

# Design No. G561

April 24, 2020

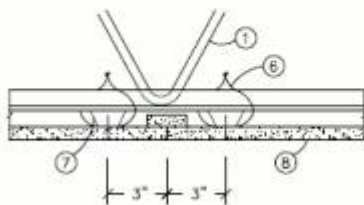
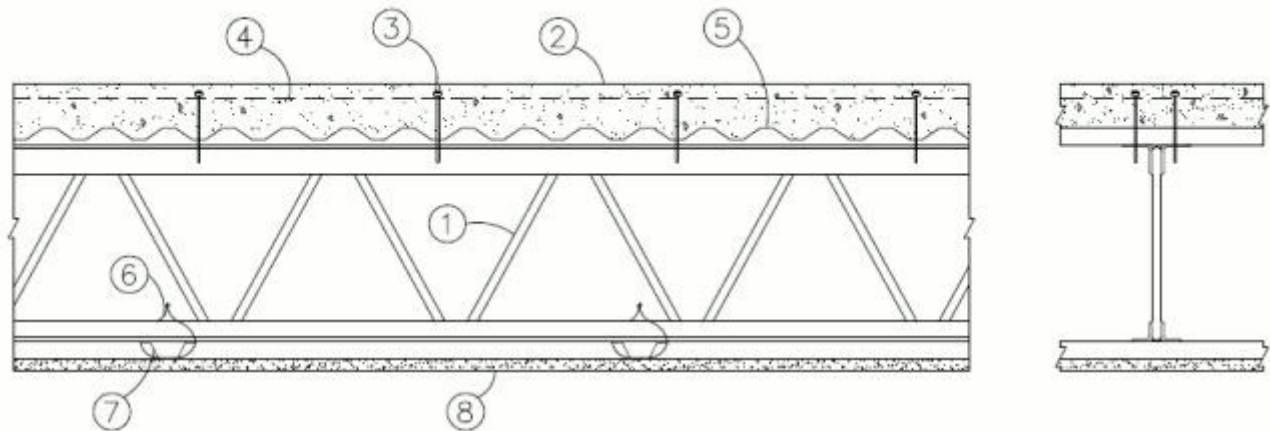
**Restrained Assembly Ratings — 1, 1-1/2, 2 and 3 Hr. (See Items 1, 1A, 1B, 1C, 1D, 2, 4A, 7C, 7E, 7I, 7K, 8, 10A - 10S, 11)**

**Unrestrained Assembly Ratings — 1, 1-1/2, 2 and 3 Hr. (See Items 1, 1A, 1B, 1C, 1D, 2, 4A, 7C, 7E, 7I, 7K, 8, 10A - 10S, 11)**

**Unrestrained Beam Ratings — 1, 1-1/2, 2 and 3 Hr. (See Items 1, 1A, 1B, 1C, 1D, 2, 4A, 7C, 7E, 7I, 7K, 8, 10A - 10S, 11)**

This design was evaluated using a load design method other than the Limit States Design Method (e.g., Working Stress Design Method). For jurisdictions employing the Limit States Design Method, such as Canada, a load restriction factor shall be used — See Guide [BXUV](#) or [BXUV7](#)

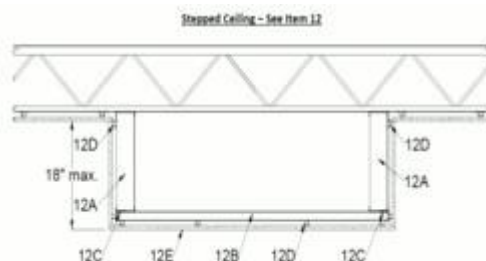
\* Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.



END JOINT DETAIL



SIDE JOINT DETAIL



1. **Steel Joists** — Composite or non-composite, spaced 48 in. OC. Min 10 in. deep and min weight of 4.9 lb/ft. Designed per S.J.I. Specifications for a max tensile stress of 30 ksi. May be either uncoated or provided with a shop coat of paint. Top and bottom chords shall each consist of two angles with a min total area of 0.652 and 0.412 sq in.,

respectively. Web members shall be either round bars or angles. Min area of the end diagonal web shall of 0.277 sq in. Min area of each of the first four interior diagonal webs shall be 0.249 sq in. All other interior webs shall have a min area of 0.196 sq in. For 1 or 2 hour ratings, the min 10 in. deep joists with min weight of 4.9 lb/ft may be spaced up to a max. 50 in. OC. For 1 or 2 hour ratings, min. 12 in. deep joists may be spaced up to a max. 72 in. OC.

1A. **Beam** — (Not Shown) — Composite or non-composite. Min W6 x 9 for 1, 1-1/2 or 2 hr ratings, and min W8 x 24 for 3 hr rating. The plenum of the assembly must maintain a minimum 10 in. depth.

1B. **Joist Girders** — (Not Shown) — As an alternate to Item 1A. Composite or non-composite. Min 10 in. deep and min weight of 4.9 lb/ft. Designed per S.J.I. Specifications for a max tensile stress of 30 ksi. May be either uncoated or provided with a shop coat of paint. Top and bottom chords shall each consist of two angles with a min total area of 0.652 and 0.412 sq in., respectively. Web members shall be either round bars or angles. Min area of the end diagonal web shall of 0.277 sq in. Min area of each of the first four interior diagonal webs shall be 0.249 sq in. All other interior webs shall have a min area of 0.196 sq in.

1C. **Structural Steel Members** — As an alternate to Item 1, 1A, or 1B. For use up to a 2 hour rating only. Composite or non-composite, spaced a maximum 48 in. OC. Min. 5 in. deep structural steel channel, fabricated from two L3.5x3.5x3/8 in. angles welded together, identified as 5VS3 (Not UL Classified). The span of the structural members shall not exceed 10 ft. The plenum of the assembly must maintain a minimum 10 in. depth.

1D. **Structural Steel Members** — As an alternate to Item 1, 1A, or 1B. For use up to a 2 hour rating only. Composite or non-composite, spaced a maximum 48 in. OC. Min. 5 in. deep structural steel member, fabricated from two C5x9 channel members welded together, identified as 5VS3 (Not UL Classified). The span of the structural members shall not exceed 10 ft. The plenum of the assembly must maintain a minimum 10 in. depth.

2. **Flooring Systems** — The flooring system shall consist of one of the following:

**Normal-Weight or Lightweight Concrete** — Min. 2-1/2 in. thick as measured from the top plane of the steel floor and form units. Normal weight concrete, carbonate or siliceous aggregate, 150 plus or minus 3 pcf unit weight, 3500 psi compressive strength. Lightweight concrete, expanded shale, clay or slate aggregate by rotary kiln method, 114 plus or minus 6 pcf unit weight, 3500 psi compressive strength. Over the top of the Normal Weight or Lightweight Concrete, **Floor Mat Materials\*** and **Floor Topping Mixtures\*** may be applied as described below.

2A. **Floor Mat Materials\*** — (Optional, Not Shown) - Floor mat material loose laid over the concrete slab. Refer to manufacturer's instructions regarding the minimum thickness of floor topping over each floor mat material.

**MAXXON CORP** — Type Encapsulated Sound Mat.

2B. **Floor Mat Reinforcement** — (Optional) - Refer to manufacturer's instructions regarding minimum thickness of floor topping for use with floor mat reinforcement. **Metal Lath** — (Optional) — 3/8 in. expanded galvanized steel diamond mesh, 3.4 lbs/sq yd loose laid over the floor mat material. **Fiber Glass Reinforcement** — (Optional) - 0.015 in. thick PVC coated non-woven fiberglass mesh, 0.368 lbs./sq. yd loose laid over the floor mat material.

2C. **Finish Flooring — Floor Topping Mixture\*** — (For use with Item 2A and/or 2B) - Min 3/4 in. thickness of floor topping mixture having a min compressive strength of 1500 psi. Refer to manufacturer's instructions accompanying the material for specific mix design.

**MAXXON CORP** — Types Maxxon Standard and Maxxon High Strength

2D. **Floor Mat Materials\*** — (Optional) — Floor mat material nom 1/8 in. (3 mm) thick loose laid over the concrete slab. Floor topping thickness shall be a min of 3/4 in. (19 mm).

**HACKER INDUSTRIES INC** — FIRM-FILL SCM 125

**Alternate Floor Mat Materials\*** (Optional) — Floor mat material nom 1/4 in. (6 mm) thick loose laid over the concrete slab. Floor topping thickness shall be a min of 1 in. (25 mm).

