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## Legacy report on the BOCA® National Building Code/1999

### DIVISION: 07—THERMAL AND MOISTURE PROTECTION

### Section: 07410—Metal Roof and Wall Panels

#### REPORT HOLDER:

**THERMASTEEL CORPORATION**  
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#### EVALUATION SUBJECT:

### THERMASTRUCTURE®/WALLFRAME™ PANELS

#### 1.0 DESCRIPTION OF EVALUATION

The Thermastructure®/Wallframe™ Panels are evaluated for load bearing applications and for compliance with the requirements for foam plastics.

#### 2.0 DESCRIPTION AND USE OF PRODUCT

##### 2.1 GENERAL

Thermastructure®/Wallframe™ Panels are manufactured by the ThermaSteel Corporation using polystyrene foam plastic and galvanized steel sections. The polystyrene foam, in densities of 1.0 pcf or 1.5 pcf, is combined with 24 gage (0.0276 inch thick) steel strips (ASTM D446, Grade B, G-90 galvanized) in a low pressure molding process to produce the panel. The steel strips are either 3½ inches or 4½ inches wide, and run the full length and width of the panel. Steel strips are fastened to each other using an adhesive. Heat activated glue is used to bond the steel strips to the expanded polystyrene foam plastic. The steel strips are formed into channels and angles before bonding to the foam plastic board. The steel strips are set around the edge of the panels and are placed lengthwise at either 16 inches on center (Type A, C, F and G panels) or 24 inches on center (Type B, D and J panels).

Panels are manufactured to 48 inches maximum width, 144 inches maximum length and nominal thicknesses of 3½ or 5½ inches. Interior partition panels are manufactured in widths of 48 inches or 24 inches, 97 inches length and nominal thickness of 3½ inches.

Electrical conduits are molded into the exterior panels, or electrical and plumbing systems and devices are installed within the cavities of interior panels. Electrical outlets are installed as specified by the manufacturer's installation instructions.

The 3½-inch panels used for load bearing applications utilize the 1.5 pcf density foam plastic, and the 5½-inch panels use the 1.0 pcf foam plastic. Figure 1 shows the different Thermastructure®/Wallframe™ Panels. Panels for exterior use also contain additional reinforcement which is

embedded within the panel. Panels available for installation as corners, doors, windows, headers and partial sizes are shown in Figure 1.

#### 2.2 INSTALLATION

##### 2.2.1 GENERAL

Installation of all Thermastructure®/Wallframe™ panels shall comply with the published manufacturer's installation instructions.

Panels are attached to each other by ½-inch No. 8 self-tapping screws located 12 inches on center in the panel metal edge overlap strip and, where used to provide racking load resistance, by No. 20 gauge steel shear plates with three ½-inch No. 8 screws in each panel at steel reinforcement studs.

**2.2.1.1 Exterior Wall Panels:** All attachments to floor and ceiling/roof structure are to be determined based on engineering calculations. Table 1 of this report reflects typical attachments including the following descriptions for Type A panels:

**2.2.1.1.1** No. 20 gauge galvanized steel shear plates, 3-inch-by-5-inch with the long edge laid parallel to the sill plate, connect the panel to a 2-by-4 wood sill plate that is naturally durable or has been preservative treated to resist decay and termites. One shear plate is located at each vertical metal reinforcement and each joint is attached with three No. 8 by ½-inch self-tapping screws into the panel and three 10d nails into the 2-by-4 wood sill plate (see Figure 2).

**2.2.1.1.2** The exterior wall panel is fastened to a No. 18 gauge galvanized steel channel or angles attached to the steel channels with No. 8, ½-inch self-tapping screws at 12 inches on center. After the exterior wall panels are erected, a single or double 2-by-4 wood top plate is attached with shear plates in the same manner as described in Part 2.2.1.1.1 of this report for the wood sill plate.

All windows, door, or other openings are framed with 2-by-4 wood within the Thermastructure®/Wallframe™ Panels. As a design alternative, metal channel or conventional wood framing shall be used.

Exposed edges and openings in the foam around hose bibs, electrical panels, or any holes in the substrate surface are caulked using an approved weather resisting material that is compatible with all materials used.

**2.2.1.2 Interior Wall Panels:** The interior wall panels are attached to a 2-by-4 wood sill plate or metal channel or angles, in the same manner as described in Parts 2.2.1.1.1 and 2.2.1.1.2 above.

