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Legacy report on the 1997 *Uniform Building Code*™

DIVISION: 07—THERMAL AND MOISTURE PROTECTION
Section: 07410—Metal Roof and Wall Panels

THERMASTRUCTURE® BUILDING SYSTEMS

THERMASTEEL
609 ROCK ROAD
RADFORD, VIRGINIA 24141

PREMIUM STEEL BUILDING SYSTEMS
1568 GRANBY STREET, NE
ROANOKE, VIRGINIA 24012

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1.0 SUBJECT

Thermastructure® Building Systems.

2.0 DESCRIPTION

2.1 General:

ThermaSteel Thermastructure Building Systems are structural panels used in wall, roof and floor applications. These panels are also marketed under the following names: Wallframe, ThermaSteel, Insulsteel, Radva Panel, Thermopanel and Radoslav Panel.

The ThermaStructure panels consist of expandable polystyrene and steel reinforcement that are combined in a low-pressure molding process to form structural panels. Each panel has No. 24 gage galvanized steel channels and angles along the edges, running the full length and width of the panel. Vertical No. 24 gage steel channels act as reinforcement and are provided on each face. Vertical reinforcement is provided at 16 inches or 24 inches (406 mm or 610 mm) on center to act as studs. Four basic types of panels are available. The Type A-1 panel is a nominal 1.5-pound-per-cubic-foot-density (24 kg/m³) expanded polystyrene board with vertical steel reinforcement on both faces spaced 16 inches (406 mm) on center, with a 3/4-inch-by-2 1/4-inch (19 mm-by-57 mm) steel angle attached to the top and bottom of each panel on both sides. The Type B-1 panel is similar to the Type A-1 panel except that the vertical steel reinforcement is spaced at 24 inches (610 mm) on center. Types A-1 and B-1 are 3 1/2 inches thick (89 mm). The Type C-1 panel is similar to the Type A-1 panel and the Type

D-1 panel is similar to the Type B-1 panel, except that Types C-1 and D-1 panels are 5 1/2 inches (140 mm) thick with a nominal foam plastic density of 1.0 pound per cubic foot (16 kg/m³).

The panels are manufactured in widths up to 48 inches (1,219 mm) and heights up to 12 feet (3,658 mm). Various conventional exterior cladding materials shall be attached to the panels, but the interior surface of wall and roof panels requires 1/2-inch-thick (12.7 mm) gypsum wallboard or a material having a 15-minute thermal barrier index when tested according to UBC Standard 26-2. See Table 1 for allowable loads and Figures 1 and 2 for typical panel construction.

2.2 Materials:

The expanded polystyrene boards are either Type I or Type II in accordance with ASTM C 578, having a nominal density of 1.0 or 1.5 pounds per cubic foot (16 or 24 kg/m³), respectively, and a flame-spread rating of 25 or less and a smoke-density rating of less than 450 when tested in accordance with ASTM E 84. The steel is typically No. 24 gage [0.0239 inch (0.61 mm)] complying with ASTM A 653 SS, Grade 37, with G-90 galvanizing. All thicknesses of steel noted in this evaluation report refer to minimum uncoated base-metal thickness. All steel noted in this report is coated with G-90 galvanizing complying with ASTM A 924. The thermosetting adhesive used to coat the steel reinforcements during panel manufacture is described in the approved quality control manual.

2.3 Installation:

2.3.1 Wall Panels:

2.3.1.1 Exterior Wall Panels: The exterior wall panels shall be attached to the floor and roof or ceiling system with No. 20 gage [0.0359 inch (0.91 mm)], 3-inch-by-5-inch (76 mm-by-127 mm) steel shear plates that connect the panel to the wall top and bottom plates. The shear plates shall be located at each vertical metal reinforcement and shall be attached with three No. 8 by 1/2-inch-long (12.7 mm), self-tapping screws into the panel and three nails into the wood plates; nails must be sized by the engineer and approved by the building official. As an alternate, the exterior wall panel shall be placed in a No. 16 [0.0598 inch (1.5 mm)] or No. 18 [0.0478 inch (1.21 mm)] gage steel channel attached to the floor system with anchor bolts, as specified in Section 1806 of the 1997 *Uniform Building Code*™ (UBC), at 4 feet on center. The wall panels shall be attached to the steel channels with three No. 8 by 1/2-inch (12.7 mm), self-tapping screws at each stud,

