

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:

ECO-BLOCK, LLC
11220 GRADER STREET, SUITE 700
DALLAS, TEXAS 75238
(800) 595-0820
www.eco-block.com

EVALUATION SUBJECT:

ECO-BLOCK INSULATED CONCRETE FORMS (ICFs)

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2003 *International Building Code*® (IBC)
- 2003 *International Residential Code*® (IRC)
- 1997 *Uniform Building Code*™ (UBC)
- BOCA® *National Building Code*/1999 (NBBC)
- 1999 *Standard Building Code*® (SBC)

Properties evaluated:

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

2.0 USES

ECO-Block insulated concrete forms (ICFs) 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 shall be covered with approved interior and exterior finish material. For use in buildings of Types I, II, III and IV (noncombustible) construction, installation shall be in accordance with Section 4.10 of this report.

3.0 DESCRIPTION

3.1 General:

ECO-Block ICFs consist of expanded polystyrene (EPS) foam plastic panels and plastic webs. These forms are classified as a flat ICF wall system in accordance with IRC Section R611.3.

3.2 Material:

3.2.1 ECO-Block Standard Forms: The EPS panels of the ECO-Block Standard forms are 16 inches (406 mm) high, 48 inches (1219 mm) long and 2.5 inches (63.5 mm) thick. The panels are manufactured by injecting and expanding polystyrene beads in molds, as described in the approved quality control manual. The resulting expanded polystyrene foam plastic complies with ASTM C 578-01 as Type II. The polystyrene has a flame-spread index of 25 or less and a smoke-developed index of 450 or less at a 1.5 pcf (24 kg/m³) density. Plastic webs embedded in the EPS panels are spaced at 8 inches (203 mm) on center and recessed 1/4 inch (6.4 mm) from the EPS panel surface. The plastic connectors, of one of four different lengths, connect the webs of two panels to form 4-inch-, 6-inch-, 8-inch- or 10-inch-thick (102 mm, 152 mm, 203 mm or 254 mm) concrete walls. Splice connectors are used to join the connectors to form 12-inch- to 24-inch-thick (305 mm to 610 mm) concrete walls. The webs, connectors and splice connectors are high-density polypropylene, a Class CC2 approved plastic, manufactured by Fourmark Manufacturing. The form units have a preformed interlocking mechanism on their top and bottom edges, to facilitate stacking. In addition to standard forms, 45-degree angle forms, 90-degree angle corner forms and ledge blocks are also available. See Figure 1 of this report for descriptions of the forms.

The 45-degree angle forms and 90-degree angle corner forms are used to construct wall intersections. The ledge blocks are used to construct concrete corbels that serve as ledges, for supporting exterior brick veneers and interior floor construction.

3.2.2 ECO-Block Commercial Forms: ECO-Block Commercial Forms are similar to ECO-Block Standard Forms, except EPS panels measure 24 inches (610 mm) high, 48 inches (1219 mm) long, and 2 inches (51 mm) thick, and the EPS used complies with ASTM C 578-01 as Type II, with a density of 1.7 pcf (27.2 kg/m³).

3.2.3 Concrete: Concrete shall be normal-weight concrete, complying with the applicable code, having a maximum aggregate size of 3/4 inch (19 mm) and a minimum compressive strength of 2,500 psi (17 MPa) at 28 days, except as noted in Section 4.9 of this report for fire-resistance-rated construction. Under the IRC, concrete shall comply with IRC Sections R404.4 and R611.6.1; under the SBC, concrete shall comply with SBC Section 1916.6.1.

3.2.4 Reinforcement: Walls shall be reinforced with deformed steel bars, having a minimum yield stress of either 40 ksi (275MPa) or 60 ksi (413MPa), depending on the structural design. The deformed steel bars shall comply with Section 3.5.3.1 of ACI 318-02 (IBC), UBC Section 1903.5, Section 3.5.3.1 of ACI 318-95 (NBBC) or SBC Section 1916.6.2, as applicable. If construction is based on the IRC, reinforcement shall comply with IRC Sections R404.4.6 and R611.6.2.

