

ICC Evaluation Service, Inc.
www.icc-es.org

Business/Regional Office ■ 5360 Workman Mill Road, Whittier, California 90601 ■ (562) 699-0543
Regional Office ■ 900 Montclair Road, Suite A, Birmingham, Alabama 35213 ■ (205) 599-9800
Regional Office ■ 4051 West Flossmoor Road, Country Club Hills, Illinois 60478 ■ (708) 799-2305

DIVISION: 03—CONCRETE
Section: 03130—Permanent Forms

REPORT HOLDER:

PLASTI-FAB, LTD.
270, 3015—5th AVENUE NE
CALGARY, ALBERTA T2A 6T8
CANADA
(888) 446-5377
www.plastifab.com

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:

- 2003 *International Building Code*® (IBC)
- 2003 *International Residential Code*® (IRC)
- 1997 *Uniform Building Code*™ (UBC)

Properties evaluated:

- Structural
- Surface-burning characteristics
- Crawl space fire evaluation

2.0 USES

The Advantage Insulating Concrete Forming System is used as permanent formwork for reinforced concrete load-bearing and nonload-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 shall be protected by an approved interior and exterior finish material as described in Sections 4.2.2 and 4.2.3 of this report. The forms are limited to use in buildings of combustible Type V-B construction under the IBC, Type V construction under the UBC, and dwellings under the IRC.

3.0 DESCRIPTION

3.1 General:

The Advantage ICF System is a flat ICF system allowing for a solid concrete wall 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 $2\frac{3}{8}$ inches (60.3 mm) thick measured at the center of the board, and

have a maximum thickness of $2\frac{5}{8}$ inches (66.7 mm). See Figure 1 of this report for an illustration of the forms.

3.2 Materials:

3.2.1 Polystyrene: The Advantage ICF System EPS foam plastic boards have a nominal density of 1.5 pcf (24 kg/m³), and a maximum flame-spread index of 25 and a maximum smoke-developed index of 450 when tested in accordance with ASTM E 84 (UBC Standard 8-1). The foam plastic insulation complies as a Type II rigid cellular polystyrene in accordance with ASTM C 578.

3.2.2 Concrete: The concrete shall be normal-weight concrete, complying with the applicable code, with a maximum $\frac{3}{4}$ -inch (19 mm) aggregate size. Concrete shall 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 shall comply with Sections R404.4.5 and R611.6.1.

3.2.3 Web Spacers: The polypropylene cross-ties, spaced 8 inches (203 mm) on center for 6-inch-wide (152 mm) walls, and at 6 inches (152 mm) on center for 8-inch-wide (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 $\frac{1}{4}$ inch (6.4 mm) below the EPS surface that are used for attaching interior and exterior wall coverings. The flanges are $1\frac{5}{8}$ inches wide (41.2 mm) by $\frac{3}{16}$ inch (4.8 mm) thick.

3.2.4 Reinforcement: Deformed steel reinforcement bars shall have a minimum yield stress of either 40 ksi (275 kPa) or 60 ksi (413 MPa), depending on the structural design, and shall comply with Section 1903 of either the UBC or the IBC. If construction of the Advantage ICF System is based on the IRC, reinforcement shall comply with Sections R404.4.6 and R611.6.2 of the IRC.

3.2.5 Other Components: When required by the code official, wood members in contact with concrete for plates or windows and door framing, shall be preservative-treated in accordance with the applicable code, and shall be attached with hot-dipped galvanized steel fasteners in accordance with Section 2304.9.5 of the IBC. 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: the standard block, half (top/bottom) block, 90-degree corner block, and 45-degree corner block. Two forms are recognized for solid concrete walls having a thickness of 6 inches (152 mm) or 8 inches (203 mm). 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 (152 mm) walls, and 48 inches (1219 mm) long, $16\frac{1}{2}$ inches (419 mm) high and $13\frac{1}{4}$ inches (337 mm) wide for 8-inch (203 mm) walls. Refer to Figure 1 for details.

4.0 DESIGN AND INSTALLATION

4.1 DESIGN:

4.1.1 General: Structural analysis and design of the concrete shall be prepared in accordance with Chapter 19 of the IBC or UBC and ACI 318, assuming a monolithic concrete wall of uniform thickness. Design loads shall comply with Chapter 16 of the IBC or UBC.

