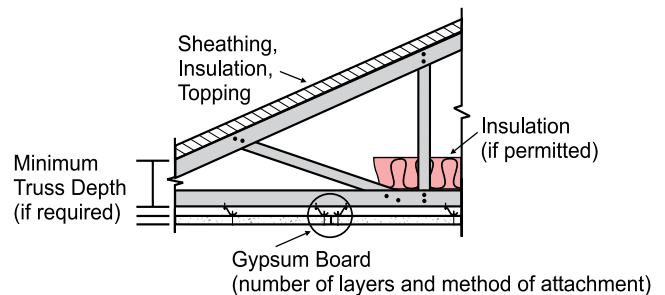
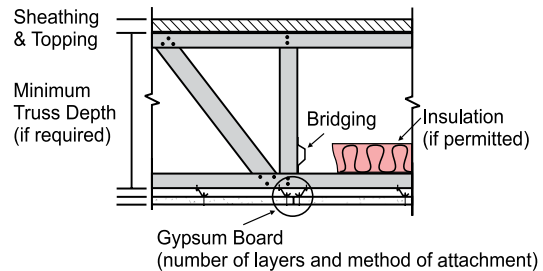


Fire Rated Cold-Formed Steel Truss Assemblies

To properly design a building for fire safety, building designers must recognize and accurately follow building fire code regulations. Building codes may require construction assemblies to have a fire resistance rating such as 1 Hour, 1-½ Hour and 2 Hour in specific construction types and occupancies. The ratings represent the minimum length of time that a laboratory tested assembly maintained its structural integrity during standardized ASTM E119 fire conditions. At this point in time, Underwriters Laboratories Inc. (UL), is the only directory that lists cold-formed steel truss assemblies. The most current listings are available in UL Online Certification Directory at www.ul.com.

Typically in fire endurance assembly testing, a system is tested and then put to use in the field. The field applications must be identical to the tested assembly. Increases in the length, depth, and size of the actual structural members are allowed because they will perform better than the tested structural members. The single-most critical element in the fire endurance performance of an assembly is the protective membrane on the side of the assembly exposed to fire, which is typically fire rated gypsum board.



These two generic assemblies show the main elements of flat and sloped cold-formed steel truss assemblies

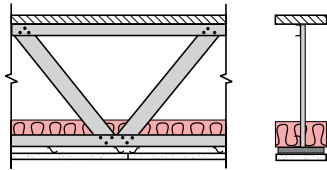
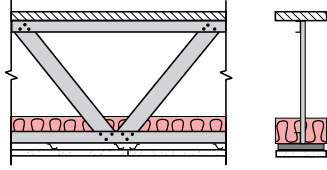
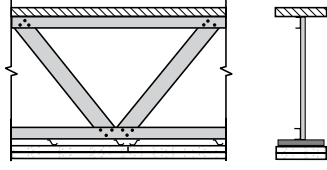
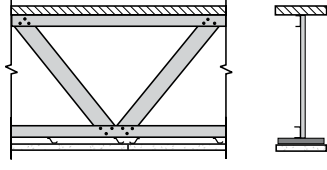
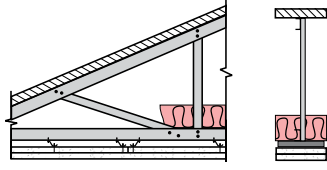
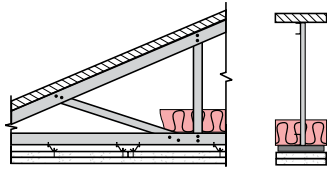
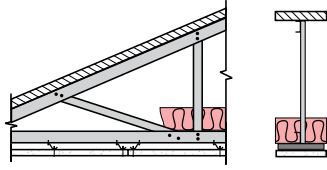
Restrained vs. Unrestrained Fire Rated Steel Truss Assemblies