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each side. Each wall panel has a steel overlap strip along the vertical edge at the outside face which overlaps the edge of the next panel approximately $\frac{3}{4}$ inch (19 mm) when set in place. This overlap strip serves as a point of attachment between panels using No. 8 by $\frac{1}{2}$ -inch (12.7 mm), self-tapping screws spaced at 12 inches (305 mm) on center. After the exterior wall panels are erected, a single or double 2-by-4 top plate is attached with shear plates in the same manner as the wood sill plate. As an alternative No. 16 [0.0598 inch (1.5 mm)], No. 18 [0.0478 inch (1.21 mm)] or No. 20 [0.0359 inch (0.91 mm)] gage steel channels may replace the wood top plates. Other attachment methods are acceptable, provided justifying calculations are submitted to the building official for each project and the allowable loads do not exceed those in Table 1. Some typical connection details are shown in Figures 3 through 6. The connection of the wall panel to top and bottom plates must be designed to the satisfaction of the building official.

All windows, doors and other openings are to be framed with conventional wood framing in accordance with Section 2320.11 of the UBC, or with steel framing in accordance with UBC Chapter 22, Division VII. Exposed edges and openings in the foam plastic around hose bibbs, electrical panels or any holes in the substrate surface are caulked with DAP Acrylic Latex No. 11465 or an approved equal.

2.3.1.2 Interior Wall Panels: The interior wall panels are attached in the same manner as described for the exterior wall panel connections.

2.3.2 Roof Panels: The roof panels are set and attached together to bear on roof beams, trusses and exterior or interior bearing wall plates. All panels shall have conventional roof sheathing installed on the top face. All roof panels shall have horizontal reinforcement field-installed across the width of the panel for attachment to wall panels as shown in Figure 6. A roof covering, underlayment and flashing complying with Chapter 15 of the UBC are applied over the panels.

2.3.3 Floor Panels: The floor panels are set and attached together to bear on foundations, beams, and exterior or interior wall plates. All panels shall have conventional wood floor sheathing on the top face. See Table 1 for allowable loads.

2.4 Cladding Attachment:

2.4.1 Walls:

2.4.1.1 Exterior: Conventional claddings such as hardboard siding, stucco, plywood, and aluminum siding are to be attached to the metal reinforcement bands with fasteners of sufficient length to penetrate and protrude through the metal at least $\frac{1}{4}$ inch (6.4 mm), as set forth in the cladding manufacturer's instructions. The claddings are attached to the metal reinforcement bands at the same spacing as used in conventional construction.

For full-size panel claddings such as plywood, the above fasteners will be used at 6 inches (152 mm) on center for edges and 12 inches (305 mm) on center in the field. In addition edge nailing is required within 2 feet (610 mm) of wall corners.

2.4.1.2 Interior: Interior claddings, such as $\frac{1}{2}$ -inch (12.7 mm) gypsum wallboard, are attached to the panel with 1-inch-long (25.4 mm), Type S, buglehead drywall screws complying with ASTM C 1002 spaced at 12 inches (305 mm) on center on all steel reinforcement, 1 inch (25.4 mm) from panel edges on perimeter metal channels and centered on interior reinforcement bands.

2.4.2 Roofs:

2.4.2.1 Exterior: For roof sheathing, fasteners are spaced at 6 inches (152 mm) on center for edges and 12 inches (305

mm) in the field. The edges are defined as the area of the roof within a distance from ridges, eaves, hips or gables of 10 feet (3,048 mm) or 0.1 times the least width of the structure, whichever is smaller.