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 shall be prepared in accordance with ACI 318, and Chapter 19 of the IBC or Sections R404.4 and R612 of the IRC, as applicable.

Design calculations and details for specific applications shall be furnished to the code official to verify compliance with this report and the applicable code.

4.1.2 Alternate Design: In lieu of calculations required by Section 4.1.1 of this report, the structural design of reinforced concrete formed by the Advantage ICF wall system for residential construction is permitted to comply with the *Prescriptive Method for Insulating Concrete Forms in Residential Construction* (publication No. EB118), dated May 1998, published by the Portland Cement Association (PCA), subject to all applicability and use limits for a flat ICF wall system specified in Table 1.1 of that document. The PCA document shall be made available to the building official upon request. Buildings constructed with the Advantage ICF wall system and designed in accordance with this section (Section 4.1.2) shall not exceed a height of two stories plus a basement, where the maximum unsupported wall height is 10 feet (3048 mm).

4.1.3 Design in Accordance with the IRC: Insulating concrete walls constructed with the Advantage ICF wall system shall be designed and constructed in accordance with Sections R404.4 and R611 of the IRC.

4.2 Installation:

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

The Advantage ICF System shall be supported on concrete footings complying with Chapter 18 of the IBC or UBC, or Chapter 4 of the IRC, as applicable. Vertical rebars, embedded in the footing, shall extend a minimum of 24 inches (610 mm) into the base of the wall system.

Advantage ICF System units shall 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 shall be placed as required by the design, the approved plans and the applicable code. All horizontal and vertical reinforcement bars shall have minimum concrete cover in accordance with the IBC or UBC, as applicable. Concrete quality, mixing, placing and curing shall comply with Chapter 19 of the IBC or UBC, as applicable.

Wood ledgers, when used, shall be attached to the concrete wall by removal of the face shell of the form units, with the height of the removed portion equal to the depth of the wood ledger. Alternatively, subject to acceptance by the designer and approval by the code official, wood ledgers are permitted to be attached by the cutting of 3-inch-square (76.2 mm) holes into the side of the foam block, before placement of

concrete. Code-complying anchor bolts used to connect the wood ledgers or plates to the concrete shall be cast-in-place, with the bolts sized and spaced as required by design or code requirements, whichever governs. The spacing, edge distance, and embedment depth of anchor bolts shall comply with the design or code requirement, whichever governs. A dam shall be used to center the anchor-bolts in the hole and hold them in place during the concrete pour. When concrete is poured into the wall system, the concrete-filled holes that are provided for the J-bolts form a solid-concrete connection from the ledger board to the concrete wall. Refer to Figures 2 and 3 for typical details.

4.2.2 Interior Finish: Advantage ICF system blocks shall be finished on the interior 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. The gypsum wallboard shall be installed either vertically or horizontally, and shall be attached to the polypropylene cross-tie fastener strips with minimum 0.136-inch-diameter-by-1⁵/₈-inch-long (3.5 mm by 41.3 mm), Type S, coarse-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 shall be taped and filled with joint compound.

4.2.3 Exterior Finish:

4.2.3.1 Above Grade: When regulated by the UBC or IBC, the Advantage ICF wall system shall be covered on the exterior with an approved wall covering in accordance with the applicable code or a current evaluation report. When regulated by the IRC, the Advantage ICF wall system shall be covered on the exterior with a water-resistive barrier, in accordance with Sections R703.1 and R703.2 of the IRC, and with an approved wall covering in accordance with the IRC or a current evaluation report.

The exterior wall covering shall 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 shall be attached to the flanges of the polypropylene cross-ties with either No. 6, Type W, coarse-thread drywall screws or No. 6, Type S, fine-thread drywall screws. The screws shall be corrosion-resistant and have sufficient length to protrude through the flanges a minimum of 1/4 inch (6.4 mm). The screws have an allowable pullout capacity of 40 pounds (178 N), and an allowable lateral load capacity of 77 pounds (343 N). The maximum spacing of the screws shall 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 shall be the same as that recognized in the applicable code for generic materials or in a current evaluation report for proprietary materials.

4.2.3.2 Below Grade: Wall surfaces shall be dampproofed and, when required by the building official, waterproofed in accordance with Section 1807 of the IBC, Section R404.4.11 of the IRC, or Appendix Chapter 18 of the UBC, as applicable. Dampproofing and waterproofing materials shall be approved by Plasti-Fab, Ltd., and the code official, and shall be free of solvents that will adversely affect the EPS foam panels.

