SBCA Research Report

Fire Resistance Rated Truss Assemblies

SRR No. 1509-01

Structural Building Components Association (SBCA)

October 16, 2017

SBCA is an APPROVED SOURCE

This research report is based on practical scientific research (literature review, testing, analysis, etc.), with the goal of supporting strategic needs for code and standards development and market expansion. This research report complies with the following sections of the building code:

- *IBC* Section 104.11.1 and Section 1703.4.2 – "**Research reports.** Supporting data, where necessary to assist in the approval of materials or assemblies not specifically provided for in this code, shall consist of valid research reports from *approved sources*."
- *IBC* Section 202 – "**APPROVED SOURCE.** An independent person, firm or corporation, *approved* by the *building official*, who is competent and experienced in the application of engineering principles to materials, methods or systems analyses."

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Introduction:

A fire endurance rating may be mandated by code for many of the applications where trusses could be used in floor/ceiling, roof/ceiling or in attic separation applications. For a discussion of each see the Background section below.

The International Building Code (*IBC*)[1] allows for five methods for determining fire resistance (Section 703.3):

1. Fire-resistance designs documented in sources. [see item 1]
2. Prescriptive designs of fire-resistance-rated building elements, components or assemblies as prescribed in Section 721. [see item 2]
3. Calculations in accordance with Section 722. [see item 3]
4. Engineering analysis based on a comparison of building element, component or assembly designs having fire-resistance ratings as determined by the test procedures set forth in *ASTM E119* or *UL 263*. [see item 4]
5. Alternative protection methods as allowed by Section 104.11. [see item 5]

The *IBC* also includes specific language regarding truss protection in fire resistance rated assemblies (Section 704.5):

> **704.5 Truss protection.** The required thickness and construction of fire-resistance-rated assemblies enclosing trusses shall be based on the results of full-scale tests or combinations of tests on truss components or on approved calculations based on such tests that satisfactorily demonstrate that the assembly has the required fire resistance.

Key Definitions (from the *IBC*):

Approved Source: An independent person, firm or corporation, approved by the building official, who is competent and experienced in the application of engineering principles to materials, methods or systems analyses.

Building Official: The officer or other designated authority charged with the administration and enforcement of this code, or a duly authorized representative.

Fire Resistance: That property of materials or their assemblies that prevents or retards the passage of excessive heat, hot gases or flames under conditions of use.

Fire-Resistance Rating: The period of time a building element, component or assembly maintains the ability to confine a fire, continues to perform a given structural function, or both, as determined by the tests, or the methods based on tests, prescribed in Section 703.

Registered Design Professional: An individual who is registered or licensed to practice their respective design profession as defined by the statutory requirements of the professional registration laws of the state or jurisdiction in which the project is to be constructed.

Background:

This section will discuss each of the five methods of determining fire resistance.

IBC Section 703.3, item 1: documented fire-resistance designs

Fire resistance rating testing on these assemblies is performed in accordance with the American Society of Testing & Materials *Standard Methods for Fire Tests of Building Construction and Materials* (*ASTM E119*) or Underwriters Laboratories *Fire Resistance Ratings* (*ANSI/UL 263*).

The primary source documents for documented fire-resistance designs used in the United States are:

- *Fire Resistance Design Manual (GA-600)*[2], published by the Gypsum Association (GA)
- *Fire Resistance Directory*[3]*,* published by Underwriters Laboratories, Inc. (UL).

Many of the UL tested designs are reproduced in the product literature of companies whose products are certified to be listed in the assemblies.

In addition, there are assemblies tested by Warnock Hersey (WH), now listed in the Intertek Directory of Certified Products; Factory Mutual (FM), and the PFS Corporation. These tested assemblies are available for specification by Architects or Building Designers, and for use by all Truss Manufacturers where a rated assembly is required, and can generally be applied to both floor and roof assembly applications.

[1] Unless otherwise noted, all IBC references are from the 2012 version.
[2] Unless otherwise noted, all GA-600 references are to the 2012 edition. A read-only version is available: http://www.gypsum.org/wp/wp-content/uploads/2011/11/GA-600-12.html
[3] UL database may be searched online: http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/fireressrch.html

See UL's BXUV.GuideInfo & GA-600's introduction for detailed discussion, especially regarding insulation in assemblies and non-listed materials.

Modifications to tested assemblies:

General: Both UL and GA emphasize that the fire resistance rating of listed assemblies applies to the assembly in its entirety. Components are not intended to be interchanged between assemblies. However, evaluation by comparison of tested assemblies is permitted by *IBC* Section 703.3, item 4.

Depth/Spacing: Dimensions included for depth of assemblies are minimums, spacings are maximums. GA-600 includes the following statement under General Explanatory Notes, item 17 & 20:

> 17. Specified floor-ceiling and roof-ceiling framing sizes or truss dimensions are minimums. Greater joist or truss sizes (depths) shall be permitted to be used in metal- or wood-framed systems. Indicated joist and truss spacings are maximums.
>
> 20. Floor-ceiling and roof-ceiling systems were fire tested at less than 36 inches total depth. However, the total depth of the systems, with either directly attached or suspended ceiling membranes, shall be permitted to extend greater than 36 inches.

Insulation: Both UL and GA include specific guidance regarding the use of insulation in assemblies. G500, L500, M500, and P500 series designs listed by UL allow addition of any depth of insulation at any location in an assembly that does not include insulation, but only as long as another layer of gypsum (of the same type as specified in the tested assembly) is installed at the ceiling. Any other method of adding insulation is prohibited in assemblies tested without insulation. A similar general provision is included in GA-600. However, the *IBC* item 4 or item 5 would allow modifications to assemblies, including inclusion or placement of insulation, based on rational design provided to the building official.

Use of floor/ceiling designs for roof/ceiling or reverse: UL BXUV.GuideInfo Section III.19 includes the following:

> Class A, B or C prepared roof coverings may be used on wood floor designs without a reduction of the fire-resistance rating, provided a nailer of equal thickness to the length of the mechanical fasteners is added to the flooring.

However, floor/ceiling designs that specify a finish floor are typically not used as roof/ceiling assemblies. *IBC* item 4 or item 5 would allow use of assemblies tested as floor/ceiling or roof/ceiling in the other application, even if not specified as such in the listing, based upon rational design provided to the building official.

See Appendix A for a summary listing of tested assemblies with metal plate connected wood trusses for use in floor/ceiling, roof/ceiling and attic separation. For complete information on the listed systems, the actual listing or test report should be reviewed.

IBC Section 703.3, item 2: prescriptive designs

IBC Table 721.(3), item 21-1.1 describes a single prescriptive 1-hour rated floor or roof assembly that includes wood trusses:

> Wood joists, wood I-joists, floor trusses and flat or pitched roof trusses spaced a maximum 24" o.c. with 1/2" wood structural panels with exterior glue applied at right angles to top of joist or top chord of trusses with 8d nails. The wood structural panel thickness shall not be less than nominal 1/2" nor less than required by Chapter 23.
>
> Base layer 5/8" Type X gypsum wallboard applied at right angles to joist or truss 24" o.c. with 1-1/4" Type S or Type W drywall screws 24" o.c. Face layer 5/8" Type X gypsum wallboard or veneer base applied at right angles to joist or truss through base layer with 1-7/8" Type S or Type W drywall screws 12" o.c. at joints and intermediate joist or truss. Face layer Type G drywall screws placed 2" back on either side of face layer end joints, 12" o.c.

