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## Legacy report on the 1997 *Uniform Building Code*™

DIVISION: 03—CONCRETE  
Section: 03370—Specially Placed Concrete

### STRUCTURAL “THERML-IMPAC™ PANEL”

IMPAC INTERNATIONAL  
16641 ORANGE WAY  
FONTANA, CALIFORNIA 92335

#### 1.0 SUBJECT

Structural “Therml-Impac™ Panel.”

#### 2.0 DESCRIPTION

##### 2.1 General:

The shop-fabricated panels consist of welded wire trusses and a foam plastic core to which field-applied plaster is placed on each side. The panels have vertical, 3-inch-deep No. 14 gage wire Warren trusses spaced at 2-inch centers with preformed 2<sup>1</sup>/<sub>4</sub>-inch-thick polystyrene or polyurethane foam strips between. The assembly is held together with No. 14 gage horizontal wires on each face at 2-inch centers welded to the truss chords.

The horizontal wires and vertical truss chords project approximately <sup>3</sup>/<sub>8</sub> inch beyond each foam plastic face to permit wire embedment within a portland cement or gypsum plaster finish applied to each face after erection on the site.

The panels are manufactured in 4-foot widths and varying heights from 6 to 14 feet in increments of 4 inches. The nominal thickness of the “Therml-Impac Panel” wire frame is 3 inches, resulting in a finished wall thickness, after plastering, of 4 inches or more. See Table 1 for allowable loads.

##### 2.2 Fire-resistive Wall Assemblies:

**2.2.1 General:** The fire-resistive wall assemblies consist of the “Therml-Impac Panel” with a 2<sup>1</sup>/<sub>4</sub>-inch-thick polystyrene core and plastered with portland cement plaster, lightweight portland cement plaster and/or lightweight gypsum plaster. All assemblies require a minimum No. 20 gage steel fire stop, such as an unpunched steel stud, at each floor level.

**2.2.2 One-hour Fire-resistive Wall Assembly:** The panels are covered with 1<sup>1</sup>/<sub>8</sub>-inch-thick portland cement plaster on both faces. As an alternate, the panels may be covered with 1-inch-thick portland cement plaster on both faces, with an additional <sup>1</sup>/<sub>2</sub>-inch-thick lightweight gypsum plaster placed on the interior face.

**2.2.3 Two-hour Fire-resistive Wall Assembly:** The panels are covered with 1-inch-thick portland cement plaster followed

by <sup>1</sup>/<sub>2</sub>-inch-thick lightweight gypsum plaster or lightweight portland cement plaster on both faces.

##### 2.3 Materials:

1. Wire—No. 14 gage panel wire conforming to UBC (1997 *Uniform Building Code*™) Standard 21-10 and ASTM A 185-97.
2. No. CL-15G Hartco clips—Formed from <sup>7</sup>/<sub>16</sub>-inch-wide, No. 20 gage cold-rolled steel and manufactured by Stanley Hartco Manufacturing Company or Spenax Flex-C-Rings, No. 516G100, manufactured by Stanley Spenax or equal.
3. Polystyrene Board—CLASS I, in accordance with Section 802.2 and Table 8-A of the UBC, at 1-pound-per-cubic-foot density by Falcon Foam Manufacturing of California, Inc. (evaluation report ER-4059).
4. Polyurethane Board—CLASS-I, in accordance with Section 802.2 and Table 8-A of the UBC, at 2-pounds-per-cubic-foot density by Apache Products Company (evaluation report ER-3240).
5. Portland Cement—Complies with ASTM C 150.
6. Aggregate—Complies with ASTM C 35-70 and C 897.
7. Gypsum—Plaster Complies with ASTM C 28-92 and Table 25-E of the UBC.
8. Portland Cement Plaster—A mixture of portland cement and aggregate complying with Table 25-F of the UBC. The plaster must have a minimum 28-day compressive strength required by Table 1 or 2 or as required by design based on testing of three 2-inch cubes in accordance with ASTM C 109.