**2.2.1.3 Roof/Floor Panels:** The roof/floor panels are set and attached to bear on joists, beams, trusses, and

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exterior or interior bearing wall plates with a 1 $\frac{1}{2}$ -inch minimum bearing on supports at the ends of the panel. Refer to the figures for typical attachment drawings. Roofing sheathing, where required, is attached to panels by self-tapping screws (see Figure 2).

**2.2.1.4** For all applications, Thermastructure®/Wallframe™ Panels shall be separated from interior spaces by 1 $\frac{1}{2}$ -inch-thick gypsum wallboard or other approved 15-minute thermal barrier. The gypsum board is attached to the metal framing of the panel using 1 $\frac{1}{4}$ -inch-long No. 8 self-tapping screws at 12 inches on center.

## 2.2.2 FIRERESISTANCE RATED ASSEMBLIES

Where Thermastructure®/Wallframe™ panels are installed in fire-resistance rated assemblies, they shall be constructed in accordance with the details set forth in the manufacturer's instructions and the following:

### 2.2.2.1 One-hour fire-resistance rated wall assembly:

The tested assembly (see Figure 3) using Type B panels was tested to ASTM E119 with an applied uniform compressive load of 300 lbs. per lineal foot or 33% of the allowable design load from Table 1 of this report. The tested assembly consisted of modified Type B panels attached to one another using No. 8, 5 $\frac{1}{8}$ -inch-long, self-tapping screws placed 12 inches on center. The modification to the Type B panel was to manufacture the panel with a recess along the exposed face's vertical joints which allows the insertion of 3-inch-wide strips of 5 $\frac{1}{8}$ -inch-thick Type X gypsum board panels. The strips are secured using 1-inch-long, Type S, bugle head, self-tapping screws at 12 inches on center.

The height of the tested wall was 9 feet, and both the exposed and unexposed faces had a layer of 5 $\frac{1}{8}$ -inch type X gypsum board attached using 1 $\frac{1}{8}$ -inch type S, bugle head, self-tapping screws at 12 inches on center. All joints were taped with joint tape and compound.

### 2.2.2.2 One-hour fire-resistance rated wall assembly:

This assembly (see Figure 4) using Type J panels was tested to ASTM E119 with an applied uniform compressive load of 1250 lbs. per lineal foot or 96% of the allowable design load from Table 1 of this report. The tested assembly consisted of Type J wall panels attached to each other using No. 8, 1 $\frac{1}{2}$ -inch-long, self-tapping screws at 12 inches on center on one side of the assembly, and using three 20 gauge, 5-inch-by-2 $\frac{3}{4}$ -inch shear plates attached to the panels with six No. 8, 1 $\frac{1}{2}$ -inch, self-tapping screws per plate on the other side of the assembly.

Attached to both sides of the tested assembly fabricated from Type J panels was: a 5 $\frac{1}{8}$ -inch-thick Type X gypsum panel, 1 $\frac{3}{8}$ -inch-thick fiberglass insulation, and a 1 $\frac{1}{2}$ -inch-thick regular gypsum panel. The 5 $\frac{1}{8}$ -inch gypsum board was attached using 1 $\frac{1}{2}$ -inch self-tapping screws at 12 inches on center. "Hat" studs were attached to the metal channel of the Type J panel through the 5 $\frac{1}{8}$ -inch gypsum board using 1 $\frac{1}{2}$ -inch-long self-tapping screws at 12 inches on center. The 1 $\frac{1}{2}$ -inch gypsum board was then attached to the "hat" studs using 1-inch self-tapping screws at 12 inches on center. All gypsum board joints were taped and compounded. The wall assembly tested was 9 feet high.

## 3.0 CONDITIONS OF USE

This report is limited to the applications and products as stated in this report. The ICC-ES Subcommittee on National Codes intends that the report be used by the code official to determine that the report subject complies with the code requirements specifically addressed, provided that this product is installed in accordance with the following conditions:

**3.1** All panels shall be installed in accordance with this report and the published manufacturer's installation instructions. Penetrations and alterations made to panels for the installation of electrical and plumbing

systems and devices shall be in accordance with the manufacturer's instructions.

**3.2** The foam plastic insulation board used in the Thermastructure®/Wallframe™ Panel is limited to a minimum thickness of 3 $\frac{1}{2}$  inches, a maximum thickness of 5 $\frac{1}{2}$  inches and a density range of 1.0 to 1.5 pcf.

**3.3** All Thermastructure®/Wallframe™ Panels shall be separated from the interior of the building by 1 $\frac{1}{2}$ -inch gypsum wallboard or an equivalent 15 minute thermal barrier.

