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RESEARCH REPORT: RR 25446
(CSI # 03100)

BASED UPON ICC ES EVALUATION
LEGACY REPORT NO. ER-5498

REEVALUATION DUE DATE:
April 1, 2006

GENERAL APPROVAL - Reevaluation/Clerical Modification - ECO-Block Insulated Concrete Forms (ICF) Concrete Walls.

DETAILS

The above products are approved under the description, identification and findings in Legacy Report No. ER-5498, dated August 1, 2003, of the ICC Evaluation Service, Incorporated. The report, in its entirety, is attached and made part of this general approval.

The approval is subject to the following conditions:

1. Complete design and calculation shall be prepared by an engineer licensed in the State of California and approved by the structural plan check.
2. The form work shall be used in areas where combustible material are permitted by the codes.
3. The maximum allowable pour rate of the forms shall be 4 feet per hour.
4. Continuous inspection by Deputy Inspectors shall be provided for placement of reinforcing steel and concrete. Any exception shall be approved by structural plan check supervisors.

RR 25446
Page 1 of 2

ECO-Block, LLC

RE: ECO Block Insulated Concrete Forms (ICF) Concrete Walls

DISCUSSION

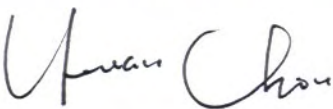
Clerical Modification is to change petitioner's address and phone number.

The approval is based on tests and analyses.

This general approval will remain effective provided the Evaluation Report is maintained valid and unrevised with the issuing organization. Any revisions to the report must be submitted to this Department, with appropriate fee, for review in order to continue the approval of the revised report.

This general approval of an equivalent alternate to the Code is only valid where an engineer and/or inspector of this Department has determined that all conditions of this Approval have been met in the project in which it is to be used.

Addressee to whom this Research Report is issued is responsible for providing copies of it, complete with any attachments indicated, to architects, engineers and builders using items approved herein in design or construction which must be approved by Department of Building and Safety Engineers and Inspectors.


YEUAN CHOU, Chief
Engineering Research Section

VC:clm
RR25446/wp8.0
R04/08/04
2C/1910.10/1914.4/1921.6

Attachments: ICC ES Evaluation Legacy Report No.ER-5498 (5 Pages).



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Legacy report on the 1997 Uniform Building Code™, the 2000 International Building Code® and the 2000 International Residential Code®

DIVISION: 03—CONCRETE
Section: 03130—Permanent Forms

ECO-BLOCK INSULATED CONCRETE FORMS (ICFs)

ECO-BLOCK, LLC
4100 POWERLINE ROAD
BUILDING I, SUITES 1 AND 2
POMPANO BEACH, FLORIDA 33373

LIFE-LIKE PRODUCTS, INC.
1000 WEST HIGHWAY 287
WAXAHACHIE, TEXAS 75165

MARKO FOAM PRODUCTS, INC.
2990 W. DIRECTORS ROW
SALT LAKE CITY, UTAH 84104

CONTOUR PRODUCTS, INC.
4001 KAW STREET
KANSAS CITY, KANSAS 66102

PREMIER INDUSTRIES, INC.
7800 SOUTH 192ND STREET
KENT, WASHINGTON 98032

1.0 SUBJECT

ECO-Block Insulated Concrete Forms (ICFs) for Concrete Walls.

2.0 DESCRIPTION

2.1 General:

ECO-Block insulated concrete forms (ICFs) consist of expanded polystyrene (EPS) foam plastic panels, plastic webbing and plastic connectors that serve as formwork for concrete load-bearing and nonload-bearing walls, foundation stem walls and basement walls. These forms are defined as a flat ICF wall system, allowing for a solid concrete wall of uniform thickness (solid rectangular cross section). The ICFs are stacked in a running bond pattern to create formwork that remains in place after the concrete has cured, and that becomes the insulation for the walls. Walls made from the ICFs are limited to combustible construction and must be covered with an approved interior thermal barrier and exterior weather-resistive barrier and wall covering, as noted in this report. ECO-Block insulated concrete forms (ICFs) are an

alternative to forms described in Section 1906 of the 1997 Uniform Building Code™ (UBC) and the 2000 International Building Code® (IBC). ECO-Block ICFs comply with Section R611.3 of the 2000 International Residential Code® as flat insulating concrete form wall systems.