The National Building Code of Canada (NBC), 2010 edition, provides an extensive listing of prescriptive assemblies that include metal plate connected wood trusses in Table A-9.10.3.1.B. These listings also include sound ratings so can be very useful to the building designer.

IBC Section 703.3, item 3: Calculations in accordance with Section 722

IBC Section 722.6 addresses fire resistance calculations for wood assemblies.

> **722.6.1 General**. This section contains procedures for calculating the fire-resistance ratings of walls, floor/ceiling and roof/ceiling assemblies based in part on the standard method of testing referenced in Section 703.2.
>
> **722.6.2.1 Fire-resistance rating of wood frame assemblies**. The fire-resistance rating of a wood frame assembly is equal to the sum of the time assigned to the membrane on the fire-exposed side, the time assigned to the framing members and the time assigned for additional contribution by other protective measures such as insulation. The membrane on the unexposed side shall not be included in determining the fire resistance of the assembly.

The maximum fire-resistance rating allowed using this method is 1-hour. This section includes tables with times assigned to both structural members and membranes.

IBC Section 703.3, item 4: Engineering analysis

This allows the determination of fire resistance ratings based on a comparison of building element, component or assemblies designs having fire-resistance ratings as determined by the test procedures set forth in *ASTM E119* or *UL 263*.

The engineering analysis listed at item 4 allows for a comparison of "building element designs" that have been tested. Combined with the provisions of *IBC* Section 104.11 listed at item 5, this allows the building official to approve a design that "complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, at least the equivalent of that prescribed in this code in quality, strength, effectiveness, fire resistance, durability and safety." A two-hour assembly has been calculated and a copy of the report is available from SBCA (SBCA SRR 1509-02).

One basis for this type of analysis is Harmathy's "Ten Rules of Fire Endurance Rating," written in 1965. They are described in a Forest Products Laboratories (FPL) article, Section 4-13 in the *SFPE Handbook of Fire Protection Engineering*, Fourth Edition, 2008. For additional information see the Resources section.

IBC Section 703.3, item number 5: Alternative protection methods as allowed by Section 104.11

> **104.11 Alternative materials, design and methods of construction and equipment**. The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been approved. An alternative material, design or method of construction shall be approved where the building official finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, at least the equivalent of that prescribed in this code in quality, strength, effectiveness, fire resistance, durability and safety.

This allows for other methods of developing a design by an approved source that complies with the intent of the code and, unless it can be demonstrated not to comply with the code, should be approved by the building official.

Conclusion:

A Building Designer may submit to a code jurisdiction a fire resistance rated design incorporating metal plate connected wood trusses using any of the five methods allowed by Section 703.3. If it is not a listed design, the Building Designer should submit details regarding how the submitted design was determined and show how it complies with the intent of the building code.

Figure 1 illustrates common components of a fire rated wood truss assembly listing construction elements.

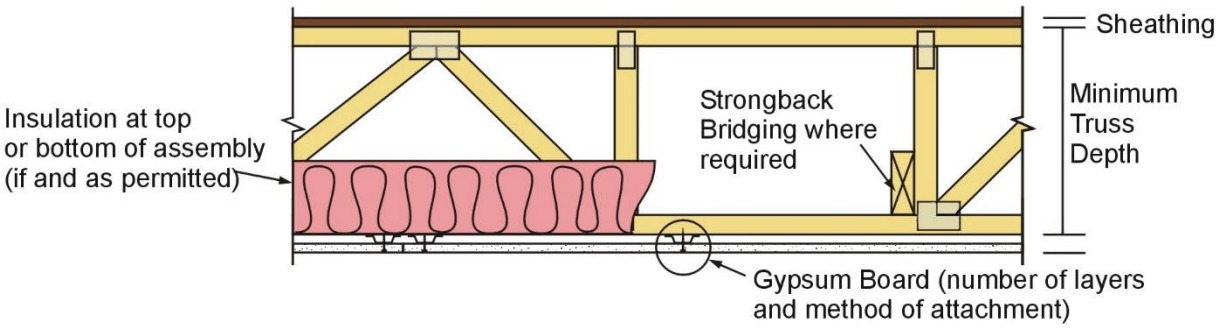


Figure 1 – Generic fire rated wood truss assembly listing construction elements

Resources:

National Design Specification® *for Wood Construction (NDS®) 2012 or 2015, American Wood Council (AWC), Section 16, Fire Design of Wood Members.*
Analytical methods for determining fire resistance of timber members, *Robert White, 2008, included in the SFPE handbook of fire protection engineering. Quincy, Mass.; National Fire Protection Association; Bethesda, Md.: Society of Fire Protection Engineers, c2008: pages 4.346-4.366.*
Guidelines on Fire Ratings of Archaic Materials and Assemblies. *International Code Council (ICC).*
National Building Code of Canada*, 2010.*
International Building Code *(IBC), 2012 and 2015, International Code Council (ICC).*
BXUV.GuideInfo, *Underwriters Laboratory.*
Gypsum Association Handbook, *GA-600, 2012*
Fire Resistance Provided by Gypsum Board Membrane Protection, *GA-610, 2013*
ESR-1338, *Gypsum Wall and Ceiling Assemblies and Gypsum Board Interior and Exterior Applications*

Intertek Directory of Certified Products
PFS Corporation
Factory Mutual

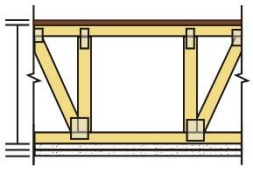
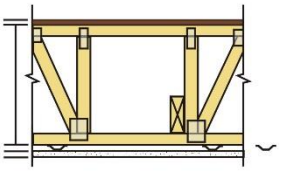
APPENDIX A – Listed Fire Resistance Rated Truss Assemblies

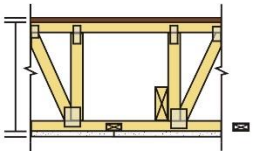
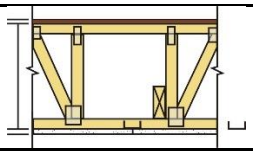
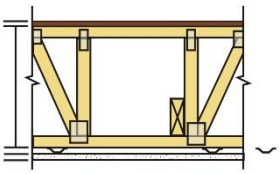
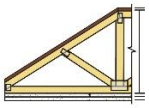
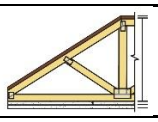
Certifying Agency Abbreviations	
GA	Gypsum Association
NER	National Evaluation Service Report
PFS	PFS Corporation
TPI/SBCA	Truss Plate Institute/Structural Building Components Association
UL	Underwriters Laboratories
WH	Warnock Hersey International (Intertek)