3.2.5 Other: Wood members in contact with concrete for plates of window and door framing shall be treated with an approved wood preservative in accordance with the applicable code, and attached with hot-dipped galvanized steel fasteners complying with IBC Section 2304.9.5, IRC Section R319.3, UBC Section 2304.3, BNBC Section 2311.3.3, or SBC Section 2306.3, as applicable.

4.0 DESIGN AND INSTALLATION

4.1 Design:

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

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

4.1.3 IRC or SBC Method: Insulated concrete walls formed by ECO-Block Standard or Commercial Forms comply with IRC Figure R611.3 and SBC Figure 1916.3 as flat insulating concrete wall forms. Wall design, construction and materials shall comply with IRC Sections R404.4 and R611, or with SBC Sections 1804.6.2 and 1916, as applicable, for flat insulating concrete form wall systems.

When the ECO-Block Standard or Commercial Forms are used to construct buildings that do not conform to the applicability limits of IRC Sections R404.4.1 and R611.2 or SBC Sections 1916.2 and 1804.6.2.1, the structural analysis and design of the concrete shall be in accordance with ACI 318 and Chapter 19 of the IBC, BNBC, SBC or UBC, as applicable.

4.2 Installation:

The ICFs and resulting concrete walls shall be supported on concrete footings complying with IBC or UBC Chapters 18 and 19, IRC Chapter 4, or BNBC or SBC Chapter 18, as applicable. The ICFs shall be assembled by connecting two side panels with connectors of the appropriate length, to form the required wall thickness. Placement of the form units shall begin at a corner and proceed around the building perimeter. The amount, placement and spacing of reinforcing required shall be determined for each project, based on the approved plans and the applicable code. Vertical rebars embedded in the footing shall extend into the base of the wall system the minimum development length necessary for compliance with Chapter 12 of ACI 318-02 (IBC and IRC), UBC Section 1912, or Chapter 12 of ACI 318-95 (BNBC and SBC). Additional reinforcement around doors and windows shall be described in the approved plans. Concrete quality, mixing and placement shall comply with IBC Section 1905, IRC Section R611.6.1, UBC Section 1905, Chapter 5 of ACI 318-95 (BNBC) or SBC Section 1916.6.1, as applicable. Window and door openings shall be built into the form units, with wood or polyvinyl chloride plastic frames of the same dimensions as the "rough stud opening" specified by the window or door manufacturer, prior to the placement of the concrete. Wood ledgers shall be attached to the concrete wall by removing the face shell of the form units, with the height of the removed portion being equal to the depth of the wood ledger. Wood plates 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 and the applicable code.

4.3 Interior Finish:

Form units exposed to the building interior 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, placed with the long side vertical. The wallboard shall be attached to the plastic webs of the form units with minimum 1 1/2-inch-long (38 mm), No. 6, coarse-thread, gypsum wallboard screws, spaced 16 inches (406 mm) on center horizontally and vertically in the field, and 8 inches (203 mm) on center along wallboard edges. The screws shall penetrate through the web 1/4 inch (6.4 mm). Gypsum wallboard joints shall be taped and filled with joint compound. See Section 4.7 of this report for installation details when 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, BNBC, SBC or UBC, the ECO-Block 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 ECO-Block ICF wall system 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 plastic webs with No. 6, coarse-thread, gypsum wallboard screws, No. 8, fine-thread, gypsum wallboard screws, No. 10 wood screws, or No. 16 gage staples with a 1/2-inch (12.7 mm) crown width. The fasteners shall be corrosion-resistant and have sufficient length to penetrate through the web flange at least 1/4 inch (6 mm). Fasteners have allowable withdrawal and lateral capacities as shown in Table 2 of this report. The maximum fastener spacing shall be designed to support the gravity loads of the wall covering and resist the negative wind pressures. 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.