2.2 Material:

2.2.1 ECO-Block Forms: The EPS panels are 16 inches (406 mm) high, 48 inches (1219 mm) long and 2.5 inches (63.5 mm) thick. The panels are molded by injecting and expanding polystyrene beads, described in the approved quality control manual, into molds. The resulting expanded polystyrene foam plastic complies with ASTM C 578 Type II. The polystyrene has a flame-spread index of 25 or less and a smoke-developed index of 450 or less at a nominal 1.5 pcf (24 kg/m³) density. High-density plastic webs are placed 8 inches (203 mm) on center and recessed 1/4 inch (6.4 mm) from the panel surface. Plastic connectors, of one of three different lengths, connect the webs of two units to form 4-inch-, 6-inch or 8-inch-thick (102 mm, 152 mm or 203 mm) concrete walls. The webs and connectors are high-density polypropylene, a Class CC2 approved plastic, manufactured by Product Moulders, Ltd. The form units have a preformed interlocking mechanism on their top and bottom edges, to facilitate stacking. Figure 1 includes unit profiles.

2.2.2 ECO-Block Commercial Forms: ECO-Block Commercial Forms are similar to ECO-Block Forms, except panels measure 24 inches (610 mm) high, 48 inches (1219 mm) long, and 2 inches (51 mm) thick, and the EPS used has a higher nominal density, 1.7 pcf (27.2 kg/m³), than the density of ECO-Block forms.

2.2.3 Concrete: Concrete must be normal-weight concrete complying with Chapter 19 of the UBC or IBC, as applicable, with a 28-day minimum compressive strength of 2,000 pounds per square inch (13.8 MPa). Maximum aggregate size is 3/4 inch (19 mm). Under the IRC, concrete must comply with Section R611.6.1 of the IRC.

2.2.4 Reinforcement: Walls are reinforced with deformed steel bars complying with Section 1903.5 of the UBC, Section 9.5.3.1 of ACI 318-99 (IBC), or Section R611.6.2 of the IRC, as applicable.

2.2.5 Other: Wood members for plates or window and door framing shall be treated with an approved wood preservative and attached with corrosion-resistant steel fasteners in accordance with UBC Section 2304.3, IBC Section 2304.9.5 or IRC Section R223.3.

ICC-ES legacy reports are not to be construed as representing aesthetics or any other attributes not specifically addressed, nor are they to be construed as an endorsement of the subject of the report or a recommendation for its use. There is no warranty by ICC Evaluation Service, Inc., express or implied, as to any finding or other matter in this report, or as to any product covered by the report.



2.3 Design:

2.3.1 UBC or IBC Method: Concrete walls formed by the ECO-Block and ECO-Block commercial forms are designed and constructed in accordance with Chapters 16 and 19 of the UBC or IBC, as applicable. Footings and foundations are designed and constructed in accordance with Chapter 18 of the UBC or IBC, as applicable.

2.3.2 Alternative Design Method: For walls limited to a maximum of two stories plus a basement, and a maximum unsupported wall span of 10 feet (3048 mm), walls may be designed in accordance with Publication No. EB118, Prescriptive Method for Insulating Concrete Forms in Residential Construction, dated May 1998, published by the Portland Cement Association, subject to all applicability limits in Table 1.1 of that document.

2.3.3 IRC Method: Insulated concrete walls formed by ECO-Block and ECO-Block Commercial Forms comply with Figure F611.3 of the IRC as flat insulating concrete wall forms. Wall design, construction and materials shall comply with Section R404.4 or R611 of the IRC as applicable to flat insulating concrete form wall systems.