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. Compliance with UBC Table 18-I-C is mandatory in jurisdictions adopting the UBC. When regulation is by the IRC, installation of the Advantage ICF System as foundation walls shall comply with IRC Sections R320.4 and R404.

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 and Section 4.1.1 of this report.

4.2.6 Crawl Spaces: The Advantage ICF System located in underfloor crawl spaces may be exposed to the crawl space with no covering applied to the crawl space side of the foam plastic, provided all the following conditions are met:

1. Entry to the crawl space is only to service utilities, and heat-producing appliances are not 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 complies with the applicable code.

4.3 Fire-resistive Construction (UBC Only):

Concrete walls constructed with the Advantage ICF System may be used in nonload-bearing, one-, two-, and three-hour-rated, fire-resistance-rated construction. Concrete wall thickness shall comply with Item 7.1.1 of UBC Table 7-B.

4.4 Special Inspection:

Special inspection is required as noted in Section 1704 of the IBC or Section 1701 of the UBC, for placement of reinforcing steel and concrete, and for concrete cylinder testing. Special inspection is not required in jurisdictions adopting the IRC.

When approved by the code official, special inspection is not required for construction regulated by the UBC when all of the following conditions are met:

1. Wall systems are a maximum of 8 feet high (2.4 m) and are limited to use in single-story construction of Group R, Division 3, or Group U, Occupancies.
2. Maximum height of a concrete pour is 48 inches (1219 mm). Succeeding lifts shall be placed in accordance with Section 1905.10 of the UBC.
3. Installation is by properly trained installers approved by Plasti-Fab, Ltd.
4. The installation instructions indicate methods used to verify proper placement of concrete.
5. Compressive strength (f'_c) of concrete used in design is one-half of that specified.

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 shall 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 shall govern.

- 5.2 Walls constructed with the Advantage ICF System shall be limited to Type VB construction under the IBC, Type VN construction under the UBC 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 or UBC shall be submitted to the code official for approval, except calculations are not required when the building design is based on Section 4.1.2 or Section 4.1.3 of this evaluation report. The calculations and details shall be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.

- 5.4 The foam plastic insulation shall be separated from the building interior with an approved 15-minute thermal barrier, such as minimum $\frac{1}{2}$ -inch-thick (12.7 mm) regular gypsum wallboard installed as specified in this report, except as described in Section 4.2.6. Other thermal barriers are acceptable, provided they are recognized in a current evaluation report.

- 5.5 When regulation is under the IBC or UBC, special inspection shall be provided in accordance with Section 4.4 of this report.

- 5.6 When regulation is under the IRC, compliance with IRC Sections R320.4, R404.4, and R611 shall be demonstrated.

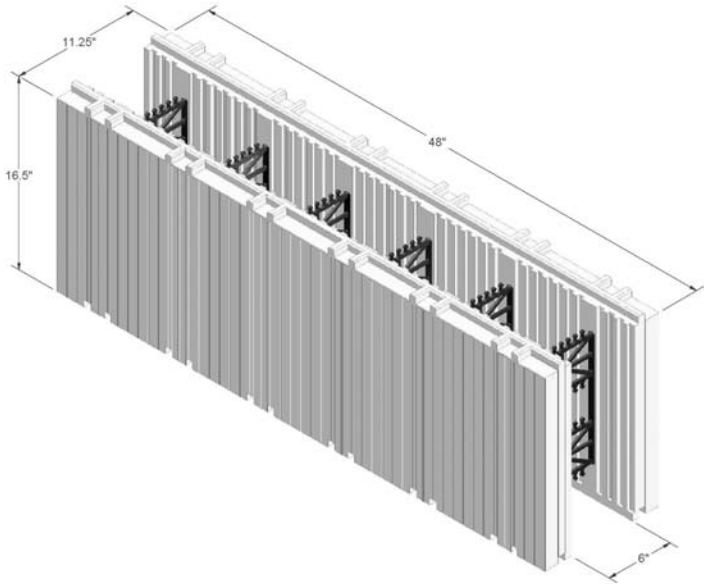
- 5.7 Advantage ICF system units are manufactured by Plasti-Fab, Ltd., at their facilities located in Crossfield, Alberta, Canada; and are produced under a quality control program with inspections conducted by Intertek Testing Services NA Ltd.—Warnock Hersey (AA-688).