##### 2.4 Modified “Therml-Impac Panel”:

The modified “Therml-Impac” wall assembly is identical to the panel described in Section 2.1 except that the No. 14 gage wire Warren trusses are spaced at 8 inches on center. The allowable loads are set forth in Table 1.

##### 2.5 Modified “Therml-Impac Panel” as a One-hour or Two-hour Fire Assembly:

The modified “Therml-Impac Panel” with faces of material described in Section 2.2 also has recognition as one-hour and two-hour fire-resistive assemblies. Maximum allowable axial load is 800 pounds per foot where used in fire-resistive assemblies.

##### 2.6 Design:

The panels may be designed in accordance with the applicable provisions in Chapter 19 of the UBC, where required. The design loads cannot exceed the values set forth in Table 1 except where additional reinforcement is provided,



substantiated by calculations. The “Therml-Impac Panel” construction assembly may be used for freestanding walls when designed and anchored as cantilever walls. Panels are reinforced and tied at vertical joints to maintain alignment. Additional reinforcing and portland cement plaster may be added as required by the design.

### 2.7 Wall Panels:

Exterior wall panels are set with a minimum  $\frac{1}{4}$ -inch clearance between the concrete slab edge and the panel reinforcement. Attachment to the slab and perimeter foundation is with  $2\frac{1}{2}$ -inch-long by  $\frac{1}{8}$ -inch-thick steel hold-down connector channels and  $\frac{1}{2}$ -inch-diameter foundation bolts placed a maximum of 48 inches on center along width and at each panel end. Panel reinforcement and connector channels are attached with 12-inch-long, No. 12 gage wires extending a approximately 45 degrees upward along each panel face from each channel end. The upper end of the diagonal wires are attached to the panel reinforcement. As an alternate, shear receivers consisting of  $2\frac{1}{8}$ -inch-long channel-shaped No. 16 gage sheet metal fastened with two Hartco clips each side and anchored with  $\frac{1}{2}$ -inch-diameter anchor bolts may be used with the placement as above. These shear receivers may also be used at panel tops and openings. For details of the shear receiver and anchor connection, see Figures 2 and 7.

Resistance to uplift or overturning forces is provided by installing a hold-down device using No. 8 gage wire loops as shown in Figure 9. This anchor allows a maximum uplift of 3,150 pounds. Where additional uplift or overturning resistance is required, design calculations for anchorage must be submitted to the building official for approval.

No. 26 gage galvanized sheet metal flashing with external and internal lips is placed between the floor slab and wall. Vertical foam core edges of exterior wall panels are treated with a  $\frac{1}{4}$ -inch to  $\frac{3}{8}$ -inch continuous bead of elastomeric sealant prior to butting with adjacent panel cores.

Panels are joined along vertical edges with 8-inch-wide strips of No. 14 gage 2-inch-square welded wire mesh on each face centered on the panel joint. The mesh is attached to the vertical panel wire reinforcement with Hartco clips spaced 12 inches on center at the edge wires and 24 inches on center at interior wire. See Figure 3. Panels may also be joined on both sides with No. 14 gage wire trusses as shown in Figure 8. In addition to the above, butting panel edge wires are attached with the clips spaced at 2 feet on center on each panel face. Corner and intersecting walls are connected with mesh trusses and clips in a similar manner. Clips installed in accordance with figures when truss strips are used as joint mesh.

Interior wall panels are set and attached to hold-down connector channels with No. 12 gage wires in the same manner as exterior panels. Approved powder-actuated anchors may be used, provided they are adequate for applicable uplift loads. A nonstructural plaster ground can be attached at the base of the interior panels if desired.

Lintel sections over openings consist of panel sections with truss reinforcement placed horizontally and reinforced as shown in Figures 6 and 11. Allowable loads are set forth in Table 1.

Electrical raceways, switch boxes and outlet boxes may be installed prior to application of the portland cement plaster in accordance with local requirements. Outlet boxes are to be placed to minimize the cutting of the wire mesh reinforcement. Where two or more wires in the same direction are cut, they must be replaced with wire of the same gage and attached with at least two Hartco clips at each end at a sufficient distance beyond the opening to develop continuity.