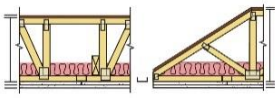
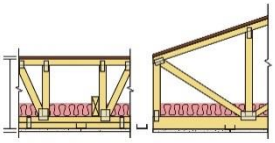
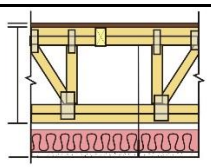
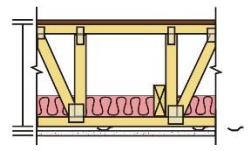
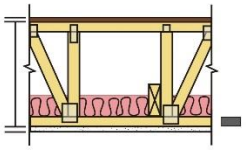
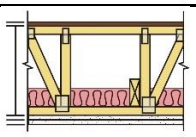
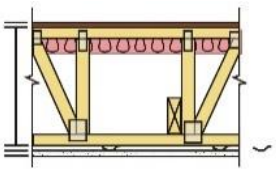
Symbols

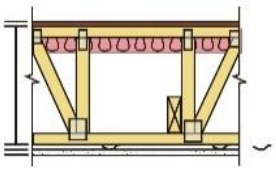
- Wood blocking at gypsum joints
- FR-Quik Channel Sets™ by Alpine Engineered Products
- Furring channel
- Resilient channel
- TrusGard Protective Channel™ by Truswal Systems
- Insulation

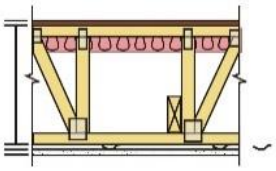
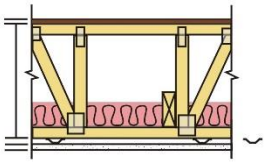
The following tables are simplified summaries of the fire rated assembly reports. Users must consult the listed testing agency's documentation or tests for complete listing information.

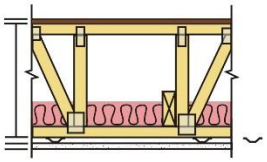
	Category	Illustration	Construction	Report Number
1 HOUR – No Insulation	Floor		24" o.c, min 12" depth Plate design values based on safety factor of 4. **2 layers ½" Type X gypsum** Sheathing min 19/32"	GA: FC 5512
			24" o.c, parallel chord, min 12" depth 2x oriented vertically or horizontally **2 layers ½" proprietary Type C gypsum** Sheathing min 23/32" T&G glued	UL: L542
			24" o.c, min 9-1/4" depth **2 layers 5/8" Type X gypsum** Sheathing min 1/2"	GA: FC 5406 (see ESR 1338) FC 5408 [note 4]
			24" o.c, no minimum depth given **2 layers 5/8" Type X gypsum** Sheathing min 1/2"	IBC: Table 720.1(3) Item 21-1.1 [note 4]
			24" o.c., parallel chord, min 12" 2x oriented vertically or horizontally Resilient channel 16" o.c. or furring channel 24" o.c. **2 layers 5/8" proprietary Type C gypsum** Sheathing min 23/32" T&G glued 1-5/8" mineral wool between layers of gyp	UL: M523 (no cavity insulation)
			24" o.c., parallel chord min 12" depth Rigid furring channel 24" o.c. **1 layer 5/8" proprietary Type C gypsum** Sheathing min nom ¾" T&G glued	GA: FC 5515 [based on L528] FC 5516 [based on L528]
			24" o.c., parallel chord, min 12" depth, 18" if damper 2x oriented vertically or horizontally Furring channel 24" o.c., resilient channel 16" o.c. **1 layer 5/8 proprietary Type C gypsum** Sheathing min 23/32" T&G glued Strongback	UL: L528 (no insulation)
			24" o.c., parallel chord, min 18" 2x oriented vertically or horizontally Furring channel 24" o.c., resilient channel 16" o.c. **1 layer 5/8 proprietary Type C gypsum** Sheathing min 23/32" T&G glued	UL: L534 (no insulation)
			24" o.c., min 12" depth, 18" if damper used 2x oriented vertically or horizontally Resilient or furring channel 24" o.c. **1 layer 5/8" proprietary Type C gypsum** Sheathing min 23/32" glued	UL: L550 (no insulation)
			24" o.c., parallel chord, min 12" depth, 18" if damper used Resilient channel 24" o.c. **1 layer 5/8" proprietary Type C gypsum** Sheathing min 23/32" glued	UL: L563 (no insulation)

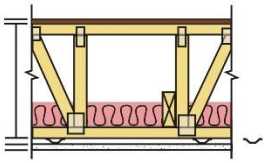
1 HOUR – No Insulation	Floor		24” o.c., parallel chord, min 18” Resilient channel 16” o.c. **1 layer 5/8” proprietary Type C gypsum** Sheathing min 23/32” Insulation required if truss depth < 18”	UL: L574 (no insulation)
			24” o.c., parallel chord, min 12” Resilient channel 16” o.c. **1 layer 5/8” proprietary Type C gypsum** Sheathing min 23/32” glued	UL: L579 (no insulation)
			24” o.c., parallel chord, min 12” 2x oriented vertically or horizontally Resilient channel 24” o.c. **1 layer 5/8” proprietary Type C gypsum** Sheathing min 23/32” glued	UL: L587 (no insulation)
			24” o.c., parallel chord, min 12” 2x oriented vertically or horizontally Resilient channel 16” o.c. **1 layer 5/8” proprietary Type C gypsum** Sheathing min 23/32” glued	UL: L592 (no insulation, no ducts or dampers)
			24” o.c., min 12” depth Wood blocking secured with metal clips **1 layer 5/8” proprietary Type C gypsum** Sheathing min nom 5/8” T&G glued	GA: FC 5517
			24” o.c., min 14-1/4” depth Wood blocking secured with metal clips **1 layer 5/8” proprietary Type X gypsum** Sheathing min 23/32” glued	TPI/SBCA: FC-392 (see PFS 86-10) (Report Available)
			Nominal 2x3, 24” o.c., min 16” depth FR-Quik Channel Sets™ **1 layer 5/8” proprietary Type X gypsum** Sheathing min 23/32” glued, or 19/32” Strongback	NER: 392 WTCA FR-SYSTEM 1™
	Floor with optional duct/damper		24" o.c., min 12" depth, 18” if damper 2x lumber oriented vertically or horizontally Resilient or furring channel 24" o.c. **1 layer 5/8" proprietary Type C gypsum** Sheathing min 23/32" glued	UL: L521 (with no insulation)
			24” o.c., parallel chord, min 12” 2x oriented vertically or horizontally Furring channel 16” o.c. **1 layer 5/8” proprietary Type C gypsum** Sheathing min 23/32” glued	UL: M508 (no insulation)
			24” o.c., parallel chord, min 12” 2x oriented vertically or horizontally Furring channel 16” o.c. **1 layer 5/8” proprietary Type C gypsum** Sheathing min 15/32”	UL: M501 (no insulation) (air duct, with dampers truss depth increased to 18”)
			24” o.c., parallel chord, min 12” 2x oriented vertically or horizontally Resilient channel 24” o.c. **1 layer 5/8” proprietary Type C gypsum** Sheathing min 23/32” glued	UL: M522 (no insulation) (optional air duct & dampers truss depth increased to 18”) (includes nonbearing wall partition parallel/perp to trusses)
	Roof with optional damper		24” o.c., no min listed Resilient channel 16” o.c. **1 layer 5/8” proprietary Type C gypsum** Sheathing min 15/32”	GA: RC 2608
			24” o.c., no min listed Resilient channel 16” o.c. **1 layer 5/8” proprietary Type C gypsum** Sheathing min 15/32” glued	GA: RC 2609
	Roof		24” o.c., min 9¼” depth [based on 2x10] **2 layers 5/8” Type X gypsum** Sheathing min ½”	GA: RC 2601 [Note 4] RC 2602 [Note 4]