**HACKER INDUSTRIES INC** — Type FIRM-FILL SCM 250

**Alternate Floor Mat Materials\*** (Optional) — Floor mat material nom 3/8 in. (10 mm) thick loose laid over the concrete slab. Floor topping thickness shall be a min of 1-1/4 in. (32 mm)

**HACKER INDUSTRIES INC** — FIRM-FILL SCM 400

**Alternate Floor Mat Materials\*** — (Optional) — Floor mat material nom 3/4 in. (19 mm) thick loose laid over the concrete slab. Floor topping thickness shall be a min of 1-1/2 in. (38 mm).

**HACKER INDUSTRIES INC** — Type FIRM-FILL SCM 750

**Metal Lath** (Optional) - For use with 3/8 in. (10 mm), or greater, floor mat materials, 3/8 in. expanded steel diamond mesh, 3.4 lbs/sq yd placed over the floor mat material. Hacker Floor Primer to be applied prior to the placement of the metal lath. When metal lath is used, floor topping thickness a nom 1 in. (25 mm) over the floor mat.

2E. **Finish Flooring — Floor Topping Mixture\*** — Min 3/4 in. thickness of floor topping mixture having a min compressive strength of 1100 psi. Mixture shall consist of 6.8 gal of water to 80 lbs of floor topping mixture to 1.9 cu ft of sand.

**HACKER INDUSTRIES INC** — Firm-Fill Gypsum Concrete, Firm-Fill 2010, Firm-Fill 3310, Firm-Fill 4010, Gyp-Span Radiant

2F. **Floor Topping Mixture\*** — (Optional) — Floor mat material nom 5/64 in. (2 mm) thick adhered to concrete slab with Hacker Floor Primer. Primer to be applied to the surface of the mat prior to the placement of floor-topping mixture. Floor topping thickness a min 1 in. over the floor mat.

**HACKER INDUSTRIES INC** — Type Hacker Sound-Mat

**Alternate Floor Mat Materials** — (Optional) — Floor mat material nom 1/4 in. (6 mm) thick adhered to concrete slab with Hacker Floor Primer. Primer to be applied to the surface of the mat prior to the placement of a min 1-1/4 in. (32 mm) of floor-topping mixture.

**HACKER INDUSTRIES INC** — Type Hacker Sound-Mat II

**Metal Lath** — — (Optional) For use with 3/8 in. (10 mm) floor mat materials, 3/8 in. expanded steel diamond mesh, 3.4 lbs/sq yd placed over the floor mat material. Hacker Floor Primer to be applied prior to the placement of the metal lath. When metal lath is used, floor topping thickness a nom 1-1/4 in. over the floor mat.

**2G. Finish Flooring — Floor Topping Mixture\*** — — Min 3/4 in. thickness of floor topping mixture having a min compressive strength of 1100 psi. Mixture shall consist of 6.8 gal of water to 80 lbs of floor topping mixture to 1.9 cu ft of sand.

**HACKER INDUSTRIES INC** — Firm-Fill Gypsum Concrete, Firm-Fill High Strength, Gyp-Span Radiant

**Gypsum Board\*** — — (For use when floor mat Item 2B is used) Two layers of nom 5/8 in. thick, 4 ft wide gypsum board, installed with long dimension perpendicular to joists on top of the floor mat material. Gypsum board secured to each other with 1 in. long No. 6 Type G bugle head steel screws spaced 12 in. OC and located a min of 1-1/2 in. from side and end joints. The joints of the gypsum board are to be staggered a minimum of 12 inches in between layers and from the joints of the concrete slab.

**GEORGIA-PACIFIC GYPSUM L L C** — Type DS

**2H. Floor Topping Mixture\* — (Optional, as an alternate to Items 2A through 2E)** — — Min 3/4 in. thickness of floor topping mixture having a minimum compressive strength of 1800 psi. Refer to manufacturer's instructions accompanying the material for specific mix design.

**UNITED STATES GYPSUM CO** — Types LRK, HSLRK, CSD

**USG MEXICO S A DE C V** — Types LRK, HSLRK, CSD

**Floor Mat Materials\*** — (Optional) — Floor mat material loose laid over the concrete slab. Refer to manufacturer's instructions regarding the minimum thickness of floor topping over each floor mat material.

**UNITED STATES GYPSUM CO** — Types SAM, LEVELROCK® Brand Sound Reduction Board, LEVELROCK® Brand Floor Underlayment SRM-25

2I. **Floor Topping Mixture\*** — (Optional, As an alternate to Items 2A through 2E) — Min 3/4 in. thickness of floor topping mixture having a minimum compressive strength of 1000 psi. Refer to manufacturer's instructions accompanying the material for specific mix design.

**FORMULATED MATERIALS LLC** — Types FR-25, FR-30, and SiteMix.

**Floor Mat Materials\*** — (Optional) — Floor mat material loose laid over the concrete slab. Refer to manufacturer's instructions regarding the minimum thickness of floor topping over each floor mat material.

**FORMULATED MATERIALS LLC** — Types M1, M2, M3, Elite, Duo, R1, and R2.

2J. As an alternate to Items 2 - 2I:

**Vapor Barrier** — (Optional) - Commercial asphalt saturated felt, 0.030 in. thick.

**Vapor Barrier** — (Optional) - Nom 0.010 in. thick commercial rosin-sized building paper.

**Finish Flooring - Floor Topping Mixture\*** — Min 3/4 in. thickness of any Floor Topping Mixture bearing the UL Classification Marking as to Fire Resistance. See Floor- and Roof-Topping Mixtures (CCOX) category for names of Classified Companies.

**Floor Mat Materials\*** — (Optional, Not Shown) - Floor mat material loose laid over the subfloor. Refer to manufacturer's instructions regarding the minimum thickness of floor topping over each floor mat material.

**LOW & BONAR INC** — EnkaSonic® by Colbond a member of the Low & Bonar group Types 125, 250, 250 Plus, 400, 400 Plus, 750, and 750 Plus.

**Floor Mat Reinforcement** — (Optional) - Refer to manufacturer's instructions regarding minimum thickness of floor topping for use with floor mat reinforcement.

**Metal Lath** — (Optional) — Expanded steel diamond mesh, 2.5 lb / sq yd loose laid over floor mat material.

**Fiberglass Mesh Reinforcement** — (Optional) — Coated non-woven glass fiber mesh grid loose laid over floor mat material.

3. **Steel Floor or Form Unit Accessories\*** — Threaded shear connectors, screwed into the top chord of joist through the steel floor units. Shear connector spacing and attachment shall be as recommended by the steel joist or girder manufacturer.

**VULCRAFT, DIV OF NUCOR CORP** — Type SHEARFLEX, for use with the ECOSPAN Composite Floor System only.

3A. **Shear Connector** — (Optional) — For use with Items, 1, 1A or 1B only. Studs, min 3/8 in. diam headed type or equivalent per A.I.S.C. specifications. Welded to the top chord of joist or joist girder through the steel floor units. Stud welding, as recommended by the stud manufacturer, should be followed.

4. **Welded Wire Fabric** — Min. 6 x 6 — W1.4 x W1.4, or as required by the latest ACI code.

4A. **Fiber Reinforcement\*** — As an alternate to Item 4, for 1, 1-1/2 and 2 hr assembly and beam ratings only. Engineered Synthetic or Steel fibers added to concrete mix to control shrinkage cracks in concrete. See Fiber Reinforcement (CBXQ) Category for rate that fibers are added to concrete mix and names of manufacturers. The floor assembly with the fiber reinforcement must still meet its structural capacity requirements.

5. **Steel Floor and Form Units\*** — For 1, 1-1/2, 2 and 3 hr ratings - Min 1 in. deep, 26 gauge uncoated or galv., fluted or cellular steel floor units, min nominal joist depth 10 in., joists may be spaced max. 48 in. OC. Floor units screwed to joists (Item 1) with shear connectors (Items 3 or 3A), or welded to joists. For 1 to 2 hour ratings, when using min nominal joist depth of 12 in. and min. 1 in. deep, 24 gauge uncoated or galv. fluted or cellular steel floor units, joists may be spaced at an average on center spacing of 57 in. with no span exceeding 66 in. OR, joists may be spaced max. 72 in. OC when using min. 1 in. deep, 22 gauge uncoated or galv. fluted or cellular steel floor units or min. 1.5 in. deep, 24 gauge uncoated or galv. fluted steel floor units.

**VERCO DECKING INC - A NUCOR CO** — Deck types PLB, HSB, Deep VERCOR; FORMLOK™ deck types PLB, B, BR, PLW2, W2, PLW3, W3. Units are min 24 in. wide and may be galvanized, phos./ptd., or mill finish. Units may be cellular or acoustical cellular, with the suffix "CD" or "CD-AC" added to the product name, respectively.