2.4 Installation:

The ICFs and resulting concrete walls shall be supported on concrete footings complying with Chapters 18 and 19 of the UBC or IBC or Chapter 4 of the IRC, as applicable. Two side panels are placed next to each other and the plastic webs are connected with connectors of the appropriate length, to form the required wall thickness. Placement of the form units begins at a corner and proceeds around the perimeter in one direction only. The amount of reinforcing, placement and spacing required shall be determined for each project, based on the approved plans and the applicable code. Vertical rebars embedded in the footing must extend the minimum development length necessary for compliance with Section 1912 of the UBC or Chapter 12 of ACI 318-99 (IBC and IRC). Additional reinforcement around doors and windows is required to be described in the approved drawings. Concrete quality, mixing and placement must comply with Section 1905 of the UBC, Chapter 5 of ACI 318-99 (IBC) and Section R611.6.1 of the IRC. Window and door openings are built into the form units, with wood or polyvinyl chloride plastic frames of the same dimensions as the "rough stud opening" specified by the window or door manufacturer, prior to the pouring of the concrete. Anchor bolts used to connect wood plates or ledgers to the concrete shall be cast in place, with the bolts sized and spaced as required by design.

Wood ledgers are attached to the concrete wall by removing the face shell of the form units, with the height of the removed portion being equal to the depth of the wood ledger. Wood plates are anchored to the top of the wall. Anchor bolts used to connect the wood ledgers or plates to the concrete are cast in place, with the bolts sized and spaced as required by design.

2.5 Interior Finish:

Form units exposed to the building interior shall be finished with minimum 1/2-inch-thick (12.7 mm) gypsum wallboard placed with the long side vertical. The wallboard is attached to plastic webs with minimum 1 1/2-inch-long (38 mm), No. 6, Type W, buglehead screws, spaced 12 inches (305 mm) on center to each web spaced 8 inches (206 mm) on center, penetrating through the web 1/4 inch (6.4 mm).

2.6 Exterior Finish:

2.6.1 Above Grade: The form units shall be covered on the exterior with an approved weather-resistive barrier as required by Section 1402 of the UBC, ~~water-resistive barrier as required by Section 1403 of the IBC, or weather-resistant~~

~~sheathing paper as required by Section R703 of the IRC.~~ This barrier or paper is installed in accordance with either the applicable code or a current evaluation report. The wall covering is attached to the plastic webs with No. 6, coarse-thread, gypsum wallboard steel screws. The screws must be corrosion-resistant and have sufficient length to penetrate through the 0.2-inch-thick (5 mm) portion of the webs at least 3/4 inch (19 mm), or, when loaded in withdrawal, to penetrate through the web at least 1 inch (25 mm). Fasteners have an allowable withdrawal capacity of 190 pounds (845 N) and an allowable lateral capacity of 42 pounds (187 N). The maximum screw spacing is 12 inches (305 mm) on center or as specified in the applicable code, evaluation report, or calculations, whichever is most restrictive. Negative wind pressure capacity of the exterior finish material is recognized in the applicable code, for generic materials, and in a current evaluation report for proprietary materials.

2.6.2 Below Grade: Materials used to damp-proof basement walls shall be specified by ECO-Block, LLC, and shall comply with the applicable code or an evaluation report, and shall be compatible with the foam plastic units. Applicable damp-proofing and waterproofing requirements are in Appendix Chapter 18 of the UBC, ~~Section 1806 of the IBC, and Section R406 of the IRC.~~ Compliance with drainage requirements in Section 1804.7 of the UBC, Section 1806.4 ~~of the IBC, or Section R406.1 of the IRC,~~ is necessary.

2.7 Crawl Space Installations:

ECO-Block Standard Forms with a solid concrete core are permitted to be used as walls of crawl spaces without a covering, subject to the following conditions:

1. Entry to the attic or crawl space is only to service utilities, and no heat-producing appliances are permitted.
2. There are no interconnected basement areas.
3. Air in the crawl space is not circulated to other parts of the building.
4. Underfloor ventilation complying with Section 2306.7 of the UBC, Section 1202.3 of the IBC, or Section R408.2 of the IRC is provided.

2.8 Fire-resistance-rated Construction:

ECO-Block Standard Forms can be used to construct fire-resistance-rated wall assemblies as follows:

CONCRETE THICKNESS (inches)	FIRE-RESISTANCE RATING (hours)
4	2
6	4
8	4

For SI: 1 inch = 25.4 mm, 1 plf = 14.6 N/m.

