Product Information Bulletin

ICC-ES Evaluation Report ESR-1578

ICC Evaluation Service, Inc. (ICC-ES) is a national evaluation body in the United States that does technical evaluations of building products, components, methods, and materials for compliance with code.

The use of insulating concrete form (ICF) systems for constructing residential walls was first recognized in the International Residential Code (IRC) 2006. Requirements have since updated in the IRC 2009. However, ICF construction is not specifically recognized in the International Building Code.

For this reason, an ICC-ES evaluation report provides a convenient means of demonstrating compliance with the intent of both the IRC and the IBC. Evaluation reports issued as a result of the ICC-ES evaluation process are made available to code officials, contractors, specifiers, architects, engineers, and anyone else with an interest in the building industry and construction.

Attached is a copy of ICC-ES Evaluation Report ESR-1578 for the Advantage ICF System updated as of March 2012. ESR-1578 provides evidence that the Advantage ICF System is a suitable alternative to methods of construction described in the codes noted below, subject to the conditions detailed in section 5.0 of the evaluation report.

- 2006 International Building Code®
- 2006 International Residential Code®
- 2009 International Building Code®
- 2009 International Residential Code®

Refer to the attached report for additional detail.
DIVISION: 03 00 00—CONCRETE
Section: 03 11 19—Insulating Concrete Forming

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EVALUATION SUBJECT:
ADVANTAGE INSULATING CONCRETE FORMING (ICF)
SYSTEM—STAY-IN-PLACE EPS FORMWORK FOR
CONCRETE CONSTRUCTION

1.0 EVALUATION SCOPE
Compliance with the following codes:
- 2009 International Building Code® (IBC)
- 2009 International Residential Code® (IRC)
- 2006 International Residential Code® (2006 IRC)*
*For the codes indicated with an asterisk, differing provisions are addressed in Section 8.0.

Properties evaluated:
- Structural
- Surface-burning characteristics
- Attic and crawl-space installation

2.0 USES
The Advantage Insulating Concrete Forming System is used as stay-in-place formwork for structural concrete load-bearing and non-load-bearing exterior and interior walls; beams and lintels; and foundation and retaining walls. The forms are limited to buildings of combustible construction. The forms remain in place after placement and curing of concrete and must be protected by an approved interior and exterior finish material as described in Sections 4.2.2 and 4.2.3, respectively, of this report. The forms are limited to use in buildings of combustible Type V-B construction under the IBC and dwellings under the IRC.

3.0 DESCRIPTION
3.1 General:
The Advantage ICF System is a flat ICF system in accordance with IRC Section R611.3.1, allowing for a solid reinforced concrete wall core of uniform thickness. Advantage ICF System blocks consist of two expanded polystyrene (EPS) foam plastic boards separated by polypropylene cross-ties molded into the EPS boards. The EPS boards are 2 7/8 inches (66.7 mm) thick. See Figure 1 for an illustration of the forms.

3.2 Materials:
3.2.1 Foam Plastic: The Advantage ICF System EPS foam plastic boards have a nominal density of 1.4pcf (22.4 kg/m^3), and a maximum flame-spread index of 25 and a maximum smoke-developed index of 450 when tested in accordance with ASTM E84. The foam plastic complies as a Type II rigid cellular polystyrene in accordance with ASTM C578.

3.2.2 Concrete: The concrete must be normal-weight concrete, complying with the IBC, with a maximum 3/4-inch (19 mm) aggregate size. Concrete must have a minimum compressive strength of 2500 psi (17.24 MPa) at 28 days. If construction of the ICF wall system is based on the IRC, the concrete must comply with Sections R404.1 and R611.5.1.

3.2.3 Cross-ties: The polypropylene cross-ties, spaced 8 inches (203 mm) on center for 6-inch-thick-concrete-core (152 mm) walls, and at 6 inches (152 mm) on center for 8-inch-thick-concrete-core (203 mm) walls, have openings to permit concrete to pass through, and have slots to support horizontal steel reinforcing bars. The cross-ties have flanges (fastening strips) located 1/4 inch (6.4 mm) below the EPS surface that are used for attaching interior and exterior wall coverings. The flanges are 1 1/8 inches wide (41.2 mm) by 3/16 inch (4.8 mm) thick. Refer to Table 1 for the maximum allowable lateral and withdrawal capacities of the fasteners in cross-tie flanges.

