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

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DIVISION: 03—CONCRETE
Section: 03130—Permanent Forms

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EVALUATION SUBJECT:

FORMTECH INSULATED CONCRETE FORMS

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
- Fire resistance
- Surface burning characteristics
- Crawl space fire evaluation

2.0 USES

Formtech Insulated Concrete Forms are expanded polystyrene (EPS) foam plastic flat insulated concrete forms that serve as stay-in-place formwork for concrete bearing and nonbearing walls, shear walls, beams and lintels, foundation stem walls, basement walls, and retaining walls. The use of the Formtech Insulated Concrete Forms shall be limited to 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 forms shall be stacked in a running bond pattern to create concrete formwork that remains in place after concrete and reinforcement is placed and concrete cured. The interior wall surface shall be covered with an approved interior thermal barrier, and the exterior wall surface shall be covered with an approved exterior wall covering.

3.2 Materials:

3.2.1 Formtech Insulated Concrete Forms: The EPS foam plastic panels are 16 inches (406 mm) (height) by 48 inches (1219 mm) (length) with a wall thickness of $2^1/_2$ inches (64 mm). The EPS panels interlock at the top and bottom edges, and interconnect with plastic webs spaced at 8 inches (203 mm) on center. The webs retain the opposing EPS panels, which form a cavity where reinforcement and concrete are placed. The EPS panels are manufactured by injecting and expanding polystyrene beads in molds as described in the approved quality control manuals. The panels have a nominal density of 1.5 lb/ft^3 (24 kg/m^3) with a maximum flame-spread index of 25 and a smoke-developed index of 450 when tested in accordance with ASTM E 84 or UBC Standard 8-1. The panels have a Type II designation in accordance with ASTM C 578. A polypropylene gripper is molded within the EPS panel, flush to the inside face, every 8 inches (203 mm) on center horizontally. High-density polypropylene (plastic) webs connect to the grippers molded into the EPS panels, to form parallel formwork. The plastic webs are 4, 6, 8 or 10 inches (102, 152, 203 and 254 mm) wide, permitting the EPS panels to provide the respective cavity size. If a larger cavity is desired, a polypropylene double gripper is used to connect two plastic webs, to form 12-, 14-, 16-, 18- or 20-inch-wide (305, 356, 406, 457 or 508 mm) cavities. See Figure 1 for additional details. The polypropylene webs and grippers are Class CC2 approved plastic, manufactured by Sci Mould Inc., a subsidiary of Formtech International Corporation.

3.2.2 Concrete: The concrete shall be normal-weight concrete complying with Chapter 19 of the IBC or Chapter 19 of the UBC, and shall attain a 28-day minimum compressive strength of 2,500 psi (17 MPa). Maximum aggregate size shall be $^3/_4$ inch (19.1 mm). In jurisdictions adopting the IRC, the concrete shall comply with IRC Sections R404.4 and R611.6.1.

3.2.3 Reinforcement: Concrete members shall be reinforced with minimum No. 4 deformed steel reinforcing bars conforming to ASTM A 615, A 616, A 617, A 706, A 767 or A 775, having a minimum yield strength of 40,000 psi (276 MPa); and shall comply with IBC or UBC Section 1903, as applicable. If construction of the wall system is based on the IRC, reinforcement shall comply with IRC Sections R404.4.6 and R611.6.2.

3.2.4 Other: Wood members for plates of windows and door framing shall be treated with an approved wood preservative and shall be attached in place with zinc-coated galvanized anchor bolts or stainless steel anchor bolts complying with, and in accordance with, IBC Section 2304.9.5, IRC Section R319.3 or UBC Section 2304.3, as applicable. The zinc coating weight shall comply with ASTM A 153.

