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DIVISION: 03—CONCRETE
Section: 03130—Permanent Forms

REPORT HOLDER:

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EVALUATION SUBJECT:

**AMVIC EXPANDED POLYSTYRENE INSULATED
CONCRETE FORMWORK**

1.0 EVALUATION SCOPE

Compliance with the following codes:

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

Properties evaluated:

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

2.0 USES

Amvic Insulated Concrete Formwork is used as a permanent insulating concrete form (ICF) 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 protected by an approved interior and exterior finish material. The forms are recognized for use in buildings of noncombustible construction when installed in accordance with Section 4.2.7 of this report.

3.0 DESCRIPTION

3.1 General:

The Amvic Insulated Concrete Formwork is classified as a Flat ICF system, allowing for a solid concrete wall of uniform

thickness (solid rectangular cross section). See Figure 1 of this report for an illustration of the form.

Amvic Insulated Concrete Formwork consists of two expanded polystyrene (EPS) foam plastic boards separated by injection-molded polypropylene webs, which are pre-inserted in the EPS mold before molding so that the webs are partially embedded into the EPS boards. The ICF system also incorporates polypropylene corner rods to assist in the attachment of finish materials. The polypropylene webs, which are spaced 6 inches (152 mm) on center horizontally, maintain the EPS board facings at a fixed clear distance of 4 inches (102 mm), 6 inches (152 mm) or 8 inches (203 mm). EPS boards are 16 inches (406 mm) high by 48 inches (1220 mm) long by 2.5 inches (64 mm) thick, measured at the center of the board. When stacked in a running bond pattern, the Amvic Insulated Concrete Formwork creates a cavity where steel reinforcement bars and concrete are placed. See Figure 1 of this report for typical dimensions.

3.2 Materials:

3.2.1 Foam Plastic: The EPS foam plastic used in the manufacture of Amvic ICF 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 at a maximum thickness of 5 inches. The foam plastic complies with ASTM C 578, Type II.

3.2.2 Polypropylene Webs and Corner Rods: The polypropylene webs are used to connect the EPS boards and for attaching interior and exterior finishes. The webs have openings to permit concrete to pass through. The webs vary in length and have 1½-inch-wide-by-11½-inch-high-by-0.118-inch-thick (38 mm by 292 mm by 3.0 mm) flanges. The plastic flange is embedded ½ inch (12.7 mm) below the outside surface of the EPS form.

The corner rods are 1-inch-by-1-inch (25.4 mm by 25.4 mm) extruded polypropylene hollow square tubes with a wall thickness of 0.125 inch (3.2 mm). The rods shall be field-installed in vertical openings at the corners of the Amvic units to provide a means for attaching interior and exterior wall coverings.

3.2.3 Concrete: Concrete shall be normal-weight concrete complying with the applicable code, having a maximum ¾-inch (19.1 mm) aggregate and a minimum compressive strength of 2,500 psi (17 250 kPa) at 28 days. If construction of the ICF wall system is based on the IRC, the concrete shall comply with Sections R404.4 and R611.6.1 of the IRC.

3.2.4 Reinforcement: Deformed steel reinforcement bars shall have a minimum yield stress of either 40 ksi (275 mPa) or 60 ksi (413 mPa), depending on the structural design, and shall comply with the applicable code. If construction of the ICF wall 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

window 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:

- 9-inch (229 mm) Standard Straight Forms
- 9-inch (229 mm) 90-Degree Corner Forms
- 9-inch (229 mm) 45-Degree Corner Forms
- 11-inch (279 mm) Standard Straight Forms
- 11-inch (279 mm) 90-Degree Corner Forms
- 11-inch (279 mm) 45-Degree Corner Forms
- 13-inch (330 mm) Standard Straight Forms
- 13-inch (330 mm) 90-Degree Corner Forms
- 13-inch (330 mm) 45-Degree Corner Forms

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 the manufacturer's recommended design procedure, ACI 318 and Chapter 19 of the applicable code. Design loads shall comply with Chapter 16 of the applicable code.