4.4.2 Below Grade: Materials used to damp-proof basement walls shall be specified by ECO-Block, LLC, and shall comply with the applicable code or a current evaluation report, and shall be compatible with the foam plastic units. Applicable damp-proofing and waterproofing requirements are in IBC Section 1807, IRC Section R406, UBC Appendix Chapter 18, BNBC Section 1813.0 and SBC Section 1814. Compliance is required with drainage requirements in IBC Section 1807.4, IRC Section R405.1, UBC Section 1804.7, BNBC Section 1813.5 or SBC Section 1814. No backfill shall be 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.

4.5 Foundation Walls:

The ECO-Block ICF 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 ECO-Block ICF System as foundation stem walls shall comply with IBC Section 1805.5, IRC Section R404.4, BNBC Section 1812.0 or SBC Section 1804.6.2, as applicable. In jurisdictions adopting the UBC, compliance with UBC Table 18-I-C is required.

4.6 Retaining Walls:

The ECO-Block ICF system is permitted to be used as a retaining wall with reinforcement designed in accordance with accepted engineering principles and Section 4.1 of this report.

4.7 Crawl Space Installations:

The ECO-Block ICF system is permitted to be used as walls of crawl spaces without a 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 no heat-producing appliances are permitted.
2. There are no interconnected basement areas.
3. Air in the crawl space is not circulated to other parts of the building.
4. Underfloor ventilation is provided that complies with IBC Section 1203.3, IRC Section R408, UBC Section 2306.7, BNBC Section 1210.2 or SBC Section 1804.6.3.1.

4.8 Protection Against Termites:

In jurisdictions that have adopted the IRC or SBC, where the probability of termite infestation is defined as "very heavy" by the code official, the foam plastic shall be installed in accordance with Section R320.4 of the IRC or Sections 1916.7.5 and 2603.3 of the SBC, as applicable. Areas of very heavy termite infestation shall be determined in accordance with Figure R301.2(6) of the IRC and Figure 2304.1.4 of the SBC, as applicable.

4.9 Fire-resistance-rated Construction:

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

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

For SI: 1 inch = 25.4 mm.

The normal-weight concrete shall have carbonate aggregate and a minimum 28-day compressive strength of 3,500 psi (24.1 MPa). The minimum reinforcement shall be No. 5 reinforcing bars. The bars placed vertically shall be in the center of the wall, and spaced 12 inches (305 mm) on center. The bars placed horizontally shall be spaced 16 inches (406 mm) on center, and shall be staggered on either side of the vertical bars, from row to row. The maximum axial compression load shall be 7 percent of the load determined in accordance with Chapter 19 of the IBC, UBC, BNBC or SBC, as applicable.

4.10 Types I, II, III and IV Construction (IBC), and Noncombustible Construction (UBC, BNBC and SBC):

4.10.1 General: For use as exterior walls of Types I, II, III and IV construction under the IBC, or as walls required to be of noncombustible construction under the UBC, BNBC or SBC, installation shall be in accordance with Section 4.10.2 of this report. The assemblies described in Section 4.10.2 of this report comply with IBC Section 1406.2.1.1.

4.10.2 Installation in Buildings Required to Be of Types I, II, III and IV Construction (IBC) and Noncombustible Construction (UBC, BNBC and SBC): Exterior walls constructed with ECO-Block ICFs are permitted to be used in buildings required to be Types I, II, III and IV construction (IBC) and noncombustible construction (UBC, BNBC and SBC), provided the applicable conditions cited below are met:

- a. Interior Finish: The EPS foam plastic insulation shall be separated from the building interior with an approved 15-minute thermal barrier, such as minimum 1/2-inch-thick (12.7 mm) regular gypsum wallboard installed as specified in Section 4.3 of this report. Other thermal barriers shall be acceptable, provided they are recognized as equivalent to minimum 1/2-inch-thick (12.7 mm) regular gypsum wallboard, and applied in accordance with a current evaluation report.
- b. Exterior Wall Covering: The exterior surface of the ECO-Block ICFs shall be covered with the Senergy Senerflex Wall System EIFS as described in Section 2.1.4 of ER-3850.
- c. Fireblocking: For applications on buildings of any height, floor-to-wall intersections shall be fireblocked in accordance with the applicable code to prevent the passage of flame, smoke and hot gases from one story to another. The foam plastic insulation on the interior side of the exterior walls and on both sides of interior walls shall not be continuous from one story to another. See Figure 2 of this report for typical details.