6.0 EVIDENCE SUBMITTED

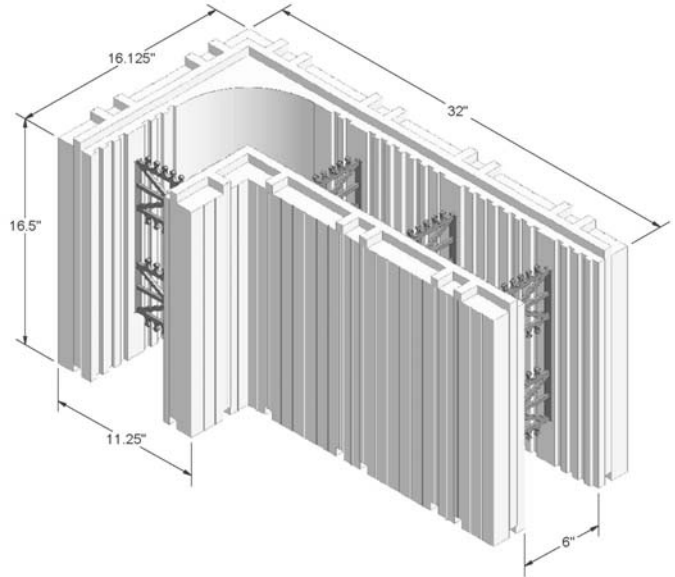
- 6.1 Manufacturer's descriptive literature.
- 6.2 Manufacturer's published installation instructions.
- 6.3 Data in accordance with the applicable sections of the ICC-ES Acceptance Criteria for Concrete Floor, Roof and Wall Systems and Concrete Masonry Wall Systems (AC15), dated June 2003.
- 6.4 Data in accordance with the applicable sections of the ICC-ES Acceptance Criteria for Foam Plastic Insulation (AC12), dated October 2004; including reports of testing performed in accordance with ASTM C 578 showing compliance with the requirements for flexural strength, compressive strength, and density testing.
- 6.5 A quality control manual.

7.0 IDENTIFICATION

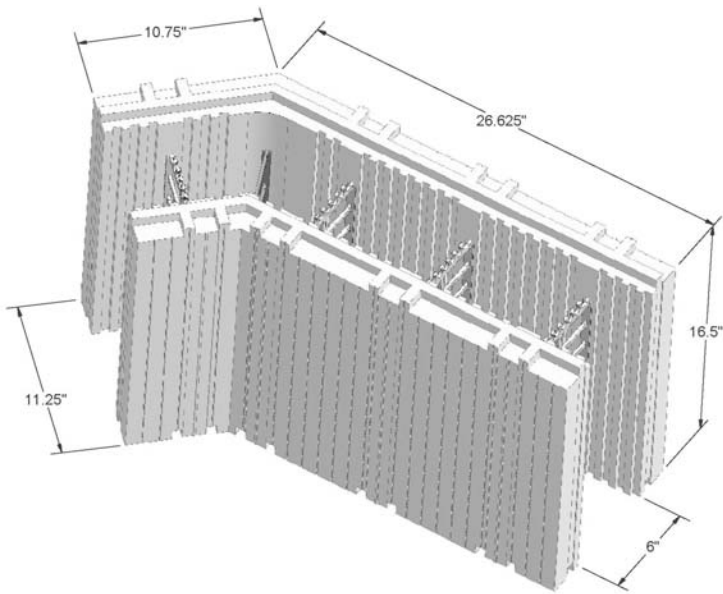
Each package of forms shall bear a label that includes the name or trademark of the report holder (Plasti-Fab, Ltd.); the evaluation report number (ESR-1578); and the name or logo of the inspection agency (Intertek Testing Services NA Ltd.—Warnock Hersey).