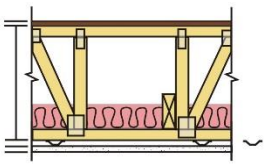
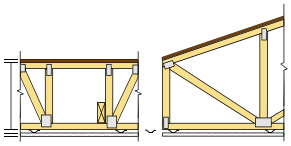
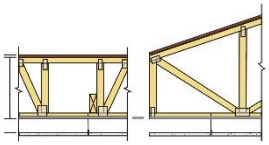
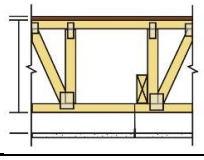
1 HOUR - Insulation	Floor or Roof		Nominal 2x3, 24” o.c, min 15” depth if flat Min 19½” depth at center if pitched min 3:12 FR-Quik Channel Sets™ **2 layers ½” Type X gypsum** Sheathing min 15/32” Strongback	NER: 392 WTCA FR-SYSTEM 3™
			Nominal 2x3, 24" o.c., min 10" depth Wood shield member FR-Quik Channel Sets™ **1 layer 5/8" proprietary Type X gypsum** Sheathing min 23/32" glued Insulation on stay wires Strongback	NER: 392 WTCA FR-SYSTEM 5™
	Floor suspended ceiling, light fixtures and insulation [Note 1]		2-ply chords max. 8 feet o.c., min 16" depth Purlins min 24" o.c. **Fire rated suspended ceiling system** Sheathing min 23/32" Insulation required [no strongback]	NER: 399 (Report Available)
	Floor		Nominal 2x3, 24” o.c., min 10” depth Truswal metal truss plates Resilient channel 16” o.c. **1 layer 5/8” proprietary Type C gypsum** Sheathing min 5/8” Strongback	WH: TSC/FCA 60-02 MCI/FCA 60-02 (insulation optional)
			Nominal 2x3 24” o.c., min 10” depth Truswal metal truss plates TrusGard Protective Channels **1 layer 5/8” proprietary Type X gypsum** Sheathing min 5/8” Strongback	WH: TSC/FCA 60-06 (Optional insulation on furring strips above bot. chord)
			Nominal 2x3, 24” o.c., min 10” depth Truswal metal truss plates **2 layers ½” Type X gypsum** Sheathing min 5/8” Strongback	WH: TSC/FCA 60-10 (Optional insulation on furring strips above bot. chord)
	Floor with damper, duct, fixtures and metal trim [Note 1]		24" o.c., min 18" depth Resilient or furring channel 16" **1 layer 5/8" proprietary Type C gypsum** Sheathing min 15/32" plus finish floor Optional insulation max 3½”	UL: L546 (with high insulation)
			24" o.c., parallel chord, min 18" depth 2x oriented vertically or horizontally Resilient channel, 16", furring 24” o.c. **1 layer 5/8" proprietary Type C gypsum** Sheathing min 23/32" glued Optional insulation max 3½”	UL: L562 (with high insulation)
			24" o.c., min 12" depth Resilient or furring channel 16" o.c. **1 layer 5/8" proprietary Type C gypsum** Sheathing min 23/32" glued plus topping	GA: FC 5012 (with high insulation)
			24" o.c., min 18" depth Resilient or furring channel 12" o.c. **1 layer 5/8" proprietary Type C gypsum** Sheathing min 23/32" glued with either ¾” gypsum or 15/32” underlayment Glass or mineral batt insulation	GA: FC 5521 (with high insulation)
			24" o.c., min 12" depth, 18” if damper 2x lumber oriented vertically or horizontally Resilient or furring channel 16" o.c. **1 layer 5/8" proprietary Type C gypsum** Sheathing min 23/32" glued plus finish floor Optional Insulation max 3½”, unless channel 12” o.c.	UL: L521 (with high insulation)
			24" o.c., parallel chord, min 12" depth, 18” if damper used Resilient channel 16" o.c. **1 layer 5/8" proprietary Type C gypsum** Sheathing min 23/32" glued plus finish floor Insulation max 3½”, unless channel 12” o.c.	UL: L563 (with high insulation)

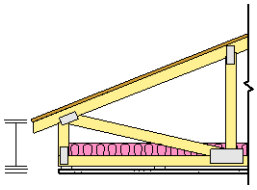
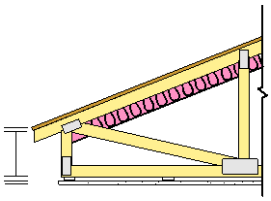
1 HOUR - Insulation	Floor or Roof with damper, duct, fixtures, insulation and metal trim [Note 1]		24" o.c., min 12" depth, 18" if damper used Resilient or furring channel, 16" or 12" o.c. **1 layer 5/8" proprietary Type C gypsum** Sheathing min 23/32" glued Insulation max 3½", unless channel 12" o.c.	UL: L550 (with high insulation)
			24" o.c., parallel chord, min 18" depth 2x oriented vertically or horizontally Resilient channel 12" o.c. **1 layer 5/8" proprietary Type C gypsum** Sheathing min 23/32" Glass fiber or loose fill insulation max 3½"	UL: L558 (with high insulation)
			24" o.c., parallel chord, min 12" depth 2x oriented vertically or horizontally Resilient channel 16" o.c. **1 layer 5/8" proprietary Type C gypsum** Sheathing min 23/32" glued Glass fiber or loose fill insulation max 3½"	UL: L576 (with high insulation)
			24" o.c., min 18" depth Resilient channel 12" o.c. **1 layer 5/8" proprietary Type C gypsum** Sheathing min 23/32" plus either ¾" gypsum topping or 15/32" underlayment Glass or mineral Insulation	GA: FC 5119 (with high insulation)
			24" o.c., min 18" depth Resilient channel 48" o.c. attached with proprietary sound isolation clips **2 layer 5/8" proprietary Type C gypsum** Sheathing min 23/32" plus either ¾" gypsum topping or 15/32" underlayment Glass or mineral Insulation	GA: FC 5102 (with high insulation)
			24" o.c., min 18" depth Resilient channel 16" o.c. **1 layer 5/8" proprietary Type C gypsum** Sheathing min 23/32" plus either ¾" gypsum or 15/32" underlayment Glass or mineral fiber no max depth	GA: FC 5515.3 (with high insulation)
			24" o.c., min 18" depth Resilient channel 12" o.c. **1 layer 5/8" proprietary Type C gypsum** Sheathing min 23/32" plus either ¾" gypsum or 15/32" underlayment Glass or mineral fiber no max depth	GA: FC 5519 (with high insulation) (based on UL L574)
			24" o.c., min 12", 18" depth with dampers Resilient channel 16" o.c. **1 layer 5/8" proprietary Type C gypsum** Sheathing min 23/32" Insulation required if truss depth < 18" Insulation max 3½"	UL: L574 (with high insulation)
			24" o.c., parallel chord, min 12" Resilient channel 16" o.c. **1 layer 5/8" proprietary Type C gypsum** Sheathing min 23/32" glued Glass fiber or loose fill max 3½"	UL: L579 (with high insulation)
			24" o.c., parallel chord, min 18" 2x oriented vertically or horizontally Resilient channel 16" o.c. **1 layer 5/8" proprietary Type C/A gypsum** Sheathing min 23/32" T&G + finish floor Glass fiber max 3½"	UL: L585 (with high insulation)
			24" o.c., parallel chord, min 18" 2x oriented horizontally Resilient channel 16" o.c. **1 layer 5/8" proprietary Type C gypsum** Sheathing min 23/32" glued Glass fiber max 3½" Optional duct & damper	UL: L586 (with high insulation only)

