

ICC-ES Evaluation Report

ESR-1552*

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DIVISION: 03—CONCRETE
Section: 03130—Permanent Forms**REPORT HOLDER:****REWARD WALL SYSTEMS, INC.**
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www.rewardwalls.com
kdoerr@rewardwalls.com**EVALUATION SUBJECT:****REWARD WALL SYSTEMS® eForm™ AND iForm™
INSULATING CONCRETE FORMS****1.0 EVALUATION SCOPE****Compliance with the following codes:**

- 2009 *International Building Code*® (IBC)
- 2009 *International Residential Code*® (IRC)
- Other Codes (see Section 8.0)

Properties evaluated:

- Structural
- Surface-burning characteristics
- Attic and crawl space fire evaluation
- Fire resistance (iForm™ only)
- Noncombustible construction

2.0 USES

Reward Wall Systems® eForm™ and iForm™ insulating concrete forms are used as stay-in-place formwork for structural concrete, load-bearing and nonload-bearing, below-grade and above-grade walls. The forms are used in construction of plain and reinforced concrete beams, lintels, exterior and interior walls, and foundation and retaining walls. The forms remain in place after placement and curing of concrete and must be protected by approved interior and exterior finish material. The forms are recognized for use in buildings of noncombustible construction when installed in accordance with Section 4.2.8.

3.0 DESCRIPTION**3.1 General:**

The Reward Wall System® eForm™ and iForm™ forms are flat ICF (insulating concrete form) wall systems.

3.2 eForm™ ICFs:

eForm™ ICFs are 48 inches (1219 mm) long by 16 inches (406 mm) high and consist of two expanded polystyrene (EPS) foam plastic boards 1⁷/₈ inches (48 mm) thick, separated by injection-molded polypropylene polymer cross-ties. The cross-tie flanges are embedded into the EPS boards, maintaining the boards at a fixed distance apart and leaving ⁵/₈ inch (15.9 mm) between the flanges and the form outer surfaces. The forms are available in two standard widths, of 9¹/₄ and 11¹/₄ inches (235 and 286 mm), which provide for 5¹/₂-inch- and 7¹/₂-inch-wide (140 and 191 mm) concrete cores. The forms are stacked in a running bond pattern and the edges interlock with adjacent standard and accessory forms. The following standard and accessory eForms are available and are detailed in Figure 1:

- 9¹/₄-inch standard Straight eForm™
- 9¹/₄-inch 90-degree Corner eForm™
- 9¹/₄-inch 45-degree Corner eForm™
- 9¹/₄-inch Ledge eForm™
- 11¹/₄-inch standard Straight eForm™
- 11¹/₄-inch 90-degree Corner eForm™
- 11¹/₄-inch 45-degree Corner eForm™

3.3 iForm™ ICFs:

iForm™ ICFs are 48 inches (1219 mm) long by 16 inches (406 mm) high and consist of two EPS boards 2¹/₂ inches (64 mm) thick, separated by injection-molded polypropylene cross-ties. The cross-tie flanges are embedded into the EPS boards, maintaining the boards at a fixed distance apart and leaving ¹/₂ inch (12.7 mm) between the flanges and the form outer surfaces. The forms are available in five standard widths, of 9, 11, 13, 15 and 17 inches (229, 279, 330, 381, and 432 mm), which provide for 4-inch-, 6-inch-, 8-inch-, 10-inch- and 12-inch-wide (102, 152, 203, 254, and 305 mm) concrete cores. The forms are stacked in a running bond pattern and the edges interlock with adjacent standard and accessory forms. The following standard and accessory iForms are available and are detailed in Figure 2:

- 9-inch standard universal Straight iForm™
- 9-inch universal 25/13 90-degree Corner iForm™
- 9-inch universal 31/19 90-degree Corner iForm™
- 9-inch universal 45-degree Corner iForm™
- 11-inch standard universal Straight iForm™

***Revised March 2010**

- 11-inch universal 27/15 90-degree Corner iForm™
- 11-inch universal 33/21 90-degree Corner iForm™
- 11-inch universal 45-degree Corner iForm™
- 11-inch Ledge iForm™
- 11-inch Taper Top iForm™
- 11-inch T-Form iForm™
- 13-inch standard universal Straight iForm™
- 13-inch universal 29/17 90-degree Corner iForm™
- 13-inch universal 35/23 90-degree Corner iForm™
- 13-inch universal 45-degree Corner iForm™
- 13-inch Ledge iForm™
- 13-inch Taper Top iForm™
- 15-inch standard universal Straight iForm™
- 15-inch universal 31/19 90-degree Corner iForm™
- 17-inch standard universal Straight iForm™
- 17-inch universal 39/27 90-degree Corner iForm™

3.4 Materials:

3.4.1 Foam Plastic: The EPS foam plastic used for the eForm™ and iForm™ ICFs has a flame-spread index of 25 or less and a smoke-developed index of 450 or less when tested in accordance with ASTM E 84. The EPS for the eForm™ forms was tested at a thickness of 1⁷/₈ inches (48 mm) and the EPS for the iForm™ forms was tested at a thickness of 2¹/₂ inches (64 mm). The foam plastic used for the eForms and iForms has a nominal density of 1.5 pcf (24 kg/m³) and complies with ASTM C 578 as Type II.

