



# ICBO Evaluation Service, Inc.

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## EVALUATION REPORT

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PFC-3602

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Filing Category: ROOF, WALL AND FLOOR PANELS—Concrete and Masonry (216)

### PRECAST WAFFLE-CRETE® WALL, FLOOR AND ROOF BUILDING PANELS

WAFFLE-CRETE INTERNATIONAL, INC.  
POST OFFICE BOX 1008  
HAYS, KANSAS 67601

#### 1.0 SUBJECT

Precast Waffle-Crete® Wall, Floor and Roof Building Panels.

#### 2.0 DESCRIPTION

##### 2.1 General:

The Waffle-Crete Panels are precast reinforced normal-weight concrete elements which consist of an 8-inch-deep (203 mm) joist in both directions and a minimum 2-inch-thick (51 mm) slab. All 2-inch (51 mm) slabs are reinforced with minimum 6 by 6 W2.9 x W2.9 welded wire mesh fabric conforming to ASTM A 185. Minimum reinforcing for thicker slabs must be provided. All reinforcing bars conform to ASTM A 615 Grade 40 or 60. The concrete has a minimum 28-day compressive strength of 4000 psi (27.6 kPa). For additional details, see Figure 1. All products are designed and constructed to conform to UBC and IBC Chapter 19 or IRC Section R612, as applicable.

##### 2.2 Design:

Panels are designed and constructed in accordance with UBC and IBC Chapter 19 or IRC Section R612, as applicable. In addition, connections develop values as follows, based on actual service loads:

**2.2.1 Wood Ledger to Wall Panel:** The 3/4-inch-diameter (19.1 mm), 6-inch-long (152 mm) ferrule bolt insert cast in center of panel rib develops 1,400 pounds (6.23 kN) in shear when load is perpendicular to the rib as in diaphragm shear. See Figure 5.

**2.2.2 Panel Base to Foundation:** Panels are anchored to concrete foundations with 3/4-inch-diameter (19.1 mm) post-installed anchors. See Figure 4. Anchors are installed in accordance with the appropriate evaluation report. Allowable shear per anchor is 3,050 pounds (13.57 kN) for in-plane shear and 2,700 pounds (12.02 kN) for out-of-plane shear, but shall not exceed allowable anchor shear recognized in the anchor's evaluation report, considering foundation concrete strength and proximity of anchor to concrete edge.

**2.2.3 Anchor Pull-out:** The 3/4-inch-diameter (19.1 mm) by 6-inch-long (152 mm) ferrule bolt insert cast in center of panel rib develops 1,100 pounds (4.89 kN) in pull-out. See Figure 5.

**2.2.4 Panel Edge Connection:** The 3/4-inch-diameter (19.1 mm), ASTM A 307 machine bolt with beveled washers at both ends is used to connect panel edges together. Bolts

develop 4,400 pounds (19.58 kN) in shear and 3,700 pounds (16.47 kN) in tension. See Figure 2.

**2.2.5 Headed Studs:** In areas enforcing the *Uniform Building Code*™ (UBC), the capacity of headed studs, cast in the concrete panels, must be determined in accordance with Section 1923.1 of the UBC. In areas enforcing the *International Building Code*® (IBC) or the *International Residential Code*® (IRC), the capacity of headed studs, cast in the concrete panels, for loads other than earthquake loads, must be determined in accordance with IBC Section 1912. See Figure 3.

The following conditions apply to "Waffle-Crete" panels and connections:

1. Connector spacing shall not exceed 48 inches (1219 mm) on center. Connection of panels to foundations may alternate 72 inches (1829 mm) on center and 24 inches (610 mm) on center averaging 48 inches (1219 mm) on center to achieve equal distribution of base shear perpendicular to wall.
2. Allowable load for connectors subject to both shear and tension forces shall be determined by the following:

$$\frac{P_s}{P_t} + \frac{V_s}{V_t} \leq 1$$

where:

$P_s$  = Applied service tension load.

$P_t$  = Service tension load.

$V_s$  = Applied service shear load.

$V_t$  = Service shear load.

3. A one-third increase in allowable load for connectors is permitted for wind or seismic loading, unless prohibited by the code or an appropriate evaluation report.
4. When more than one wall panel constitutes a shear pier, the individual panels must be sufficiently connected to act as a single-unit shear pier.
5. Panel to foundation anchors are limited to shear resistance. Uplift or overturning resistance requires special supplementary connections determined by the designer and approved by the building official.
6. In computing gross-section properties of a wall panel, effect of ribs may be considered by calculating an equivalent thickness for the panel.

Plans and calculations for each project must be submitted to the local jurisdiction for approval.

#### 2.3 Identification:

The product bears a label with the name WCI, the panel number, and the job initial. There is also the label of the quality

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control agency, Bucher, Willis & Ratliff, which includes the evaluation report number (PFC-3602).

### 3.0 EVIDENCE SUBMITTED

Calculations, descriptive literature and quality control manual have been submitted.