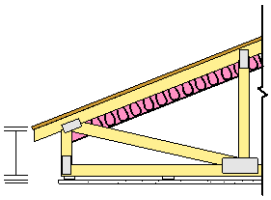
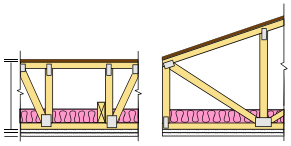
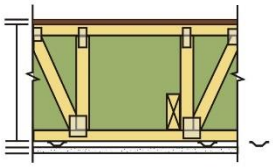
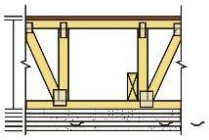
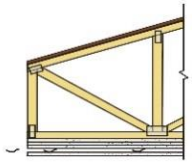
1 HOUR - Insulation	Floor with damper, duct, fixtures and metal trim [Note 1]		24” o.c., parallel chord, min 12” 2x oriented vertically or horizontally Resilient channel 16” o.c. **1 layer 5/8” proprietary Type C gypsum** Sheathing min 23/32” T&G Glass fiber or mineral wool insulation max 3-½”	UL: L587 (with high insulation)
			24” o.c., parallel chord, min 18” 2x oriented vertically or horizontally Resilient channel 16” o.c. **1 layer 5/8” proprietary Type C gypsum** Sheathing min 23/32” T&G Glass fiber or mineral wool max 3-½”	UL: L592 (with high insulation & ducts & dampers)
			24” o.c., parallel chord, min 12” 2x oriented vertically or horizontally Furring channel 16” o.c. **1 layer 5/8” proprietary Type C gypsum** Sheathing min 15/32” Glass fiber or mineral wool max 3-½”	UL: M501 (with high insulation) (air ducts. With dampers truss depth increase to 18”)
			24” o.c., parallel chord, min 12” 2x oriented vertically or horizontally Furring channel 16” o.c. **1 layer 5/8” proprietary Type C gypsum** Sheathing min 15/32” Glass fiber or mineral wool max 3-½”	UL: M508 (with high insulation)
			24” o.c., parallel chord, min 12” 2x oriented vertically or horizontally Furring channel 16” o.c. **1 layer 5/8” proprietary Type C gypsum** Sheathing min 15/32” Glass fiber, mineral wool or sprayed fiber max 3-½”	UL: M509 (with high insulation)
			24” o.c., parallel chord, min 12” 2x oriented vertically or horizontally Furring channel 16” o.c. **1 layer 5/8” proprietary Type C gypsum** Sheathing min 15/32” Glass fiber or mineral wool max 3-½”	UL: M516 (with high insulation) (ducts, 18” depth with dampers)
			24” o.c., parallel chord, min 12” 2x oriented vertically or horizontally Resilient channel 16” o.c. **1 layer 5/8” proprietary Type C gypsum** Sheathing min 23/32” glued Optional Glass fiber, mineral wool or loose fill max 3-1/2”	UL: M522 (high insulation) (optional air duct & dampers truss depth increased to 18”) (includes nonbearing wall partition parallel/perp to trusses)
			24" o.c., parallel chord, min 18" depth 2x oriented horizontally Resilient or furring channel 16" o.c. **1 layer 5/8" proprietary Type C gypsum** Sheathing min 23/32” glued Glass fiber or mineral wool max 3-1/2”	UL: P548 (high insulation only)
	Floor		24" o.c., parallel chord, min 18" depth 2x oriented vertically or horizontally Resilient channel 12" o.c. **1 layer 5/8" proprietary Type C gypsum** Sheathing min 23/32" Glass fiber or loose fill max 3½”	UL: L558 (with low insulation)
			24" o.c., parallel chord, min 18" depth 2x oriented vertically or horizontally Resilient channel, 12", furring 12” o.c. **1 layer 5/8" proprietary Type C gypsum** Sheathing min 23/32" glued Optional insulation max 3½”	UL: L562 (with low insulation)
			24" o.c., min 18" depth Resilient channel 12" o.c. **1 layer 5/8" proprietary Type C gypsum** Sheathing min 23/32" glued plus Glass fiber, mineral fiber batt or loose fill	GA: FC 5514 (with low insulation) **(**based on UL L558**)**

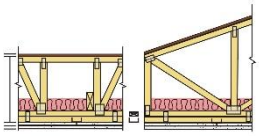
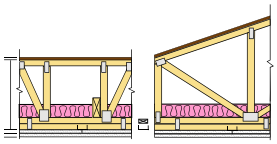
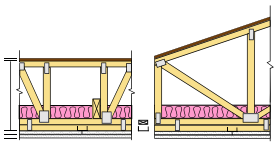
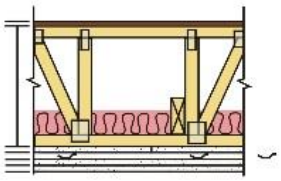
1 HOUR - Insulation	Floor		24" o.c., min 18" depth Resilient channel 12" o.c. **1 layer 5/8" proprietary Type C gypsum** Sheathing min 23/32" glued plus either ¾" gypsum topping or 15/32" underlayment Glass fiber, mineral fiber batt or loose fill	GA: FC 5514.4 (with low insulation **(**based on UL L585**)**
			24" o.c., min 18" depth Resilient channel 12" o.c. **1 layer 5/8" proprietary Type C gypsum** Sheathing min 23/32" plus either ¾" gypsum or 15/32" underlayment Loose fill insulation over gypsum board	GA: FC 5519 (with low insulation) (based on UL L592)
			24" o.c., min 18" depth Resilient channel 12" o.c. **1 layer 5/8" proprietary Type C gypsum** Sheathing min 23/32" plus either ¾" gypsum or 15/32" underlayment Loose fill insulation over gypsum board	GA: FC 5521 (with low insulation) (based on UL L562)
			24" o.c., min 12" depth Resilient channel 12" o.c. **1 layer 5/8" proprietary Type C gypsum** Sheathing min 3/4" nom. glued 3½" batt over resilient channel	GA: FC 5528 (with low insulation) (based on UL L528)
			24" o.c., min 18" depth Rigid channel 48" o.c. attached with proprietary sound isolation clips **2 layer 5/8" proprietary Type C gypsum** Sheathing min 23/32" plus finish floor Loose fill insulation over gypsum	GA: FC 5102 (with low insulation)
			24" o.c., min 18" depth 7/8" Rigid channel 24" o.c. attached with proprietary sound isolation clips **2 layer 5/8" proprietary Type C gypsum** Sheathing min 3/4" T&G glued Insulation max 3½"	GA: FC 5103 (with low insulation)
			24" o.c., min 12" depth, 18" with dampers Resilient channel 12" o.c. **1 layer 5/8" proprietary Type C gypsum** Sheathing min 23/32" Insulation required if truss depth < 18" Insulation max 3½"	UL: L574 (with low insulation)
			24" o.c., min 12" depth Resilient furring channel 12" o.c. **1 layer 5/8" proprietary Type C gypsum** Sheathing min 23/32" glued	GA: FC 5012 (with low insulation)
			24" o.c., min 12" depth/18" with damper 2x oriented either vertically or horizontally Resilient or furring channel 12" o.c. **1 layer 5/8" proprietary Type C gypsum** Sheathing min 23/32" glued plus finish floor Optional insulation	UL: L521 (with low insulation)
			24" o.c., parallel chord, min 12" depth, 18" if damper used Resilient channel 12" o.c. **1 layer 5/8" proprietary Type C gypsum** Sheathing min 23/32" glued Optional batt or loose fill insulation	UL: L563 (with low insulation)