3.4.2 Cross-ties: In addition to holding the EPS boards in place, the cross-ties support steel reinforcing bars, and the cross-tie flanges provide a point of attachment for interior and exterior wall finishes using the fasteners and allowable load capacities given in Table 2. The eForm™ and iForm™ cross-ties are spaced at 6 inches (152 mm) on center and line up vertically with cross-ties in adjacent forms. The cross-tie flanges for the eForms and the iForms are ⁷/₃₂ inch (5.55 mm) thick and 1¹/₄ inches (31.8 mm) wide. Fasteners must be long enough to pass through the wall finish and embed 1¹/₈ inches (28.6 mm) beyond the outer surface of the ICF foam. The web shapes are proprietary and are described in the manufacturer's approved quality documentation. The iForm™ and eForm™ cross-tie materials have a self-ignition temperature of 650°F (343°C) or greater when tested in accordance with ASTM D 1929, and a CC2 classification when tested in accordance with ASTM D 635.

3.4.3 Concrete: The concrete must be normal-weight concrete complying with the applicable code, having a maximum aggregate size of ³/₄ inch and a minimum compressive strength of 2,500 psi (17.2 MPa) at 28 days, except as noted in Table 1 for fire-resistance-rated assemblies. The concrete must have a slump as recommended by the manufacturer's published installation instructions, unless otherwise approved by the code official. Under the IRC, the concrete must comply with Sections R404.1 and R611.5.1.

3.4.4 Reinforcement: The deformed steel reinforcement bars must have a minimum yield stress of either 40 ksi (276 MPa) or 60 ksi (414 MPa), depending on the structural design, and must comply with Section 3.5.3.1 of ACI 318 and IBC Section 1903 or Sections R404.1.2.3.7 and R611.5.2 of the IRC, as applicable.

3.4.5 Other Components: Wood members in contact with concrete for plates of window and door framing must be treated with an approved wood preservative or be of a naturally durable species, 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.

4.0 DESIGN AND INSTALLATION

4.1 Design:

4.1.1 IBC Design, Including Alternative IBC Wind Design for Reward Wall Systems™ ICFs in Accordance with ICC 600-2008: For buildings constructed under the provisions of the IBC, concrete walls formed by Reward Wall Systems® ICFs must be designed and constructed in accordance with Chapters 16 and 19 of the IBC. Footings and foundations must be designed and constructed in accordance with IBC Chapter 18.

Solid concrete walls formed by flat 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 limitations found in Exception 1 of IBC Sections 1609.1.1 and 1609.1.1.1. Design and construction under the provisions of ICC 600-2008 are limited to the resistance of wind forces.

4.1.2 IRC Design, Including Alternative IRC Design: For buildings constructed under the provisions of the IRC, concrete walls formed by Reward Wall Systems® 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 Sections R404.1 and R611 of the IRC. Reward Wall Systems ICFs not complying with the dimensional requirements found in IRC Table R611.3 (i.e., solid concrete wall thicker than 10 inches) must be designed and constructed in accordance with the provisions of Section 4.1.1 of this report. Footings and foundations must be designed and constructed in accordance with IRC Chapter 4.

When buildings constructed under IRC provisions 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 (PCA 100), or a structural analysis and design of the concrete must be in accordance with ACI 318 and Chapters 16, 18 and 19 of the IBC.

4.2 Installation:

4.2.1 General: Reward Wall Systems® forms must be installed in accordance with the Reward Wall Systems published installation instructions, this report and the applicable code. The published installation instructions and this report must be strictly adhered to and a copy of the instructions must be available at all times on the jobsite during installation.

Reward Wall Systems® ICFs must be supported on concrete footings complying with Chapter 18 of the IBC or Chapter 4 of the IRC, as applicable. Vertical reinforcement bars embedded in the footing must extend a minimum of 24 inches (610 mm) into the wall system. Vertical and horizontal reinforcing bars must have concrete protection in accordance with, and must be placed as required by, the design and the applicable code.

Concrete quality, mixing and placing must comply with the applicable code. The minimum ambient temperature during placement must be in accordance with ACI 306.

4.2.2 Interior Finish: Walls built using Reward Wall Systems® forms must be finished on the interior side of the building with an approved 15-minute thermal barrier, such as minimum 1/2-inch-thick (12.7 mm) regular gypsum wallboard complying with ASTM C 36 or C 1396, as required by IBC Section 2603.4 and IRC Section R316.4, as applicable. Except as required for fire-resistance-rated construction in Section 4.2.7, the gypsum wallboard must be installed vertically or horizontally and attached to the flanges of the cross-ties with No. 6, 2-inch-long (51 mm), coarse-thread gypsum wallboard screws spaced as required by the applicable code. Gypsum wallboard joints must be taped and filled with joint compound in accordance with ASTM C 840 or GA-216.

See Section 4.2.4 for installation of Reward ICFs when used in walls of attics and crawl spaces without a covering on the interior face

4.2.3 Exterior Finish:

4.2.3.1 Above Grade: Reward Wall Systems® ICFs must be covered on the exterior with an approved wall covering in accordance with the applicable code or a current ICC-ES evaluation report. Under the IRC, the walls must be flashed in accordance with Section R703.8.