Plumbing and waste lines are limited to extending at right angles through the wall panels and located to minimize the cutting of panel wires.

### 2.8 Roof and Floor Panels:

The “Therml-Impac Panel” and the modified “Therml-Impac Panel” may be used only for floor or roof panels. The panels are not permitted to bear on wood-frame walls. The connection method of the roof panels to wall panels is shown in Figures 1 and 10, and the allowable loads for the connection are shown in Table 2. Horizontal diaphragms are permitted the same shear values as vertical racking shear, provided the panels are fastened to each other and to walls as described in this report.

### 2.9 Special Connection Device: Ledger Bolt:

The bolt consists of a  $\frac{1}{2}$ -inch-diameter ASTM A 307 L-shaped bolt with washers and nuts that is fastened to the panel wires and plastered in accordance with Figure 4. The portland cement plaster for the panel for use with this connection device must have a minimum 28-day compressive strength of 3,700 psi. The maximum allowable load is 500 pounds tension and 750 pounds shear.

### 2.10 Special Inspection:

Continuous special inspection according to Sections 1701.5.1, 2, and 4 and 1701.5.12 of the code is required. The special inspector’s duties include:

1. Plaster mix design.
2. Plaster quality.
3. Impac panel identification and dimensions.
4. Anchor type and placement.
5. Plaster placement and thickness.
6. Test specimen preparation.

### 2.11 Identification:

The panel bundles are identified with a tag noting the manufacturer’s name and address, the product name and the evaluation report number. The outer foam plastic board strips along the vertical edges of the panel are stamped with the words “IMPAC—Evaluation Report No. 3509.”

## 3.0 EVIDENCE SUBMITTED

Descriptive literature, construction details, structural calculations, load test reports and reports of tests conducted in accordance with UBC Standard 7-1.

## 4.0 FINDINGS

**That the Structural “Therml-Impac Panels” comply with the 1997 Uniform Building Code™ (UBC), subject to the following conditions:**

- 4.1 **The panels are fabricated and erected to comply with this report and the manufacturer’s instructions. Panel design is in accordance with the UBC and Table 1. Structural calculations verifying compliance with this report and the UBC must be submitted to the building official for approval.**
- 4.2 **The remaining portions of the structure are designed and constructed in accordance with the UBC.**
- 4.3 **The panels and their attachments are inspected and approved by the building official prior to their being enclosed with plaster.**
- 4.4 **The wall panels are assigned one-hour and two-hour fire-resistive ratings when constructed in accordance with this report.**
- 4.5 **The panels may be installed where noncombustible construction is required.**
- 4.6 **Special inspection is provided according to Section 2.10 except under the following conditions:**

- 4.6.1 Construction only involves walls up to 8 feet high, supporting only the roof.
- 4.6.2 Occupancy is Group R, Division 3 or Group U, Division 1.
- 4.6.3 Installation is by installers approved by Impac International.

4.6.4 Half stresses or loads otherwise permitted in this report are used.

This report is subject to re-examination in two years.