3.2.4 Reinforcement: Deformed steel reinforcement bars must have a minimum yield stress of either 40 ksi (275 kPa) or 60 ksi (413 MPa), depending on the structural design, and must comply with Section 1903 of the IBC and Section 3.5.3.1 of ACI318. If construction of the Advantage ICF System is based on the IRC, reinforcement must comply with Sections R404.1.2.3.7 and R611.5.2 of the IRC.

3.2.5 Other Components: Wood members in contact with concrete for plates or windows and door framing, must be preservative-treated in accordance with the applicable code, and must be attached with hot-dipped galvanized steel fasteners complying with IBC Section 2304.9.5 or IRC Section R317.3, as applicable. Materials other than wood, such as vinyl, are permitted for window and door framing if approved by the code official.
3.2.6 Standard and Accessory Forms: Four Advantage ICF System blocks are recognized for each recognized concrete wall core thickness: the standard block, half (top/bottom) block, 90-degree corner block, and 45-degree corner block. The standard block is 48 inches (1219 mm) long, 16\(\frac{1}{2}\) inches (419 mm) high, and 11\(\frac{1}{4}\) inches (286 mm) wide for 6-inch-core (152 mm) walls, and 48 inches (1219 mm) long, 16\(\frac{1}{2}\) inches (419 mm) high and 13\(\frac{3}{4}\) inches (337 mm) wide for 8-inch-core (203 mm) walls. Refer to Figure 1 for details.

4.0 DESIGN AND INSTALLATION

4.1 DESIGN:

4.1.1 IRC Method: Concrete walls formed by Advantage ICFs must be designed and constructed in accordance with IRC Chapters 16 and 19. Footings and foundations must be designed and constructed in accordance with IRC Chapter 18.

Concrete walls formed by the ICFs may be designed and constructed in accordance with the prescriptive provisions of Section 209 of the ICC Standard for Residential Construction in High Wind Regions (ICC 600-2008), subject to the limits found in Section 1609.1.1.1 in accordance with Exception 1 to 1609.1.1. Design and construction under the provisions of ICC 600-2008 are limited to resistance to wind forces.

4.1.2 IRC Method: Concrete walls formed by Advantage ICFs, which comply with the dimensional requirements found in IRC Table R611.3, and Figure R611.3(1), must be designed and constructed in accordance with IRC Sections R404.1.2 and R611. Footings and foundations must be designed and constructed in accordance with IRC Chapter 4.

4.1.3 Alternate IRC Method: When the ICFs are used to construct buildings that do not conform to the applicability limits of IRC Sections R404.1.2 and R611.2, construction must be in accordance with the prescriptive provisions of the 2007 Prescriptive Design of Exterior Concrete Walls (PC-100), or structural analysis and design of the concrete must be in accordance with ACI 318 and IRC Chapters 16, 18, and 19.

4.2 Installation:

4.2.1 General: The Advantage ICF wall system must be installed in accordance with the applicable code, the manufacturer's published installation instructions and this report. The manufacturer's instructions and this report must be strictly adhered to and a copy of these instructions must be available on the jobsite at all times during installation.

The Advantage ICF System must be supported on concrete footings complying with Chapters 18 and 19 of the IRC or Chapter 4 of the IRC, as applicable. Vertical reinforcement bars, embedded in the footing, must extend into the base of the wall system the minimum development length necessary for compliance with Chapter 12 of ACI 318 (IBC) or IRC Section R611.5.4, as applicable. Additional reinforcement around doors and windows must be in accordance with the approved plans. Concrete quality, mixing, and placement must comply with Section 1905 or IRC Sections R404.1.2.3 and R611.5.1, as applicable. Window and door openings must be built into the forms, with wood or plastic frames of the same dimensions as the "rough stud opening" specified by the window or door manufacturer, prior to the placement of concrete. Connections of concrete walls to footings, floors, ceilings, and roofs must be in accordance with IRC Section R611.9 or be engineered in accordance with the IBC, whichever code is applicable. Wood ledgers must be installed with the ledger in contact with the concrete by removing the face shell of the forms, with the height of the removed portion being equal to the depth of the wood ledger. Wood plates must be anchored to the top of the wall. Anchor bolts used to connect the wood ledgers and plates to the concrete must be cast in place, with the bolts sized and spaced as required by design and the applicable code. Details must be prepared to accommodate the specific job situation, in accordance with the applicable code and the requirements of this report, subject to the approval of the code official.