The approved exterior wall covering must be designed and installed in accordance with the applicable code or a current evaluation report. When the wall covering is required to be attached to structural members, the wall covering must be attached to the flanges of the cross-ties with coarse-thread gypsum wallboard screws as described in Table 2, which lists the fasteners' allowable withdrawal and lateral load capacities, or as otherwise set forth in Sections 4.2.7 and 4.2.8. The screws must be corrosion-resistant and have sufficient length to penetrate through the flanges of the cross-ties a minimum of 1/4 inch (6.4 mm). The maximum spacing of the screws must be designed to resist the gravity loads of the wall covering and to resist the negative wind pressures. Negative wind pressure capacity of the exterior wall covering must be the same as that recognized in the applicable code for the generic wall covering or as listed in the current evaluation report for proprietary materials

4.2.3.2 Below Grade: For basement wall installations, Reward Wall Systems® form surfaces must be dampproofed or waterproofed in accordance with IBC Section 1807 or IRC Section R406, as applicable. The dampproofing and waterproofing materials must be approved by the code official, and must be free of solvents, hydrocarbons, ketones and esters that will adversely affect the EPS foam plastic. Adherence is required to the drainage requirements in IBC Section 1805.4 or IRC Section R405.1, as applicable. No backfill is permitted to be applied against the wall until the complete floor system 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 Attic and Crawl Space Installation: The Reward Wall Systems® forms may be installed exposed in attics and crawl spaces without a covering applied to the interior side of the foam plastic, provided all the following conditions are met:

1. Entry to the attic and crawl space is limited to service of utilities, and no storage is permitted.
2. There are no interconnected attic or crawl space areas.
3. Air in the attic or crawl space is not circulated to other parts of the building.

4. Attic ventilation is provided in accordance with IBC Section 1203.2 and IRC Section R806. Crawl space ventilation is provided in accordance with IBC Section 1203.3 and IRC Section R408.1.

5. Combustion air is provided in accordance with *International Mechanical Code* (IMC) Sections 701 and 703.

4.2.5 Foundation Walls: The eForm™ and iForm™ wall systems used to form foundation stem walls supporting wood-framed construction must be supported on concrete footings complying with the applicable code. Design and installation of Reward Wall Systems® as foundation stem walls must comply with IBC Section 1807.1.5 or IRC Sections R404 and 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), R404.1.2(4), 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 IRC.

4.2.6 Protection Against Termites: Reward Wall Systems 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.

4.2.7 Fire-resistance-rated Wall Assemblies: Walls constructed with Reward Wall Systems® iForms™ have fire-resistance ratings for bearing and nonbearing wall assemblies as shown in Table 1.

4.2.8 Installation in Buildings Required to Be of Noncombustible Construction:

4.2.8.1 Exterior Walls of Buildings of Any Height: Exterior walls constructed with Reward Wall Systems® eForms and iForms are recognized for use in buildings of Types I, II, III or IV construction under the IBC, under the following conditions:

4.2.8.1.1 EIFS and One-coat Stucco—Exterior Finish: The following EIFS (exterior insulation and finish system) or one-coat stucco lamina may be installed over the exterior of the forms using the reinforcing fabric or lath, base coat and finish coat materials described in the respective evaluation reports:

- Dryvit Systems, Inc., Outsulation System as described in [ESR-1232](#).
- BASF Construction Chemicals, LLC, Senergy Senerflex EIFS as described in [ESR-1794](#).
- Sto Corp. StoTherm Essence Next, Classic Next, and Premier Next EIFS systems as described in [ESR-1748](#).
- Omega Products International, Inc., Omega Diamond Wall One Coat Stucco as described in [ESR-1194](#).
- Total Wall, Inc., SoftCoat PB System as described in [ESR-2771](#).
- ParexLaHabra, Inc., Water Master Commercial PB System as described in [ESR-2562](#).
- Masterwall, Inc., Aggre-flex Class PB EIFS as described in [ESR-1181](#).
- BASF Construction Chemicals, LLC, Sonowall Flex Wall EIFS as described in [ESR-2163](#).
- BASF Construction Chemicals, LLC, Finestone Pebbletex EIFS as described in [ESR-2165](#).

4.2.8.1.2 Brick Veneer—Exterior Finish: Anchored brick veneer must be attached to the flanges of the cross-ties with fasteners as described in Section 4.2.3.1. The brick veneer must comply with the applicable code and must be installed with a minimum 1-inch (25.4 mm) air gap between the face of the exterior EPS formwork and the brick. The brick must be supported on a steel shelf angle attached to concrete at each floor line and at the top of each window and door opening, in accordance with the applicable code.

4.2.8.1.3 Exterior Cement Plaster—Exterior Finish: Metal lath and exterior cement plaster must comply with the applicable code, and the exterior plaster must be a minimum of $\frac{7}{8}$ inch (22 mm) thick. The lath must be attached to the flanges of the cross-ties with fasteners as described in Section 4.2.3.1.

4.2.8.1.4 Interior Finish: Reward Wall Systems® eForms™ and iForms™, for use in noncombustible construction, must be finished on the interior with an approved 15-minute thermal barrier in accordance with Section 4.2.2, except that the gypsum board must be installed vertically and attached to the flanges of the cross-ties with No. 6 by 2-inch-long (51 mm) coarse-thread gypsum wallboard screws spaced 12 inches (305 mm) on center in the field of the board and 8 inches (203 mm) on center around the perimeter.