TABLE 1—ALLOWABLE ROOF, FLOOR AND WALL PANEL LOADS<sup>1,2</sup>

TYPE OF LOADING	PANEL HEIGHT OR SPAN <sup>5</sup> (feet)	POUNDS PER LINEAR FOOT	POUNDS PER SQUARE FOOT	REMARKS
Axial <sup>3</sup>	8	3100 <sup>6</sup>	—	None
	12	2700 <sup>6</sup>	—	
Axial <sup>4</sup>	8	2700	—	None
Transverse <sup>3</sup> for wall, roof or floor panels	4	—	89	Wind or lateral load applied perpendicular to the face of panel. For superimposed roof or floor loads, no increase for duration of load is permitted.
	5	—	79	
	6	—	56	
	7	—	51	
	8	—	40	
	10	—	25	
	12	—	16	
Transverse <sup>4</sup> for wall panels only.	8	—	23	Wind or lateral load applied perpendicular to the face of wall panels. The 10- and 12-foot-high panel can be used only for interior walls.
	10	—	13	
	12	—	10	
Racking shear <sup>3</sup> for wall panels	$H/D = 1.5$ or less	330 <sup>6</sup>	—	In continuous panel runs, $\frac{1}{2}$ -inch-diameter anchor bolts are required at each end and at a maximum of 48 inches on center at intermediate locations. Where panel runs a maximum of 4 feet wide are encountered, the anchor bolts are placed at each end of the panel.
Racking shear for wall panels. <sup>4</sup>	$H/D = 1.0$	275	—	The lower shear values must be used where intermediate $H/D$ values are encountered.
	$H/D = 1.5$	240	—	
	$H/D = 2.0$	225	—	
	$H/D = 4.0$	170	—	
Superimposed vertical load on lintel beams.	6	540	—	Lintels are constructed in accordance with Figure 6 or 11.
	8	400	—	

For **SI**: 1 foot = 304.8 mm, 1 plf = 14.5939 N/m, 1 psf = 47.8803 Pa.

<sup>1</sup>Where the modified "Therml-Impac Panel" is used as a fire-resistive assembly, the allowable axial load is limited to 800 plf.

<sup>2</sup>Axial loads and transverse loads due to wind or earthquake may be combined as follows for wall panels:

$$\frac{P}{P_{all}} + \frac{W}{W_{all}} \leq 1.33$$

**Where:**

- $P$  = Axial load at wall midheight, including tributary wall height.
- $P_{all}$  = Allowable axial load set forth in Table 1.
- $W$  = Transverse wind or earthquake load.
- $W_{all}$  = Allowable transverse load set forth in Table 1.

<sup>3</sup>Minimum 1-inch-thick portland cement plaster on both faces.

<sup>4</sup>Minimum 1-inch-thick portland cement plaster with a minimum compressive strength of 1,000 psi on one face and  $\frac{7}{8}$ -inch-thick gypsum plaster on the opposite (interior) face.

<sup>5</sup> $H$  is height of panel and  $D$  is the width of panel.

<sup>6</sup>Normal construction allows plaster to extend approximately  $\frac{3}{8}$  inch outside of floor slab. When full bearing of the entire panel (including plaster) the allowable axial load for the 8- and 12-foot-high panels may be increased to 5,000 and 4,200 pounds per linear foot of panel, respectively, and the racking shear to 425 pounds per lineal foot of panel.

TABLE 2—ALLOWABLE LOAD FOR ROOF PANEL TO WALL PANEL CONNECTION

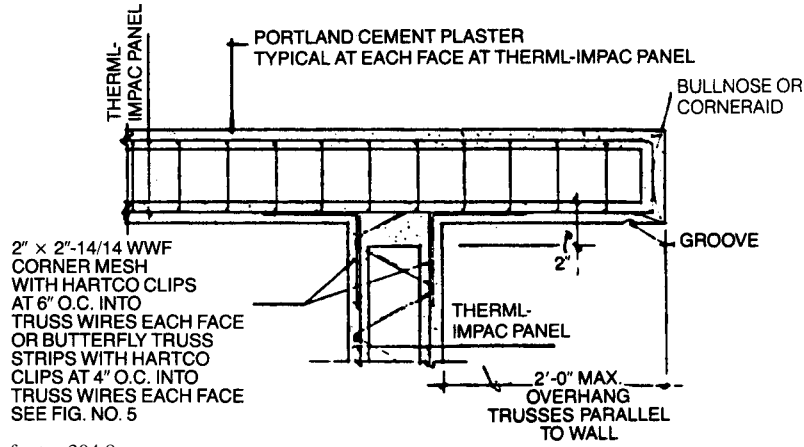
CONNECTION TYPE	DIRECTION OF LOAD	ALLOWABLE LOAD <sup>1,3</sup> (pounds per linear feet)
"Butterfly" Truss	Uplift <sup>2</sup>	150
	Transverse	730
	Longitudinal	730
No. 14 Gage Wire	Uplift <sup>2</sup>	190
	Transverse	730
	Longitudinal	730

For **SI**: 1 plf = 14.5939 N/m.