4.11 Special Inspection:

4.11.1 IBC: Special inspection is required as noted in IBC Section 1704 for placement of reinforcing steel and concrete, and for concrete cylinder testing.

Special inspections in accordance with IBC Sections 1704.1 and 1704.12 are required when the EIFS wall covering system is applied. Duties of the special inspector include verifying field preparation of materials, expiration dates, installation of components, curing of components, installation of joints and sealants.

4.11.2 IRC: For walls constructed in accordance with Section 4.1.3 of this report, special inspection is not required. For walls designed in accordance with the IBC, as permitted by IRC Sections R104.11 and R301.1.2, special inspection in accordance with Section 4.11.1 of this report is required.

4.11.3 UBC: Special inspection is required as noted in 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 of the following conditions are met:

1. Walls are a maximum of 8 feet (2.4 m) high, and are limited to use in single-story construction of Group R, Division 3, or Group U, Division 1, Occupancies.
2. Maximum height of a concrete deposit is 48 inches (1219 mm). Succeeding deposits must be placed in accordance with UBC Section 1905.10.5.
3. Installation is by installers approved by ECO-Block, LLC.
4. Half the allowable stresses or loads permitted by the UBC are used for the design of the walls.
5. Installation instructions indicate methods used to verify proper placement of concrete.

4.11.4 BNBC: Special inspection is required as noted in BNBC Section 1705.4, and is to include, but not be limited to: concrete, reinforcing steel and formwork materials, installation of reinforcing steel, formwork installation, bracing, and concreting operations.

4.11.5 SBC: Special inspection is required as noted in SBC Section 1707.1, and is to include, but not be limited to: concrete, reinforcing steel and formwork materials, installation of reinforcing steel, formwork installation, bracing, and concreting operations.

5.0 CONDITIONS OF USE

The ECO-Block Insulated Concrete Forms (ICFs) 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 are manufactured, identified and installed in accordance with this report and ECO-Block'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 Form units shall be separated from the building interior with an approved 15-minute thermal barrier, except for crawl space construction as described in Section 4.7 of this report.
- 5.3 When use is as part of a fire-resistance-rated assembly, Section 4.9 of this report shall apply.
- 5.4 Except as described in Section 4.10 of this report, concrete walls formed by the units are limited to combustible construction as defined in Chapter 6 of the IBC, BNBC, SBC or UBC, as applicable, and to construction in accordance with the IRC.
- 5.5 When use is in buildings required to be of noncombustible construction, as described in Section 4.10 of this report, one label as described in Section 7.0 of this report shall be visible in every 160 square feet (14.7 m²) of wall area.
- 5.6 When required by the code official, calculations showing compliance with the general design requirements of Chapter 16 of the IBC, BNBC 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 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.
- 5.7 Concrete quality, mixing and placement shall comply with IBC Section 1905, IRC Section R611.6.1, UBC Section 1905, Chapter 5 of ACI 318-95 (BNBC) or SBC Section 1916.6.1, as applicable.

5.8 Special inspection shall be provided in accordance with Section 4.11 of this report.

5.9 Form units are manufactured by the manufacturers noted in Table 1 of this report, under a quality control program with inspections conducted by Intertek Testing Services NA, Inc. (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 3.3.2.2; 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.

6.3 Reports of fire-resistance tests in accordance with ASTM E 119.

6.4 Reports of fastener withdrawal and lateral load tests.

6.5 Manufacturer's published installation instructions.

6.6 Quality control manuals.

7.0 IDENTIFICATION

Both faces of each ICF shall be labeled with the product name (ECO-Block Standard or ECO-Block Commercial); the ECO-Block, LLC, name, address and telephone number; the evaluation report number (ESR-1182); the manufacturing date; the lot number; the manufacturing location number (see Table 1 of this report); and the name of the inspection agency (Intertek Testing Services NA, Inc.). See Table 1 of this report for manufacturer location number and recognized product name(s).