4.2.8.1.5 Fire-blocking: Foam plastic on the interior sides of walls must be discontinuous at floor lines. Floor-to-wall intersections must be constructed to prevent the passage of flame, smoke and hot gases from one story to another. Details of floor-to-wall intersections must be provided to the code official. See Figure 3 for typical details.

4.2.8.2 eForms and iForms for Use in Exterior Walls of Single-story Buildings: Exterior walls constructed with Reward Wall Systems eForms and iForms are recognized for use in buildings of Types I, II, III or IV, in accordance with IBC Section 2603.5, provided the following conditions are met:

4.2.8.2.1 Fire Sprinklers: The building must be equipped throughout with an automatic sprinkler system in accordance with IBC Section 903.3.1.1.

4.2.8.2.2 Exterior Finish: The foam plastic on the exterior face of the wall must be covered with aluminum not less than 0.032 inch (0.81 mm) thick, or corrosion-resistant steel having a base-metal thickness of 0.0160 inch (0.41 mm), in accordance with IBC Section 2603.4.1.4. Attachment of the metal wall covering must be designed by a registered design professional.

4.2.8.2.3 Interior Finish: The forms must be finished on the interior with an approved 15-minute thermal barrier such as $\frac{1}{2}$ -inch-thick (13 mm) regular gypsum board as required by the applicable code. The gypsum board must be installed and attached as described in Section 4.2.2.

4.3 Special Inspections:

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, special inspection is not required. For walls designed in

accordance with the IBC, as described in Sections 4.1.1 and 4.1.2 of this report, special inspection in accordance with Section 4.3.1 is required.

5.0 CONDITIONS OF USE:

The Reward Wall Systems® eForm™ and iForm™ forms described in this report comply with, or are suitable alternatives to what is specified in, those codes listed in Section 1.0, subject to the following conditions:

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

5.2 The Reward Wall Systems® forms must be separated from the interior of the building with an approved 15-minute thermal barrier in accordance with Section 4.2.2, except for attic and crawl space construction as described in Section 4.2.4.

5.3 Concrete walls formed by Reward Wall Systems® ICFs are limited to buildings of combustible construction (Type V and construction in accordance with the IRC), except as described in Section 4.2.8.

5.4 When use is in buildings required to be of noncombustible construction as described in Section 4.2.8, one label as described in Section 7.0 must be visible in every 160 square feet (15 m²) of wall area.

5.5 Special inspection is required as described in Sections 4.3 and 8.4.2.5.

5.6 When use is as part of a fire-resistance-rated assembly, Section 4.2.7 of this report applies.

5.7 When required by the code official, calculations showing compliance with Chapter 16 of the IBC must be submitted to the code official for approval, except that calculations are not required when the building design is based on the prescriptive provisions found in Section 4.1.2 of this report, or foundation design is based on the prescriptive provisions in Section 4.2.5. 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.

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

5.9 When required by the code official, calculations showing compliance with IRC Sections R611.5.3 and R404.1.2.3.6 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, must be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.

5.10 The forms are produced for Reward Wall Systems®, Inc., by Tegrant Corporation, in New Brighton, Pennsylvania, and Colorado Springs, Colorado; by Diversified Plastics Corporation, in Nixa, Missouri; by Diversifoam Products, in Rockford, Minnesota; by FMI-EPS, LLC., in Post Falls, Idaho; by Plymouth Foam, in Becker, Minnesota; and by Cellofoam, Inc., in Orlando, Florida, under a quality control program with inspections by Intertek Testing Services NA, Ltd. (AA-657).

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 February 2010.

7.0 IDENTIFICATION

Each pallet of forms must be labeled with the Reward Wall Systems® name, the product name, the manufacturing location, the production date, the inspection agency name (Intertek Testing Services) and/or trademark, and the evaluation report number (ESR-1552). Additionally, one form on each pallet must be labeled on the outer sides of the form with the same information.

When used in buildings required to be of noncombustible construction as described in Section 4.2.8 of this report, the ICFs must be labeled in accordance with Section 5.4.

8.0 OTHER CODES

8.1 Evaluation Scope:

In addition to the codes referenced in Section 1.0, the products described in this report were evaluated for compliance with the requirements of the following codes:

- 2006 *International Building Code*® (2006 IBC)
- 2006 *International Residential Code*® (2006 IRC)
- 1997 *Uniform Building Code*™ (UBC)
- BOCA® *National Building Code*/1999 (BNBC)
- 1999 *Standard Building Code*® (SBC)

The products described in this report comply with, or are suitable alternatives to what is specified in, the codes listed above, subject to the provisions of Sections 8.2 through 8.5.

8.2 Uses:

See Section 2.0.

