

2C. **In lieu of Item 2, 2A or 2B, roof covering consisting of one ply of UL Classified glass fiber ply sheet (See Building Materials Directory) randomly nailed in place followed by one layer of self-adhering Roofing Membrane*** — covered as indicated below. Lap detail per manufacturer's specification.

W R GRACE & CO - CONN

CONSTRUCTION PRODUCTS DIV — Type GRM-230 surfaced with 400 lbs per 100 sq ft of roofing gravel embedded in manufacturer's UL Classified GRM-GA-200 gravel adhesive (See Building Materials Directory) applied at a rate of 3 gal per 100 sq ft or Type GRM-120 surfaced with a coating of manufacturer's UL Classified GRM-WC-200 or GRM-WC-300 coating material (See Building Materials Directory) applied at nom rates of 1 gal and 3/4 gal per 100 sq ft, respectively; or Type GRM-500 not surfaced.

2D. In lieu of Item 2, 2A, 2B or 2C, roof covering consisting of single-ply Roofing Membrane* that is either ballasted, adhered or mechanically attached as permitted under the respective manufacturer's Classification. See Fire Resistance Directory-Roofing Membranes (CHCI).

3. **Insulating Concrete** — Various types of insulating concrete prepared and applied in the thickness specified below:

A. **Vermiculite Concrete** — Mix consists of 6 cu ft of Vermiculite Aggregate* to 94 lbs. of Portland cement and 0.5 lb. of air entraining agent. Thickness to be 2 in. min from the top plane of the steel roof deck or from the top surface of the foamed plastic (Item 4) when it is used.

ELASTIZELL CORP OF AMERICA

SIPLAST INC

VERMICULITE PRODUCTS INC

B. **Cellular Concrete — Roof Topping Mixture*** — Foam concentrate mixed with water and Portland cement per manufacturer's specifications. Cast dry density and 28-day compressive strength of min 190 psi as determined in accordance with ASTM C495-66. A 1/8 in. min slurry coat of cellular concrete from the top of the steel form units corrugations, shall be employed. The thickness above foamed plastic shall be 2 in. min.

CELCORE INC — Cast dry density of 31 (+ or -) 3.0 pcf.

ELASTIZELL CORP OF AMERICA — Type II. Mix #1 of cast dry density 39 (+ or -) 3.0 pcf, Mix #2 of cast dry density 40 (+ or -) 3.0 pcf, Mix #3 of cast dry density 47 (+ or -) 3.0 pcf.

CELLULAR CONCRETE L L C — Cast dry density 37 (+ or -) 3.0 pcf.

LITE-CRETE INC — Cast dry density of 29 (+ or -) 3.0 pcf.

SIPLAST INC — Mix #2. Cast dry density of 36 (+ or -) 3.0 pcf.

C. **Perlite Concrete** — 6 cu ft of Perlite Aggregate* to 94 lb of Portland cement and 1-1/2 pints of air entraining agent. Thickness of perlite concrete topping to be 2 in. min as measured to the top plane of the steel form units or to the top surface of the foamed plastic (Item 4) when it is used.

See **Perlite Aggregate** (CFFX) category in Fire Resistance Directory for names of Classified Companies.

D. Cellular Concrete — Roof Topping Mixture* — Foam Concentrate mixed with water, Portland Cement and UL Classified Vermiculite Aggregate per manufacturer's application instructions. Cast dry density of 33 (+ or -) 3.0 pcf and 28-day compressive strength of min 250 psi as determined in accordance with ASTM C495-86. A 1/8 in. min slurry shall be employed below the foamed plastic (Item 4). The cellular concrete topping thickness, above the foamed plastic, shall be 2 in. min.

CELLULAR CONCRETE L L C — Mix #3.

SIPLAST INC — Mix #3.

4. Foamed Plastic* — Optional-Nom 24 by 48 in. with or without holes and slots. Max thickness 8 in.

SIPLAST INC

VERMICULITE PRODUCTS INC

4A. Foamed Plastic* — Nom 24 by 48 in., 48 by 48 in. or 30 by 60 in. by max 8 in. thick polystyrene foamed plastic insulation boards with holes symmetrically placed having a max density of 2.0 pcf. For use only with cellular concrete roof topping mixture.