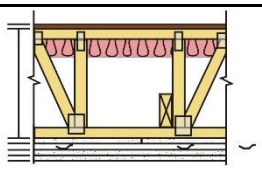
1 HOUR - Insulation	Floor		24" o.c., min 12" depth, 18" if damper used 2x oriented vertically or horizontally Resilient or furring channel 12" o.c. **1 layer 5/8" proprietary Type C gypsum** Sheathing min 23/32" glued No limit on insulation depth	UL: L550 (with low insulation)
			24" o.c., parallel chord, min 12" depth 2x oriented vertically or horizontally Resilient channel 12" o.c. **1 layer 5/8" proprietary Type C gypsum** Sheathing min 23/32" glued Glass fiber or loose fill insulation any depth	UL: L576 (with low insulation)
			24" o.c., parallel chord, min 12" Resilient channel 12" o.c. **1 layer 5/8" proprietary Type C gypsum** Sheathing min 23/32" glued Glass fiber or loose fill insulation any depth	UL: L579 (with low insulation)
			24" o.c., parallel chord, min 12" 2x oriented vertically or horizontally Furring channel 16" o.c. **2 layer 5/8" proprietary Type C gypsum** Sheathing min 3/4" T&G glued Glass fiber 3-1/2" required Optional ducts and dampers	UL: L581 (with low insulation)
			24" o.c., parallel chord, min 12" 2x oriented vertically or horizontally Furring channel 24" o.c. with steel framing **2 layer 5/8" proprietary Type C gypsum** Sheathing min 3/4" T&G glued Glass fiber 6-1/4" required Optional ducts and dampers	UL: L583 (with low insulation)
			24" o.c., parallel chord, min 18" 2x oriented vertically or horizontally Resilient channel 12" o.c. **1 layer 5/8" proprietary Type C/A gypsum** Sheathing min 23/32" T&G + finish floor Glass fiber insulation max 3½"	UL: L585 (with low insulation)
			24" o.c., parallel chord, min 12" 2x oriented vertically or horizontally Resilient channel 12" o.c. **1 layer 5/8" proprietary Type C gypsum** Sheathing min 23/32" T&G Glass fiber or mineral wool insulation no depth limit	UL: L587 (with low insulation)
			24" o.c., parallel chord, min 18" 2x oriented vertically or horizontally Resilient channel 12" o.c. **1 layer 5/8" proprietary Type C gypsum** Sheathing min 23/32" T&G Glass fiber or mineral wool insulation max 3-1/2"	UL: L592 (with low insulation & ducts & dampers)
			24" o.c., parallel chord, min 12" 2x oriented vertically or horizontally Furring channel 12" o.c. **1 layer 5/8" proprietary Type C gypsum** Sheathing min 15/32" Glass fiber or mineral wool insulation no depth limit	UL: M501 (with low insulation) (air ducts. With dampers truss depth increase to 18")
			24" o.c., parallel chord, min 12" 2x oriented vertically or horizontally Resilient channel 16" o.c. **1 layer 5/8" proprietary Type C gypsum** Sheathing min 23/32" glued Insulation max 3-1/2"	UL: M503 (with low insulation) (air ducts & dampers)
			24" o.c., parallel chord, min 12" 2x oriented vertically or horizontally Resilient channel 12" o.c. **1 layer 5/8" proprietary Type C gypsum** Sheathing min 23/32" glued Glass fiber or mineral wool insulation no depth limit	UL: M508 (with low insulation) (optional ducts & dampers)

1 HOUR - Insulation	Floor		24” o.c., parallel chord, min 12” 2x oriented vertically or horizontally Resilient channel 12” o.c. **1 layer 5/8” proprietary Type C gypsum** Sheathing min 23/32” glued Glass fiber, mineral wool or sprayed fiber insulation no depth limit	UL: M509 (with low insulation) (ducts & dampers)
			24” o.c., parallel chord, min 12” 2x oriented vertically or horizontally Resilient channel 12” o.c. **1 layer 5/8” proprietary Type C gypsum** Sheathing min 23/32” glued Glass fiber or mineral wool insulation no depth limit	UL: M516 (with low insulation) (ducts, 18” depth with dampers)
			24” o.c., parallel chord, min 18” 2x oriented vertically or horizontally Resilient channel 12” o.c. **1 layer 5/8” proprietary Type C gypsum** Sheathing min 23/32” glued Glass fiber or mineral wool insulation no depth limit	UL: M520 (low insulation)
			24” o.c., parallel chord, min 12” 2x oriented vertically or horizontally Resilient channel 12” o.c. **1 layer 5/8” proprietary Type C gypsum** Sheathing min 23/32” glued Optional Glass fiber, mineral wool or loose fill no depth limit	UL: M522 (low insulation) (optional air duct & dampers truss depth increased to 18”) (includes nonbearing wall partition parallel/perp to trusses)
	Floor with damper, duct, fixtures and metal trim [Note 1]		24" o.c., parallel chord, min 18" depth 2x oriented vertically or horizontally Resilient or furring channel 12" o.c. **1 layer 5/8" proprietary Type C gypsum** Sheathing min 15/32” glued Optional Glass fiber, mineral wool or loose fill no depth limit	UL: L546 (with low insulation)
1 HOUR – No Insulation	Pitched or Parallel Roof		24" o.c., pitched or parallel, min depth 5-1/4” [Note 3] min slope 3/12 2x oriented vertically or horizontally Resilient channel 12" o.c. **1 layer 5/8" proprietary Type C gypsum** Sheathing min 15/32"	UL: P549 (no insulation or damper)
	Floor or Roof suspended ceiling & fixtures [Note 1]		Nominal 2x3, 24” o.c., min 10” depth Truswal metal truss plates TrusGard Protective Channel **Fire rated suspended ceiling dropped 7½”** Sheathing min nom 5/8” Strongback	WH: TSC/FCA 60-08
			Nominal 2x3, 24” o.c., min 10” depth Truswal metal truss plates **Fire rated suspended ceiling dropped 7½”** Sheathing min nom 5/8” Strongback	WH: TSC/FCA 60-04
	Floor suspended ceiling & fixtures [Note 1]		24” o.c., parallel chord, min 12” depth 2x oriented vertically or horizontally Steel runner system dropped 7½” **1 layer 5/8” proprietary Type C gypsum** Sheathing min 23/32” T&G glued	UL: L529