**VULCRAFT, DIV OF NUCOR CORP** — 32 through 36 in. wide, Types 1.0C, 1.5C, 1.5VLR, 1.5VL, 1.5VLI, 1.5VLP, or 36 in. wide, Types 2VLI, 2VLP, 3VLI, 3VLP

6. **Tie Wire** — No. 18 SWG (0.048 in. diam) galv steel wire. Tie wire used to attach gypsum board furring channels to steel joists, joist girders or cold rolled channels.

6A. **Hanger Wire** — (Not Shown) No. 12 SWG galv steel wire for use where indicated.

6B. **Hanger Clips** — (Not shown) Galv steel angles, 3/4 in. long with 1-3/8 in. horizontal and 1 in. vertical legs. Vertical leg provided with a 5/16 in. diam hole to accommodate hanger wire. Horizontal leg provided with a 3/16 in. diam hole for insertion of fastener. Hanger clips secured to underside of concrete slab using nom 1 1/8 in. long, 0.145 in. diam shank with 0.312 in. diam head, powder-driven galv steel fasteners.

7. **Furring Channels** — Min 0.0188 in. thick (25 gauge) galv steel, 7/8 in. high, 2-5/8 in. (or 2-9/16 in. or 2-23/32 in.) base width and 1-1/4 in. face width. Installed perpendicular to steel joists 24 in. OC. When **Batts and Blankets\*** (Item 11) are used, furring channels spaced 16 in. OC. At gypsum board end joints, one channel shall be located on each side and 3 in. from end joint. All channels tied to bottom chord of each joist with double strand of tie wire. At splices, channels overlapped 8 in. and tied together with double strand of tie wire near each end of overlap. As an option for maximum 1 hour ratings (not shown) wood or fiberglass shims, 3 in. by 5 in. by maximum 1 in. thick, or wool felt pad

shims, 2 in. by 4 in. by maximum 1 in. thick, may be friction-fit between the top surface of the furring channels and the lower surface of the steel joists or joist girders.

**7A. Cold Rolled Channels** — (Not Shown) — For use where indicated in Items 10 - 10Q. Min 0.053 in. thick (16 gauge) cold-rolled steel channels, 1-1/2 in. deep with 7/16 in. flanges. When it is necessary to lower the ceiling below the bottom plane of the joists, the cold rolled steel channels shall be used for attachment of furring channels. The channels shall be installed with their web oriented vertically and suspended from the joists or from the hanger clips (Item 6B) with 12 SWG or heavier gauge hanger wire at a max spacing of 50 in. OC. The spacing of the channels shall be no greater than the spacing of the joists. Adjoining lengths of cold-rolled channel spliced together by overlapping min 12 in., face to face or back to back, and tying with three double strands of 18 SWG galv steel wire.

**7B. Cold-Rolled Channels** — (Not shown) - Min 0.053 in. thick (16 gauge) cold-rolled steel channels, 1-1/2 in. deep with 7/16 in. flanges. When the composite or noncomposite steel joists are spaced more than 50 in. OC, a cold-rolled steel channel shall be suspended between joists, with its web vertical and with its lower flange flush with the plane at the bottom of the joists, to provide an intermediate support for the furring channels (Item 7). The channel shall be placed so as to provide support for the furring channel such that the span of the furring channel does not exceed 50". The cold-rolled channels are suspended from hanger clips (Item 6B) using 12 SWG galv steel hanger wire spaced max 50 in. OC. The channels shall be installed with their web oriented vertically and suspended from the joists or from the hanger clips (Item 6B) with 12 SWG or heavier gauge hanger wire at a max spacing of 50 in. OC. The channels spaced a maximum of 50 in. OC.

**7C. Steel Framing Members\*** — (Not Shown) — For the 1, 1-1/2 and 2 Hr Assembly and Beam Ratings only, as alternate to Furring Channels (Item 7), the following suspension system may be used:

a. **Main runners** — Nom. 12 ft. long spaced 4 ft OC perpendicular to steel joists.

b. **Cross Tees** — Nom 4 ft. long, 1-1/2 in. wide face or 15/16 in. wide face installed at sides of light fixtures, installed perpendicular to the main runners, spaced 24 in. OC. When **Batts and Blankets\*** (Item 11) are used, cross tees spaced 16 in. OC. Additional cross tees or cross channels used at 8 in. from each side of butted wallboard end joints. The cross tees or cross channels may be riveted or screw attached to the wall angle or channel to facilitate the ceiling installation.

**ROXUL USA INC. D/B/A ROCKFON** — Types 650, 650C, 670, 670C.

**7D. Wall Molding** — (Not Shown) — For use with Items 7C or 7E, min 0.019 in. thick steel channel, 1-11/16 in. with 15/16 in. legs, nailed to walls along perimeter of ceiling.

**7E. Steel Framing Members\*** — (Not Shown) — As an alternate to Items 7, 7C and 7D. Main runners nom 12 ft long, spaced 48 in. OC. Cross channels, 4 ft long, installed perpendicular to main runners and spaced 24 in. OC. Additional cross channels required 8 in. from and on each side of gypsum board end joints.

**ROXUL USA INC. D/B/A ROCKFON** — Types 630, 650, 650C, 670, 670C. When Type 630 Steel Framing Members or Types 654C or 674C cross tees are used, unrestrained assembly and beam ratings are limited to 2 hr.

**7F. Steel Framing Members\*** — (Not Shown) — As an alternate to Items 7, 7A, 7B, 7C, 7D and 7E. Main runners, cross tees, cross channels and wall angle as listed below:

- a. **Main runners** — Nom 10 or 12 ft. long, 15/16 in. or 1-1/2 in. wide face, spaced 4 ft. OC.
- b. **Cross Tees** — Nom 4 ft. long, 1-1/2 in. wide face or 15/16 in. wide face installed at sides of light fixtures, installed perpendicular to the main runners, spaced 24 in. OC. When **Batts and Blankets\*** (Item 11) are used, cross tees spaced 16 in. OC. Additional cross tees or cross channels used at 8 in. from each side of butted wallboard end joints. The cross tees or cross channels may be riveted or screw attached to the wall angle or channel to facilitate the ceiling installation.
- c. **Cross Channels** — Nom 4 ft. long, installed perpendicular to main runners, spaced 24 in. OC. When **Batts and Blankets\*** (Item 11) are used, cross channels spaced 16 in. OC.
- d. **Wall Angle or Channel** — Painted or galv steel angle with 1 in. legs or channel with 1 in. legs, 1-9/16 in. deep attached to walls at perimeter of ceiling with fasteners 16 in. OC. To support steel framing member ends and for screw-attachment of the gypsum board.

**CGC INC** — Type DGL or RX

**USG INTERIORS LLC** — Type DGL or RX

7G. **Steel Framing Members\*** — (Not Shown) — As an alternate to Items 7, 7A, 7B, 7C, 7D, 7E and 7F, main runners nom 12 ft long, spaced 48 in. OC. Ends of main runners at walls to rest on wall molding (Item 7D), without attachment, with 1/2 to 3/4 in. end clearance. Primary cross tees (1-1/2 in. wide across flange) or cross channels, nom 4 ft long, installed perpendicular to main runners and spaced 24 in. OC. Additional primary cross tees or cross channels required at each gypsum board end joint and 8 in. from and on each side of gypsum board end joint.

**ARMSTRONG WORLD INDUSTRIES INC** — Type DFR-8000

7H. **Cold Rolled Channels** — (Not Shown) — For use with Items 1A, 1C or 1D. Min 0.053 in. thick (16 gauge) cold-rolled steel channels, 1-1/2 in. deep with 7/16 in. flanges. Required to lower the ceiling below the bottom plane of the structural members to a minimum plenum depth of 10 in., the cold rolled steel channels shall be used for attachment of furring channels. The channels shall be installed with their web oriented vertically and suspended from the structural steel members or from the hanger clips (Item 6B) with 12 SWG or heavier gauge hanger wire at a max spacing of 48 in. OC. The spacing of the channels shall be no greater than the spacing of the structural steel members. Adjoining lengths of cold-rolled channel spliced together by overlapping min 12 in., face to face or back to back, and tying with three double strands of 18 SWG galv steel wire.