The normal-weight concrete shall have carbonate aggregate and a minimum 28-day compressive strength of 3,500 psi (24.1 MPa). The minimum reinforcement is No. 5 reinforcing bars centered in the concrete, and spaced 12 inches (305 mm) on center vertically and 16 inches (406 mm) horizontally. The axial compression load must be 7 percent (maximum) of the load determined in accordance with Chapter 19 of the UBC or IBC.

2.9 Special Inspection:

2.9.1 UBC: Special inspection is required as noted in Section 1701 of the UBC for placement of reinforcing steel and concrete, and for concrete cylinder testing. When approved by the building official, special inspection may be waived when all of the following conditions are met:

1. Walls are a maximum of 8 feet (2.4 m) high, and are limited to use in single-story construction of Group R, Division 3, or Group U, Division 1, Occupancies.

2. Maximum height of a concrete pour is 48 inches (1219 mm). Succeeding lifts must be placed in accordance with Section 1905.10.5 of the UBC.
3. Installation is by installers approved by ECO-Block, LLC.
4. Half the allowable stresses or loads permitted by the UBC are used for the design of the walls.
5. Installation instructions indicate methods used to verify proper placement of concrete.

~~2.9.2 IBC: Special inspection is required as noted in Section 1704 of the IBC for placement of reinforcing steel and concrete, and for concrete cylinder testing. When approved by the building official, special inspection may be waived for construction of Group R, Division 3, or Group U Occupancies. Quality assurance plans for seismic resistance and wind requirements shall be prepared in accordance with Sections 1705 and 1706 of the IBC, respectively, when required.~~

~~2.9.3 IRC: For walls designed in accordance with Section 2.3.3, special inspection is not required. For walls designed in accordance with the IBC, as permitted by Sections R104.11 and R301.1.2 of the IRC, special inspection in accordance with Section 2.9.2 of this report is required.~~

2.10 Identification:

Each bundle of forms is labeled with the product name (ECO-Block Standard or ECO-Block Commercial); the ECO-Block, LLC, name, address and telephone number; the evaluation report number (ER-5498), the manufacturing date; the lot number; the manufacturing location; and the name of the quality control agency (Intertek Testing Services NA, Inc.).

3.0 EVIDENCE SUBMITTED

Data in accordance with the ICC-ES Interim Criteria for Foam Plastic Insulation (AC12), dated July 2002, and the ICC-ES

Interim Criteria for Concrete and Concrete Masonry Wall Systems (AC15), dated June 2003; reports of room fire tests in accordance with UBC Standard 26-3; and a quality control manual.