### 4.0 FINDINGS

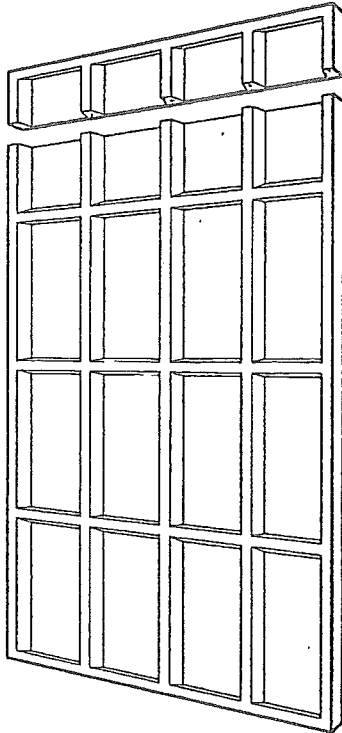
That the Precast Waffle-Crete® Wall, Floor and Roof Building Panels described in this report comply with the 1997 *Uniform Building Code*™, the 2000 *International Building Code*® and the 2000 *International Residential Code*®, subject to the following conditions:

- 4.1 Plans and calculations for each project must be submitted to the building official.
- 4.2 The design must comply with Section 2.2 of this report.
- 4.3 Design loads shall not exceed the allowable loads set forth in this report unless alternate engineering calculations are submitted for approval to the local jurisdiction.
- 4.4 Panels are produced at 2500 East 9th Street, Hays, Kansas, with quality control inspections by Bucher, Willis & Ratliff (AA-586).

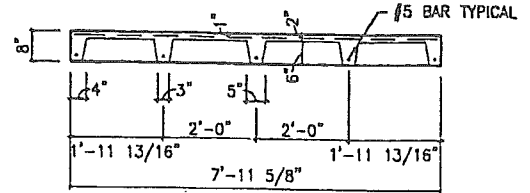
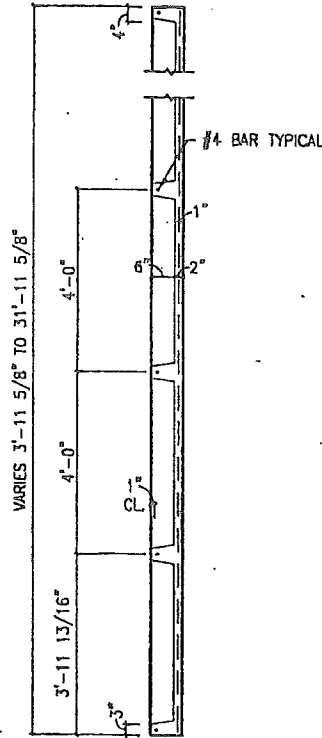
This report is subject to re-examination in one year.