Advantage ICF System units must be stacked in a running bond pattern, such that the polypropylene cross-ties align vertically, enabling the modified tongue-and-groove joints on the top and bottom surfaces of the Advantage blocks to be connected together. Vertical and horizontal reinforcement bars must be placed as required by the design, the approved plans and the applicable code. All horizontal and vertical reinforcement bars must have minimum concrete cover in accordance with the IBC. Concrete quality, mixing, placing and curing must comply with Chapter 19 of the IBC or IRC Section R611.5, as applicable.

4.2.2 Interior Finish:

4.2.2.1 General: The installation details of this section (Section 4.2.2) address compliance with the thermal barrier and interior finish requirements of the codes. Advantage ICF system blocks must be finished on the interior with an approved 15-minute thermal barrier, such as minimum 1\(\frac{1}{2}\)-inch-thick (12.7 mm) regular gypsum wallboard complying with ASTM C36 or C1396. The gypsum wallboard must be installed either vertically or horizontally, and must be attached to the polypropylene cross-tie flanges with minimum 0.136-inch-diameter-by-\(\frac{3}{4}\)-inch-long (3.5 mm by 41.3 mm). Type S, fine-thread gypsum wallboard screws spaced 12 inches (305 mm) on center vertically and a maximum of 16 inches (406 mm) on center horizontally in the field. Gypsum wallboard joints and screw heads must be taped and filled with joint compound in accordance with ASTM C840 or GA 216. See Section 4.2.2.2 for installation details for attic and crawl space applications without an ignition barrier on the interior face.

4.2.2.2 Attic and Crawl Space Installations: When the ICFs are used on walls of attics and crawl spaces without an ignition barrier applied to the crawl space side of the foam plastic, all the following conditions must be met:

- Entry to the attic and crawl space is only to service utilities, and no storage is permitted.
- There are no interconnecting attic or crawl space areas.
- Air in the attic or crawl space is not circulated to other parts of the building.
- Attic ventilation is provided in accordance with IBC Section 1203.2 and IRC Section R806, as applicable; crawl space ventilation is provided in accordance with IBC Section 1203.3 and IRC Section R408.1, as applicable.
- Combustion air is provided in accordance with IMC (International Mechanical Code\textsuperscript{®}) Section 701.

4.2.3 Exterior Finish:

4.2.3.1 Above Grade: The Advantage ICF wall system must be covered on the exterior with an approved wall covering in accordance with the applicable code or a current ICC-ES evaluation report. When regulated by the IRC, the walls must be flashed in accordance with IRC Section R703.8.
The wall covering must be attached to the flanges of the polyp丙ylene cross-ties with either No. 6, Type W, coarse-thread drywall screws or No. 8, Type W, coarse-thread drywall screws. The screws must be corrosion-resistant and have sufficient length to protrude through the flanges a minimum of \( \frac{1}{4} \) inch (6.4 mm). Refer to Table 1 for the maximum allowable lateral and withdrawal capacities of the fasteners in cross-tie flanges. The maximum spacing of the screws must be designed to support the gravity loads of the wall covering and to resist the negative wind pressures. Negative wind pressure capacity of the exterior finish material must be the same as that recognized in the applicable code for generic materials or in a current ICC-ES evaluation report for proprietary materials.

4.2.3.2 Below Grade: Wall surfaces must be dampproofed and, when required by the code official, waterproofed in accordance with Section 1805 of the IBC or Section R406 of the IRC, as applicable. Dampproofing and waterproofing materials must be approved by Plasti-Fab Ltd., and the code official, and must be free of solvents that will adversely affect the EPS foam panels. Foundation drainage must be provided in accordance with IBC Section 1805.4 or IRC Section R405.1, as applicable. No backfill may be applied against the wall until the complete floor is in place, unless the wall is designed as a freestanding wall that does not rely on the floor system for structural support.

4.2.4 Foundation Walls: The Advantage ICF System may be used as a foundation stem wall when supporting wood-framed construction and when the structure is supported on concrete footings complying with the applicable code. Design and installation of the Advantage ICF System as foundation walls must comply with IBC Section 1807.1.5 and IRC Section R404.1.2, as applicable. For concrete foundation walls in accordance with the IRC, vertical reinforcement size and spacing must be in accordance with IRC Tables R404.1.2(2), R404.1.2(3), and R404.1.2(8). For concrete foundation walls in accordance with the IBC, vertical reinforcement size and spacing must be in accordance with IBC Table 1807.1.6.2. Alternative design and construction may be in accordance with ACI 318, ACI 332, or PCA 100 (see IRC Section R404.1.2) for buildings under the IBC.