STARRFOAM MFG INC

4B. Foamed Plastic* — Nom 24 by 48 by max 8 in. thick polystyrene foamed plastic insulation boards having a density of 1.0 + 0.1 pcf encapsulated within cellular concrete topping (Item 2). Each insulation board shall contain six nominal 3 in. diameter holes oriented in two rows of three holes each with the holes oriented in two rows of three holes each with the holes spaced 12 in. OC, transversely and 16 in. OC longitudinally.

See Foamed Plastic* (BRYX) category in Building Materials Directory or **Foamed Plastic* (CCVW)** category in Fire Resistance Directory for list of manufacturers.

5. Wire Mesh — (Optional) — No. 19 SWG galv steel wire twisted to form 2 in. hexagons. In addition, straight 16 SWG galv steel wire woven into mesh and spaced 3 in. apart for stiffness. Mesh installed without attachment perpendicular to supports and overlapped 6 in. at the sides.

5A. Fiber Reinforcement* — (Optional) - For use only with Roof-Topping Mixtures* manufactured by Cellular Concrete LLC. In lieu of Wire Mesh (Item 5), Fiber Reinforcement may be added to roof topping mixtures (Items 3B or 3D). See Fiber Reinforcement (CBXQ) Category for rate that fibers are added to roof topping mixture.

FORTA CORP — Types Econo-Mono, Mighty-Mono, Stucco-Bond, Econo-Net, Cast-Master , Super-Net, Ultra-Net.

6. Steel Floor and Form Units* — Noncomposite design, 9/16, 15/16 or 1-5/16 in. deep, nom 30 to 36 in. wide corrugated units, min 0.016 in. thick (28 gauge) galv steel. Welded to supports with puddle welds through welding washers. Welds located at each side lap with an additional weld midway between side laps. End laps to occur over joists.

CONSOLIDATED SYSTEMS INC — Consoliform and Comvent Types EHD, HD, S, SD.

7. Steel Joists — Type 8H3 or 10K1, min size; spaced max 6 ft OC and welded to end supports.

Note: When 8H3 joists are used, the design load shall stress joists to a max tensile stress of 22,000 psi.

8. Bridging — Steel bars, 5/8 in. diam, welded to top and bottom chords of each joist.

9. **Cold Rolled Channels** — Min 0.053 in. thick (16 gauge) painted cold-rolled steel channels, 1-1/2 in. deep with 9/16 in. flanges. Channels wire-tied to top of joist lower chord and spaced as required to provide attachment provision for ceiling hanger wires. When steel joists are spaced more than 4 ft 0 in. OC, pairs of channels are positioned vertically face to face, forming box sections tied together with double strand of 18 SWG galv steel wire tied together with double strand of 18 SWG galv steel wire at 24 in. OC, and placed at 4 ft OC perpendicular to, and on top of bottom at chord of joists for hanger wire support. Channels tied to each joist bottom chord with 12 SWG galv steel wire. Additional pairs of channels shall be placed as required to provide the support points for the hanger wires.

10. **Hanger Wire** — No. 12 SWG galv steel wire, twist-tied to lower chord of joists, bridging, or cold-rolled steel channels. Hanger wires spaced 48 in. OC or at every other main runner/cross tee intersection, whichever dimension is smaller, along main runners. Hanger wires to occur at all four corners of light fixtures, at midspan of cross tees adjacent to 4 and 5 ft long light fixtures and air duct outlets, at midspan of each 5 ft long cross tee, and adjacent to each main runner splice location.

11. **Air Duct** — No. 24 MSG min galv steel. Total area of duct openings not to exceed 144 sq in. per each 100 sq ft of ceiling area with the total area of each ind duct opening not to exceed 144 sq in. When the ceiling consists of nom 24 by 48 in. or 20 by 60 in. lay-in panels, the total area of duct openings may be increased to 576 sq in. per each 100 sq ft of ceiling area with the area of each ind duct opening not to exceed 576 sq in. Max dimension of 144 sq in. opening is 12 in. Max dimension of 576 sq in. opening is 30 in. When light fixture Item 14B is used total area of duct opening not to exceed 57 sq in. per 100 sq ft of ceiling area with the total area of each ind duct opening not to exceed 113 sq in. Max dimension of opening is 12 in. Where air duct penetrates through a suspension system member, each cut end of the suspension system member near the duct outlet must be independently supported by a hanger wire.