2.4.2.2 Interior: The attachment of cladding is as specified for interior wall applications.

2.5 Party Wall:

The Party Wall consists of a Type D-1 panel, 4 feet (1219 mm) wide by 8 feet (2,438 mm) in height, with a laminate of one $\frac{5}{8}$ -inch-thick (15.9 mm), Type X Fire Code gypsum wallboard and one $\frac{1}{2}$ -inch-thick (12.7 mm), regular gypsum wallboard fastened on each side. The $\frac{5}{8}$ -inch-thick (15.9 mm), Type X wallboard is fastened to the vertical panel members with $1\frac{1}{4}$ -inch-long (32 mm) drywall screws at 8 inches (203 mm) on center, except at the hat channels where it is fastened at 12 inches (305 mm) on center. Hat channels $2\frac{1}{8}$ inches (54 mm) deep and 2 inches (50.8 mm) wide are then attached to the vertical reinforcement members through the $\frac{5}{8}$ -inch-thick gypsum wallboard with $1\frac{1}{2}$ -inch-long (38.1 mm) drywall screws at 12 inches (305 mm) on center, offset 6 inches (152 mm) from the previous screws. The $\frac{1}{2}$ -inch-thick (12.7 mm) regular gypsum wallboard is then attached to the hat channels with 1-inch-long (25.4 mm) drywall screws. See Figures 1 and 2 and Table 1 for additional details. The Party Wall has a minimum STC rating of 50 when tested in accordance with ASTM E 90 and E 413.

2.6 Fire-resistive Construction:

2.6.1 One-hour Fire-resistive Limited-load-bearing Wall Construction:

The construction consists of a Party Wall panel as described in Section 2.5, with joints and fastener heads on both faces and on each of the inner and outer layers of gypsum wallboards taped and covered with joint compound. Axial compression loads up to 1,250 pounds per lineal foot (18.2 kN/m) may be superimposed provided structural considerations for axial, flexural and other stresses are resolved in accordance with the UBC.

2.6.2 Two-hour Fire-resistive Nonload-bearing Wall Construction:

The construction consists of a Type B-1 panel with two layers of $\frac{1}{2}$ -inch-thick (12.7 mm) Type X gypsum wallboard complying with ASTM C 36 on each side. A No. 20 gage, $3\frac{5}{8}$ -inch-by-1-inch (92 mm by 25.4 mm) steel channel is fitted to both top and bottom ends of the panel, and the panels are then connected to the top and bottom plates by toe-nailing both sides with six 16-penny common nails per 4-foot (1,219 mm) panel. The panels are attached to each other with $\frac{3}{4}$ -inch-long (19 mm) sheet metal screws at 12 inches (305 mm) on center along the shiplap edges. The base layer of $\frac{1}{2}$ -inch-thick (12.7 mm), Type X gypsum wallboard is vertically applied to both sides and secured using 1-inch-long (25.4 mm) drywall screws 24 inches (610 mm) on center with each vertical member and 12 inches (305 mm) on center to top and bottom channels. The face layer of $\frac{1}{2}$ -inch-thick (12.7 mm), Type X gypsum wallboard is then applied horizontally to both sides and secured using $1\frac{5}{8}$ -inch-long (41.3 mm) drywall screws at 12 inches (305 mm) on center in top, bottom and field. The screw locations and the vertical joints are staggered from the layer. The joints are taped and coated with joint compound. Screw heads are also coated with joint compound.

2.7 Identification:

The name ThermaStructure appears in the upper right-hand corner of the interior face of each panel. In lieu of the name ThermaStructure, the panels may be identified with one of the following names: Wallframe, ThermaSteel, Insulsteel, Radva Panel, Thermopanel or Radoslav Panel. In addition, each panel bears the manufacturer's name (Thermasteel, Wardco., or Premium Steel Building Systems) and address; the serial

number; the date of manufacture; the evaluation report number (PFC-4216); and the name of the quality control agency, RADCO (AA-650) or Omega Point Laboratories (AA-657).

3.0 EVIDENCE SUBMITTED

Data in accordance with the ICC-ES Acceptance Criteria for Sandwich Panels (AC04), dated September 2002; reports of fire tests in accordance with UBC Standards 7-1 and 26-3, and sound transmission tests; descriptive literature; and quality control manuals.

4.0 FINDINGS

That the ThermaStructure Building Systems described in this report comply with the 1997 Uniform Building Code™ (UBC), subject to the following conditions:

- 4.1 Structural analysis of the panels, panel connections and supporting structure must be submitted to the building official for review, based on allowable loads in Table 1.**
- 4.2 The panels are recognized for Type V construction only.**

4.3 The panels must be separated from the building interior by a thermal barrier complying with Section 2602.4 of the UBC. Minimum 1/2-inch-thick (12.7 mm) gypsum wallboard attached in accordance with Section 2.4.1.2 of this report is an acceptable thermal barrier.