Plastic web connectors and splice connectors are provided in boxes that are marked with the connector manufacturing date and lot number. Also, web connectors and splice connectors are molded with the word "ECO".

TABLE 1—ICF PRODUCT AND MANUFACTURER INFORMATION

ICF PRODUCT NAME	MANUFACTURER	MANUFACTURER'S ADDRESS	MANUFACTURING LOCATION NO.	CONTACT	TITLE	PHONE	FAX
Standard Commercial	Contour Products, Inc.	4001 Kaw Street Kansas City, Kansas 66102	66102	James Jaramillo	QC Representative	913-321-4114	913-321-8063
Standard Commercial	Life Like Products	17 Douglas Street Rome, Georgia 30161	30161	Wayne Helton	QC Manager	706-235-5832	706-235-0494
Standard	Life Like Products	1600 West Highway 287 Waxahachie, Texas 75165	75165	David Talley	QC Manager	972-937-6512	972-384-9430
Standard Commercial	Marko Foam Products	2990 W. Directors Row Salt Lake City, Utah 84104	84104	Zach Jone	QC Representative	801-872-1354	801-972-9463
Standard Commercial	Polymos, Inc.	150, 5e Boulevard Terrasse Vaudreuil Quebec, Canada J7V 5M3	57856	Danny Roch	QC Representative	514-453-1920	514-453-0295
Standard	SCA North America Packaging Division	1830 Rockdale Industrial Boulevard Conyers, Georgia 30012	30012	Brian Strong	QA Manager	770-929-3800	770-760-7725
Standard	SCA North America Packaging Division	109 Lynch Street Pardeeville, Wisconsin 53954	53954	Josh Short	QA Manager	608-429-2104	608-429-2821

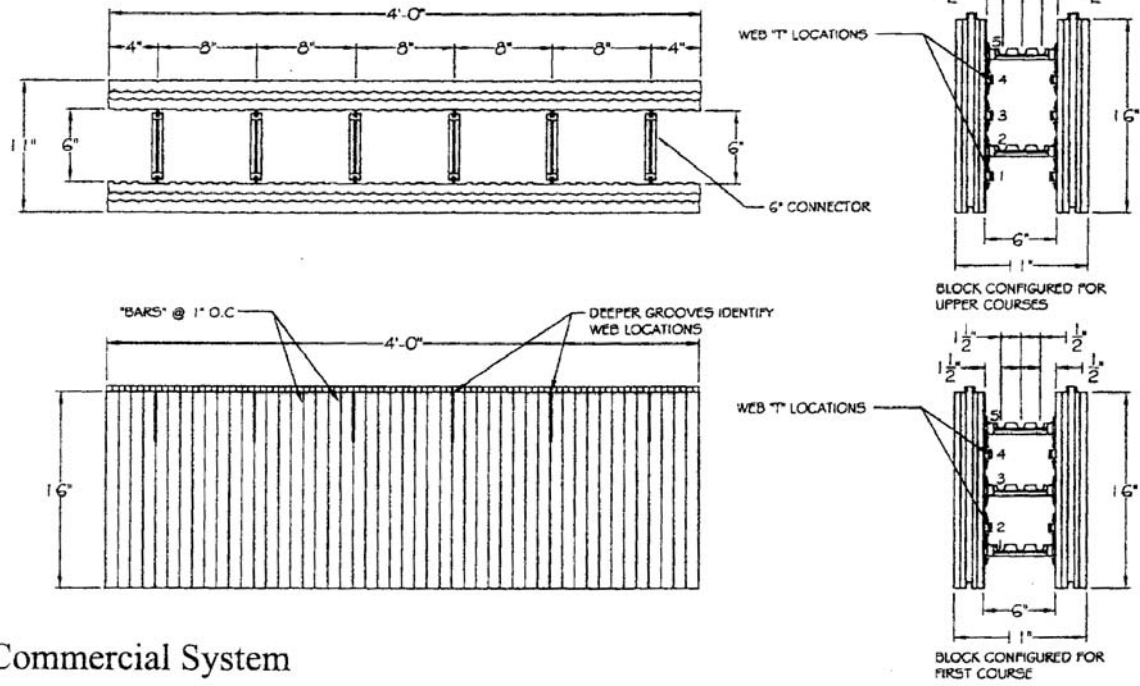
TABLE 2—ALLOWABLE WITHDRAWAL AND LATERAL CAPACITIES OF FASTENERS IN PLASTIC WEB FLANGES¹