12. **Damper** — No. 22 MSG galv steel, sized to overlap duct opening 2 in. min. Protected on both surfaces with 1/16 thick ceramic fiber paper and held open with a **Fusible Link** (bearing the UL Listing Mark).

Where the total area of duct openings per 100 sq ft of ceiling area does not exceed 144 sq in., and where the area of ind duct openings does not exceed 144 sq in., Duct Outlet Protection System A as described in the Design Information Section may be used in lieu of the damper described above.

13. **Fixtures, Recessed Light** — (Bearing the UL Listing Mark). Fluorescent lamp type, steel housing, 2 by 2 ft, 2 by 4 ft, and 20 by 60 in. size. The nom 2 by 4 ft fixtures may be provided with or without vented sides for air boots (Item No. 16). Air boots must be used in conjunction with fixtures designed for that purpose. The nom 2 by 4 ft fixtures may be provided with or without vented tops for air return purposes. When nom 20 by 60 in. fixtures are used, fixture stabilizers (Item No. 14) shall be used in addition to the hanger wires occurring at the midspan of the 5 ft long cross tees. When nom 2 by 2 ft fixtures are used, aggregate of fixtures not to exceed five per 100 sq ft of ceiling area. When nom 2 by 4 ft or 20 by 60 in. fixtures are used, aggregate of fixtures not to exceed three per 100 sq ft of ceiling area. Wired in conformance with the National Electrical Code. Fixtures and ballasts must be considered for these ambient temperature conditions before installation.

13A. **Fixture Stabilizer** — (Not shown) — One per 20 by 60 in. fixture assembly. No. 16 MSG painted steel channel formed as a yoke, secured to the web at midspan of 5 ft long cross tee on each side of fixture.

When The type 1650 metal pans are used (See Item 18A); One min. 0.047 in. thick (16 MSG) galvanized steel channel yoke per all light fixtures, secured to the web at midspan of cross tee on each side of fixture.

13B. **Fixture Stabilizer** — (Not shown) (Optional) — Min. 0.020 in. thick (25 MSG) painted steel spacer bar formed as an angle with 1 in. legs and hemmed edges and slots perpendicular to and near the ends of the spacer bar for engaging over the bulb of the tees. Engaged over the bulb at

midspan of the cross tees on each side of all light fixtures and over the bulb of the adjacent cross tee.

14. Fixtures, Recessed Light — (Bearing the UL Listing Mark) — (Not Shown) — As an alternate to Item 13, incandescent lamp type, steel housing, nom 6-1/2 in. diam by 7-1/2 in. high. Each fixture provided with a nom 7-3/4 in. by 12-1/2 in. base plate screw-attached to the "high hat" fixture with three steel screws. Base plate to be provided with steel bar hangers designed to span across nom 24 in. spacing of cross tees for fixture support. Fixture secured to cross tees with steel clips provided at the end of the steel bar hangers. A max of two "high hat" fixtures may be substituted for each nom 24 in. by 48 in. fixture permitted in the ceiling (max six "high hat" fixtures per 100 sq ft of ceiling area). For use with USG Interiors, Inc. steel framing members and acoustical materials only. Wired in accordance with National Electrical Code.

14A. Alternate Recessed Light Fixtures — (Not shown) — As an alternate to the fluorescent lamp lighting fixture, High Intensity Discharge (HID) lighting fixture may be used at a spacing of one per min 200 sq ft of ceiling area. These fixtures are used in conjunction with the nom 24 by 24 in. acoustical panels. The fixture consists of 20 MSG or heavier steel mounting pan having 23-3/4 by 23-3/4 in. outside dimensions and a 13-1/2 in. diam opening at it's center with a 5/8 in. high stiffening return flange at all four sides. The reflector and reflector top are made of spun aluminum. The total height of the reflector and the reflector top is 17-1/2 in. The total weight of the fixture with lamp and ballast shall not exceed 40 lb. The 24 by 24 in. suspension system module containing the HID fixture shall be supported at each corner by a hanger wire. Electrical wiring of the fixture shall conform with the National Electrical Code.

14B. Fixtures, Recessed Light — As an alternate to Item 13 — (Bearing the UL Listing Mark). Fluorescent lamp type, steel housing, 2 by 4 ft size. Fixtures spaced so their area does not exceed 16 sq ft per 100 sq ft of ceiling area. For use with 24 x 48 in. Acoustical Material (Item 19) only. Protected in accordance with Item 15C. Wired in conformance with the National Electrical Code.