**3.4** Thermastructure®/Wallframe™ Panels used for exterior wall construction shall be limited to buildings of Type 5 construction only.

**3.5** Allowable design loads shall be in accordance with Table 1 or as justified by structural calculations signed and sealed by a registered design professional. The allowable design loads for the limited load bearing fire-resistance rated assemblies shall be 300 lbs. per lineal foot (33% of the allowable design load) for the assembly described in Part 2.2.2.1 and 1250 lbs per lineal foot (96% of the allowable design load) for the assembly described in Part 2.2.2.2. For every installation structural calculations shall be submitted to the code official. The calculations shall address all aspects of the design which affect the use of the Thermastructure®/Wallframe™ Panel.

**3.6** All Thermastructure®/Wallframe™ Panels shall bear the label of RADCO.

**3.7** The maximum height of the one hour fire-resistance rated wall assemblies described in Part 2.2.2 of this report shall be 9 feet. The maximum allowable compressive loads shall be 300 lbs. per lineal foot for the assembly described in Part 2.2.2.1 and 1250 lbs. per lineal foot for the assembly described in Part 2.2.2.2.

**3.8** Exterior wall coverings used over Thermastructure®/Wallframe™ panels shall conform to the requirements of Chapter 14 in the building code.

**3.9** This report is subject to periodic re-examination. For information on the current status of this report, contact the ICC-ES.

## 4.0 INFORMATION SUBMITTED

Test data and information submitted by the proponent addresses the following aspects of the performance of the Thermastructure®/Wallframe™ Panel: structural, weather resistance and fire-resistance. In addition, supporting data for the use of specific polystyrene foam plastic boards manufactured by others has been submitted. A quality control manual has been submitted which details the inspection agreement undertaken between ThermaSteel Corporation and RADCO, Inc., Listing and Testing Division.

## 5.0 INFORMATION REQUIRED ON CONSTRUCTION DOCUMENTS

To aid in the use of this report the following represents the minimum level of information to be reflected on construction documents in order to determine compliance with this report.

**5.1** The language "See ICC-ES Legacy Report No. 91-40."

**5.2** The design loads and panel types used.

**5.3** The materials used for the wall finish system.

## 6.0 PRODUCT IDENTIFICATION

All ThermaSteel Corporation Thermastructure®/Wallframe™ Panels manufactured in accordance with this report shall be marked at the plant with the identifying language, "See ICC-ES Legacy Report No. 91-40."

TABLE 1—ALLOWABLE DESIGN LOAD VALUES<sup>1</sup>

PANEL	COMPRESSIVE (AXIAL) LBS./FT. (WIDTH)	TRANSVERSE LBS./SQ.FT	RACKING SHEAR LBS.	CONCENTRATED MID-POINT LBS.	
				Single Top Plate	Double Top Plate
Type A	1240	26.7	871/1573 <sup>2</sup>	2647	3515
Type B	1000	19.5	831/1146 <sup>2</sup>	2437	2807
Type C	1869	40.3	1248 <sup>2</sup>	3010	3024
Type D	1300	0	640	0	0
Type F	1133	19.1	0	1867	0
Type G	1133	14.6	0	2667	0
Type H	268	0	0	0	0
Type J	1300	20.8	730 <sup>2</sup>	2631	2942
Type K	1000	0	0	0	0
Type D + G	0	0	1520	0	0

<sup>1</sup>Values are based on the lesser of the following: Ultimate Load ÷ 2.5, or the load at deflection L/240.

<sup>2</sup>Racking shear value applied to panel with 1/2-inch-thick gypsum board attached using 1 1/4-inch drywall screws spaced 12 inches o.c. around perimeter and in field.