FASTENER	ALLOWABLE CAPACITY (pounds)	
	Lateral	Withdrawal
No. 6, coarse-thread gypsum wallboard screw	50	31
No. 8, fine-thread gypsum wallboard screw	97	34
No. 10 wood screw	112	40
No. 16 gage staple (1/2-inch crown width)	24	7

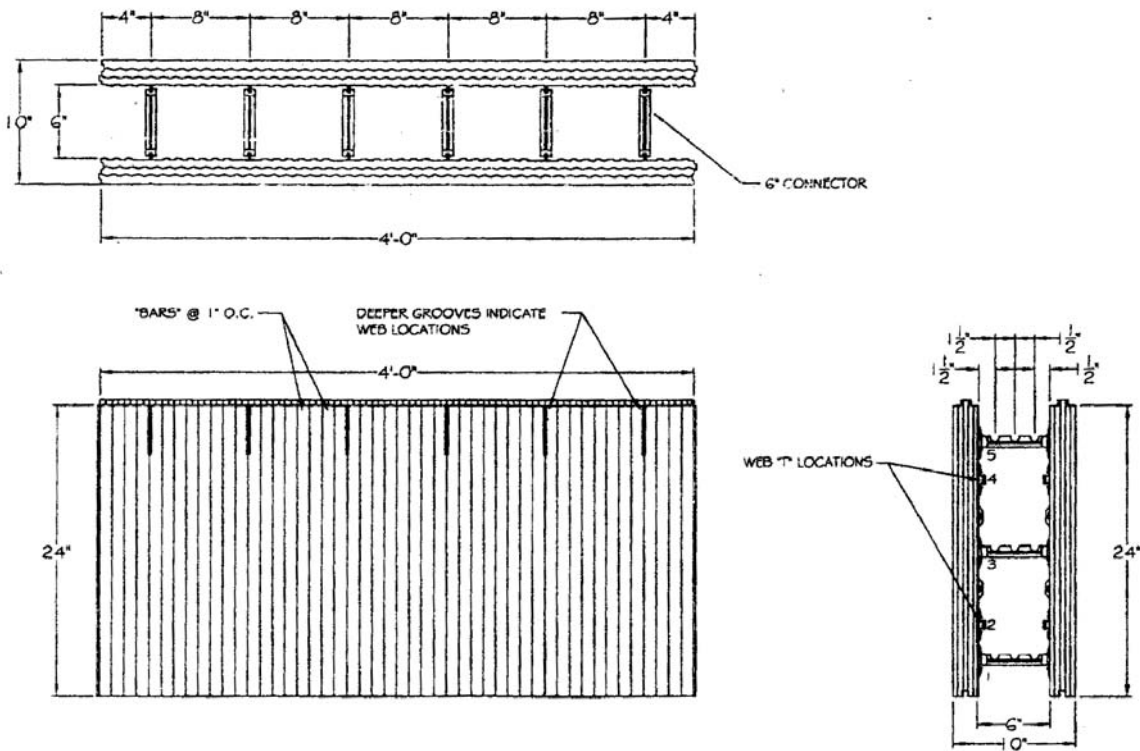
For SI: 1 pound = 4.45 N; 1 inch = 25.4 mm.

¹Fasteners shall be corrosion-resistant and have sufficient length to penetrate through the web flange at least 1/4 inch (6 mm).