15. Fixture Protection-Batts and Blankets* — 1-1/4 in. thick, cut into pieces to form a three-sided enclosure. The fixture protection consists of a top piece, equal in length to the fixture, and two end pieces, equal to the height of the fixture plus 1-1/2 in. or, when air supply fixtures are used, equal to the height of the air boots (Item 16). When nom 2 by 2 or 4 ft fixtures are used, the width of the top piece and the length of the end piece shall be 30 in. When nom 20 by 60 in. fixtures are used, the width of the top piece and the length of the end piece shall be min of 26 in. Scrap pieces of steel framing members (Item 18, main runners and cross tees), 10 to 14 in. long, shall be used as spacers on top of the fixture. The spacers shall be located as required to maintain a min 1 in. clearance between the top of the light fixture and the fixture protection top piece.

The spacers and top piece are laid in place and the end pieces are held in place by slipping them between the fixture housing and the hanger wire at each corner of the fixture. In addition, the top piece shall be secured to each end piece with 18 SWG galv steel wire threaded through the pieces and twist-tied. The long sides of the top piece over the 4 and 5 ft long fixtures are slit to accommodate the cross tee hanger wires on both sides of the fixtures.

THERMAFIBER L L C — Type FR.

15A. Fixture Protection — Acoustical Material* — For use with "high hat" light fixtures (Item 14). Five sided enclosure, rectangular in cross section, cut from the same acoustical material used in the ceiling assembly. Two side pieces measuring 8 in. high by 23-3/4 in. long resting upon ceiling tile, two end pieces measuring 6-3/4 in. high by 16 in. long resting upon steel bar hangers and one top piece measuring 14 in. by 18 in. resting upon side and end pieces with 18 in. dimension parallel with end pieces. Enclosure secured with four 8d nails installed through side pieces into end pieces near the top of the assembly.

15B. Fixture Protection For Alternate Fixture (Item 14A.) — Acoustical Material*-(Not shown)-Five sided box enclosure with 1 in. high opening at top of two opposite sides. Pieces cut from the same acoustical material as Item 19. Top piece is 23-3/4 by 23-3/4 in. size; two opposite side pieces each is 23-3/4 in. long by the height of the fixture plus 1 in.; remaining two opposite

side pieces each is 22-1/2 in. long by the height of the fixture. Pieces assembled with 8d nails spaced 6 in. OC.

15C. Fixture Protection-Acoustical Material* — Same as Item 19. For use with Item 14B 24 by 48 in. size panel placed over each fixture. Two 24 by 2 in. pieces located near each end of fixture to provide 1-in. clearance between protection board and back of light fixture. Spacers secured to protection board with 8d common nails.

16. Air Boots — Min 0.023 in. thick (24 gauge) galv steel air boots with internal glass fiber insulation are installed in pairs, along both sides of nom 2 by 4 ft air supply light fixtures, and are connected by a min 0.023 in. thick (24 gauge) galv steel crossover duct.

17. Air Duct Connector — 6 in. diam. Any Class O or Class I **Air Duct Connector** bearing the UL Listing Mark.

18. Steel Framing Members* — Main runners nom 10 or 12 ft long, spaced 4 ft OC. Cross tees nom 4 ft long, installed perpendicular to main runners, spaced 2 ft OC. When nom 2 by 2 ft lay-in panels are used, nom 2 ft long cross tees installed perpendicular to 4 ft cross tees at midspan, spaced 4 ft OC. For 2 by 2 or 4 ft lay-in panels.

CGC INTERIORS, DIV OF CGC INC — Types DXL, DXLZ, SDXL.

USG INTERIORS INC — Types DXL, DXLZ, SDXL.

18A. Steel Framing Members* — Main runners nom 12 ft long, spaced 48 in. OC. Cross tees nom 4 ft long installed perpendicular to main runners and spaced 24 in. OC. When the ceiling is composed of nom 24 by 24 in. lay-in panels, cross tees nom 2 ft long installed perpendicular to 4 ft cross tees, midway between main runners, spaced 48 in. OC — For 24 by 24 or 48 in. lay-in panels.

ARMSTRONG WORLD INDUSTRIES INC — Types AFG, AFG-A

BPB AMERICA INC — Types PAC, PCH, PCS

CHICAGO METALLIC CORP — Types 250, 260, 1250, 1260, 1850, 1860.