7I. **Steel Framing Members\*** — (Not Shown) — For 1, 1-1/2 or 2 Hour Ratings Only — As an alternate to Item 7 — Furring channels and **Steel Framing Members\*** as described below:

- a. **Furring Channels** — Formed of No. 25 MSG galv steel, 2-3/8 in. wide by 7/8 in. deep, spaced 24 in. OC perpendicular to joists. When **Batts and Blankets\*** (Item 11) are used, furring channels spaced 16 in. OC. Channels secured to joists as described in Item b. Ends of adjoining channels overlapped 6 in. and tied together with double strand of No. 18 SWG galv steel wire near each end of overlap.



b. **Steel Framing Members\*** — Used to attach furring channels (Item a) to joists (Item 1). Clips spaced 48 in. OC and secured to the bottom chord of consecutive joists with cup washer installation kit provided by manufacturer. GenieClip clip attached to the bottom chord with a 1/4 in. dia. zinc plated bolt inserted through the center grommet and between the chord members; depth of bolt determined as 2 in. plus the depth of the bottom chord of the joist. Furring channels are friction fitted into clips. Adjoining channels are overlapped as described in Item a. Additional clips required to hold furring channel that supports the gypsum board butt joints, as described in Item 8.

**PLITEQ INC** — Type Genie Clip

7J. **Steel Framing Members\*** — (Not Shown) — For 1, 1-1/2, 2, or 3 Hour Ratings — As an alternate to Item 7 — Furring channels and **Steel Framing Members\*** as described below:

a. **Furring Channels** — Min 0.020 in. thick (25 gauge) galv steel, 2-9/16 in. or 2-11/16 in. or 2-23/32 in. wide at top and 1-3/4 in. wide at bottom by 7/8 in. deep; spaced 24 in. O.C., perpendicular to joists, except at wallboard end joints as noted below. When **Batts and Blankets\*** (Item 11) are used, furring channels spaced 16 in. OC. Two courses of furring channel positioned 6 in. O.C., 3 in. on each side of wallboard end joints. Channels secured to each joist with 18 SWG galv steel wire bent into double strand saddle ties. Channels spliced with adjoining pieces overlapped 6 in. and tied together with strand of 18 SWG galv steel wire at each end of overlap.

b. **Steel Framing Members\*** — (Optional, Not Shown) — Alternate method to attach furring channels (7Ja) to joists (Item 1 or 1B). Clips spaced 48 in. OC., and secured to alternating joists with cup washer installation kit provided by manufacturer. On underside of bottom chord, 1-1/2 in. dia x 3/8 in. deep No. 16 galv steel cup washer is placed to surround the rubber insert. Clip attached to the bottom chord with a 1/4 in. dia. zinc plated bolt inserted through the center grommet and between the chord members; depth of bolt determined as 1-1/2 in. plus the depth of the bottom chord of the joist. Fastened on the top side of the bottom chord with a second cup washer placed open side up, and a 1/4 in. zinc plated "Nyloc" nut. Furring channels are friction fitted into clips. RSIC-1 clip for use with 2-9/16 in. wide furring channels. RSIC-1 (2.75) clip for use with 2-23/32 in. wide furring channels. Ends of adjoining channels are overlapped 6 in. and tied together with double strand of No. 18 SWG galv steel wire near each end of overlap. As an alternate, ends of adjoining channels may be overlapped 6 in. and secured together with two self-tapping No. 6 framing screws, min. 7/16 in. long at the midpoint of the overlap, with one screw on each flange of the channel. Additional clips required to hold furring channel that supports the wallboard butt joints, as described in Items 7 and 8.

**PAC INTERNATIONAL L L C** — Types RSIC-1, RSIC-1 (2.75)

7K. **Steel Framing Members\*** — (Not Shown) — For 1, 1-1/2 or 2 Hour Ratings Only — As an alternate to Item 7 — Furring channels and **Steel Framing Members\*** as described below:

a. **Furring Channels** — Formed of No. 25 MSG galv steel, 2-3/8 in. wide by 7/8 in. deep, spaced 24 in. OC perpendicular to joists. When **Batts and Blankets\*** (Item 11) are used, furring channels spaced 16 in. OC. Channels secured to joists as described in Item b. Ends of adjoining channels overlapped 6 in. and tied together with double strand of No. 18 SWG galv steel wire near each end of overlap.

b. **Steel Framing Members\*** — Used to attach furring channels (Item 7Ka) to joists (Items 1 or 1B). Clips spaced 48 in. OC and secured to the bottom chord of consecutive joists with min 1-1/2 in. long No. 12 self-drilling, self-tapping, hex head screw through the center grommet. Furring channels are friction fitted into clips. Adjoining channels are overlapped as described in Item a. Additional clips required to hold furring channel that supports the gypsum board butt joints, as described in Items 7 and 8.

**PAC INTERNATIONAL L L C** — Types RSIC-1, RSIC-1 (2.75).

7L. **Steel Framing Members\*** — (Not Shown) — As an alternate to items 7 through 7K. **When Type DWS Steel Framing Members are used, assembly and beam ratings are limited to 2 hr.** Main runners, cross tees, cross channels, and wall angle as shown below:

a. **Main Runners** — Nom. 12 ft. long, 1-1/2 in. wide face, spaced 4 ft. OC.

b. **Cross Tees** — Nom. 4 ft. long, 1-1/2 in. wide face installed at sides of light fixtures, installed perpendicular to the main runners, spaced 24 in. OC. When **Batts and Blankets\*** (Item 11A) are used, cross tees spaced 16 in. OC. Additional cross tees used at 8 in. from each side of butted gypsum board (Item 8A) end joints. The cross tees may be riveted or screw attached to the wall angle to facilitate the ceiling installation.

c. **Wall Angle** — Painted or galv steel angle with min. 1-1/2 in. legs attached to walls at perimeter of ceiling with fasteners 16 in. OC to support steel framing member ends and for screw-attachment of the gypsum board.

**CERTAINTED CORP** — Types DWS12-13-20, DWS4-13-20, and DWA1.5-1.5

7M. **Steel Framing Members\*** — (Not Shown) — For 1, 1-1/2 or 2 Hour Ratings Only — As an alternate to Item 7 — Furring channels and Steel Framing Members\* as described below:

a. **Furring Channels** — Formed of No. 25 MSG galv steel, 2-3/8 in. wide by 7/8 in. deep, spaced 24 in. OC perpendicular to joists. When **Batts and Blankets\*** (Item 11) are used, furring channels spaced 16 in. OC. Channels secured to joists as described in Item b. Ends of adjoining channels overlapped 6 in. and tied together with double strand of No. 18 SWG galv steel wire near each end of overlap.

b. **Steel Framing Members\*** — Used to attach furring channels (Item a) to joists (Item 1). Clips spaced 48 in. OC and secured to the bottom of the joists with cup washer installation kit provided by manufacturer. On underside of bottom chord, 1-1/2 in. dia x 3/8 in. deep No. 16 galv steel cup washer is placed to surround the rubber insert of clip. Clip attached to the bottom chord with a 1/4 in. dia zinc plated bolt inserted through the center grommet and between the chord members; depth of bolt determined as 1-1/2 in. plus the depth of the bottom chord of the joist. Fastened on the top side of the bottom chord with a second cup washer placed open side up, and a 1/4 in. zinc plated "Nyloc" nut. Furring channels are friction fitted into clips. Ends of channels are overlapped 6" and tied together with double strand of No. 18 AWG galvanized steel wire. Additional clips required to hold furring channel that supports the gypsum board butt joints, as described in Item 8.

**STUDCO BUILDING SYSTEMS** — RESILMOUNT Sound Isolation Clips - Type A237R

8. **Gypsum Board\*** — 5/8 in. thick, 4 ft wide installed with long dimension perpendicular to furring channels and side joints located between joists. End joints in adjacent rows may be staggered or in line. End joints shall be protected with a 3 in. wide backer strip of wallboard to be inserted for entire length of end joint between the two furring channels. The 3 in. wide backer strip is optional for 1 and 2 hour restrained and unrestrained assemblies. Gypsum board secured to furring channels with 1-1/4 in. long self-drilling, self-tapping bugle head screws spaced 12 in. OC. Along side joints, screws located 7/8 in. from board edge.

When **Steel Framing Members\*** (Item 7C) are used, gypsum board installed with long dimension perpendicular to cross tees with side joints centered along main runners. Gypsum board fastened to each cross tee with five gypsum board screws (Item 8) with one screw located at the midspan of the cross tee, one screw located 12 in. from and on each side of the cross tee midspan and one screw located 1-1/2 in. from each gypsum board side joint. Except at gypsum board end joints, screws shall be located on alternating sides of cross tee flange. At gypsum board end joints screws shall be located 1/2 in. from the joint. Gypsum board fastened to main runners with screws located 1/2 in. from side joints midway between intersections with cross tees (24 in. OC). End joints of the gypsum board sheets shall be staggered with joints in adjacent gypsum board courses not less than 4 ft OC. Gypsum board sheets screw-attached to flange of wall molding with screws spaced 12 in. OC.