# WAFFLE-CRETE Panel Details

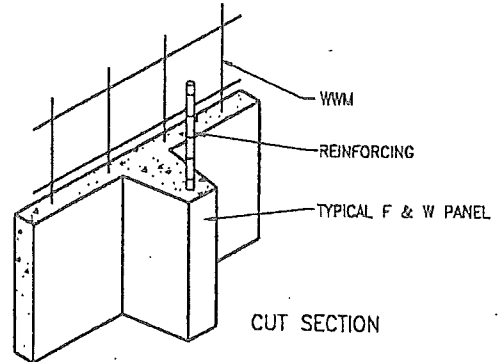
## TYPICAL F PANEL



F PANEL



HORIZONTAL SECTION

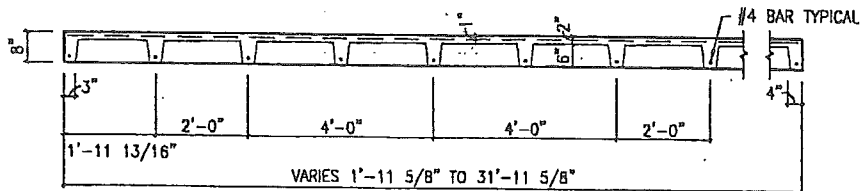


CUT SECTION

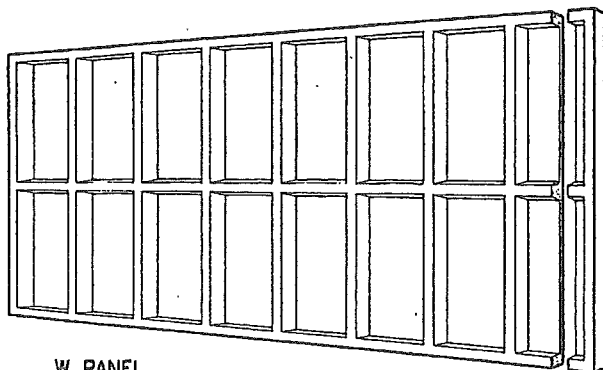
### MINIMUM REINFORCING ALL PANELS

- 1 - #5 BAR AT EACH LONGITUDINAL RIB
- 1 - #4 BAR AT EACH TRANSVERSE RIB
- 6x6 - W2.9xW2.9 WWM AT SKIN

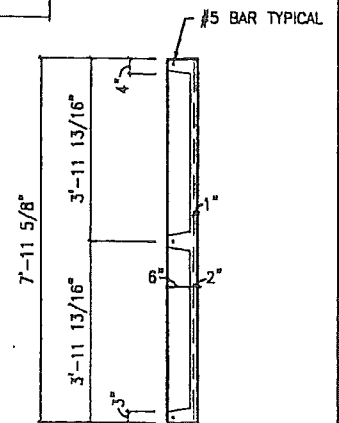
## TYPICAL W PANEL



HORIZONTAL SECTION



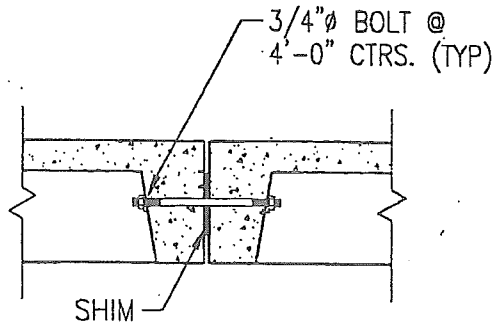
W PANEL



VERTICAL SECTION

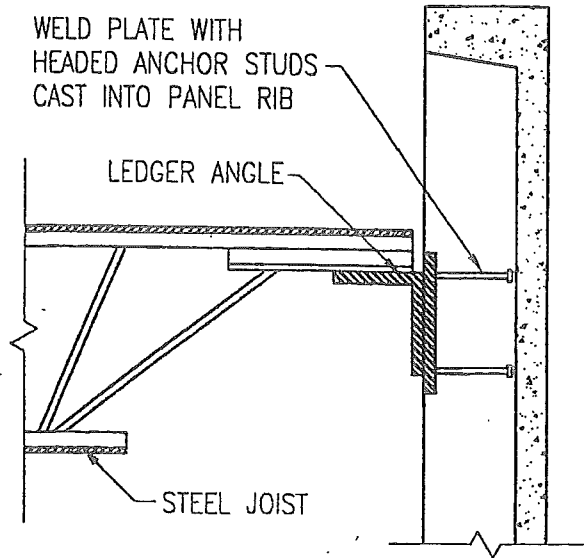
FIGURE 1

# WAFFLE-CRETE Panel Details



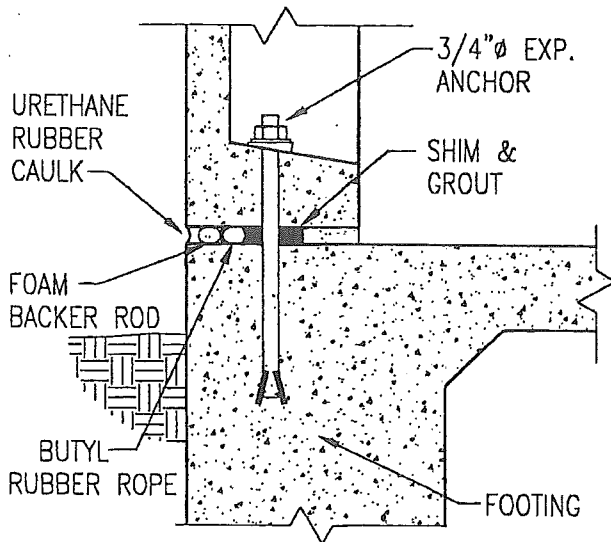
PANEL TO PANEL CONNECTION

FIGURE 2



LEDGER ANGLE JOIST CONSTRUCTION

FIGURE 3



MONOLITHIC FOUNDATION/FLOOR

FIGURE 4

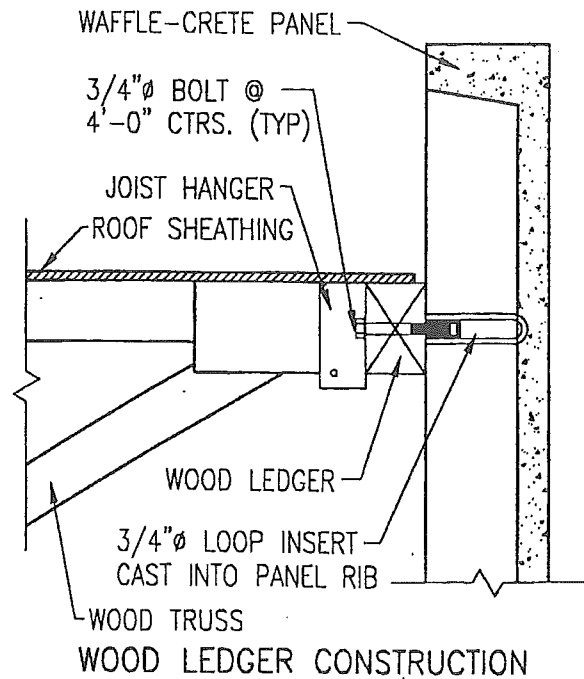


FIGURE 5