***Revised December 2006**

4.0 DESIGN AND INSTALLATION

4.1 Design:

4.1.1 IBC and UBC: Concrete members formed by the Formtech Insulated Concrete Forms shall be designed and constructed in accordance with Chapter 19 of the IBC or UBC, as applicable, and design loads shall comply with Chapter 16 of the applicable code. Under the UBC only, for walls limited to a maximum of two stories plus basement, and a maximum unsupported wall span of 10 feet (3048 mm), the design of the concrete walls formed by the Formtech Insulated Concrete Forms shall be in accordance with the Prescriptive Method for Insulating Concrete Forms in Residential Construction (publication No. EB118), dated May 1998, published by the Portland Cement Association, subject to all applicability limits of Table 1.1 contained therein. The document shall be made available to the code official for review and approval. Concrete wall systems formed using the EPS panels shall be classified as Flat Insulated Concrete Form Wall Systems, which are defined as a solid-concrete wall of uniform thickness (solid rectangular cross section) produced by the insulated concrete forms. In accordance with the provisions of Section 1806.3 of the UBC, foundation stem walls conforming to Table 18-1-C of the UBC and supporting stud-bearing walls shall not be required to be designed.

4.1.2 IRC: Insulated concrete walls formed by Formtech Insulated Concrete Forms comply with IRC Figure R611.3 as flat insulating concrete wall forms. Formtech Insulated Concrete Forms used in foundation walls and above-grade walls shall be designed and constructed in accordance with IRC Sections R404.4 and R611, respectively.

When the Formtech Insulated Concrete Forms are components of 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 concrete shall be prepared in accordance with ACI 318 and Chapter 19 of the IBC or UBC, as applicable. Use of the empirical design approach specified in the codes is prohibited for the design of concrete walls formed by the Formtech Insulated Concrete Forms system.

4.2 Installation:

The Formtech Insulated Concrete Forms and the resulting concrete wall system shall be supported on concrete footings complying with Chapter 18 of the IBC, Section R403 of the IRC or Chapter 18 of the UBC. Vertical rebars, embedded in the footing, shall extend a minimum of 24 inches (610 mm), or a length complying with Chapter 12 of ACI 318-02 or Section 1912 of the UBC, into the concrete wall system. The Formtech Insulated Concrete Forms shall be installed in a running bond pattern, with the high-density polypropylene (plastic) webs spaced 8 inches (204 mm) on center. The webs shall be aligned vertically to support the interior and exterior finish materials. Placement and coverage of vertical and horizontal steel reinforcement bars shall be in accordance with the applicable code and the approved design. Concrete and reinforcement shall comply with Chapter 19 of the IBC or UBC or Sections R404.4 and R611.6 of the IRC. See Figures 2 through 5 for typical details. Wood ledgers shall be attached to the concrete wall by removing portions of the face shell of the Formtech Insulated Concrete Forms. The height of the removed portion shall be equal to the depth of the wood ledger. Wood plates shall be anchored to the top of the wall. 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.

4.3 Interior Finish:

Formtech Insulated Concrete Forms exposed to the interior of the building shall be finished with an approved 15-minute thermal barrier, such as minimum $^1/_2$-inch-thick (12.7 mm) gypsum wallboard complying with ASTM C 36, installed and attached to the polypropylene grippers molded in the EPS panels using minimum $1^1/_4$-inch-long (31.8 mm), No. 6, Type S, bugle head screws spaced 12 inches (305 mm) on center vertically, and penetrating through each gripper at least $^3/_{16}$ inch (4.76 mm). Gypsum wallboard joints shall be taped and filled with joint compound. See Section 4.6 of this report for installation details when the forms are used as walls of crawl spaces without a covering on the interior face.

4.4 Exterior Finish:

4.4.1 Above Grade: When regulated by the IBC and UBC, Formtech Insulated Concrete Forms shall be covered on the exterior side of the building with an approved wall covering in accordance with the applicable code or a current evaluation report. When regulated by the IRC, Formtech Insulated Concrete Forms shall be covered on the exterior with a weather-resistant sheathing paper, in accordance with IRC Sections R703.1 and R703.2, and with an approved wall covering in accordance with the IRC or a current evaluation report. The approved exterior wall covering shall be attached to the polypropylene grippers using either minimum $1^5/_8$-inch-long (41.3 mm), No. 6, Type S, fine-thread, corrosion-resistant screws, or minimum $1^5/_8$-inch-long (41.3 mm), No. 6, Type W, coarse-thread, corrosion-resistant screws. The screws shall have sufficient length to penetrate the plastic grippers at least $^9/_{16}$ inch (14.3 mm). The No. 6, Type S screws described above have an allowable pullout capacity of 54 pounds (240 N), and an allowable lateral load capacity of 65 pounds (289 N). The No. 6, Type W screws described above have an allowable pullout capacity of 58 pounds (258 N) and an allowable lateral capacity of 76 pounds (338 N). The negative wind pressure capacity of the exterior finish material shall be the same as that recognized in the applicable code for generic materials, or that recognized in a current evaluation report for proprietary materials. Negative wind pressure capacity and capacity to support the gravity load of the wall covering shall also be limited by the fastener allowable loads reported in this section (4.4.1).