When alternate **Steel Framing Members\*** (Item 7E, 7F or 7G) are used, gypsum board installed with long dimension (side joints) perpendicular to the cross channels and 4 ft cross tees and with the side joints centered along the main runners. Gypsum board fastened to cross channels with gypsum board screws located 1/2 in. from butted end joints, with one screw located at the midspan of the cross channel, one screw located 12 in. from and on each side of the channel mid span, and one screw located 2-3/4 in. from each side joint. End joints of the sheets shall be staggered as described above.

When **Steel Framing Members** (Item 7M) are used, one layer of nom 5/8 in. thick, 4 ft wide gypsum board is installed with long dimensions perpendicular to furring channels. Gypsum board secured to furring channels with nom 1 in. long Type S bugle-head steel screws spaced 8 in. OC in the field of the board. Gypsum board butted end joints shall be staggered minimum 48 in. At the gypsum board butt joints, each end of each gypsum board shall be supported by a single length of furring channel equal to the width of the gypsum board plus 3 in. on each end. The two supporting furring channels shall be spaced approximately 3 in. in from the end joint. Screw spacing along both additional furring channels shall be 8 in. OC. Additional screws shall be placed in the adjacent section of gypsum board into the aforementioned 3 in. extension of the extra butt joint channels. Butt joint furring channels shall be attached with one RESILMOUNT Sound Isolation Clip at each end of the channel.

When **Batts and Blankets\*** (Item 11) and **Steel Framing Members\*** (Item 7F) are used, rating is limited to 1 Hr, gypsum board installed with long dimension perpendicular to cross tees with side joints centered along main runners and end joints centered along cross tees. Fastened to cross tees with 1 in. long steel gypsum board screws spaced 8 in. OC in the field and 8 in. OC along end joints. Fastened to main runners with 1 in. long gypsum board screws spaced midway between cross tees. Screws along sides and ends of boards spaced 3/8 to 1/2 in. from board edge. End joints of the sheets shall be staggered with spacing between joints on adjacent boards not less than 4 ft OC.

When **Batts and Blankets\*** (Item 11) and **Furring Channels** (Item 7I, 7J, 7K, or 7M) are used, rating is limited to 1-1/2 Hr, gypsum board installed with long dimension perpendicular to furring channels. End joints centered along the furring channels. Boards fastened to the furring channels with 1 in. long Type S high/low bugle head screws spaced 8 in. OC. at the perimeter with two screws located 3/4 in. and 4 in. from the board edge; and 12 in. OC. in the field with 2 screws located 3/4 in. and 6 in. from the board edge. End joints shall be staggered with spacing between end joints on adjacent gypsum boards not less than 4 ft. OC.

**AMERICAN GYPSUM CO** — Type AG-C

**CGC INC** — Type ULIX

**CONTINENTAL BUILDING PRODUCTS OPERATING CO, L L C** — Type LGFC-C/A.

**GEORGIA-PACIFIC GYPSUM L L C** — Types TG-C, DAPC

**NATIONAL GYPSUM CO** — Types FSK-C, FSK-G, FSW-C, FSW-G

**UNITED STATES GYPSUM CO** — Type C, ULIX

**USG BORAL DRYWALL SFZ LLC** — Type C

8A. **Gypsum Board\*** — When alternate **Steel Framing Members\*** (Item 7L) are used - 4 ft wide; installed with long dimension parallel to main runners and perpendicular to cross tees, and attached with screws spaced 8 in. OC on the ends and 8 in. OC in the field with additional screws located 1-1/2 in. from the side edges. Sheets are attached to main tees with screws spaced 8 in. OC with additional screws located 4 in. OC from the side edges. Screws on the sides located 3/4 in. from the side edge of the gypsum board, and screws at the end of the gypsum board located 1/2 in. from the board ends. Joints to be covered with paper tape and joint compound.

**CERTAINTED CORP** — Type C

**THAI GYPSUM PRODUCTS PCL** — Type C

9. **Joint System** — (Not Shown) — Paper tape embedded in joint compound over joints, and covered with two layers of compound with edges feathered out. Gypsum board screw heads covered with two layers of compound.

10. **Air Duct and Damper** — (Not Shown) — Optional — Duct made of min 0.0078 in. thick (35 gauge) galv steel. Total area of duct openings not to exceed 144 sq in. per 100 sq ft of ceiling area. Area of individual duct opening not to exceed 144 sq in. Max dimension of opening 12 in. Duct supported by 1 1/2 in. deep, min 0.061 in. thick (16 gauge) cold-rolled steel channels spaced not over 48 in. O.C. and on each side of duct opening. Channels suspended from upper chord of joists by 12 SWG galv steel wire. Min clearance of 4 in. required between back of ceiling membrane and bottom of air duct.

Damper made of min 0.056 in. thick (16 gauge) galv steel protected on both surfaces with 1/16 in. ceramic fiber paper. Located over each duct outlet, attached to bottom of duct with corrosion resistant hinges and held open with a **Fusible Link** (Bearing the UL Listing Mark). Damper to overlap duct outlet 1 in. min. As an alternate, any UL Classified Ceiling Damper covered for use in 2 Hr or longer rated assemblies. To be installed in duct drop close to the back of ceiling per accompanying installation instructions.

Ducts containing 5 in. diam or smaller duct drops do not require dampers or other protection at the duct drops. Total area of unprotected duct outlets not to exceed 20 sq. in. per 100 sq ft of ceiling area. Area of individual duct opening not to exceed 20 sq. in.

The unprotected and protected duct openings shall not be installed within the same 100 sq. ft. of ceiling area  
10A. **Air Duct Materials\*** — (Not Shown) — Optional — For the 2 h ratings, as an alternate to Air Duct (Item 10), Rigid Air Duct Materials may be used in accordance with their Fabrication Instructions. The duct outlet throat is positioned at the center of 24 in. long min. 0.029 in. thick (22 gauge) galv steel duct liner. These ducts are supported by min. 0.053 in. thick (16 gauge) cold-rolled steel channels suspended from the joists by 12 SWG galv steel wire. Channels are placed directly below the steel duct liner, one on each side of the throat, and otherwise spaced 72 in. OC for ducts up to 36 in. wide, and 48 in. OC for ducts between 36 and 60 in. wide. Additional supporting channels to be installed at a distance ranging from 3 to 6 in. from the ends of each individual duct section. Min. clearance of 4 in. required between back of ceiling membrane and bottom of air duct. When the gypsum board end joints are not protected with 3 in. wide backer strips (as described in Item 8), the rating is limited to 1 hour.

**JOHNS MANVILLE** — Rigid, Class I

**KNAUF INSULATION LLC** — Rigid, Class I

**OWENS CORNING** — Rigid, Class I

10B. **Damper** — (Not Shown) — Optional — For use with Item 10A. Min 0.020 in. thick (25 gauge) galv steel. Protected on both surfaces with 1/16 in. ceramic fiber paper and held open with a Fusible Link (bearing the UL Listing Mark). Damper to overlap duct outlet 1 in. min. When the gypsum board end joints are not protected with 3 in. wide backer strips (as described in Item 8), the rating is limited to 1 hour.

10C. **Flexible Air Duct** — (Not Shown) — Optional (Bearing the UL Listing Mark). As an alternate to the 5 in. unprotected duct outlet. Nom 8 in. diam consisting of 0.006 in. thick vinyl coated, glass fiber reinforced fabric over helically wound 0.077 in. diam coated spring steel wire. As an alternate, nom 6 in. diam air duct connector consisting of 0.005 in. thick vinyl coated, glass fiber reinforced fabric over helically wound 0.071 in. diam coated spring steel wire. The flexible air duct and/or duct connector is connected to galv steel sleeve (Item 10D) by means of a stainless steel hose clamp. Flexible air duct or duct connector do not require dampers or other protection at ceiling penetrations.

The flexible air duct or air duct connector shall be suspended from structural steel or hanger wire anchors by means of a steel strap near the end connected to the steel sleeve (Item 10D), with the remainder of its length placed on the ceiling furring channels or supported approximately 1 in. or higher above the gypsum board with additional steel straps or hanger wires.

The total area of the flexible air duct opening shall not exceed 50.3 sq in. per each 100 sq ft of ceiling area; max dimension of opening is 8 in. The total area of the air duct connector opening shall not exceed 28.3 sq in. per each 100 sq ft of ceiling area; max dimension of opening is 6 in. Damper is not required when flexible air duct or air duct connector is used.

As an alternate, the flexible air duct may be supported by the metal hanger straps attached directly to the bottom of the concrete slab with powder-actuated pins. Pins, nom 1 in. long, consisting of 0.145 in. diam smooth-finish galv steel shank with 1/4 in. diam head. Pins tightly inserted in 3/8 in. long gear-shaped plastic washers and driven into the slab through both ends of the strap.