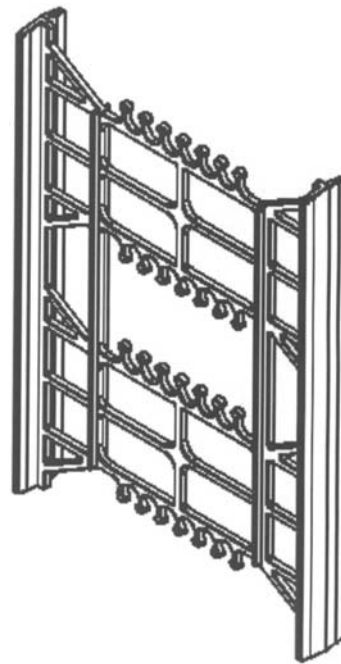
Advantage ICF System Straight Block



Advantage ICF System 90° Block



Advantage ICF System 45° Block



Advantage ICF System Web Connector

FIGURE 1—ADVANTAGE ICF SYSTEM

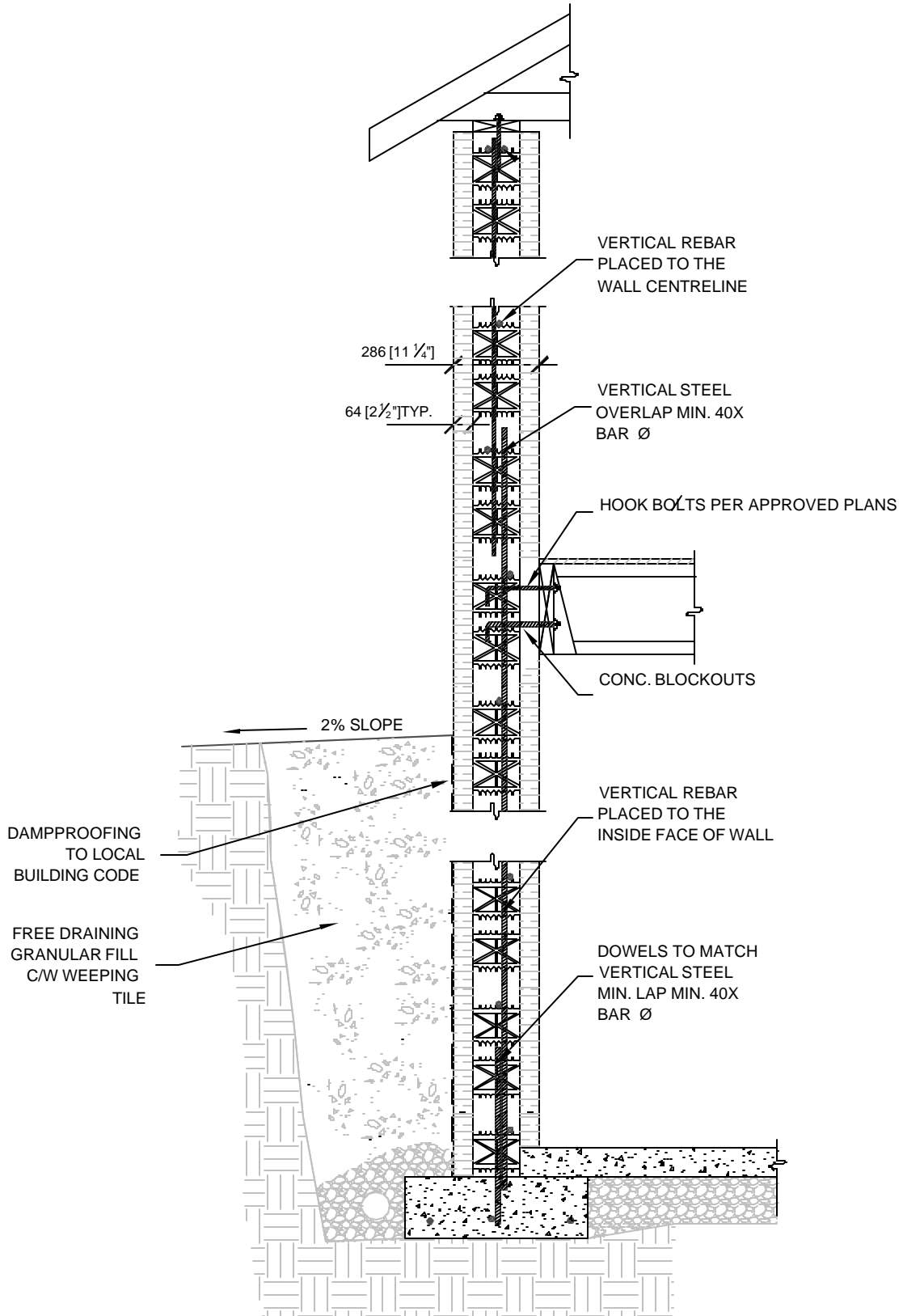


FIGURE 2—TYPICAL WALL SECTION, ADVANTAGE ICF SYSTEM, FOUNDATION AND ABOVE GRADE

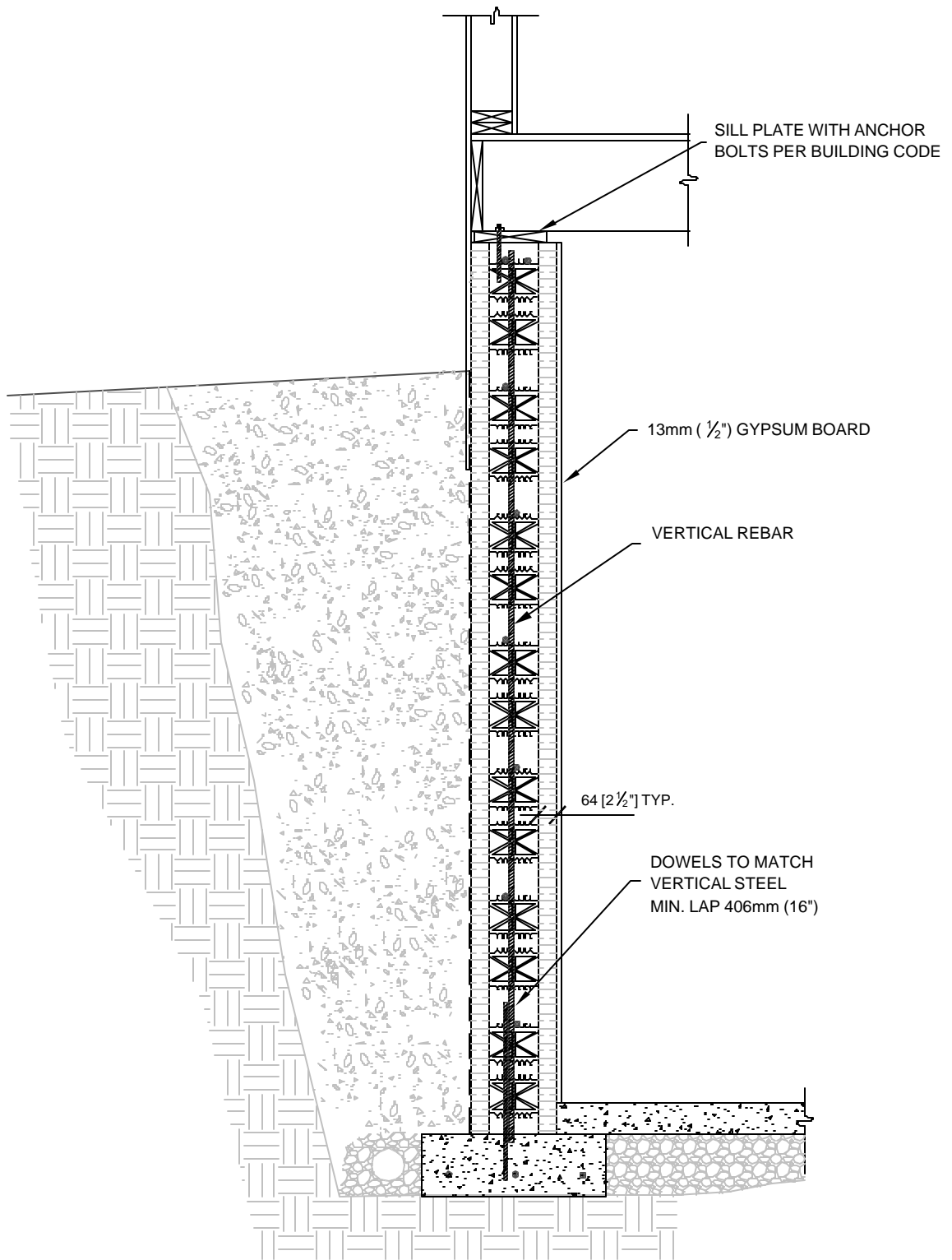


FIGURE 3—TYPICAL WALL SECTION, ADVANTAGE ICF SYSTEM, FOUNDATION AND WOOD STUD ABOVE GRADE