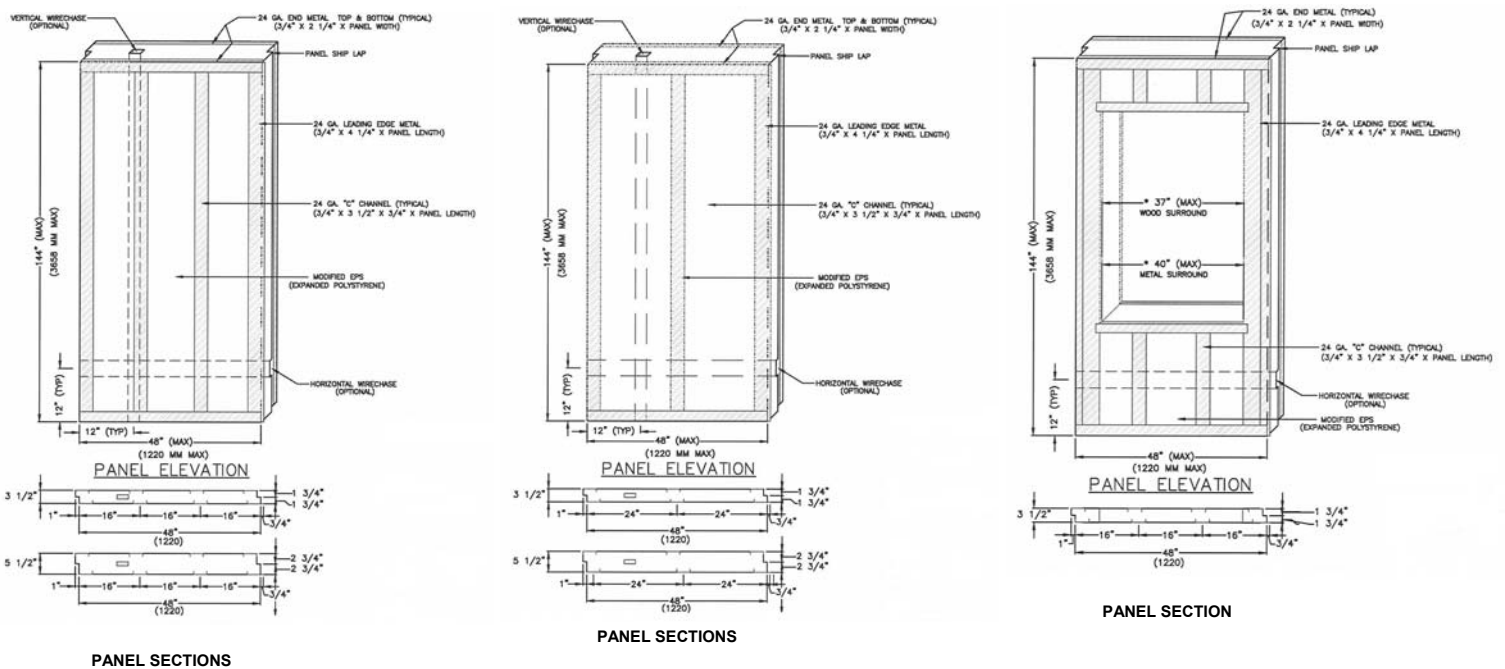


FIGURE 1\*—THERMASTRUCTURE®/WALLFRAME™ PANELS

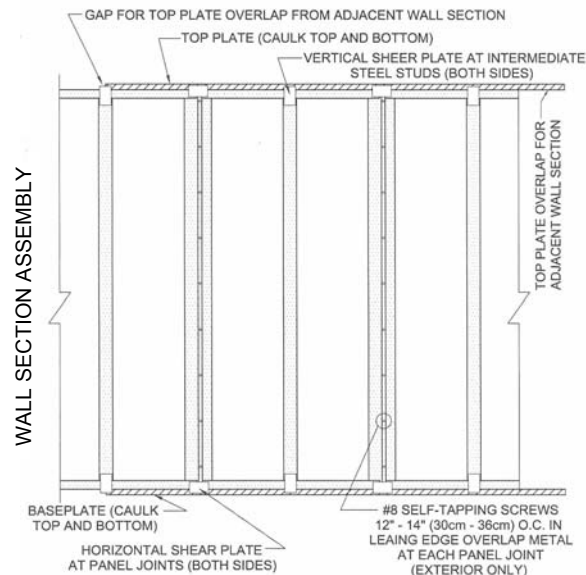
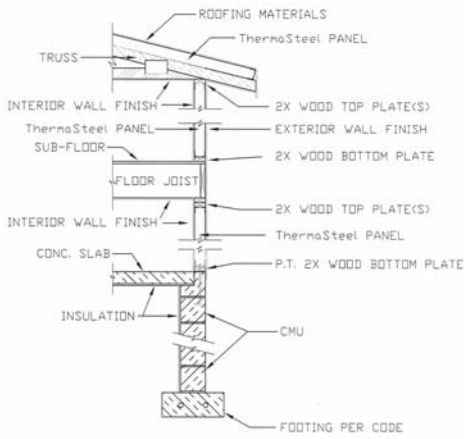
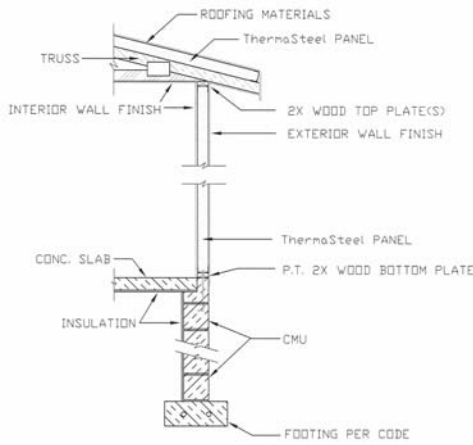