When the gypsum board end joints are not protected with 3 in. wide backer strips (as described in Item 8), the rating is limited to 1-1/2 hour.

**10D. Duct Outlet Sleeve** — (Not Shown) — Optional — For use with Flexible Air Duct or Air Duct Connector (Item 10C) at openings in gypsum board ceiling. 4 in. long sleeve made from 28 gauge galv steel for the 8 in. diam opening and from 30 gauge galv steel for the 6 in. diam opening. The sleeve shall be mounted between two 7/8 in. steel angles of 26 gauge galv steel which are placed on top and overlap the adjacent furring channels approximately 3 in. Each angle is tied to the two furring channels with a double strand of 18 SWG galv steel tie wire through 1/8 in. diam hole drilled in the vertical leg of the steel angles. The sleeve is attached to each of the two angles with one 3/8 in. long Tek sheet steel screw. When the gypsum board end joints are not protected with 3 in. wide backer strips (as described in Item 8), the rating is limited to 1-1/2 hour.

**10E. Heating and Air Conditioning Plenum Box Outlet** — (Not Shown) — Optional — For the 1-1/2 h ratings, as an alternate to the 5 in. diam unprotected duct outlet. 14 by 14 in. opening penetrating the ceiling. Fabricated from pieces of min 26 MSG galv steel, attached together with lock seams and rivets. Finished box size 16 by 16 by 15 in. outside dimensions. Opposite sides of the box have 10 in. diam openings. The open bottom of the box has 1 in. wide flanges at the four sides to engage into hemmed hanger bars for attaching the box to the furring channels. Hanger bars consist of 1 in. wide plates made from No. 26 gauge galv steel, folded back to form a 5/8 in. return at the top side, for engaging the horizontal flanges at the bottom of the plenum box outlet. The top and the four sides of the box, except for the 10 in. diam openings, shall be lined with 1 in. thick UL Classified fiberglass insulation weighing nom 5 pcf. The 10 in. diam openings on two opposing sides of the box shall be provided with nom 3 in. long collars fabricated from No. 28 gauge galv steel for connecting the box to the nom 10 in. diam flexible air ducts (Item 10F). Box and flexible air duct suspended directly from hanger clips (Item 6B) by hanger wires connected to hanger straps made from 1 in. wide, No. 26 MSG galv steel, spaced max 30 in. OC. As an alternate the strap may be directly attached to the slab by the powder-driven galv steel fasteners described to support the flexible air duct in Item 10C. Top of the box to be min. 5 in. below the bottom plane of the steel floor and form units. Only one 14 by 14 in. outlet is allowed per 100 sq ft of ceiling area. When the gypsum board end joints are not protected with 3 in. wide backer strips (as described in Item 8), the rating is limited to 1 hour.

**10F. Flexible Air Duct** — (Not Shown) — Optional — For use with Item 10E. Bearing the UL Listing Mark. 10 in. ID, with a spirally wound steel wire helix (0.045 in. diam wire) covered with vinyl fiber. Core covered with 1 in. thick UL Classified fiberglass insulation weighing 1.0 pcf. Flexible air duct wrapped with outer jacketing consisting of aluminized vinyl film. Flexible air ducts mounted on collars of box (Item 10E), attached to collars with adjustable 10-1/2 in. diam, 9/16 in. wide hose clamp made of 0.024 in. thick stainless steel. When the gypsum board end joints are not protected with 3 in. wide backer strips (as described in Item 8), the rating is limited to 1 hour.

**10G. Heating and Air Conditioning Plenum Box Outlet** — (Not Shown) — Optional — For the 2 h ratings (1-1/2 h when combined with Item 10O), as an alternate to the 5 in. diam unprotected duct outlet. 8 by 10 in. opening penetrating the ceiling. Four sides of box formed from one 5 in. wide strip of No. 28 gauge galv steel, with ends of strip overlapping 3/4 in. and fastened together with two 1/4 in. diam punches. The bottom 1 in. of the strip forming the box sides, bent 90 deg to the outside of the box forming horizontal flanges around the perimeter of the box to

engage into hanger bars for supporting the box assembly. Sides of the box lined with 1 in. thick fiberglass insulation weighing nom 5 pcf. Fiberglass lining to be supported on a 1 in. wide steel plate attached at the bottom perimeter of the box's four sides. Top of the box fabricated from No. 28 gauge galv steel with 8 in. diam cutout at the center. Edges of the steel plate forming the top of the box bent down around the box's side perimeter and riveted to the four sides of the box by one rivet at the center of each side. Top of the box, except for the 8 in. cutout, also lined with 1 in. thick UL Classified fiberglass insulation, weighing 5 pcf. Top insulation lining, having 8 in. diam cutout at the center, bears along its perimeter on the 1 in. thick fiberglass lining at the box sides. The 8 in. diam cutout at the top of the box connected to a 4 in. long, 8 in. diam sleeve made from No. 28 gauge galv steel for top mounting of an 8 in. flexible air duct (Item 10H). Flexible air duct suspended by a hanger wire from hanger clip (Item 6B), connected to a nom 1 in. wide, No. 26 MSG galv steel plumbing strap wrapped around the flexible air duct near its connection to the box. As an alternate the strap may be directly attached to the slab by the powder-driven galv steel fasteners described to support the flexible air duct in Item 10C. The remainder of the flexible air duct length placed on the ceiling furring channel or supported min. 1 in. above the gypsum board with additional steel straps or hanger wires.

Only one 8 by 10 in. box outlet is allowed per 100 sq ft of ceiling area. When the gypsum board end joints are not protected with 3 in. wide backer strips (as described in Item 8), the rating is limited to 1-1/2 hour.

**10H. Flexible Air Duct** — (Not Shown) — Optional — (Bearing the UL Listing Mark) — For use with Item 10G, nom 8 in. diam, consisting of 0.005 in. thick vinyl-coated reinforced fiberglass fabric, wrapped over helically wound 0.038 in. diam coated spring steel wire. Flexible air duct attached to box sleeve with adjustable 8-1/2 in. diam, 9/16 in. wide hose clamp made from 0.024 in. thick stainless steel. For use with Item 10S, nom 9 in. diam, consisting of 0.005 in. thick vinyl-coated reinforced fiberglass fabric, wrapped over helically wound 0.038 in. diam coated spring steel wire. Flexible air duct attached to box sleeve with adjustable 9-1/2 in. diam, 9/16 in. wide hose clamp made from 0.024 in. thick stainless steel. When the gypsum board end joints are not protected with 3 in. wide backer strips (as described in Item 8), the rating is limited to 1-1/2 hour.

**10I. Heating and Air Conditioning Plenum Box Outlet** — (Not Shown) — Optional — For the 2 h ratings (1-1/2 h when combined with Item 10O), as an alternate to the 5 in. diam unprotected duct outlet. 10 by 10 in. opening penetrating the ceiling. Box fabricated from pieces of No. 28 gauge galv sheet steel and riveted together. Finished box size: 12 by 12 by 12 in. One side of the box has 10 in. diam opening. Box top and four sides of the box except the 10 in. cutout for opening, have 1 in. thick of UL Classified fiberglass, 5 pcf. Neck at side opening consisting of 10 in. diam sleeve fabricated from 3-1/2 in. wide strip of No. 28 gauge galv steel. One end of the sleeve notched 1/8 by 3/4 in. at 5/8 in. OC along its perimeter and bent 90 deg against the fiberglass lining around the 10 in. diam opening to secure the sleeve to the box. The sleeve to be connected to a 10 in. diam, UL Listed side-mounted flexible air duct (Item 10J). Flexible air duct suspended by a hanger wire from hanger clip (Item 6B), connected to a nom 1 in. wide, No. 26 MSG galv steel plumbing strap wrapped around the flexible air duct at its connection to the box's sleeve. As an alternate the strap may be directly attached to the slab by the powder-driven galv steel fasteners described to support the flexible air duct in Item 10C. The remainder of the flexible air duct length placed on the ceiling furring channel or supported min. 1 in. above the gypsum board with additional steel straps or hanger wires.

Only one 10 by 10 in. box outlet is allowed per 100 sq ft of ceiling area. When the gypsum board end joints are not protected with 3 in. wide backer strips (as described in Item 8), the rating is limited to 1-1/2 hour.

