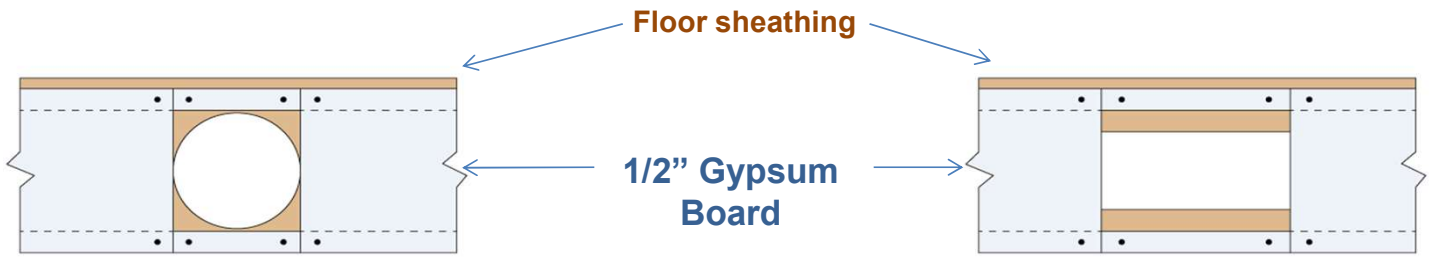
For smaller flanged I-joists
(min. 1-1/8 inches x 1-3/4 inches)

Fire Protective Membrane Requirements

(ESR-1405 and APA SR-405)

Web Attachment of Gypsum Board – Hole protection

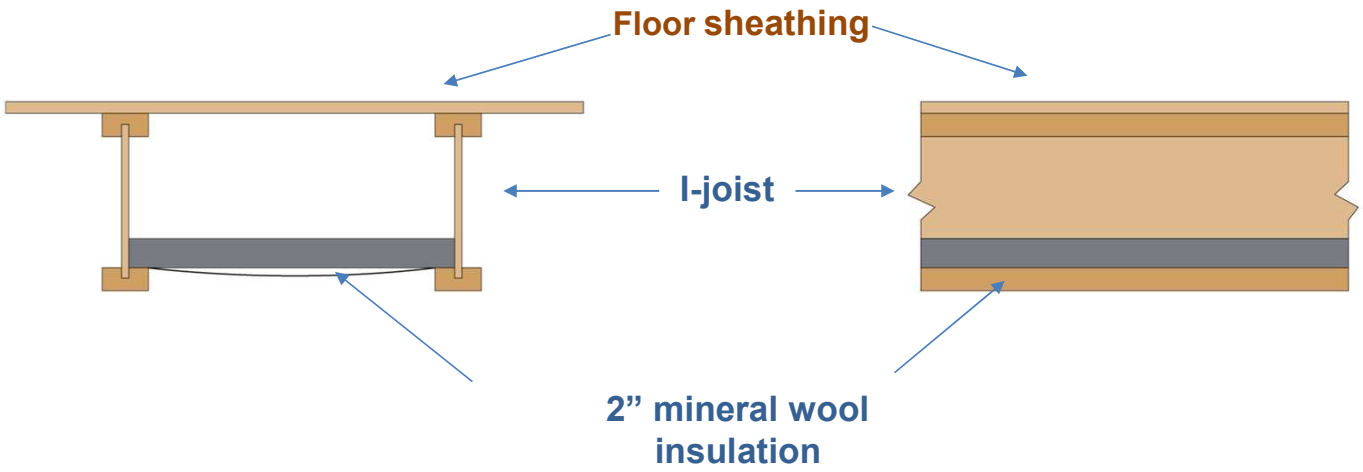




Fire Protective Membrane Requirements

(APA SR-405)

Mineral Wool Insulation (FP-04)



Minimum flange size:

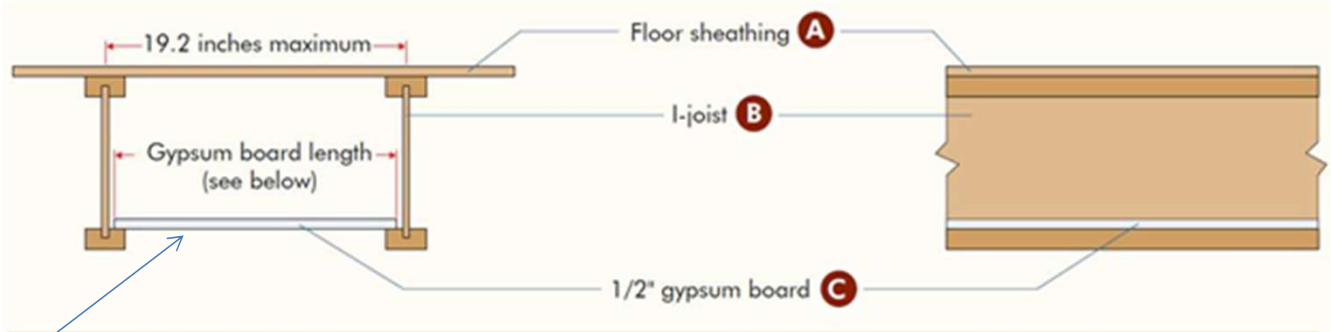
1-1/8 inches thick x 1-3/4 inches wide

Fire Protective Membrane Requirements

(APA SR-405)