<sup>1</sup>Based on detail shown in Figure 1 or 10.

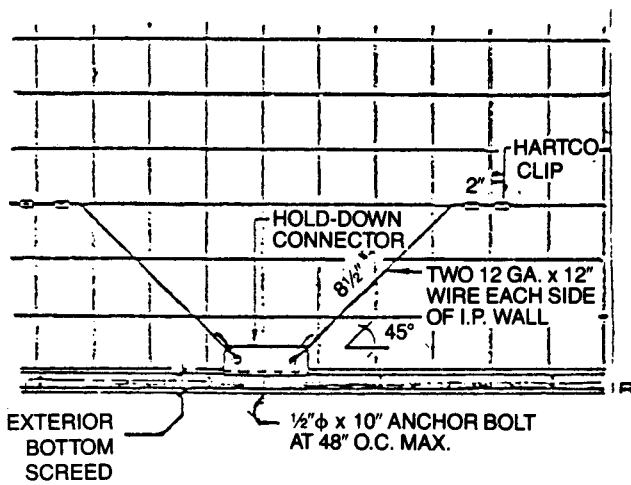
<sup>2</sup>Load due to dead load not included. Connection must be designed for vertical downward loads.

<sup>3</sup>Portland cement plaster must have a minimum compressive strength of 2,000 psi.

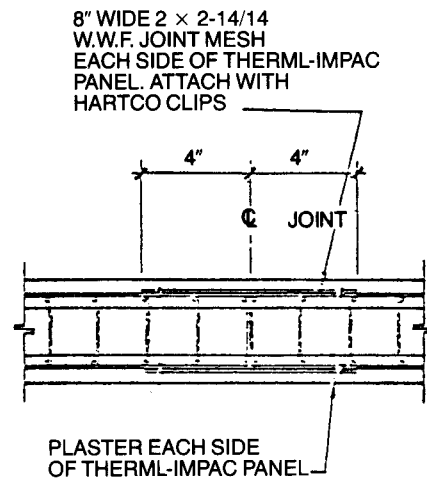


TYPICAL OVERHANG DETAIL  
FIGURE 1

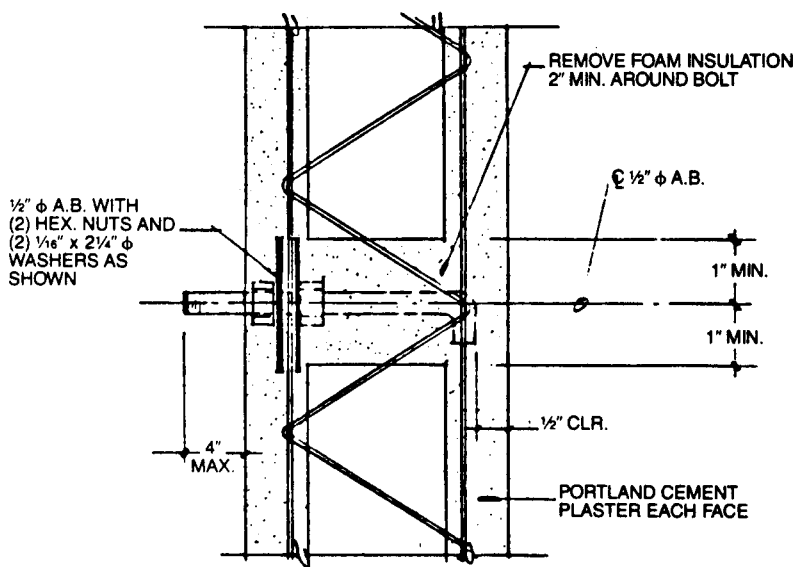
For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.