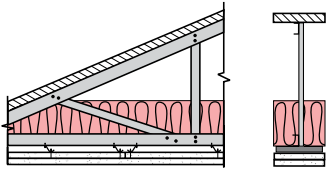
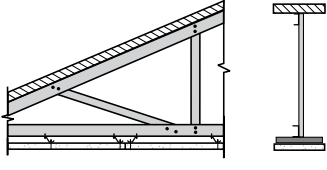
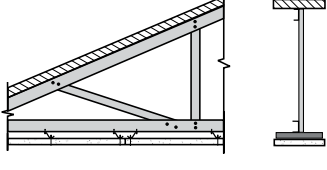
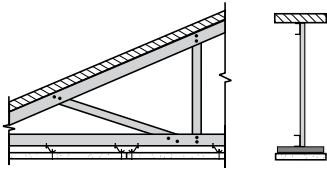
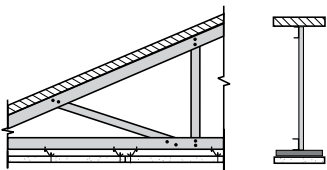
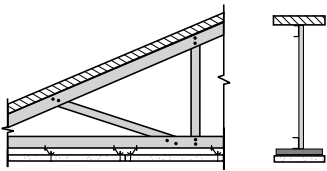
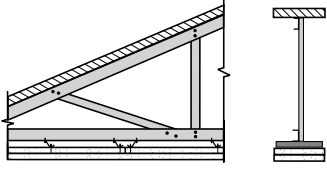
Steel assemblies may be rated as restrained or unrestrained. These are two different test procedures to mimic two types of installations. ANSI/UL 263 defines these conditions: "Floor-ceiling and roof-ceiling assemblies and individual beams in buildings shall be considered restrained when the surrounding or supporting structure is capable of resisting substantial thermal expansion throughout the range of anticipated elevated temperatures. Constructions not complying with this definition are assumed to be free to rotate and expand and shall be therefore considered as unrestrained." ASTM E119 Table 3.1 lists restrained and unrestrained construction systems. Note that restraint in fire testing is not the same as restraint in structural design.

Because of the more restrictive criteria, unrestrained assembly ratings may be used for floors and roofs designed for either restrained or unrestrained conditions. The decision on whether to use a restrained or unrestrained steel truss assembly will depend on what the building designer and building code requires. Only the UL Lxxx assemblies do not list both a restrained and unrestrained rating.

Summaries

The following table is a summary to aid in steel truss assembly selection. Always consult the full current listings for complete assembly information.

Rating	Illustration	Construction	UL Report Number
FLOOR			
1 Hr Unrestrained		Max. 48" oc truss spacing 1 layer 5/8" Type C gypsum Resilient channel 16" oc, 12" oc with insulation Ceiling insulation optional 1x4 T&G, 15/32" panel, or 3/4" topping on 23/32" subfloor; or mineral or fiber board on subfloor	L549, L551, L552, L553, L559, L560 L565
1 Hr Restrained 1 Hr Unrestrained		Max. 48" oc truss spacing 1 layer 5/8" Type C gypsum Resilient channel 16" oc, 12" oc with insulation Ceiling insulation optional Metal lath, welded wire fabric, and normal or lightweight concrete	G540, G542, G543, G544, G545, G546
2 Hr Restrained 2 Hr Unrestrained		Max. 48" oc truss spacing 2 layers 5/8" Type C gypsum Resilient channel 16" oc Ceiling insulation not allowed Metal lath, welded wire fabric, and normal or lightweight concrete	G540
2 Hr Restrained 2 Hr Unrestrained		Max. 48" oc truss spacing 1 layer 5/8" Type C gypsum Resilient channel 16" oc Ceiling insulation not allowed Metal lath, welded wire fabric, and normal or lightweight concrete	G545
ROOF			
1 Hr Restrained 1 Hr Unrestrained		Max. 48" oc truss spacing Min. depth 11-7/8" or 5" with a min. 3/12 slope 2 layers 5/8" Type X gypsum (Type C, if insul. within 1" of gyp.) Resilient channel 24" oc, not req. for trusses spaced max. 24" oc Ceiling insulation optional. Roof insulation required Roof covering, roof membrane or metal roof deck panel; steel roof deck; gypsum board	P515, P541
1 Hr Restrained 1 Hr Unrestrained		Max. 48" oc truss spacing Min. depth 11-7/8" or 8" with a min. 3/12 slope 2 layers 5/8" Type X gypsum Resilient channel 24" oc, not req. for trusses spaced max. 24" oc Ceiling insulation required. Roof insulation not allowed Roof covering, roof membrane or metal roof deck panel; steel roof deck; gypsum board	P524
1 Hr Restrained 1 Hr Unrestrained		Max. 48" oc truss spacing 1 layer 5/8" Type C gypsum Resilient channel 16" oc, 12" oc with insulation Ceiling insulation optional. Roof insulation may be required UL Class A, B, C roofing system or prepared roof covering on 23/32" panel; steel roof deck, or for P523, P534, P537 only, steel floor and form units. P526, P528 and P530 allow 15/32" panel with trusses 24" oc and min. 9-1/2" ceiling insulation	P523, P526, P528, P530, P534, P537