8.3 Description:

Same as Section 3.0, except:

- The Reward Wall System® eForm™ and iForm™ forms are flat ICF (insulating concrete form) wall systems in accordance with Section R611.3 of the 2006 IRC.
- Concrete must comply specifically with 2006 IRC Sections R404.4 and R611.6.1, BNBC Section 1906 or SBC Section 1916.6.1, as applicable.
- Reinforcing must comply with 2006 IRC Sections R404.4.6 and R611.6.2, or Section 1903 of UBC, BNBC, or SBC, as applicable, and specifically with SBC Section 1916.6.2 or UBC Section 1903.5, as applicable.
- Attachment of wood members in contact with concrete must comply with 2006 IRC Section R319.3, UBC Section 2304.3, BNBC Section 2311.3.3, or SBC Section 2306.3, as applicable.

8.4 Design and Installation:

Same as Section 4.0, except as described in Sections 8.4.1 through 8.4.2.5.2.

8.4.1 Design: Under the UBC and BNBC, Reward Wall Systems® ICF walls must be designed in accordance with Chapters 16 and 19, and foundations must be designed in accordance with Chapter 18, of those codes, as applicable. Alternatively for UBC applications, walls limited to a maximum of two stories plus a basement, and a maximum

unsupported wall span of 10 feet (3 m), may be designed in accordance with publication 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 Section 1.3 and Table 1.1 of that document.

For SBC applications conforming to the applicability limits in SBC Sections 1916.2 and 1804.6.2.1, ICF walls must comply with SBC Section 1916, and ICF foundations must comply with SBC Section 1804.6.2, otherwise, structural design of the concrete must be in accordance with ACI 318-95 and SBC Chapter 19.

For buildings constructed under the provisions of the 2006 IRC, concrete walls formed by Reward Wall Systems ICFs must be designed and constructed in accordance with Sections R404.4 and R611 of the 2006 IRC. Footings and foundations must be designed and constructed in accordance with 2006 IRC Chapter 4. When buildings constructed under the 2006 IRC provisions do not conform to the applicability limits of 2006 IRC Sections R404.4.1 and R611.2, the structural analysis and design of the concrete must be in accordance with ACI 318 and Chapter 19 of the 2006 IBC.

For alternative 2006 IBC design, the structural design of reinforced concrete formed by iForms as described in the Engineering Specifications and Tables section of the *Reward Wall Systems*® Product Manual, Release H, dated February 1, 2007, is applicable. This document must be made available to the code official upon request, and evidence must be submitted to the code official that the applied loads are less than the loads tabulated in the product manual.

For alternative IBC design for eForms and iForms in accordance with SSTD 10-99, the ICFs must be designed and constructed using the load tables for flat ICF forms in Section 206 of SSTD 10-99, under the exceptions in 2006 IBC Section 1609.1.1, and subject to the limitations of 2006 IBC Section 1609.1.1.1. Construction under the SSTD 10-99 is limited to the resistance of wind forces only.

Design of foundation wall reinforcement may also be in accordance with the following code sections:

- BNBC Section 1812.3.2 and Tables 1812.3.2(1) and 1812.3.2(2)
- SBC Section 1804.6 and Table 1804.6.1(A)
- *International One-and Two-Family Dwelling Code* Section 404.1 and Tables 404.1.1(1) and 404.1.1(2)
- 2006 IBC Section 1805.5 and Table 1805.5(5)
- 2006 IRC Table 404.1.1(5)

8.4.2 Installation:

8.4.2.1 General: Under the UBC, Reward Wall Systems® ICFs must be supported on concrete footings in accordance with UBC Chapter 18.

8.4.2.2 Below-grade: Dampproofing and waterproofing must conform to UBC Chapter 18, BNBC Section 1813, or SBC Section 1814, and drainage must conform to the requirements of UBC Section 1804.7, BNBC Section 1813.5, or SBC Section 1814, as applicable.

8.4.2.3 Foundation Walls: Design and installation of Reward Wall Systems® ICFs as foundation stem walls must comply with 2006 IBC Section 1805.5, 2006 IRC Sections R404 and R404.1.2, BNBC Section 1812 or SBC Section 1804.6.2, as applicable. In jurisdictions adopting the UBC, compliance with UBC Table 18-1-C is required.

8.4.2.4 Protection Against Termites: For applications governed by the SBC, Reward Wall Systems® ICFs must be installed in accordance with Sections 1916.7.5 and 2603.3 of the SBC, with areas of very heavy termite infestation determined in accordance with SBC Figure 2304.1.4.

8.4.2.5 Special Inspection:

8.4.2.5.1 2006 IBC: Special inspection is required in accordance with 2006 IBC Section 1704 for placement of reinforcing steel and concrete, and for concrete cylinder testing. Special inspection in accordance with 2006 IBC Sections 1704.1 and 1704.12 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.

8.4.2.5.2 UBC: Special inspection is required in accordance with UBC Section 1701 for placement of reinforcing steel and concrete, and for concrete cylinder testing. When approved by the code official, special inspection may be waived when all 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 UBC Section 1905.10.5.
3. Installation is by installers approved by Reward Wall Systems, Inc.
4. Design of the wall uses half the allowable stresses or loads permitted by the UBC.
5. Installation instructions indicate methods used to verify proper placement of concrete.

8.4.2.5.3 BNBC and SBC: Special inspection is required as noted in BNBC Section 1705.4 and SBC Section 1707.1, as applicable, and must include, but not be limited to, verification of material specifications for concrete, reinforcing steel and formwork materials, installation of reinforcing steel, formwork installation, bracing and concreting operations.