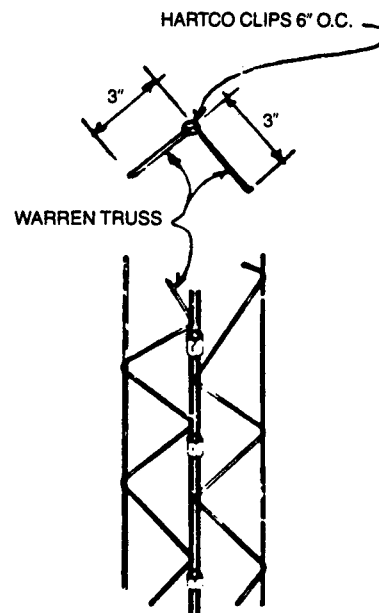
PANEL SHEAR CONNECTOR  
FIGURE 2



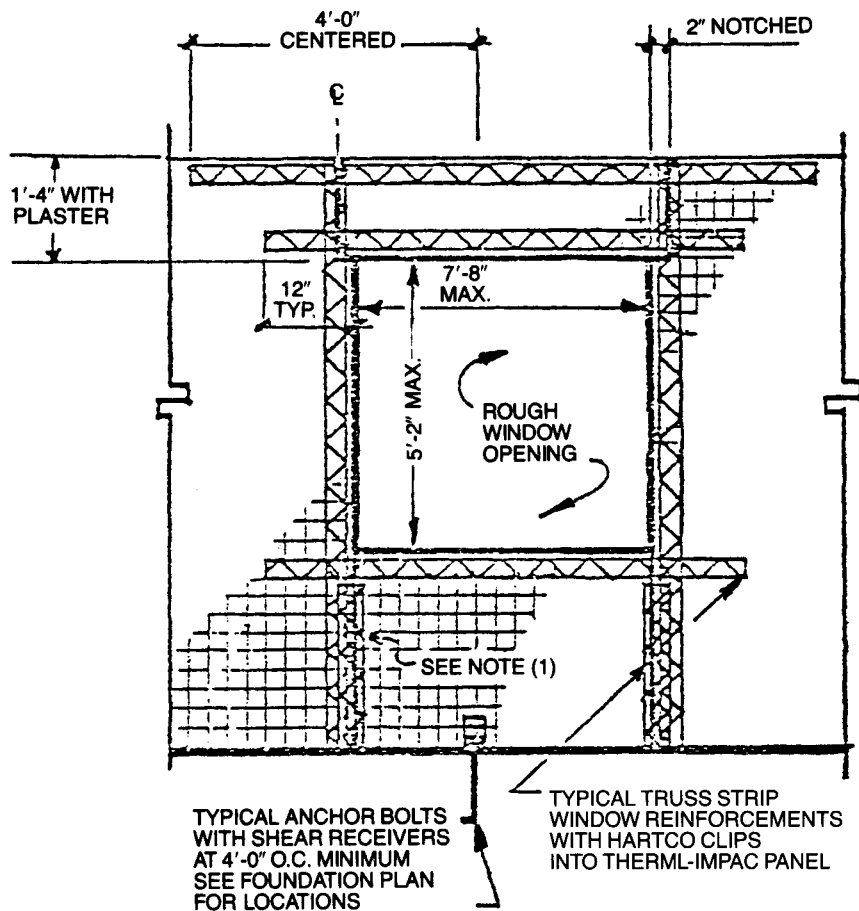
WALL PANEL JOINT  
FIGURE 3



LEDGER BOLTS TO THERML-IMPAC PANEL  
FIGURE 4



\"BUTTERFLY\" TRUSS STRIP  
FIGURE 5



**NOTES:**

1. PROVIDE ADDITIONAL TRUSS STRIP SPLICE, SPLICE STRIP TO TERMINATE 4" BELOW SILL.
2. SPECIFIED TRUSS STRIP END LAPS ARE MINIMUM EXCEPT WHERE CONFINED BY WALL JUNCTURES.
3. ALL TRUSS STRIP REINFORCEMENTS OCCUR AT BOTH SIDES OF THERML-IMPAC PANEL.
4. WHERE TRUSS STRIP SPLICES ARE REQUIRED, A 1'-0" MINIMUM LAP SHALL BE OBSERVED.