4.4 Panels are fabricated, identified and installed in accordance with this report and the manufacturer's instructions.

4.5 The panels are manufactured in Radford, Virginia, under a quality control program with inspections by RADCO (AA-650), or in North Pole, Alaska, under a quality control program with inspections by Omega Point Laboratories (AA-657).

4.6 Lateral load design, including details for resistance to racking shear, need to be submitted to the building official for approval. Racking shear values are beyond the scope of this report.

This report is subject to re-examination in one year.

TABLE 1—ALLOWABLE ROOF, FLOOR AND WALL PANEL LOADS

PANEL TYPE	ALLOWABLE LOADS ^{1,4}					
	Axial Uniform Loading ⁸		Axial Center Point Loading ⁹		Transverse ^{5,6,7}	
	8' Span (plf)	12' Span (plf)	8' Span (plf)	12' Span (plf)	8' panel ² (psf)	12' panel ³ (psf)
A-1	1,195	1,120	595	—	25	10
B-1	915	975	585	—	20	5
C-1	1,265	1,230	630	890	40	15
D-1	910	970	590	735	30	10
Party Wall	2,970	—	1,335	—	45	—

For SI: 1 inch = 25.4 mm, 1 plf/ft. = 14.59 N/m, 1 psf = 47.9 Pa.

¹Values are not subject to increase for duration of load and are for a minimum 4-foot-wide panel with no openings.

²Values are for panel span equal to panel height (8 feet) or panels having a maximum cantilever of 2 feet.

³Values are for panel span equal to panel height (12 feet) or panels having a maximum cantilever of 4 feet.

⁴Axial and transverse loads may be combined using the following equation:

$$\frac{P}{P_a} + \frac{M}{M_a} \leq 1$$

where:

M = Applied moment.

M_a = Allowable moment using loads and spans in Table 1.

P = Applied axial load (lbs).

P_a = Allowable axial load from Table 1.

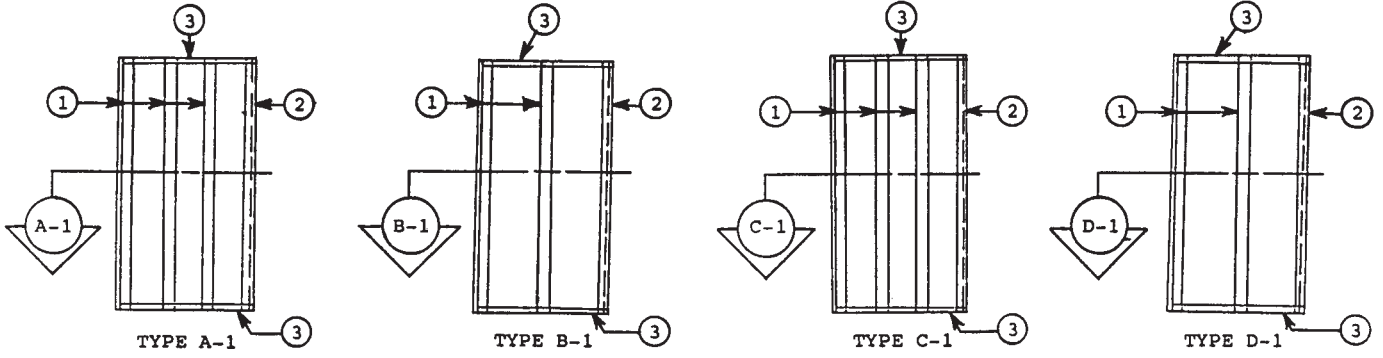
⁵Floor panels are limited to Group R Occupancies.

⁶The design of the steel connector plates and design of wall connections to wood sill plates/headers shall be engineered for each project; designs must be approved by the building official.