Standard System

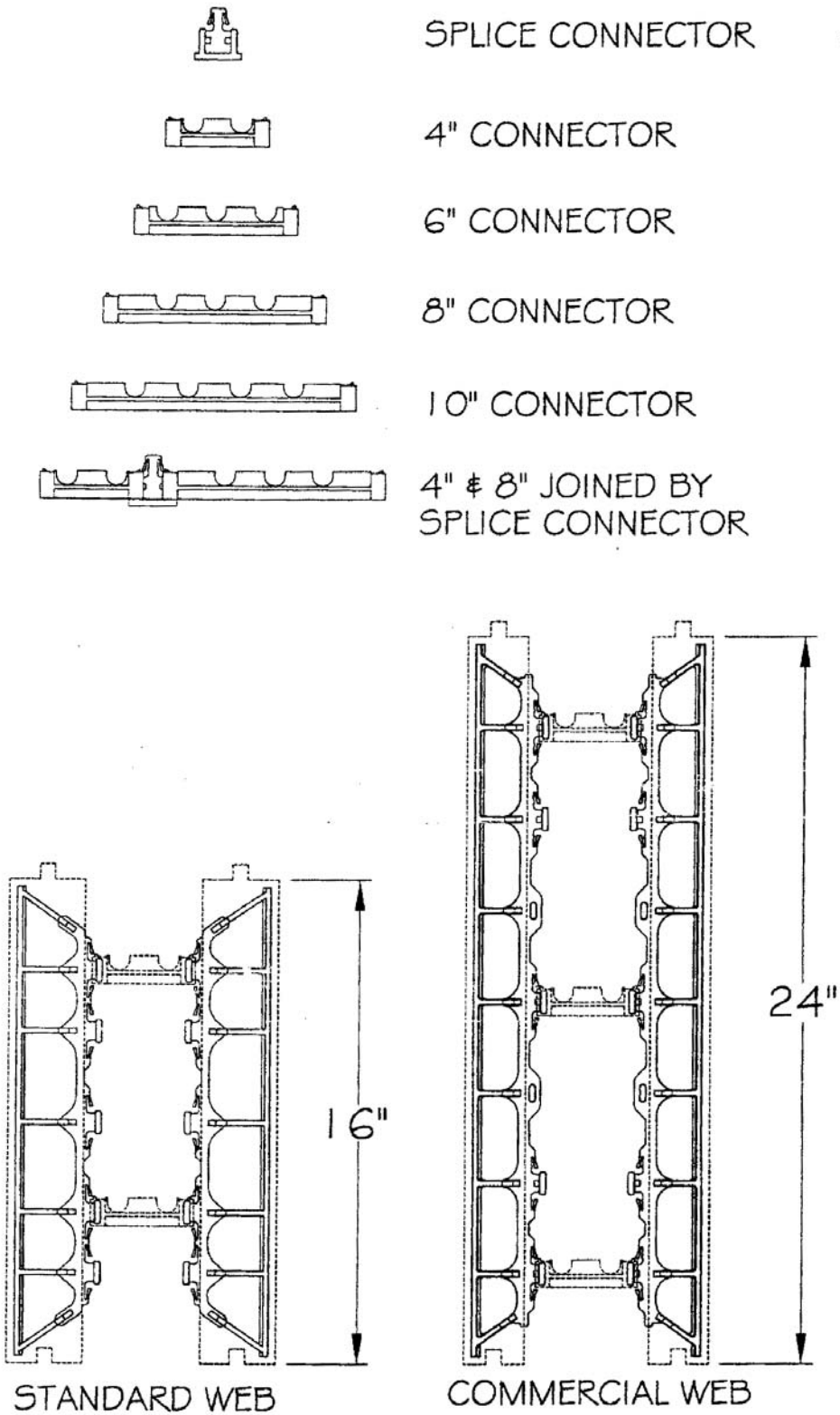


Commercial System



For SI: 1 inch = 25.4 mm.

FIGURE 1—ECO-BLOCK DESCRIPTIONS



For SI: 1 inch = 25.4 mm.