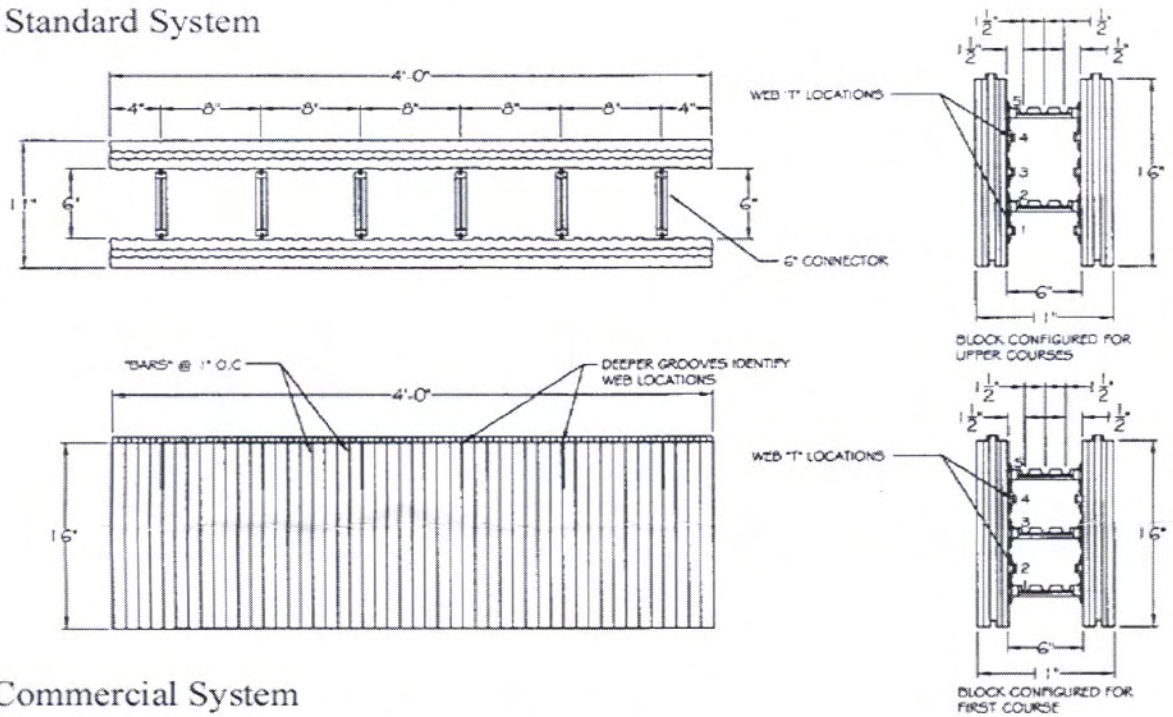
4.0 FINDINGS

That the ECO-Block Insulated Concrete Forms (ICFs) for Concrete Walls 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 Form units are manufactured, identified and installed in accordance with this report and ECO-Block's published installation instructions.
- 4.2 Concrete walls formed by the units are limited to combustible construction as defined in Chapter 6 of the UBC ~~or IRC~~, as applicable.
- 4.3 Plans and calculations showing compliance with this report are submitted to the building official for each structure.
- 4.4 Form units are separated from the building interior with minimum 1/2-inch-thick (12.7 mm) regular gypsum wallboard, installed as noted in Section 2.4 of this report.
- 4.5 Special inspection is provided in accordance with Section 2.9 of this report.
- 4.6 Form units are manufactured by the additional listees noted in this report, with quality control inspections conducted by Intertek Testing Services NA, Inc. (AA-647-2).