4.4.2 Below Grade: Materials used to dampproof or waterproof basement walls shall be specified by Formtech International Corporation and shall be compatible with the foam plastic units. Compliance with the drainage requirements in IBC Section 1807.4, IRC Section R405.1 or UBC Section 1804.7, as applicable, shall be provided. Basement walls designed to retain soil shall not be backfilled until concrete has reached the 28-day specified design strength and 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.

4.5 Foundation Stem Walls:

The Formtech Insulated Concrete Forms system is permitted to be used as a foundation stem wall when supporting wood-framed or concrete construction and when the structure is supported on concrete footings complying with the applicable code. Design and installation of the Formtech Insulated Concrete Forms system as foundation walls shall comply with IBC Section 1805.5 or IRC Sections R320.4 and R404.4, as applicable. In jurisdictions adopting the UBC, compliance with UBC Table 18-I-C is required.

4.6 Crawl Space Installation:

The Formtech Insulated Concrete Forms system located at underfloor crawl spaces shall be permitted to be exposed in a crawl space without a covering applied to the crawl space side of the foam plastic, provided all of the following conditions are met:

a. Entry to the crawl space shall be only to service utilities, and heat-producing appliances shall not be permitted.

b. There shall be no interconnected basement areas.

c. Air in the crawl space shall not be circulated to other parts of the building.

d. Ventilation shall comply with IBC Section 1203.3, IRC Section R408, or UBC Section 2306.7, as applicable.

4.7 Protection Against Termites:

In jurisdictions that have adopted the IRC, where the probability of termite infestation is "very heavy," the foam plastic shall be installed in accordance with IRC Section R320.4. Areas of very heavy termite infestation shall be determined in accordance with IRC Figure R301.2(6).

4.8 Fire-resistance-rated Construction:

Concrete walls that comply with the construction specifications listed in Item 4-1.1 of Table 720.1(2) of the IBC or Item 7-1.1 of Table 7-B of the UBC, formed by the Formtech Insulated Concrete Forms, have the fire-resistance ratings specified in Table 720.1(2) of the IBC and Table 7-B of the UBC.

4.9 Special Inspection:

4.9.1 IBC and UBC: Special inspection shall be required as noted in Section 1704 of the IBC or Section 1701 of the UBC for placement of reinforcing steel and concrete, and concrete cylinder testing, except that inspection shall not be required for foundation stem walls conforming to Table 18-1-C of the UBC. Under the UBC only, with approval by the code official, special inspection shall not be required when all of the following conditions are met:

a. Wall systems shall be a maximum of 8 feet (2.4 m) in height and shall be limited to use in single-story construction of Group R, Division 3, or Group U, Division 1, Occupancy.

b. Maximum height of the concrete pour shall be 48 inches (1219 mm). Succeeding deposits must be placed in accordance with UBC Section 1905.10.5.

c. Installation is by installers approved by Formtech International Corporation.

d. Half the allowable stresses or loads permitted by the UBC are used for the design of walls.

e. Installation instructions indicate methods used to verify proper placement of concrete.

4.9.2 IRC: For walls constructed in accordance with Section 4.1.2 of this report, special inspection is not required. For walls designed in accordance with the IBC, as permitted by IRC Sections R104.11 and 4301.1.2, special inspection in accordance with Section 4.9 of this report is required.