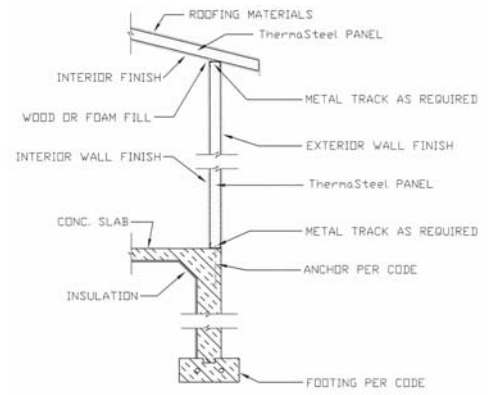
FIGURE 2\*—TYPICAL INSTALLATION DETAILS



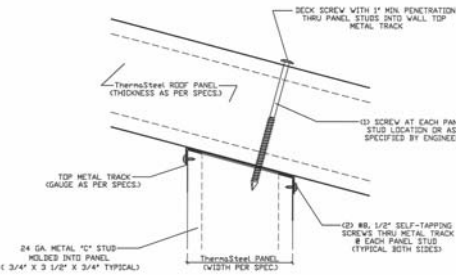
**2 STORY WALL SECTION WITH CMU FOUNDATION**



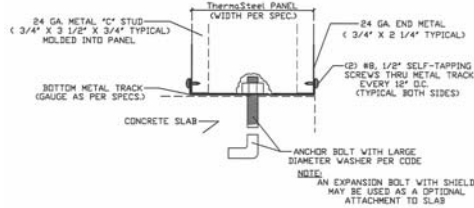
**1 STORY WALL SECTION WITH CMU FOUNDATION**



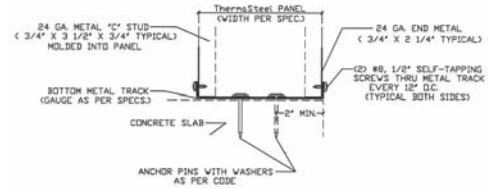
**1 STORY WALL SECTION WITH TURNED DOWN SLAB**



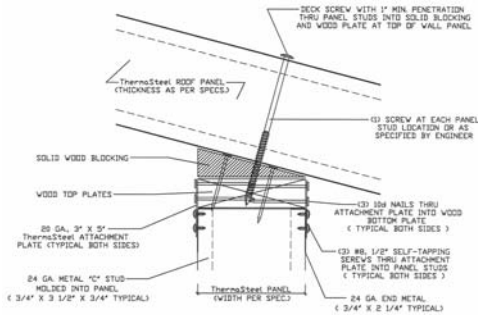
**THERMASTEEL PANEL ROOF PANEL CONNECTION (WITH TOP METAL TRACK ON PANEL MOLDED TO ROOF PITCH)**



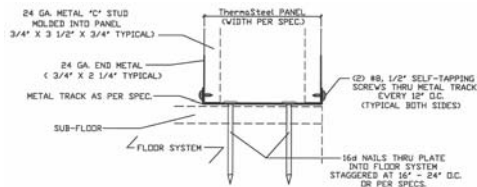
**THERMASTEEL PANEL TO CONCRETE SLAB CONNECTION (WITH ANCHOR BOLT AND METAL TRACK)**



**THERMASTEEL PANEL TO CONCRETE SLAB CONNECTION (WITH ANCHOR PINS AND METAL TRACK)**



**THERMASTEEL PANEL ROOF PANEL CONNECTION (WITH TOP PLATE AND SOLID WOOD BLOCKING)**



**THERMASTEEL PANEL TO FLOOR SYSTEM CONNECTION (WITH METAL TRACK NAILED DOWN)**

**FIGURE 2\*—TYPICAL INSTALLATION DETAILS (Continued)**

\*THESE DRAWINGS ARE FOR ILLUSTRATION PURPOSES ONLY. THEY ARE NOT INTENDED FOR USE AS CONSTRUCTION DOCUMENTS FOR THE PURPOSE OF FABRICATION OR ERECTION.