Drop-in 1/2-inches Gypsum Board –

Joists spaced up to 19.2” on center (FP-06: 07/2017)



Joist spacing (in.)	Required length for gypsum boards (in.)
12	11-1/8 ± 1/8
16	15-1/8 ± 1/8
19.2	18-3/8 ± 1/8

1/2-inch Gypsum board

Minimum flange size:

1 1/8 x 2 inches

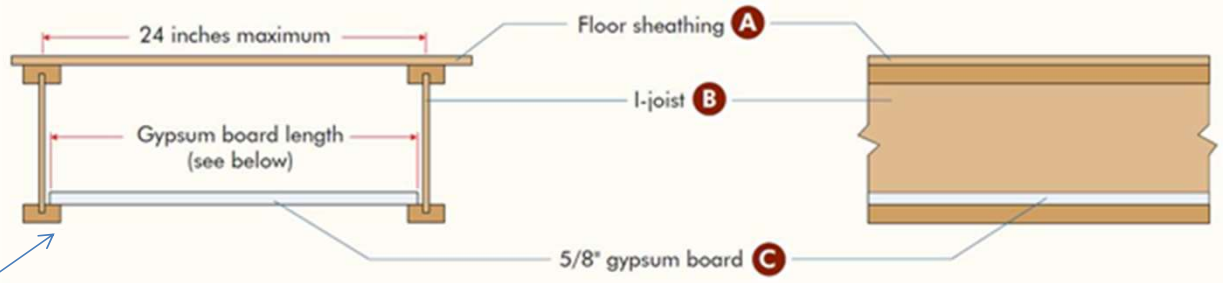
Fire Protective Membrane Requirements

(APA SR-405)

Drop-in 5/8-inches Gypsum Board

Joists spaced up to 24” on center (FP-07: 07/2017)

5/8-INCH GYPSUM BOARD[a,d]



Joist spacing (in.)	Required length for gypsum boards (in.)
12	11-1/8 ± 1/8
16	15-1/8 ± 1/8
19.2	18-3/8 ± 1/8
24	23-1/8 ± 1/8

5/8-inch Gypsum board

Minimum flange size

1 1/8 x 2.0 inches

Fire Protective Membrane Requirements

(APA SR-405)

Drop-in Gypsum alternative - benefits

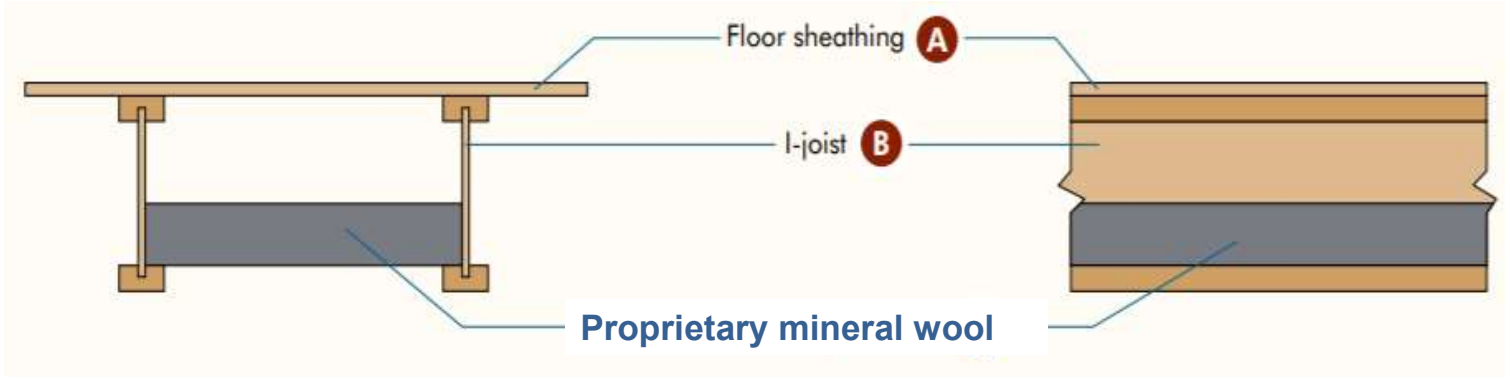
- No fasteners or adhesives
- No need to work around plumbing or mechanical penetrations
- Allows easy access to the floor cavity if needed
- Can be installed as scheduling permits
- Reduces noise
- Meets IRC® floor fire protection requirements

Fire Protective Membrane Requirements

(APA SR-405)

Drop-in 3-inches proprietary mineral wool

Joists spaced up to 24” on center (FP-09: 07/2017)