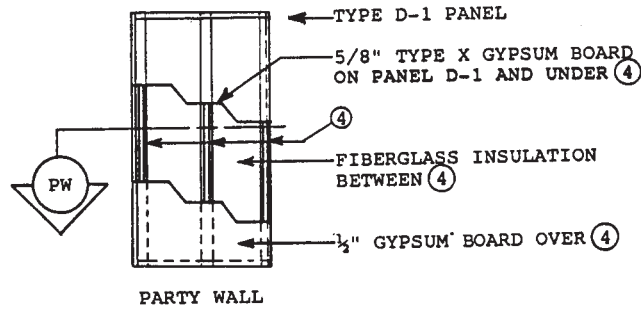
⁷The roof panels shall be installed at a minimum slope of 2.5 percent.

⁸Values are for axial loads applied uniformly on the wall top plate.

⁹Values are for axial point loads applied at the center of the wall top plate; design values are limited to point loads applied across the width of the panel, and a minimum length of 9 1/4 inches for the Party Wall and 6 inches for the other wall panels.

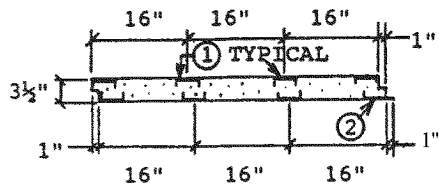


*NOTE: SEE FIGURE 2 FOR EXPLANATION OF DETAILS.

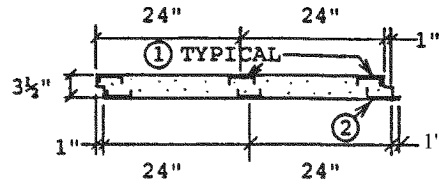


For SI: 1 inch = 25.4 mm.

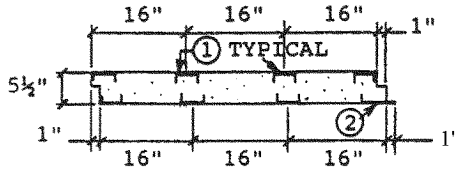
FIGURE 1—PANEL EXTERIOR FACE ELEVATIONS
(Interior Face Similar)



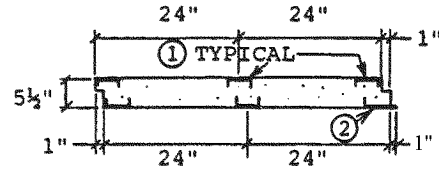
PANEL SECTION (A-1)



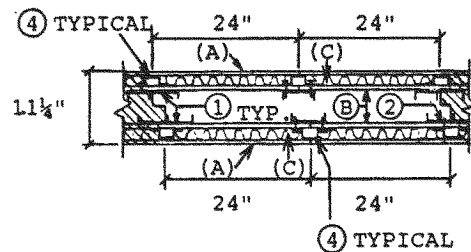
PANEL SECTION (B-1)



PANEL SECTION (C-1)

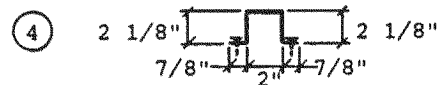
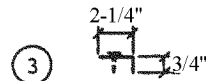
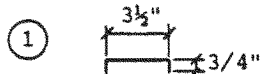
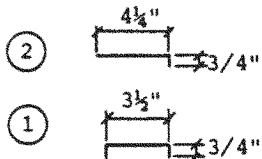


PANEL SECTION (D-1)



PANEL SECTION (PW)

- (A) 1/2" REGULAR GYPSUM BOARD
- (B) 5/8" FIRE CODE C GYPSUM BOARD
- (C) UNFACED 2" FIBER-GLASS INSULATION



24 GAUGE METAL REINFORCEMENT

For SI: 1 inch = 25.4 mm.