8.5 Conditions of Use:

The conditions of use in Section 5.0 apply except that;

- When design is based on the UBC or BNBC, upon request, calculations showing compliance with the general design requirements of Chapter 16 of those codes must be submitted to the code official for approval, except that calculations are not required when the design is in accordance with Sections 8.4.1 and 8.4.2.3.
- Combustible construction is defined as Type V under the UBC, Type 5 under the BNBC, and Type VI under the SBC.
- Noncombustible construction is defined as Type 1, 2, 3 or 4 under the BNBC, Type I, II, III or IV under the SBC, and Types I and II under the UBC.
- Concrete quality, mixing and placement must comply with UBC Section 1905 for installations under the UBC, ACI 318-95 Chapter 5 for installations under the BNBC, or SBC Section 1916.6.1 for installations under the SBC.
- Special inspection must be in accordance with Section 8.4.2.5.
- Section 5.9 of this report may be omitted.

TABLE 1—REWARD WALL SYSTEMS IN FIRE-RESISTANCE-RATED ASSEMBLIES⁴

TYPE-RATING ²	FORM TYPE	INTERIOR WALL FINISH ^{3,5}	STEEL REINFORCEMENT ¹ (MINIMUM)
Bearing wall—4 hr. Design axial load 5,000 lbf/ft. ^{2,8}	iForm 13", 15", and 17" widths	1/2 in. gypsum wallboard, fasten 12 in. o.c. in field and 8 in. o.c. at perimeter	Vertical—# 5, 12 in. o.c. Horizontal—#5, 16 in. o.c.
Bearing wall—3 hr. Design axial load 3,000 lbf/ft. ^{2,8}	iForm 11" width	1/2 in. gypsum wallboard, fasten 12 in. o.c. in field and 8 in. o.c. at perimeter	Vertical—# 5, 24 in. o.c. Horizontal—#5, 24 in. o.c.
Nonbearing wall—4 hr. ²	iForm 13", 15", and 17" widths	1/2 in. gypsum wallboard, fasten 12 in. o.c. in field and 8 in. o.c. at perimeter	Not required for fire- resistance rating, except as required by code
Nonbearing wall—3 hr. ²	iForm 11" width	1/2 in. gypsum wallboard, fasten 12 in. o.c. in field and 8 in. o.c. at perimeter	Not required for fire- resistance rating, except as required by code
Bearing wall—1 hr. Design axial load 2,250 lbf/ft. ^{2,8}	iForm 9" width	1/2 in. gypsum wallboard, fasten 12 in. o.c. in field and 8 in. o.c. at perimeter	Vertical—#5, 24 in. o.c. Horizontal—#5, 24 in. o.c.
Bearing wall—2 hr. Design axial load 2,250 lbf/ft. ^{6,8}	iForm 9" width	1/2 in. gypsum wallboard, fasten 12 in. o.c. in field and 8 in. o.c. at perimeter	Vertical—#5, 24 in. o.c. Horizontal—#5, 24 in. o.c.
Bearing wall—2 hr. Design axial load 2,250 lbf/ft. ^{2,7,8}	iForm 9" width	1/2 in. type X gypsum wallboard, fasten 12 in. o.c. in field and 8 in. o.c. at perimeter - both sides	Vertical—#5, 24 in. o.c. Horizontal—#5, 24 in. o.c.
Nonbearing wall—1 hr. ²	iForm 9" width	1/2 in. gypsum wallboard, fasten 12 in. o.c. in field and 8 in. o.c. at perimeter	Not required for fire- resistance rating, except as required by code
Nonbearing wall—2 hr. ⁶	iForm 9" width	1/2 in. gypsum wallboard, fasten 12 in. o.c. in field and 8 in. o.c. at perimeter	Not required for fire- resistance rating, except as required by code
Nonbearing wall—2 hr. ^{2,7}	iForm 9" width	1/2 in. type X gypsum wallboard, fasten 12 in. o.c. in field and 8 in. o.c. at perimeter - both sides	Not required for fire- resistance rating, except as required by code

For SI: 1 inch = 25.4 mm, 1 lbf/ft = 14.59 N/m.

¹Steel reinforcement is the minimum required for the design loads given.

²Concrete must be normal-weight concrete with a 3,000 psi (20 684 kPa) compressive strength.

³See Section 4.2.2 of this report for type of fastener.

⁴Exterior finishes: not required to achieve assembly rating. The following are permitted to be applied to the exterior side of the wall assembly without diminishing the assembly rating: any exterior insulation and finish system (EIFS), any exterior stucco, brick or brick veneer, stone or stone veneer, cultured stone and siding made from vinyl, aluminum, wood or steel. Exterior finishes must be applied in accordance with the applicable code and the manufacturer's published installation instructions. When the wall is required to be of noncombustible construction, then exterior finishes must be limited to those listed in Section 4.2.8 of this report.

⁵The wall assembly may be used as either an interior or exterior wall. When used as an interior wall, both sides of the form must be protected with the interior wallboard as noted in the table.

⁶Concrete must be sand-lightweight or lightweight structural concrete.

⁷Interior walls only.

⁸Design loads are based on 10-foot wall heights.