5.0 CONDITIONS OF USE

The Formtech Insulated Concrete Forms described in this report comply with, or are suitable alternatives to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

5.1 Form units shall be manufactured, identified and installed in accordance with this report and Formtech's published installation instructions. If there is a conflict between the manufacturer's published installation instructions and this report, this report shall govern.

5.2 Concrete walls formed by the units shall be limited to combustible construction, as defined in Chapter 6 of the IBC and UBC, and to construction in accordance with 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 the UBC shall be submitted to the code official for approval, except calculations are not required when the building design is based on Section 4.1.1 or Section 4.1.2 of this 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 Except as described in Section 4.6 of this report, form units shall be separated from the interior of the building by an approved thermal barrier, such as minimum $^1/_2$-inch-thick (12.7 mm) regular gypsum wallboard installed as described in Section 4.3 of this report.

5.5 When used as part of a fire-resistance-rated assembly, Section 4.8 of this report shall apply.

5.6 Special inspection shall be provided in accordance with Section 4.5 of this report.

5.7 Form units are manufactured by SCA Packaging North America at their facility in either New Brighton, Pennsylvania, or Colorado Springs, Colorado, under a quality control program with inspections by Intertek Testing Services NA Ltd. (AA-688).

6.0 EVIDENCE SUBMITTED

6.1 Data in accordance with the ICC-ES Acceptance Criteria for Foam Plastic Insulation (AC12), dated February 2005, including data in accordance with Section 3.2.1; reports of tests in accordance with ASTM C 578; reports of comparative crawl space fire tests; and a report of a room corner fire test in accordance with UBC Standard 26-3.

6.2 Data in accordance with the ICC-ES Acceptance Criteria for Concrete and Concrete Masonry Wall Systems (AC15), dated June 2003 (editorially revised March 2005).

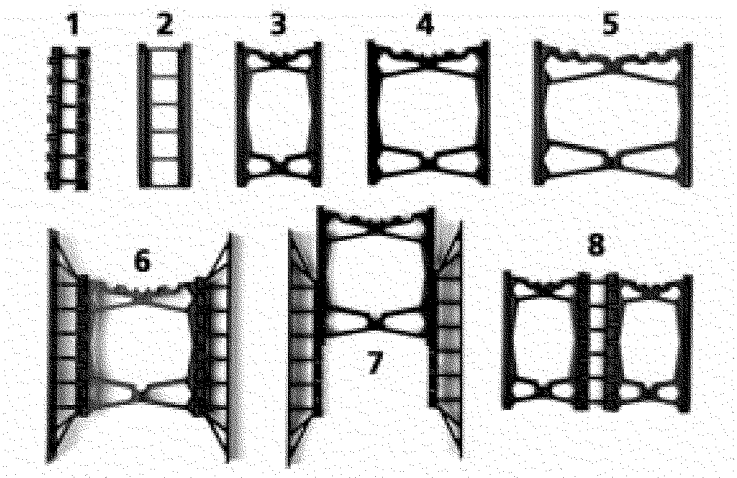
6.3 Reports of fastener withdrawal and lateral load tests.

6.4 A quality control manual.

7.0 IDENTIFICATION

Each bundle or pallet of form units shall bear a stamped label that includes the name and address of SCA Packaging North America, the evaluation report number (ESR-1521), and the name of the inspection agency (Intertek Testing Services NA Ltd.).

Plastic web connectors are provided in boxes that are marked with the name WebTec (the Formtech plastics trade name), the cavity size, and Formtech's logo and phone numbers.