1 HOUR- Insulation	Pitched Roof Optional duct & damper [Note 1]		24" o.c., min depth not stated Resilient channel 12" o.c. **1 layer 5/8" proprietary Type C gypsum** Sheathing min 15/32"	GA: RC 2603 (based on UL P533)
			24" o.c., pitched or parallel, min depth 5-1/4" [Note 3] min slope 3/12 2x oriented vertically or horizontally Resilient channel 12" o.c. **1 layer 5/8" proprietary Type C gypsum** Sheathing min 15/32"	UL: P522 (optional low insulation) P533 (optional low insulation) P538 [Note 2] (optional low insulation) P545 (optional low insulation) P547 (optional low insulation) P552 (low insulation) P554 (optional low insulation) P556 (optional low insulation) P559 (low insulation)
			24" o.c., no min depth Resilient channel 12" o.c. **1 layer 5/8" proprietary Type C gypsum** Sheathing min 15/32" Glass fiber or mineral batt directly over gypsum board	GA: RC 2606 (With low insulation)
			24" o.c., min 3" depth [Note 3] min 3:12 slope Resilient channel 12" o.c. **1 layer 5/8" proprietary Type C gypsum** Sheathing min 15/32" glued	UL: P531 (optional low insulation) P544 (optional low insulation)
			24" o.c., min 3" no minimum depth Resilient channel 12" o.c. **1 layer 5/8" proprietary Type C gypsum** Sheathing min 15/32" Glass fiber insulation	GA: RC 2604 (With low insulation)
			24" o.c., no min listed Resilient channel 12" o.c. **1 layer 5/8" proprietary Type C gypsum** Sheathing min 15/32" Glass fiber of mineral batt applied directly over gypsum board	GA: RC 2608 (based on UL P549)
			24" o.c., no min listed Resilient channel 12" o.c. **1 layer 5/8" proprietary Type C gypsum** Sheathing min 15/32" glued Glass fiber or mineral batt applied directly over gypsum board	GA: RC 2609 (with low insulation) (based on UL P538)
			24" o.c., no min listed parallel or pitched Resilient channel 12" o.c. **1 layer 5/8" proprietary Type C gypsum** Sheathing min 23/32" Glass fiber batt applied directly over resilient channel	GA: RC 2610 (with low insulation) (based on UL P552)
			24" o.c., no min listed pitched Resilient channel 12" o.c. **1 layer 5/8" proprietary Type C gypsum** Sheathing min 15/32" Glass fiber batt applied directly over gypsum board	GA: RC 2611 (with low insulation) (based on UL P547)
			24" o.c., pitched or parallel, min depth 5-1/4" [Note 3] min slope 3/12 2x oriented vertically or horizontally Resilient/furring channel 16" o.c. **1 layer 5/8" proprietary Type C gypsum** Sheathing min 15/32"	UL: P522 (optional high insulation) P538 [Note 2] (optional high insulation) P545 (optional high insulation) P547 (optional high insulation) P552 (high insulation) P554 (optional high insulation) P556 (optional high insulation) P559 (low insulation)
			24" o.c., parallel or sloped, min 5-1/4" depth [Note 3] min 3:12 slope 2x oriented vertical or horizontal Furring channel 12" o.c. **1 layer 5/8" proprietary Type C gypsum** Sheathing min 15/32"	UL: P533 (optional high insulation)

1 HOUR- Insulation	Pitched Roof Optional duct & damper [Note 1]		24" o.c., min 3" no minimum depth Resilient channel 16" o.c. **1 layer 5/8" proprietary Type C gypsum** Sheathing min 15/32"	GA: RC 2604 (With high insulation)
			24" o.c., no min listed Resilient channel 16" o.c. **1 layers 5/8" proprietary Type C gypsum** Sheathing min 15/32" Glass fiber of mineral batt secure to sheathing	GA: RC 2608 (with high insulation) (based on UL P549)
			24" o.c., no min listed Resilient channel 16" o.c. **1 layers 5/8" proprietary Type C gypsum** Sheathing min 15/32" glued Glass fiber of mineral batt secure to sheathing	GA: RC 2609 (with high insulation) (based on UL P538)
			24" o.c., no min listed parallel or pitched Resilient channel 16" o.c. **1 layer 5/8" proprietary Type C gypsum** Sheathing min 23/32" Glass fiber batt secured to wood sheathing	GA: RC 2610 (with high insulation) (based on UL P552)
			24" o.c., min 5-1/4" depth [Note 3] min 3:12 slope Resilient channel 16" o.c. **1 layer 5/8" proprietary Type C gypsum** Sheathing min 15/32" glued	UL: P531 (optional high insulation) P538 [Note 2] (optional high insulation) P544 (optional high insulation)
1.5-HOUR Rating	Floor or Roof		Nominal 2x3, 24" o.c., min 10" depth Truswal metal truss plates **2 layers 5/8" Type X gypsum** Sheathing min nom 5/8" Optional insulation on furring strips above bottom chord Strongback	WH: TSC/FCA 90-02 MCI/FCA 90-02
			24" o.c., parallel chord, min 12" depth 2x oriented vertically Furring channel 16" o.c. with steel framing members **1 layer 5/8" proprietary Type C gypsum** Sheathing min 23/32" T&G glued Proprietary spray fiber insulation filling cavity	UL: L582
2-HOUR – No Insulation	Floor		24" o.c., min 18" depth 7/8" hat-shaped rigid furring channel 24" o.c. **4 layers 5/8" Type X gypsum** Sheathing min 3/4" [not nominal]	GA: FC 5751 [Note 4] (based on UL L556)
			24" o.c., parallel chord, min 18" depth Resilient channel 24" o.c. **4 layers 1/2" Type X gypsum** (X515)**, or** **4 layers 5/8" Type X gypsum** (L501 or G512) Sheathing min 23/32" glued	UL: L556 (alt. truss configuration)
	Roof		24" o.c. Rigid furring channel 24" o.c. **4 layers 5/8" Type X gypsum** Sheathing min 3/4" [not nominal]	GA: RC 2751 (based on UL L556) [Note 4]