TABLE 2—ALLOWABLE WITHDRAWAL AND LATERAL CAPACITIES OF FASTENERS INSTALLED IN CROSS-TIE FLANGES

FASTENER	ALLOWABLE LOAD CAPACITY (lbf) ¹			
	iForm™ Cross-Ties		eForm™ Cross-Ties	
	Withdrawal	Lateral	Withdrawal	Lateral
No. 6, Type W coarse-thread gypsum wallboard screws	42	47	40	45
No. 8, Type W coarse-thread gypsum wallboard screws	46	38	45	60
No. 10, Type W coarse-thread gypsum wallboard screws	52	30	50	65

For SI: 1lbf = 4.45N.

¹Based on safety factor of 5.0.

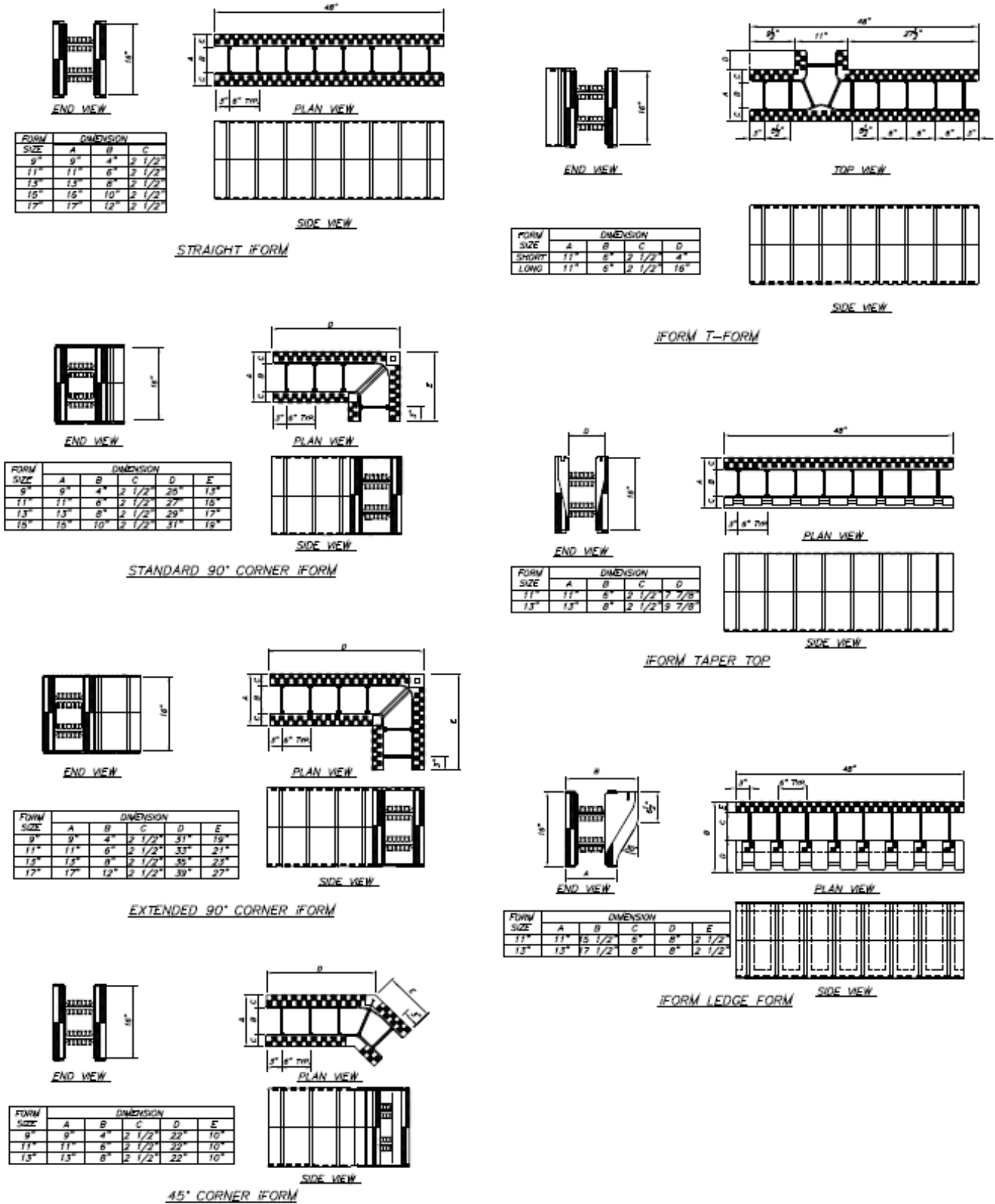


FIGURE 1—iForms

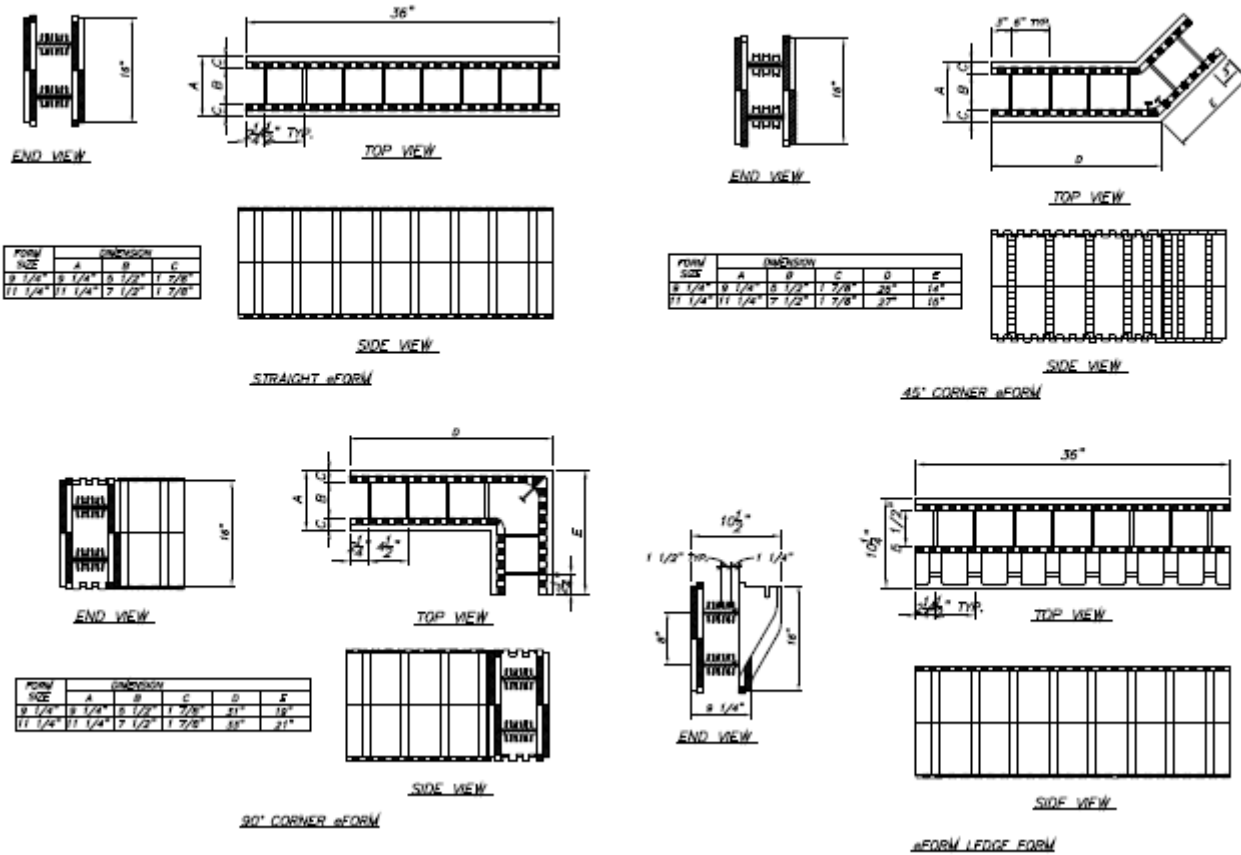


FIGURE 2—eForms

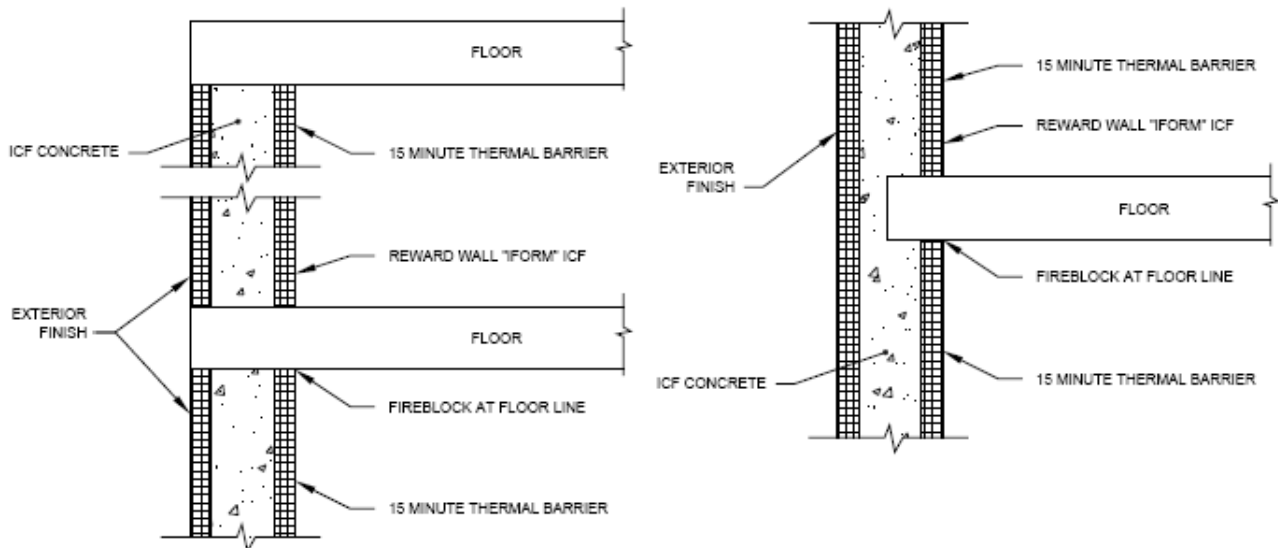


FIGURE 3—TYPICAL FLOOR-WALL DETAIL FOR NONCOMBUSTIBLE CONSTRUCTION