FIGURE 6

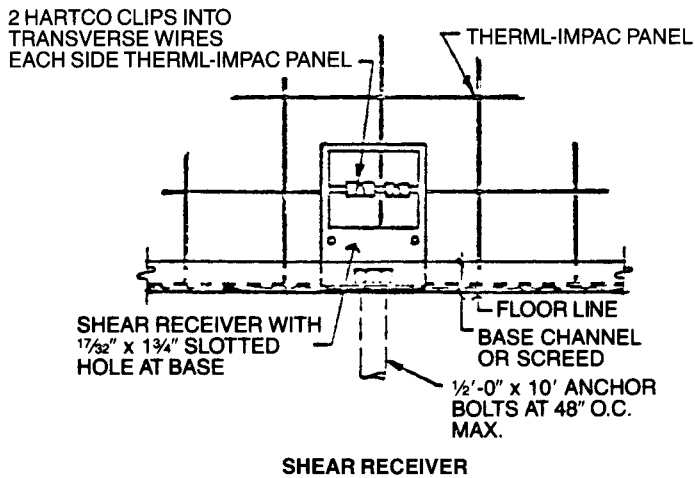
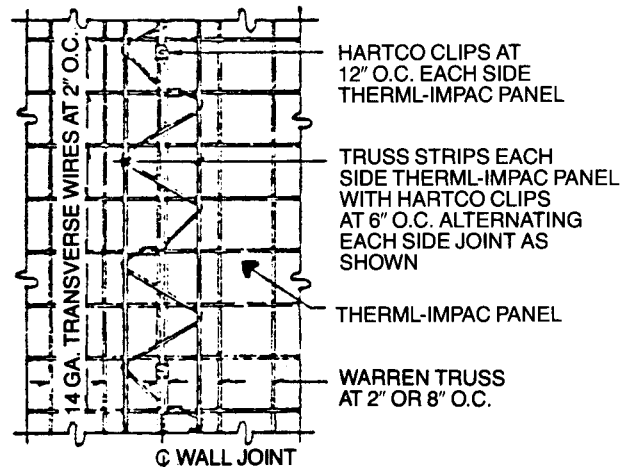
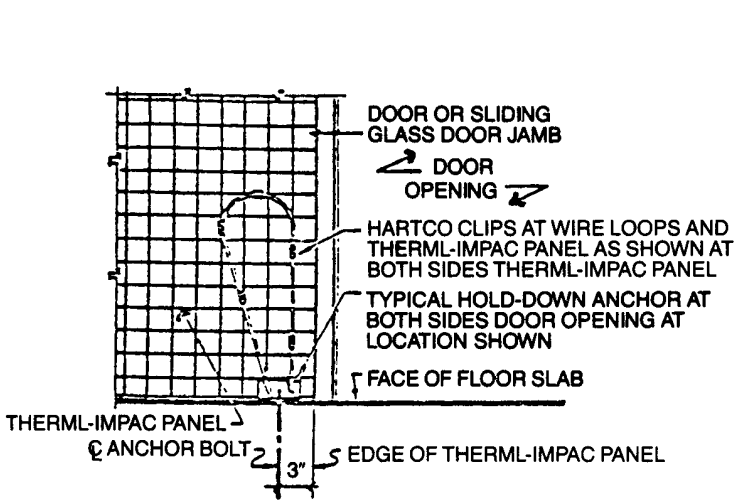