Minimum flange size:

1 1/8 x 2 inches

Fire Protective Membrane Requirements

(Other Options)

Fire Protective Coatings

- **Factory installed protection and coatings**
  - **Must meet ICC-ES® Acceptance Criteria AC14**
  - **Look for evaluation report statement that the joist meets IRC® requirements for membrane protection**
  - **Availability?**

Fire Protective Membrane Requirements

(Other Options)

Fire Protective Coatings

- **Field-applied coatings**
  - **Outside the scope of ICC-ES Acceptance Criteria (AC14)**
  - **Certify I-joist structural and fire performance with coating company or their agency**
  - **Review evaluation reports and application instructions with the Authority Having Jurisdiction (AHJ) or code official**
  - **Recommend having documented justification for acceptance**

Module 6: Review

Summary

- **Residential construction and wood I-joists**
- **Wood I-joist fire protective assemblies and *International Residential Code®* (IRC®) *Residential Code of New York State (RCNYS®)* requirements**
- **Preventing civilian and firefighter injuries and deaths**
- **Wood products industry engagement in firefighter safety**

Summary

- **APA has developed and tested alternate compliance methods using ICC ES Report 1405**
- **APA System Report SR405 details alternate protection methods**

Learning Check

Engineered Wood Products

1. Any floor assembly that is equal to or less than 2-inch by 10-inch dimensional lumber must be protected by automatic sprinklers. True or False

2. Floor/ceiling assemblies above basement spaces less than _____ sq. ft. may remain unprotected to provide access for equipment installation.
   a. 20
   b. 40
   c. 60
   d. 80

Learning Check

Engineered Wood Products

3. **Fire protection requirements for wood I-joist floor ceiling assemblies first appeared in which edition of the *International Residential Code*®?**
   a. 2006
   b. 2009
   c. 2012
   d. 2015
   e. 2018

4. **According to one statewide fire marshal survey, which are acceptable methods to protect wood I-joist floor-ceiling assemblies:**
   a. Automatic fire sprinklers
   b. Gypsum wallboard applied to the joist bottom flange
   c. Gypsum wallboard applied to the joist web
   d. Any of the above

Learning Check

Engineered Wood Products

5. All engineered wood I-joists that support floors above basements must be protected with not less than one layer of 5/8-inch Gypsum Board. True or False

6. The wood I-joist benefits for a contractor include all but which of the following?
   a. Ease of installation
   b. Lower material cost
   c. Longer allowable spans
   d. Consistent material quality

Learning Check

Engineered Wood Products

7. **Which of the following is not an approved method for protecting exposed wood I-joist floor/ceiling assemblies?**
   a. Automatic fire sprinkler protection
   b. Wood structural panels
   c. 3/8-inch polycarbonate sheeting
   d. 1/2-inch Gypsum Board

8. **Where wood I-joists are installed above a crawl-space that has no heating equipment in it, joist fire protection may be omitted. True or False**

Learning Check

Engineered Wood Products

9. International Code Council-Evaluation Service® reports are used to assess the performance of engineered wood I-joists. True or False

10. APA research offers _____ prescriptive alternatives to wood I-joist protection required by the building codes.
    a. 0
    b. 3
    c. 5
    d. 6

Fire Service Education and Training

- **Wood industry is committed to provide education to the fire service to reduce firefighter injuries and deaths from structural collapse**
- **Committed to working with homebuilders**

Fire Service Education Resources

Wood product awareness guides:

- www.woodaware.info

American Wood Council:

- General wood-related fire topics
  - www.awc.org/codes-standards/fire
- Buildings under construction:
  - www.ConstructionFiresafety.org

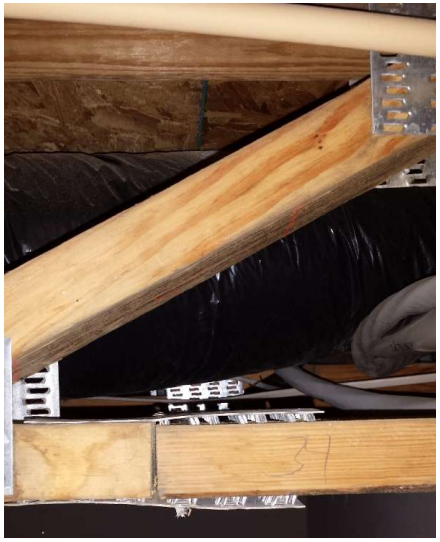
APA

- Engineered wood fire topics:
  - www.apawood.org/i-joist-fire-assemblies

Our Commitment

APA & American Wood Council will continue to work with fire service leaders to:

- **Define collapse risk of unprotected floors**
- **Define factors that contribute to collapse**
- **Develop solutions that meet their needs**



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Robert Kuserk, PE ***Bob.Kuserk@apawood.org***

www.woodaware.info

Questions?

www.phrc.psu.edu

Fire Protection of Lightweight Floor Assemblies

www.phrc.psu.edu

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