**10J. Flexible Air Duct** — (Not Shown) — Optional — (Bearing the UL Listing Mark) For use with Item 10I. Nom 10 in. diam consisting of 0.002 in. thick vinyl-coated reinforced fiberglass fabric, wrapped over helically wound 0.051 in. diam, coated spring steel wire. Flexible air duct attached to box sleeve with adjustable 10-1/2 in. diam, 9/16 in. wide hose clamp made from 0.024 in. thick stainless steel. When the gypsum board end joints are not protected with 3 in. wide backer strips (as described in Item 8), the rating is limited to 1-1/2 hour.

**10K. Fixtures, Recessed Light** — (Not Shown) — Optional — (Bearing the UL Listing Mark) — For the 1-1/2 h ratings, as an alternate to the 5 in. diam unprotected duct outlet. A max of four fixtures per 100 sq ft of ceiling area. Fixture

housing 6-1/2 in. diam, 7-1/2 in. high, made from painted or galv steel. Each fixture supported on a base 6-1/2 in. by 9-7/8 in., made from painted or galv steel and screw-attached to the fixture by four screws. Each fixture with trim and lens weighs 4 lb max. Short sides of the base containing tabs for engagement into adjustable hanger bars supporting the fixture. Each fixture hanger bar screw-attached at one end to the ceiling furring channel and at the other end to additional furring channel parallel to and at 9 in. from the ceiling furring channel. Fixture trim 8 in. OD with a 5-1/4 in. inside diam opening to support a 5-3/8 in. diam diffused glass lens. Each fixture may be activated with nom 1 in. diam UL Listed electrical nonmetallic tubing wired with three No. 12 AWG Type THWN copper conductor wires or a UL Listed nonmetallic sheathed cable with three No. 12 AWG Type THWN copper conductor wires.

**10L. Fixture, Recessed Light** — (Not Shown) — Optional — (Bearing the UL Listing Mark) — For the 2 h ratings (1-1/2 h when combined with Item 10O), as an alternate to the 5 in. diam unprotected duct outlet. Fluorescent lighting fixture with 12 by 12 by 5-1/2 in. aluminum housing, lampholder, ballast for fluorescent lamp and nom 2-1/2 by 4 by 2-1/4 in. deep galv steel junction box attached to one side of the light housing. Penetration of light into the ceiling is 7-3/4 in. diam max. Light fixture weighs 8 lbs max. Hanger tabs of light fixture wire-tied to nom 27 in. long cold-rolled steel channels on both sides of fixture. Ends of cold-rolled channels supporting the fixture wire-tied to top surface of two consecutive ceiling furring channels using No. 18 SWG galv steel tie wire. Light fixture may be activated with a 3/4 in. diam electrical nonmetallic tubing (ENMT) containing three No. 12 or No. 14 AWG Type THHN wire; or nonmetallic sheathed cable with two conductors with grounding, or 1/2 in. diam flexible metal conduit containing three No. 12 AWG Type THHN wires. Only one fixture is allowed per 100 sq ft of ceiling area. When the gypsum board end joints are not protected with 3 in. wide backer strips (as described in Item 8), the rating is limited to 1-1/2 hour.

**10M. Exhaust Fan** — (Not Shown) — Optional — (Bearing the UL Listing Mark) — For use with Item 10O for the 2 h ratings, as an alternate to the 5 in. diam unprotected duct outlet. Frame made of painted steel measuring 7-1/2 by 7-1/8 by 3-5/8 in. Fan gross weight 3.75 lb max. The ceiling penetration from the exhaust fan shall not exceed 7-1/2 by 7-1/8 in. The installation of the exhaust fan requires an additional furring channel parallel to the ceiling channel and tied to two consecutive cold rolled channels or joists bottom chord. Fan screw-attached from one side to the ceiling furring channel and from the other side to the additional furring channel with two screws at each side through holes predrilled in the fan housing. Fan wired with a UL Listed nonmetallic sheathed cable with three No. 12 AWG conductors. Fan includes a 3 in. diam exhaust steel duct fastened to the outlet with aluminum foil tape.

Only one exhaust fan penetration and one ceiling runner penetration are allowed per 100 sq ft of ceiling area. When the gypsum board end joints are not protected with 3 in. wide backer strips (as described in Item 8), the rating is limited to 1-1/2 hour.

**10N. Electrical Junction Box** — (Not Shown) — Optional — Bearing the UL Listing Mark. Max 4 in. diam steel junction box with cover plate flush with ceiling. Attached with two 3/8 in. long steel screws to a section of steel furring channel placed on top and perpendicular to ceiling furring channels (Item 7), with its ends extending about 5 in. beyond the adjacent ceiling furring channels. Electrical cable to be supported from the steel joists, cold-rolled channels (Item 7A) or hanger clips (Item 6B). As an alternate the electrical junction box may be supported by a 2 by 4 in. wood nailer screw-attached to the furring channels using two screws per each wood nailer.

For the 2 h ratings, only one junction box is allowed per 100 sq ft of ceiling area in addition to the 5 in. diam unprotected duct outlet. When the gypsum board end joints are not protected with 3 in. wide backer strips (as described in Item 8), the rating is limited to 1-1/2 hour.

For the 3 h ratings, only one junction box is allowed per 100 sq ft of ceiling area as an alternate to the 5 in. diam unprotected duct outlet. When the gypsum board end joints are not protected with 3 in. wide backer strips (as described in Item 8), the rating is limited to 2 hour.

**10O. Ceiling Runner Penetration** — (Not Shown) — Optional — Framing consisting of either nominal 4 or 6 in. wide steel C-channels with 2 in. flanges; or nominal 2x4 or 2x6 plates of structural grade lumber runner into stud cavity of steel or structural grade lumber stud sheathed with generic unclassified gypsum wallboard partition (Not Shown).



Bottom runner suspended by hanger wires tied to a cold rolled channel (Item 7A) running parallel to the runner. Hanger wires used for supporting the bottom runner and penetrating the top runner shall be spaced a max 12 in. OC. Top runner placed directly above, and screw-attached to web of 24 in. long pieces of furring channel, spaced at 16 in. OC. One in. long pieces of the supporting channel's web removed at both ends with the steel surfaces on both flanges bent 90 deg, for screw-attaching the supporting channels to the main ceiling furring channels. The top cold rolled channel supporting the suspended boxed partition shall be directly suspended from hanger clips, Item 6B. Bottom of partition protected with two layers of gypsum board (Item 8) as shown.

For the 2 h ratings, only one ceiling runner penetration together with one exhaust fan. (Item 10M) are allowed per 100 sq ft of ceiling area as an alternate to the 5 in. diam unprotected duct outlet. When the gypsum board end joints are not protected with 3 in. wide backer strips (as described in Item 8), the rating is limited to 1-1/2 hour.

For the 1-1/2 h ratings only one ceiling runner penetration together with one of the following combinations are allowed per 100 sq ft of ceiling area as an alternate to the 5 in. diam unprotected duct outlet: When the gypsum board end joints are not protected with 3 in. wide backer strips (as described in Item 8), the rating is limited to 1 hour.

- (a) One heating and air conditioning plenum box outlet with flexible air duct (Items 10G and 10H); or
- (b) One heating and air conditioning plenum box outlet with flexible air duct (Items 10I and 10J); or
- (c) One recessed light fixture (Item 10L); or
- (d) One heating and air conditioning plenum box outlet with flexible air duct (Items 10S and 10H).

For the 1 h ratings, only one ceiling runner penetration together with Nonmetallic Pipes (Item 10P) are allowed per 100 sq ft of ceiling area as an alternate to the 5 in. diam unprotected duct outlet.

**10P. Nonmetallic Pipes** — (Not Shown) — Optional — For the 1 h floor-ceiling ratings, as an alternate to the 5 in. diam unprotected duct outlet. Nom 2 in. and 4 in. diam Schedule 40 PVC (polyvinyl chloride) or CPVC (chlorinated polyvinyl chloride) supply or drain, waste and vent piping system. PVC or CPVC pipes penetrate the ceiling runner into stud cavity of steel or structural grade lumber stud sheathed with generic unclassified gypsum wallboard partition (Item 10O). The PVC or CPVC pipes are supported by hanger straps in conjunction with steel hanger wires suspended from hanger clips, Item 6B. As an alternate the strap may be directly attached to the slab by the powder-driven galv steel fasteners described to support the flexible air duct in Item 10C. The spacing of hanger straps supporting the pipes shall not exceed 25 in. OC. Only one nom 4 in. diam PVC or CPVC pipe and one nom 2 in. diam PVC or CPVC pipe are allowed per 100 sq ft of ceiling area. Min clearance of 4 in. required between back of ceiling membrane and bottom of nonmetallic pipes.