FIGURE 1—ECO-BLOCK DESCRIPTIONS (Continued)

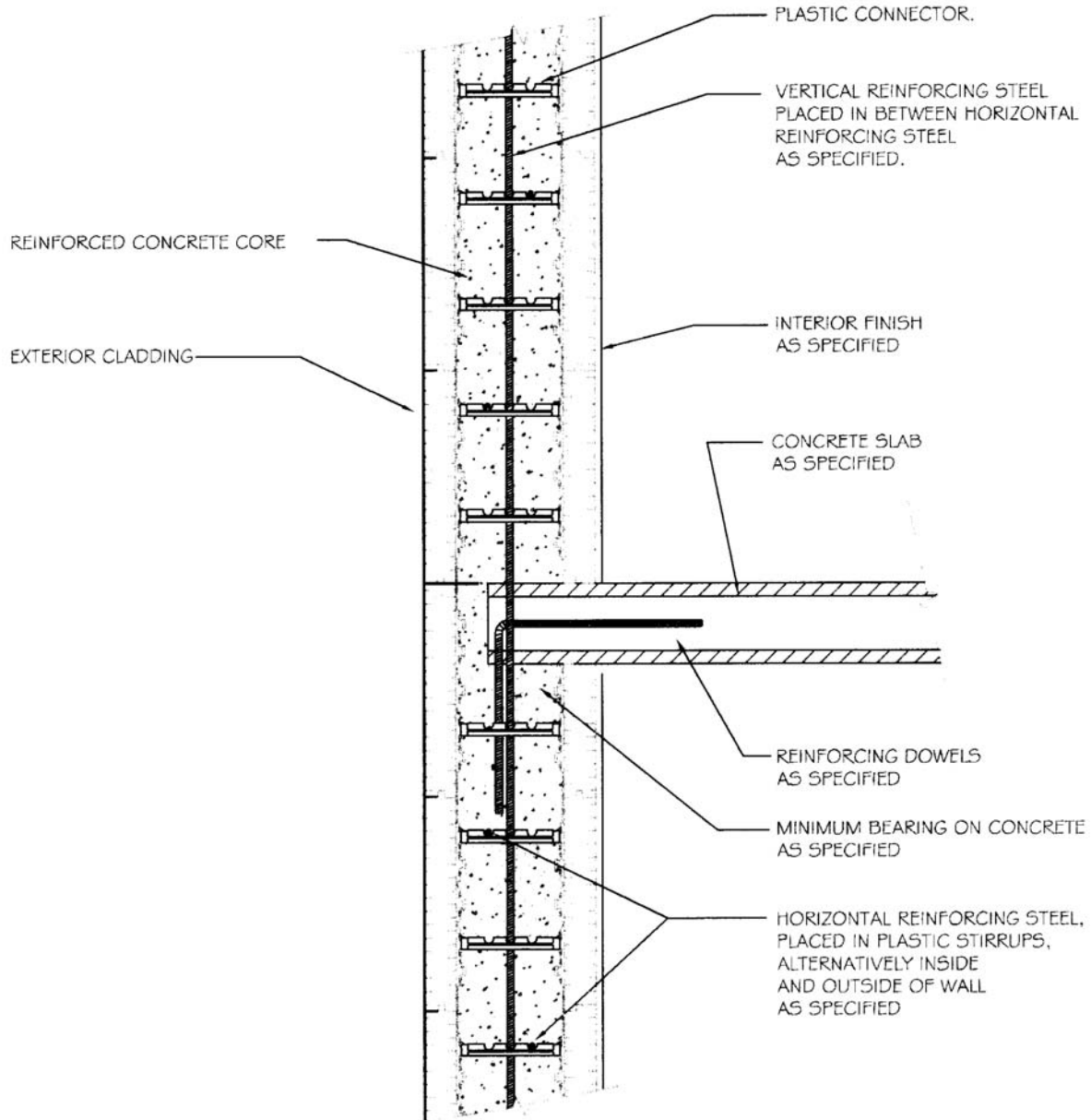


FIGURE 2—TYPICAL WALL-TO-FLOOR INTERSECTION FOR TYPES I, II, III AND IV CONSTRUCTION (IBC), AND NONCOMBUSTIBLE CONSTRUCTION (UBC, BNBC AND SBC)