FIGURE 2—PANEL SECTIONS AND METAL DETAILS

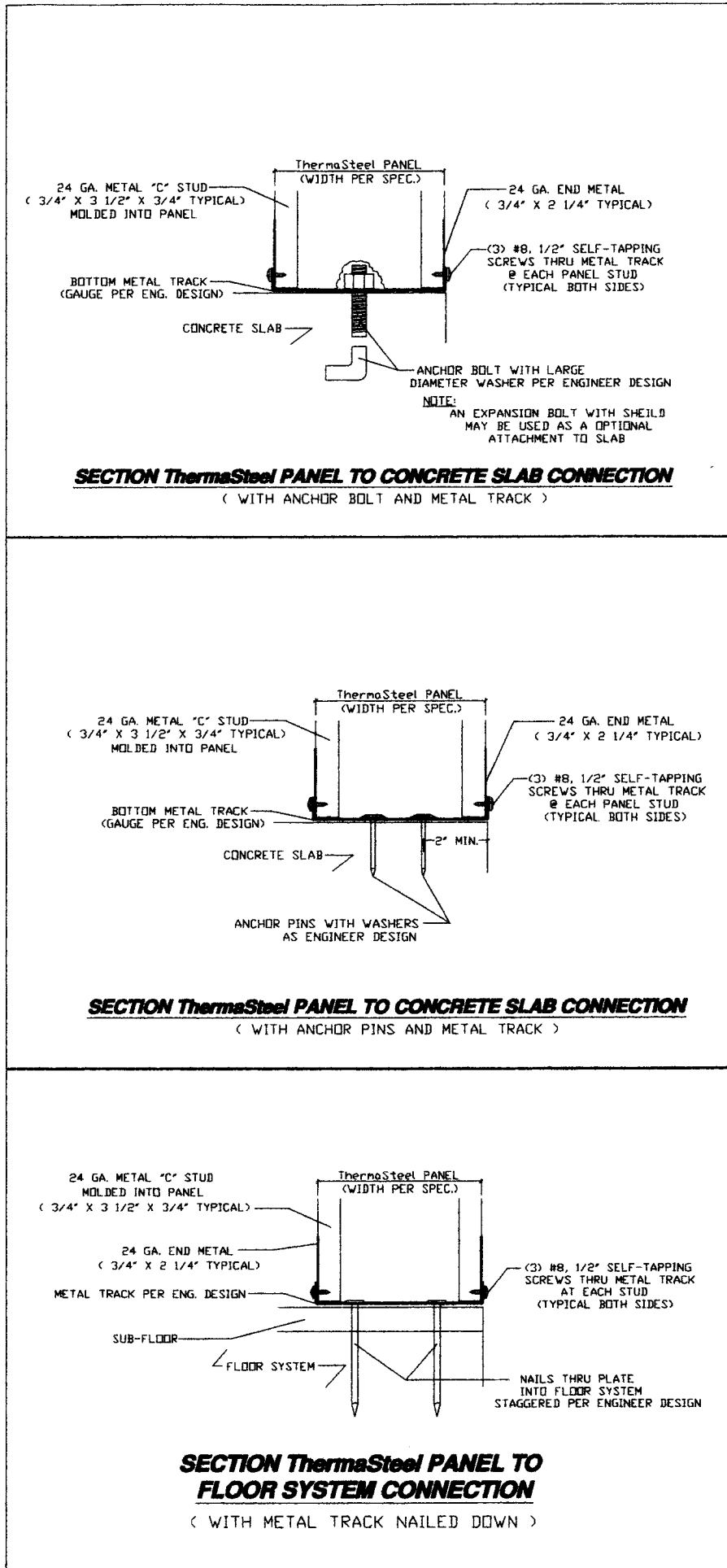


FIGURE 3—TYPICAL CONNECTION OF WALL TO FOUNDATION OR FLOOR USING METAL TRACK

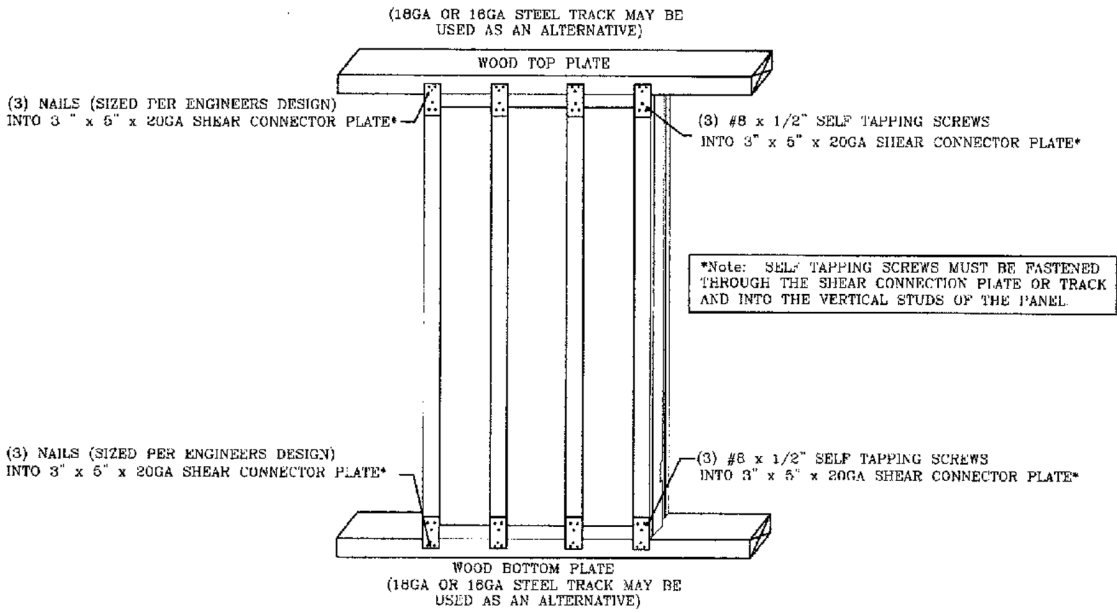