**10Q. Alternate Penetrating Items** — (Not Shown) — Optional — One or all of the following may be used in conjunction with 10P: ENMT (Non-metallic tubing), Romex Cable, and an additional bundle of tubing including 2 copper tubes (7/8 in. diam), non-metallic pipe (1 in. diam schedule 40 PVC), and non-metallic wire (low voltage). These items are located within the stud cavity of a gypsum wallboard rated or non-rated partition. When the gypsum board end joints are not protected with 3 in. wide backer strips (as described in Item 8), the rating is limited to 1 hour.

**10R. Heating and Air Conditioning Plenum Box Outlet** — Optional — For the 1 hr ratings as an alternate to the 5 in. diam unprotected duct outlet (Item 10). Plenum box outlet 18 in. by 18 in. by 19 in. high penetrating the ceiling, with 16 by 16 in. clear opening. Sides and top of the box fabricated from Listed Air Duct, Class 1, 1 in. thick rigid fiberglass boards. The box attached from two opposite sides to 1-1/4 by 1-3/4 by 0.037 in. thick galv steel angles. The 1-3/4 in. vertical side of the steel angles adhered to the outside board of the box with a 2-1/2 in. wide continuous Listed Air Ducts and Air Connectors pressure sensitive aluminum foil duct tape. The horizontal side of the steel angle supported on, and screw-attached to two consecutive 1 in. deep, 2.5 in. wide, .020 in. thick galv furring channels with two 1/2 in. long No. 6 Type S washer screws near each of the four corners of the box. The box extends 2-1/2 in. below the gypsum wallboard ceiling, and its top has min 2 in. clearance from the bottom of the concrete slab. Two opposite sides of the box, which have 10 in. diam cutouts, also have steel sleeves built in to accommodate the flexible air ducts.

The sleeves made from 3-1/2 in. wide strips, fabricated from No. 28 ga galv steel, with one of its sides notched 1/8 by 3/4 in. at 5/8 in. OC, bent 90 degree against the fiberglass side board through the cutout to secure the sleeve to the box. The 10 in. diam Listed flexible air ducts mounted on, and secured to the sleeves with nom 3/8 in. wide, 1/16 in. thick vinyl hose clamps. A 10 by 10 in. (inside) square, Listed Air Duct Materials, fabricated from 1 in. thick fiberglass board, supported from one end on a 12 by 12 in. cutout in a third side of the plenum box outlet and taped around the connected perimeter of the duct to the box outlet exterior side, with a 2-1/2 in. wide Listed pressure sensitive aluminum foil duct tape. The three air ducts are supported with 1 in. wide, 0.021 in. thick galv steel straps near the ends connected to the box. The straps placed around the bottom of ducts, secured to the bottom of the concrete slab with powder-actuated 1 in. long, 0.145 in. diam shank, with 1/4 in. diam head steel pins having a 3/8 in. diam plastic retainer washer. The ducts are draped on the furring channels. Only one 16 by 16 in. box outlet opening is allowed per 100 sq ft of ceiling area. When the gypsum board end joints are not protected with 3 in. wide backer strips (as described in Item 8), the rating is limited to 1 hour.

**10S. Heating and Air Conditioning Plenum Box Outlet** — (Not Shown) — Optional — For the 2 h ratings (1-1/2 h rating when combined with Item 10O), as an alternate to the 5 in. diam unprotected duct outlet. 10 by 10 in. opening penetrating the ceiling. Outlet box measuring 12 by 12 by 7 in. outside, fabricated from 1 in. thick UL Classified fiberglass insulation boards. Box supported from two sides with 1 in. by 1 in., 25 gauge thick galv steel angles, by adhering the angles to the box sides with aluminum duct tape. Angles supported on and screw-attached to two consecutive furring channels. Box has a 9 in. diam cutout at the top to install a steel sleeve to connect the box to a flexible air duct. Sleeve fabricated from 3-1/2 in. wide strip of 28 gauge galv steel, bent to form a 9 in. diam collar, with its bottom perimeter notched 1/8 by 3/4 in. at 5/8 in. OC and bent 90 degrees against the bottom surface of the box top. Flexible Air Duct (Item 10H) mounted on the collar of the sleeve and secured with hose clamp. The top curved part of the air duct supported with a 1 in. wide, 28 MSG galv steel strap and secured to the slab by the powder-driven fasteners described in Item 10C. When the gypsum board end joints are not protected with 3 in. wide backer strips (as described in Item 8), the rating is limited to 1-1/2 hour.

**11. Batts and Blankets\*** — (Not Shown) — Optional — Rating is limited to 1 Hr. when used with Steel Framing Members\* (specifically Item 7F) - Any thickness mineral wool or glass fiber insulation bearing the UL Classification Marking for Surface Burning Characteristics, having a flame spread value of 25 or less and a smoke spread value of 50 or less. Insulation fitted in the concealed space, draped over steel framing members/gypsum wallboard ceiling membrane. Rating is limited to 1-1/2 Hr. when used with **Furring Channels\*** (specific to Items 7, 7I, 7J, 7K or 7M) - Any thickness mineral wool or glass fiber insulation bearing the UL Classification Marking for Surface Burning Characteristics, having a flame spread value of 25 or less and a smoke spread value of 50 or less. Insulation fitted in the concealed space, draped over steel framing members/gypsum wallboard ceiling.

**11A. Batts and Blankets\*** — (Not Shown) — Optional — when using **Steel Framing Members\*** (Item 7L) and **Gypsum Board\*** (Item 8A) - min. 3-1/2 in. thick, min. density 0.9 lb/ft<sup>3</sup> unfaced fiberglass batt insulation bearing the UL Classification Marking for Surface Burning Characteristics, having a flame spread value of 25 or less and a smoke spread value of 50 or less. Insulation fitted in the concealed space, draped over steel framing members/gypsum board ceiling membrane and light fixture protection.

**12. Stepped Ceiling (Optional)** — Limited to 2 Hr. ratings, with steel joists as specified in Item 1, spaced max 48 in. OC. When the intent is to have a stepped ceiling to accommodate duct work, the stepped ceiling may be constructed as shown. Stepped ceiling size limited to 18 in. max depth and 50 in. max width. Stepped ceiling not to be used with ceiling grid systems. Duct specifications and its independent support/suspension, minimum clearance to back of ceiling membrane, opening size, diffusers and other accessories shall be installed and limited to the conditions detailed in design text above. All other details of the assembly not part of the stepped ceiling as described as follows, shall be as per the general text of the design.

12A. **Steel Stud and Track** — 3-5/8 in. wide by 1-5/8 in. deep, min 0.033 in. thick (20 gauge) steel studs with 9/16 in. folded back return on stud flange legs. Top track fastened to each joist with No. 12 screws. Top and bottom tracks fastened to studs on both sides with No. 8 screws.

12B. **Cold-Rolled Channels** — 1-1/2 in. deep with 7/16 in. flanges, min. 0.053 in. thick (16 gauge) steel channels, spaced max 48 in. OC. Channels fastened to each stud/track support (Item 12A) at both ends with No. 12 screws.

12C. **Steel Angles** — 1-3/4 in. by 1-3/4 in. min. 0.053 thick (16 gauge) steel angles. Angles fastened to each stud/track support (Item 12A) at both ends with No. 12 screws.

12D. **Furring Channels** — 7/8 in. high, 2-5/8 in. base width and 1-1/4 in. face, min 0.021 in. (25 gauge) galv steel furring channels spaced max 16 in. OC. Furring channels fastened to each stud/track support (Item 12A) and cold rolled channel (Item 12B) with No. 12 screws.

12E. **Gypsum Board\*** — Gypsum board as specified in Item 8 installed on the horizontal and vertical portions of the stepped ceiling. Gypsum board installed perpendicular to the furring channels with no end joints on the horizontal portion of the stepped ceiling and installed perpendicular to the furring channels with no side joints on the vertical portion of the stepped ceiling. Each side joint on the horizontal portion of the stepped ceiling shall be protected with a 3 in. wide backer strip of wallboard, inserted over the entire length of the side joint. Gypsum board secured to furring channels and steel studs with 1-1/4 in. long self-drilling, self-tapping bugle head screws spaced max 8 in. OC. Screws located 7/8 in. from board edge along the side and end joints. Drywall compound applied in two coats to screw heads and joints, with embedded paper tape to all joints.

12F. **Corner Bead** — (Not Shown) 1-1/4 in. by 1-1/4 in. min 0.033 in. thick (20 gauge) steel legs. Legs perforated with 1/4 in. diameter holes approx. 1 in. OC. Attached to wallboard corners of the stepped ceiling with special crimping tool approx. 6 in. OC. As an alternate, corner bead may be nailed to the wallboard. Drywall compound applied in two coats to corner joints.

**\* Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**

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