Rating	Illustration	Construction	UL Report Number
1-1/2 Hr Restrained 1-1/2 Hr Unrestrained		<p>Max. 48" oc truss spacing 2 layers 5/8" Type X gypsum Resilient channel 12" oc Minimum 9-1/2" ceiling insulation. Roof insulation may be required UL Class A, B, C roofing system or prepared roof covering on 23/32" panel; steel roof deck, or for P523, P534, P537 only, steel floor and form units. P526 allows 15/32" panel with trusses 24" oc</p>	P523, P526, P534, P537
1 Hr Unrestrained 1 Hr Unrestrained		<p>Max. 48" oc truss spacing 1 layer 5/8" Type C gypsum Resilient channel 16" oc No ceiling insulation. Roof insulation required, no minimum thickness Steel roof deck; cementitious backer or gypsum board; roof covering, membrane or metal deck panel</p>	P527, P529
1-1/2 Hr Restrained 1-1/2 Hr Unrestrained		<p>Max. 48" oc truss spacing 1 layer 5/8" Type C gypsum Resilient channel 16" oc No ceiling insulation, Minimum 2" roof insulation Steel roof deck; cementitious backer or gypsum board; roof covering, membrane or metal roof deck panel</p>	P527, P529
1 Hr Restrained 1 Hr Unrestrained		<p>Max. 48" oc truss spacing 1 layer 5/8" Type C gypsum Resilient channel 16" oc No ceiling insulation, Roof insulation minimum thickness may be required Steel floor and form units, min. gauge varies; cementitious backer or gypsum board; roof covering, membrane or metal roof deck panel</p>	P521, P525, P532, P536, P540
1-1/2 Hr Restrained 1-1/2 Hr Unrestrained		<p>Max. 48" oc truss spacing 1 layer 5/8" Type C gypsum Resilient channel 16" oc No ceiling insulation, min. thickness roof insulation required Steel floor and form units, min. 22 gauge; cementitious backer or gypsum board; roof covering, membrane or metal roof deck panel</p>	P521, P525, P532, P536
2 Hr Restrained 2 Hr Unrestrained		<p>Max. 48" oc truss spacing 1 layer 5/8" Type C gypsum Resilient channel 16" oc No ceiling insulation, min. thickness roof insulation required Steel floor and form units, min. 22 gauge; cementitious backer or gypsum board; roof covering, membrane or metal roof deck panel</p>	P532
2 Hr Restrained 2 Hr Unrestrained		<p>Max. 48" oc truss spacing 2 layers 5/8" Type C gypsum Resilient channel 16" oc No ceiling insulation, min. thickness roof insulation required Steel floor and form units, min. 22 gauge; cementitious backer or gypsum board; roof covering, membrane or metal roof deck panel</p>	P521, P525, P536

Cold-formed Steel Truss Assemblies by Supplier

SUPPLIER	FLOOR-CEILING	ROOF-CEILING
Aegis (MiTek) – UltraSpan	G540, L549, L565	P521, P523, P540
Allied Studco – Amkey	G543, L552, L565	P527, P528, P540
Alpine – TrusSteel	G542, L551, L565	P525, P526, P540
Dale/Incor – Versa-Truss	G544, L553, L565	P529, P530, P540
Hexaport – StrongSpan	G545, L559, L565	P532, P534, P540
NUCONSTEEL – NUTRUSS/NUTRUSS2.0	G546, L560, L565	P536, P537, P540
Generic		P515, P524, P541

Product Substitutions

Where branded products are specified in assemblies, product substitutions are not allowed. Where generic product categories are listed, substitutions of products within the category with equal or greater specifications may be allowed.

Gypsum Board Specifications

“Regular” gypsum board has a naturally occurring fire resistance from the gypsum used as its core. “Type X” gypsum board has additives to the core that increase the fire resistance of regular gypsum board. “Improved Type X” (often referred to as “Type C”) has been improved with additives which further enhance the fire resistive characteristics. “Improved Type X” can be substituted for “Type X”, but not the reverse. Gypsum may be listed as generic or as proprietary.

<p>Type X:</p> <p>FSW = NGC Fire-Shield</p> <p>SCX = USG FIRECODE Core</p> <p>IP-X1 = USG Plaster Base (Type X)</p>
<p>Improved Type X (Type C or G):</p> <p>FSW-C = NGC FireShield C</p> <p>FSW-G = NGC FireShield G</p> <p>C = USG FIRECODE C Core</p> <p>IP-X2 = USG Plaster Base (Type C)</p> <p>IPC-AR = USG Plaster Base C (Abuse Resistant)</p>
<p>Category (CKNX), per UL/ANSI 263, section 9. Gypsum Board:</p> <p>“For designs containing the statement ‘See Gypsum Board (CKNX) Category for names of Classified Companies,’ any product in the Category (CKNX) that meets the specifications (i.e. thickness, size, etc.) described in the design may be used.”</p>

References

Fire Resistance Directory, Underwriters Laboratories Inc., Northbrook, IL. www.ul.com.

ASTM E119-98. “Standard Test Methods for Fire Tests of Building Construction and Materials”, American Society for Testing and Materials (ASTM), West Conshohocken, PA. 1998. www.astm.org.

SA100 Construction Selector (rev.3-02). United States Gypsum Company, Chicago, IL. www.usg.com.

Gypsum Construction Guide, 7th Edition (rev. 8/2001). National Gypsum Company, Charlotte, NC. www.nationalgypsum.com

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