FIGURE 4—PANEL DETAIL AND NOTES FOR TYPICAL CONNECTION TO WOOD TOP AND BOTTOM PLATES

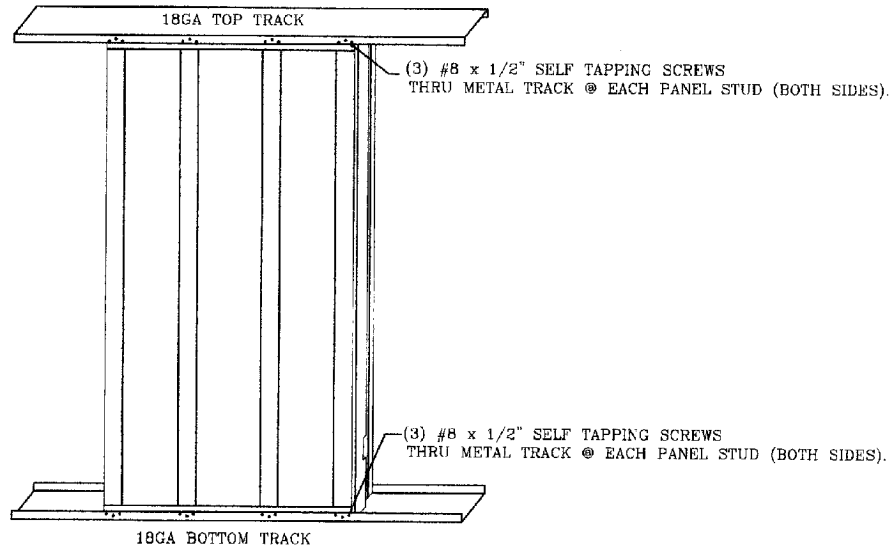
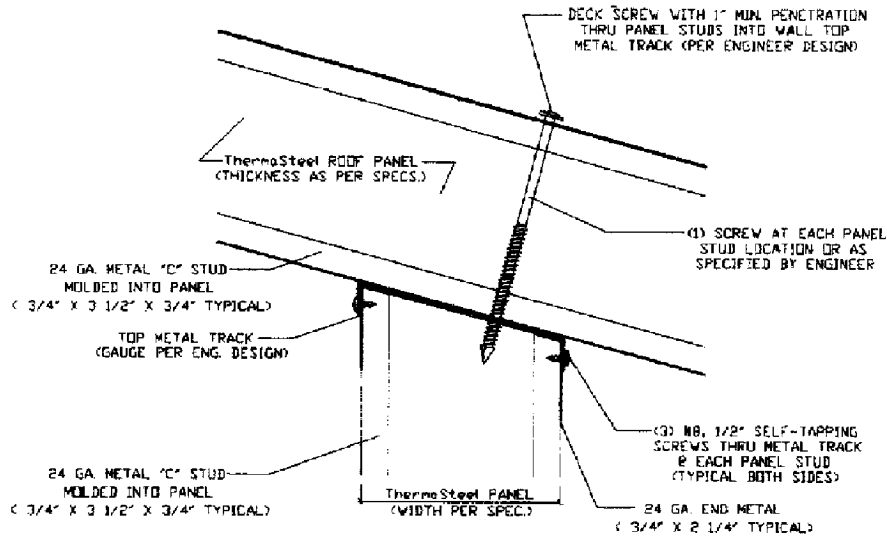
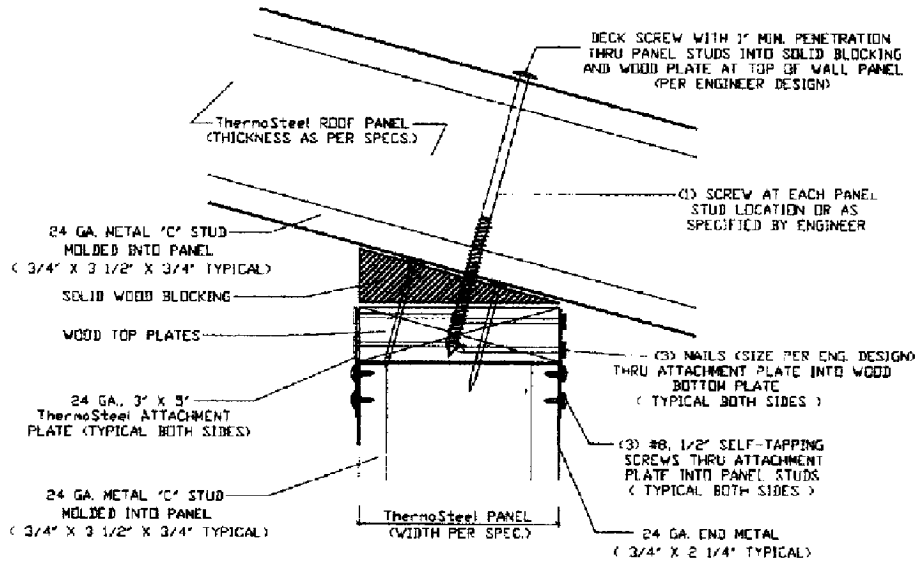