18B. Steel Framing Members* — Main runners nom 10 ft long, spaced 60 in. OC. Cross tees nom 5 ft long installed perpendicular to main runners and spaced 20 in. OC. — For nom 20 by 60 in. lay-in panels.

CHICAGO METALLIC CORP — Types 250, 260, 1250, 1260, 1850, 1860.

18C. Steel Framing Members* — Main runners nom 10 or 12 ft long, spaced in. OC. Cross tees nom 5 ft long installed perpendicular to main runners and spaced 20 in. OC. For nom 20 by 60 in. lay-in panels.

CGC INTERIORS, DIV OF CGC INC — Types DXL, DXLZ, SDXL.

USG INTERIORS INC — Types DXL, DXLZ, SDXL.

18D. Steel Framing Members* — **Metal pans** — (Not shown) (Optional) — Channel-shaped metal pans in various colors and finishes, installed perpendicular to cross tees or main runners and spaced 4 or 6 in. OC. The flange edges of the metal pans engage and interlock with the vertical tabs of the corresponding grid adapters with tabs 4 or 6 in. OC (See Item 18B). End laps joints of the metal pans shall occur adjacent to main runners or cross tees. The metal pans shall each be supported by at least two main runners or cross tees.

CHICAGO METALLIC CORP — Type 1650.

18E. **Steel Framing Members*** — **Grid adapter** — (Not shown) (Optional) — For use with Type 1650 metal pans (See Item 18A). Angle shaped adapter with a looped return flange; installed parallel to cross tees or main runners by engaging return flange of adapter to the flange of the cross tee or main runner. The 48 or 24 in. long adapters are intended for use with cross tees or main runners, respectively.

CHICAGO METALLIC CORP — Type 1650.

18F. **Steel Framing Members*** — **Filler strips** — (Not shown) (Optional) — For use with Type 1650 metal pans. Filler strips are 0.018 to 0.024 in. thick, steel or aluminum, 13/32 or 5/8 in. deep by 3/4 in. wide, placed between the metal pans.

CHICAGO METALLIC CORP — Type 1650.

19. **Acoustical Material*** — Lay-in panels. Border panels supported at walls by min. 0.016 in. thick painted steel angle with 7/8 in. legs or min. 0.016 in. thick painted steel channel with a 1 by 1-9/16 by 1/2 in. profile.

Panel Dimensions Nom, in.	Types
24 by 24 by 5/8 or 3/4	FR-83
24 by 48 by 5/8 or 3/4	FR-83
20 by 60 by 5/8 or 3/4	FR-83
24 by 24 by 3/4	FR-X1
24 by 48 by 3/4	FR-X1

EMCO LTD — Types FR-83, FR-X1 . See **Acoustical Materials** (BYIT), EMCO Ltd., for specific tile details.

USG INTERIORS INC — Types FR-83, FR-X1. See **Acoustical Materials** (BYIT), USG Interiors, Inc., for specific tile details.

20. **Hold Down Clips** — (Not shown) — Min 0.013 in. thick spring steel. When ceiling is composed of nom 24 by 24 in. lay-in panels, one clip placed over bulb of cross tee near cross tee midpoint. When ceiling is composed of nom 20 by 60 in. or 24 by 48 in. lay-in panels, two clips placed over bulb of each cross tee near cross tee quarter-points. One leg of each clip is to be cut off when placed over bulb of cross tee adjacent to long side of light fixture.

21. **Accessible Hold-Down Clips** — (Not shown) — Min 0.013 in. thick spring steel. To be used in lieu of hold-down clips on each access panel in ceiling.

22. **Speaker Assemblies*** — (Not Shown) Optional. The speaker assemblies consist of speakers, speaker enclosures and their accessories. The ceiling penetration for the speaker enclosure shall not exceed 11-7/8 by 11-7/8 in. for the square speaker enclosures and 12 in. in diam for the round speaker enclosures. The speaker assemblies are installed in accordance with the installation instructions provided. A maximum of two 144 sq. in. speaker assemblies per 100 sq ft of ceiling area is allowed.

ATLAS/SOUNDOLIER, DIV OF AMERICAN TRADING & PRODUCTION CORP

See **Speaker Assemblies For Fire Resistance (CHML)** , Atlas/Soundolier, Div of American Trading & Production Corp. for specific Types.

*Bearing the UL Classification Mark

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