1. Two-sided gripper
2. 2-1/2" web
3. 4" web
4. 6" web
5. 8" web
6. 2 grippers with a 6" web
7. Same as 6 with web sliding into gripper
8. Two 4" webs connected with a double-sided gripper

FIGURE 1—CAVITY WEBS

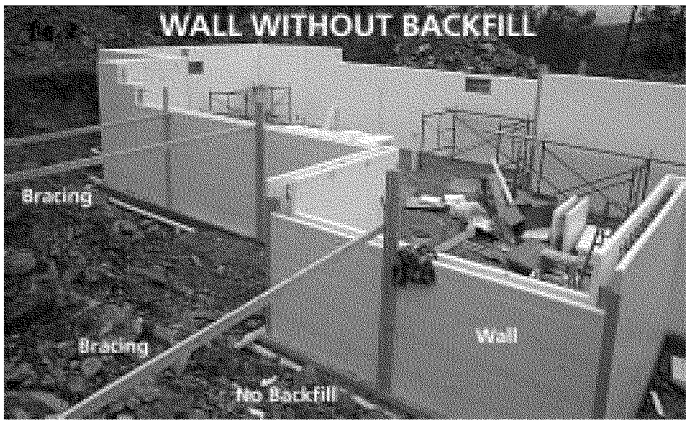