FIGURE 7

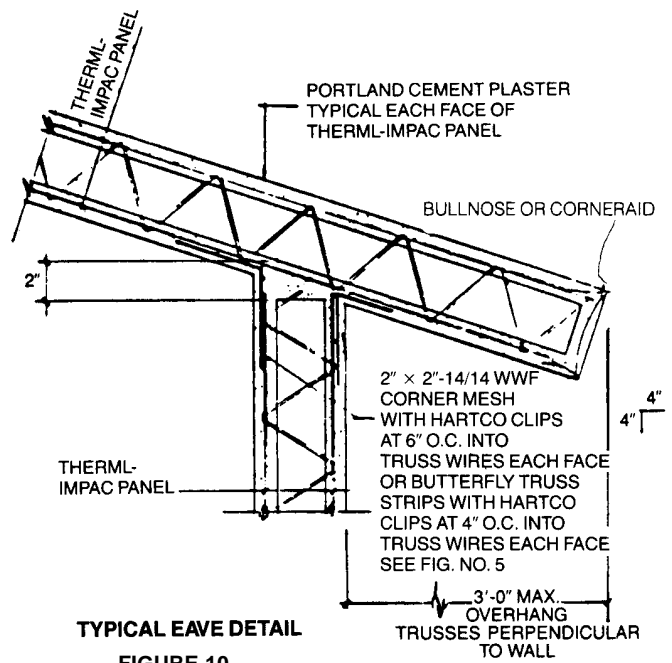


TRUSS STRIP CONNECTION AT VERTICAL WALL JOINT

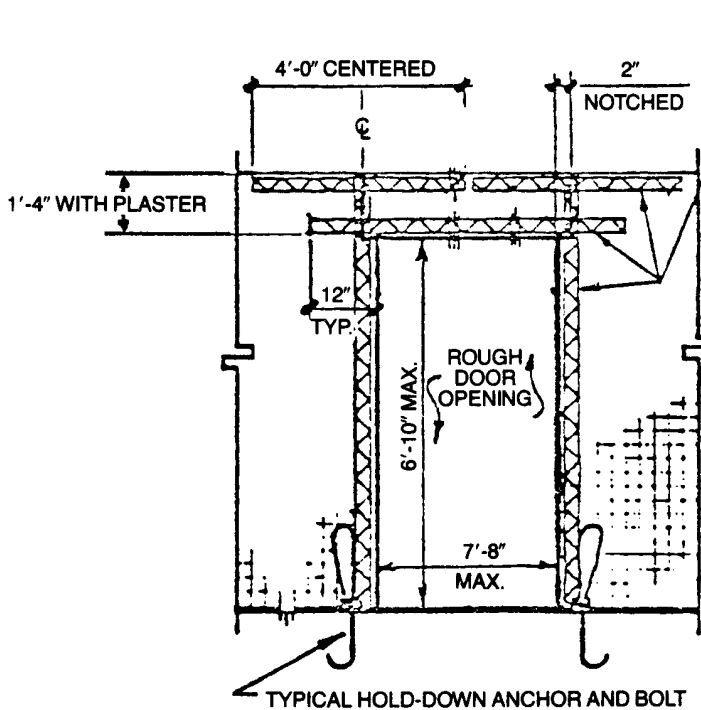
FIGURE 8



**HOLD-DOWN ANCHOR**  
FIGURE 9



**TYPICAL EAVE DETAIL**  
FIGURE 10



**TYPICAL DOOR OPENING REINFORCEMENT**  
FIGURE 11

TYPICAL TRUSS STRIP REINFORCEMENT WITH HARTCO CLIPS INTO THERML-IMPAC PANEL

**NOTES:**

1. THIS REINFORCEMENT DIAGRAM APPLIES BOTH TO COMMON ENTRY DOORS AND SLIDING GLASS DOORS.
2. SPECIFIED TRUSS STRIP END LAPS ARE MINIMUM EXCEPT WHERE CONFINED BY WALL JUNCTURES.
3. ALL TRUSS STRIP REINFORCEMENTS OCCUR AT BOTH SIDES THERML-IMPAC PANEL.
4. WHERE TRUSS STRIP SPLICES ARE REQUIRED A 1'-0" MINIMUM LAP SHALL BE OBSERVED.
5. LAP AN 8-INCH-WIDE PIECE OF NO. 14 GA. 2 x 2 WIRE MESH AT TOP CORNER EACH SIDE OF OPENING. BOTH FACES OF PANEL FASTEN WITH 4 CLIPS EACH SIDE OF LAP.