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

Standard System



Commercial System

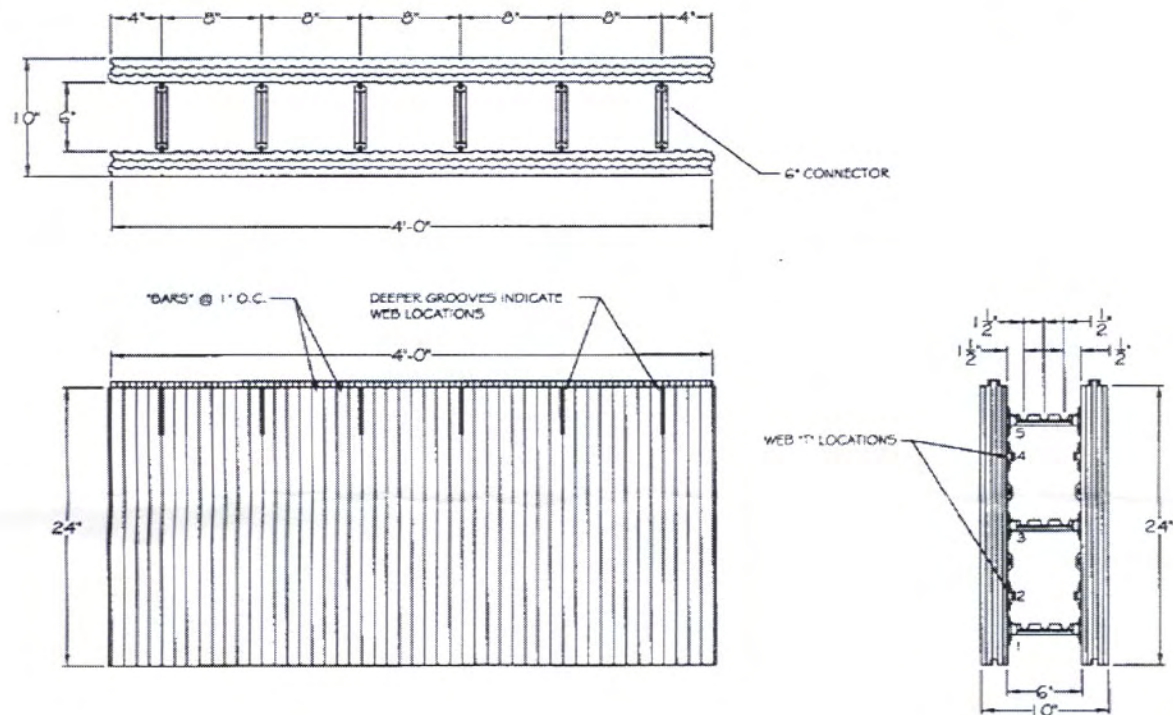


FIGURE 1

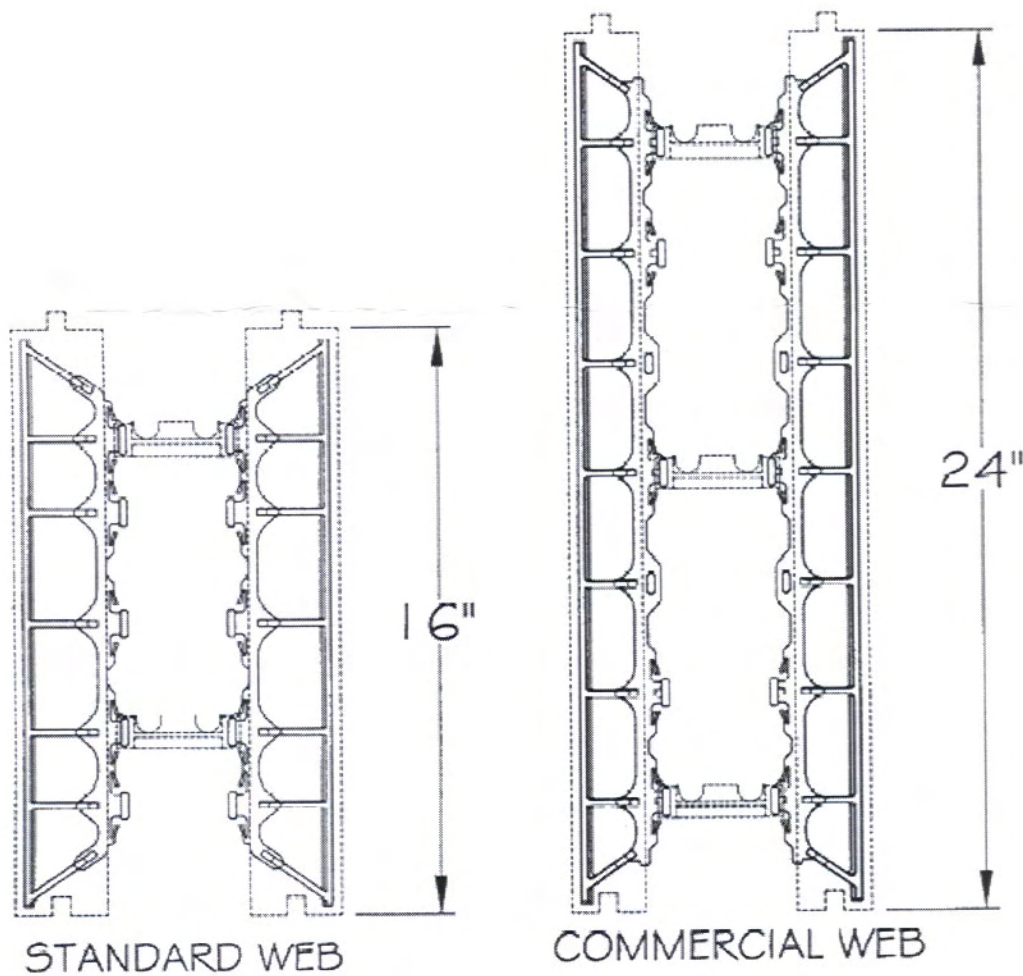


FIGURE 1—(Continued)