2-HOUR - Insulation	Floor or Roof		Nominal 2x3, 24” o.c., min 16” depth Wood shield member FR-Quick Channel Sets ™ **2 layers 5/8” proprietary Type X gypsum** Sheathing 19/32” or 23/32” glued Insulation on stay wires Strongback	NER: 392 WTCA FR-SYSTEM 2™
			Nominal 2x3, 24” o.c., min 9-1/4” depth Proprietary metal truss plates Resilient or furring channel 16” o.c. **3 layers 5/8” proprietary Type X gypsum** Sheathing min 23/32” glued Insulation on stay wires Strongback	NER: 392 WTCA FR-SYSTEM 6™ (1991) (Report available)
			Max 24” o.c. min 12” depth metal-plate connected wood truss Resilient or furring channel (25 ga) 24” o.c. between gyp layer 1 & 2 **3 layers 5/8” proprietary Type C gypsum** Sheathing min 5/8” T & G ply or OSB Optional insulation	Calculated Assembly See SRR 1509-02 (Report Available)
	Floor		24” o.c., min 12” depth Resilient or furring channel 16” o.c. **3 layers 5/8” proprietary Type C gypsum** Sheathing min 23/32” glued plus min ½” proprietary gypsum topping Glass batt, mineral fiber or loose fill insulation applied directly over gypsum board	GA: FC 5752 (based on UL L577)
			24” o.c., parallel chord, min 12” depth Resilient or furring channel 16” o.c. **3 layers 5/8” proprietary Type C gypsum** Sheathing min 23/32” glued Glass batt, mineral fiber or loose fill insulation applied directly over gypsum board or secured to subfloor or suspended in cavity. No depth limit.	UL: M500 (insulation required)
			24” o.c., min 12” depth Resilient or furring channel 16” o.c. **3 layers 5/8” proprietary Type C gypsum** Sheathing min 23/32” glued Glass batt, mineral fiber or loose fill insulation applied directly over gypsum board or secured to subfloor or suspended in cavity. Max 3-1/2”	UL: M510 (insulation required)
			24” o.c., min 18” depth Resilient or furring channel 12” o.c. **1 layer 5/8” proprietary Type C batten** **2 layers 5/8” proprietary Type C gypsum** Sheathing min 23/32” glued Glass batt or mineral fiber insulation applied directly over gypsum board. Min 3-1/2”	UL: M521 (insulation required)
			24” o.c., parallel chord, min 12” depth 2x oriented vertically or horizontally Resilient or furring channel 16” o.c. **3 layers 5/8” proprietary Type C gypsum** Sheathing min 23/32” glued Glass fiber or mineral wool any depth	UL: L577 (insulation low)
			24” o.c., min 12” depth Resilient or furring channel 16” o.c. **3 layers 5/8” proprietary Type C gypsum** Sheathing min 23/32” plus min ½” proprietary gypsum topping 3-1/2” Glass batt, mineral fiber or loose fill insulation applied directly over gypsum board	GA: FC 5753 (based on UL M510)

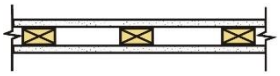
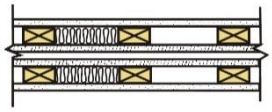
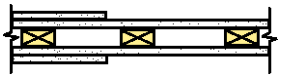
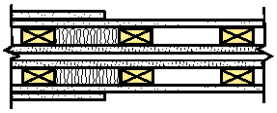
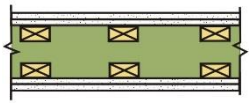
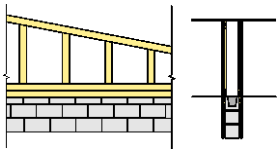
			24” o.c., parallel chord, min 12” depth 2x oriented vertically or horizontally Resilient or furring channel 16” o.c. **3 layers 5/8” proprietary Type C gypsum** Sheathing min 23/32” glued Glass fiber or mineral wool any depth	UL: L577 (insulation high

NOTES to Roof/Floor assembly Table:

1. Assemblies include ducts, dampers, lighting or other fixtures, some of which may be proprietary. See full report for details.
2. Truss plate thickness in P538 assembly erroneously list 0.040, other Pxxx assemblies correctly list 0.0356.
3. Depth of truss measured in plane of interior face of exterior wall.
4. Fire resistance provided by membrane protection (see Gypsum Association publication GA 610-13).

Attic Separation Assemblies:

If a fire rated assembly, rather than draftstopping, is required within concealed attic spaces, the following details show approved one-hour and two-hour rated assemblies that may be used in the roof cavity and that may be constructed with gable end frames. All require fire stopping per code.

	Category	Illustration	Construction	Report Number
1 –Hour Rating	Attic Separation Non-Bearing		Nominal 2x3 or 2x4 flat 24" o.c. single wall **1 layer 5/8" gypsum each side** (UL classified for use in L501, G512, or U305) Optional max 1" batt glass fiber or mineral wool insulation (BZJZ) Optional proprietary sprayed insulation to fill cavity	UL: U338
	Attic Separation Non-Bearing		Nominal 2x3 or 2x4 flat 24" o.c. double wall **1 layer 5/8" gypsum each side** (UL classified for use in L501, G512, or U305) Septum sheathed with plywood or mineral and fiber boards Optional max 1" batt insulation Optional sprayed insulation	UL: U339
	Attic Separation Bearing		Nominal 2x3 or 2x4 flat 24" o.c. single wall **2 layers 5/8" Type X gypsum each side** Optional max 1" batt insulation Optional sprayed insulation	UL: U338
	Attic Separation Bearing		Nominal 2x3 or 2x4 flat 24" o.c. double wall **2 layers 5/8" gypsum each side (**UL classified for use in L501, G512, or U305) Optional plywood or mineral and fiber board sheathing in septum Optional max 1" batt insulation Optional proprietary sprayed insulation to fill cavity	UL: U339
2-HOUR Rating	Attic Separation Bearing		Nominal 2x4 flat 24” o.c. double wall **2 layers 5/8” gypsum each side** (UL classified for use in L501, G512, or U305) Insulation – fill with proprietary spray applied cellulose	UL: U377
	Attic Separation		2 nominal 2x4 parallel chord trusses with vertical members 16” o.c., spaced 6-3/8" apart **1 layer of 5/8"proprietary gypsum 1 side each truss to ceiling cavity** Optional insulation in wall cavity Roof sheathing min. 15/32" See assembly details for block wall construction	UL: L554

General Notes:

a) Explanation of gypsum terminology:
   Regular: Any gypsum wallboard of the specified dimensions.
   Type X: Wallboard which has additives, typically glass fiber, to increase fire resistance, and manufactured in accordance with *ASTM C1396* or *C36*.
   Proprietary Type X: Indicates the assembly requires specific Type X gypsum products which were tested with that assembly.
   Type C: Similar to Type X but typically has more glass fiber in the core as well as a shrinkage-compensating additive. Manufactured in accordance with *ASTM C1396* Section 5 (*C 36*).
   Proprietary Type C: Indicates the assembly requires specific Type C gypsum products which were tested with that assembly.
   See GA 605 for proprietary gypsum panel used in UL classified assemblies. See also: UL CKNX
b) Strong backing is nominal 2x6 or greater stress-graded lumber attached perpendicular to trusses installed according to the specifications of the assembly.
c) Where listing indicates 20 MSG steel plates this is equivalent to 0.0356 inches.
d) Review all listings for required finish floor or roof materials
e) Minimum truss lumber size is nominal 2x4 or 4x2 unless otherwise stated