4.2.5 Retaining Walls: The wall system may be used as a retaining wall when reinforcement is designed in accordance with accepted engineering principles, the applicable code, and Section 4.1 of this report.

4.2.6 Protection Against Termites: Where the probability of termite infestation is defined as "very heavy" by the code official, the foam plastic must be installed in accordance with IBC Section 2603.8 or IRC Section R318.4 as applicable. Areas of very heavy termite infestation must be determined in accordance with IBC Figure 2603.8 or IRC Figure R301.2(6) as applicable.

4.3 Special Inspection:

4.3.1 IBC: Special inspection is required in accordance with IBC Section 1704 for placement of reinforcing steel and concrete, and for concrete cylinder testing. Special inspection in accordance with IBC Sections 1704.1 and 1704.14 is required when an EIFS wall covering is applied. Duties of the special inspector include verifying field preparation of materials, expiration dates, installation of components, curing of components, treatment of joints, and application of sealants.

4.3.2 IRC: For walls constructed in accordance with the prescriptive provisions of the IRC or PCA 100, as described in Section 4.1.2 or Section 4.1.3, respectively, special inspection is not required. For walls designed in accordance with the IBC, as described in Section 4.1.3 of this report and permitted by IRC Sections R104.11 and R301.1.1, special inspection in accordance with Section 4.3.1 of this report is required.

5.0 CONDITIONS OF USE

The Advantage Insulating Concrete Forming (ICF) System described in this report complies with, or is a suitable alternative to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

5.1 The ICF units must be manufactured, identified and installed in accordance with this report and the manufacturer's installation instructions. If there is a conflict between the manufacturer's instructions and this report, this report must govern.

5.2 Walls constructed with the Advantage ICF System must be limited to Type VR construction under the IBC and dwellings under the IRC.

5.3 When required by the code official, calculations showing compliance with the general design requirements of Chapter 16 of the IBC must be submitted to the code official for approval, except calculations are not required when the building design is based on the prescriptive provisions of Section 4.1.2 or Section 4.1.3 of this evaluation report, or when foundation design is based on the prescriptive provisions in Section 4.2.4 of this report. The calculations and details must be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.

5.4 The foam plastic insulation must be separated from the building interior with an approved 15-minute thermal barrier, as described in Section 4.2.2.1 of this report, except as described in Section 4.2.2.2 for attic and crawl space construction.

5.5 Special inspection must be provided in accordance with Section 4.3 of this report.

5.6 Concrete quality, mixing and placement must comply with IBC Section 1905 or IRC Section R611.5.1, as applicable.

5.7 As described in Section 4.2.6 of this report, protection from termites must be provided as required by IBC Section 2603.8 or IRC Section R318.4, as applicable.

5.8 When required by the code official, calculations and details showing compliance with the provisions found in IRC Sections R404.1.2.3.6 and R611.5.3 must be submitted to the code official for approval. The calculations and details, establishing that the ICFs provide sufficient strength to contain concrete during placement and that the cross-ties are capable of resisting the forces created by fluid pressure of fresh concrete, shall be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.

5.9 Advantage ICF system forms are manufactured by Plasti-Fab Ltd., at their facilities located in Crossfield, Alberta, Canada, or Kitchener, Ontario, Canada; and are produced under a quality control program with inspections conducted by Intertek Testing Services NA Ltd. (AA-691).

6.0 EVIDENCE SUBMITTED

Data in accordance with the ICC-ES Acceptance Criteria for Stay-in-place, Foam Plastic Insulating Concrete Form (ICF) Systems for Solid Concrete Walls (AC353), dated October 2010.
7.0 IDENTIFICATION

Each package of forms must bear a label that includes the name or trademark and the address of the report holder (Plasti-Fab Ltd.); the product name; the production location; the product serial number; the evaluation report number (ESR-1578); and the name of the inspection agency (Intertek Testing Services NA Ltd.).

When use is in an attic or crawl space without an ignition barrier, as described in Section 4.2.2.2, one label bearing the evaluation report number and the phrase "Acceptable for use in attics and crawl spaces" must be visible in every 160 square feet (14.7 m²) of exposed interior wall area.

8.0 OTHER CODES

8.1 Evaluation Scope:

The products described in this report were also evaluated for compliance with the requirements of the following codes:
- 2006 International Residential Code® (2006 IRC)

The products comply with the above-noted codes as follows:

8.2 Uses:

See Section 2.0.