FIGURE 2—WALL WITHOUT BACKFILL

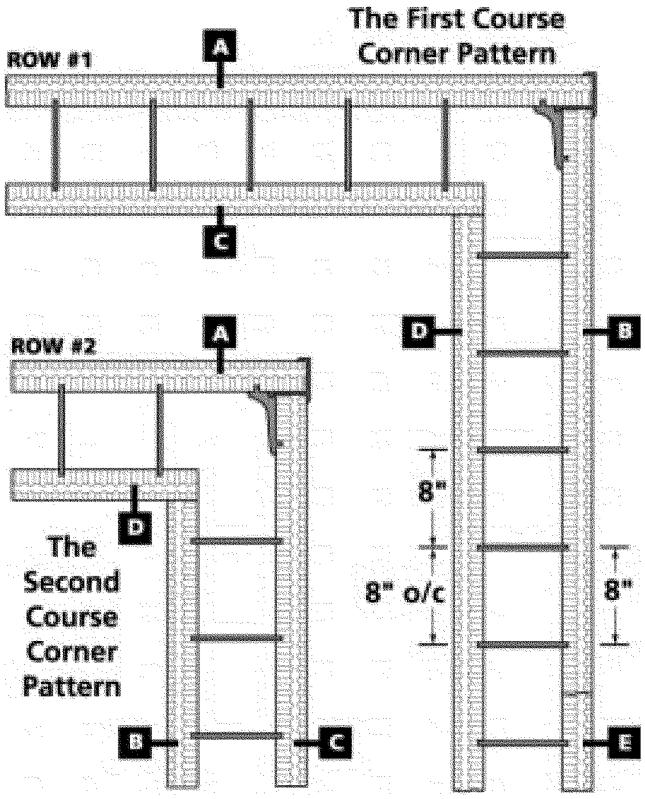


FIGURE 3—CORNER ASSEMBLY

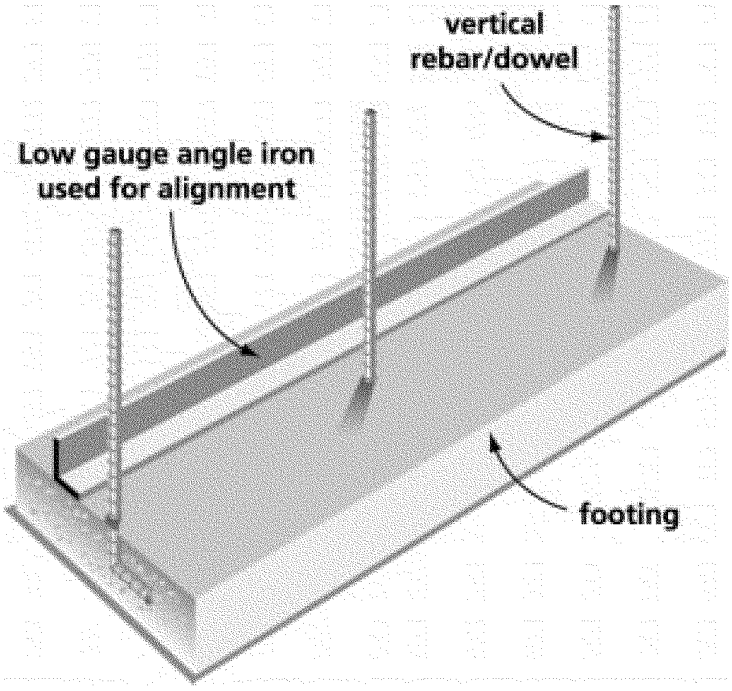


FIGURE 4—FOOTING DETAIL

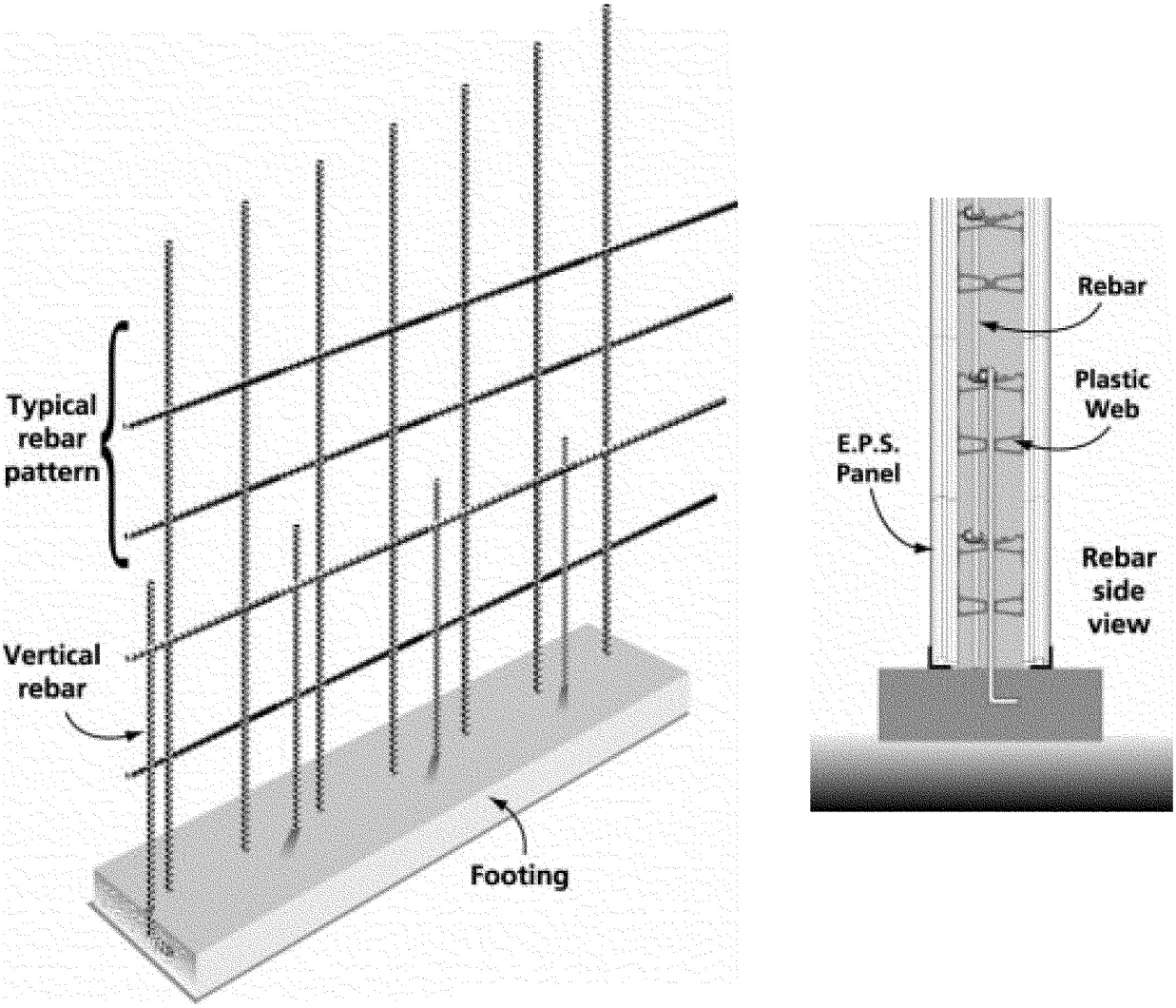


FIGURE 5—REBAR DETAIL