FIGURE 5—PANEL DETAIL AND NOTES FOR TYPICAL CONNECTION TO METAL TOP AND BOTTOM TRACK



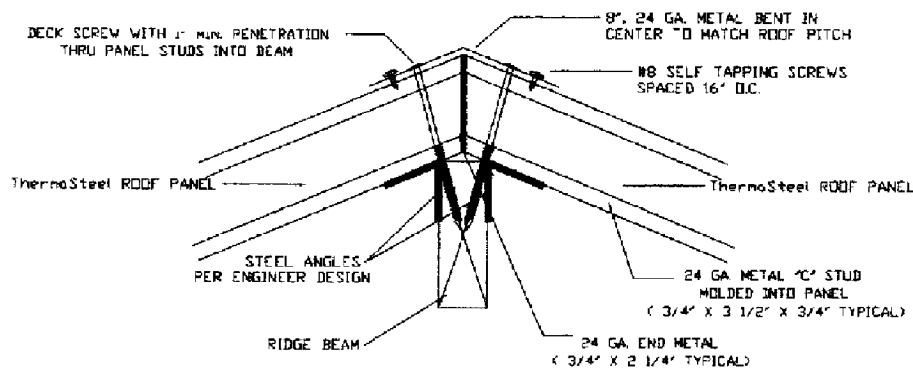
RECOMMENDED ThermoSteel ROOF PANEL CONNECTION

(TO ThermoSteel BEVELED PANEL)



RECOMMENDED ThermoSteel ROOF PANEL CONNECTION

(WITH TOP PLATE AND SOLID WOOD BLOCKING)



RECOMMENDED ThermoSteel ROOF PANEL CONNECTION

(AT RIDGE TO BEAM AND PANEL)

ALL CONNECTIONS TO BE DESIGNED BY ENGINEER

FIGURE 6—TYPICAL CONNECTION AT THE ROOF