8.3 Description:

See Section 3.0 except: Under the 2006 IRC, concrete must comply with Sections R404.4.5 and R611.6.1, reinforcement must comply with Sections R404.4.6 and R611.6.2, and fasteners used with preservative-treated wood must comply with Section R319.3, of the 2006 IRC. The ICFs are classified as flat ICFs in accordance with IRC Section R911.3.

8.4 Design and Installation:

8.4.1 Design:

8.4.1.1 IBC Design: Concrete walls formed by the Advantage Insulating Concrete Forming System must be designed and constructed in accordance with 2006 IBC Chapters 16 and 19, as applicable. Footings and foundations must be designed and constructed in accordance with 2006 IBC Chapter 18.

8.4.1.2 IRC Design: Concrete walls formed by the Advantage Insulating Concrete Forming System must be designed and constructed in accordance with 2006 IRC Sections R404.4 and R611 for flat ICF wall systems. Footings and foundations must be designed and constructed in accordance with 2006 IRC Chapter 4.

8.4.1.3 Alternate IRC Method: When the flat ICF forms are installed on buildings that do not conform to the applicability limits of Sections R404.4.1 and R611.2 of the IRC, the structural analysis and design of the concrete must be prepared in accordance with ACI 318, and Chapter 19 of the IBC as applicable.

8.4.2 Installation: See Section 4.2 except:

For attic and crawl-space installations, combustion air must be provided in accordance with 2006 IMC Section 7C1 and 703.

Under the 2006 IRC, concrete quality, mixing, placing and curing must comply with Section R611.6.

Below grade wall surfaces must be waterproofed, and, when required by the code official, waterproofed in accordance with Section 1807 of the 2006 IBC or Section R404.4.11 of the 2006 IRC, as applicable.

When regulation is by the 2006 IBC or 2006 IRC, design and installation of the Advantage ICF System as foundation walls must comply with Section 1805.5 of the 2006 IBC or Section R404.4 of the 2006 IRC, as applicable.

Under the 2006 IRC, where termite infestation is "very heavy," foam plastic must be installed in accordance with IRC Section R320.5.

Special inspection is required in accordance with Sections 1704.1 and 1704.12 when an EIFS wall covering is applied under the 2006 IBC.

8.5 Conditions Of Use:

See Section 5.0, except for the following revisions:

Concrete quality, mixing and placement must comply with Section R611.6.1 for buildings under the 2006 IRC.

Under the 2006 IRC, protection from termites must be provided as required by IRC Section R320.5.

8.6 Evidence Submitted:

Data in accordance with the ICC-ES Acceptance Criteria for Stay-in-place, Foam Plastic Insulating Concrete Form (ICF) Systems for Solid Concrete Walls (AC353), dated October 2007 (editorially revised April 2008).

8.7 Identification:

See Section 7.0.
TABLE 1—MAXIMUM ALLOWABLE CAPACITIES OF FASTENERS IN CROSS-TIE FLANGES

<table>
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<th>FASTENER</th>
<th>ALLOWABLE LOAD CAPACITY (lbf)</th>
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<tr>
<td></td>
<td>Withdrawal</td>
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<tr>
<td>6-inch &amp; 8-inch Concrete Cores #6 x 1 1/2 in. coarse thread drywall screws</td>
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<tr>
<td>6-inch &amp; 8-inch Concrete Cores #8 x 1 3/4 in. coarse thread drywall screws</td>
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<table>
<thead>
<tr>
<th>Advantage ICF Block Type</th>
<th>Advantage Block Dimensions</th>
<th>Concrete Wall thickness</th>
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<td>Standard Block</td>
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<td>&quot;6 1/2'&quot;</td>
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<td>48&quot;</td>
</tr>
<tr>
<td>&quot;6 1/2'&quot;</td>
<td>13 1/4&quot;</td>
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<td>45° Corner Block</td>
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<td>25 3/8&quot; x 9 1/2&quot;</td>
</tr>
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<td>13 1/4&quot;</td>
<td>21 1/4&quot; x 9 1/4&quot;</td>
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<td>90° Corner Block</td>
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Advantage ICF System Web Connector

FIGURE 1—ADVANTAGE ICF SYSTEM
FIGURE 2—TYPICAL WALL SECTION, ADVANTAGE ICF SYSTEM, FOUNDATION AND ABOVE GRADE
FIGURE 3—TYPICAL WALL SECTION, ADVANTAGE ICF SYSTEM, FOUNDATION AND WOOD STUD ABOVE GRADE