4.1.2 Amvic Insulated Concrete Formwork: Amvic ICF is defined as a Flat ICF wall system and shall be designed and reinforced in accordance with the load tables for Flat ICF forms in Sections R404.4 and R611 of the IRC, provided the building conforms to the applicability limits defined in Sections R404.4.1 and R611.2 of the IRC, or Sections 1916 and 1804.6.2 of the SBC, provided the building conforms to the applicability limits defined in Sections 1916.2 and 1804.6.2.1 of the SBC. When using the code-prescriptive design methods, the wall thickness shall be limited as noted in the applicable code sections referenced above.

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

- IRC Section R404.1.2, and Tables R404.1.1(2), R404.1.1(3) and R404.1.1(4)
- BNBC Section 1812.3.2 and Table 1812.3.2(2)
- SBC Section 1804.6

When the forms are installed on buildings that do not conform to the applicability limits of Sections R404.4.1 and R611.2 of the IRC or Sections 1916.2 and 1804.6.2.1 of the SBC, the structural analysis and design of the concrete shall be prepared in accordance with ACI 318 and Chapter 19 of the IBC, BNBC, SBC or UBC, or Sections R404.4 and R612 of the IRC, as applicable.

4.1.3 Alternative Design: In lieu of calculations required by Section 4.1.1 of this report, the structural design of reinforced concrete formed by the Amvic ICF is permitted to comply with the *Prescriptive Method for Insulating Concrete Forms in Residential Construction* (publication EB118), dated May 1998, published by the Portland Cement Association (PCA), subject to all applicability and use limits for Flat ICF walls defined in Table 1.1 of that document. The PCA document shall be made available to the code official upon request. Buildings constructed with the Amvic Insulated Concrete Formwork wall system and designed in accordance with this section (Section 4.1.3) shall not exceed a height of two stories plus a basement, where the maximum unsupported wall height is 10 feet (3048 mm).

4.1.4 Design in Accordance with the IRC: Insulating concrete walls constructed with the Amvic 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: Amvic ICF shall be installed in accordance with the manufacturer's published installation instructions and this report. The manufacturer's published installation instructions and this report shall be strictly adhered to, and a copy of the instructions shall be available at the jobsite at all times during installation.

The maximum concrete lift height shall be 4 feet (1.2 m). The minimum ambient temperature during placement shall be in accordance with ACI 306.

4.2.2 Interior Finish: The Amvic ICF shall be finished on the interior of the building with an approved 15-minute thermal barrier, such as minimum 1/2-inch-thick (12.7 mm) regular gypsum wall board complying with ASTM C36. The gypsum wall board shall be installed vertically and attached to the flanges of the plastic webs with No. 6, 1⁵/₈-inch-long (41 mm), Type W, coarse-thread, gypsum wallboard screws spaced as required by the applicable code. The maximum allowable capacity of the wall board screws shall be as indicated Table 1 of this report.

4.2.3 Exterior Finish:

4.2.3.1 Above Grade: The Amvic 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 Amvic 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 wall covering shall be attached to the flanges of the plastic webs and the Amvic corner rods using either minimum No. 6, Type S, fine-threaded drywall screws, or minimum No. 6, Type W, coarse-thread drywall screws. The maximum allowable capacity of the wall board screws shall be as indicated in Table 1 of this report. The fasteners shall be corrosion-resistant and have a sufficient length to penetrate the flanges of the webs and the wall of the corner rods by a minimum of 1/4 inch (6.4 mm). A continuous length of the Amvic corner rods shall be field-installed in walls with a maximum total height of 25 feet (7620 mm) in the preformed slot of the 90-degree corner units.

4.2.3.2 Below Grade: For basement wall installations, the ICF surfaces shall be dampproofed or waterproofed in accordance with the applicable code. The dampproofing and waterproofing materials shall be approved by Amvic Incorporated and the code official, and shall be free of solvents, hydrocarbons, ketones or esters that will adversely affect the EPS foam boards. No backfill shall be permitted to be applied against the wall until the complete flooring system is in place, unless the wall is designed as a freestanding wall that does not rely on the flooring system for structural support.

4.2.4 Crawl Space Installation: The Amvic ICF may be installed in a crawl space 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 limited to service of 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. Ventilation of the crawl space is provided in accordance with the applicable code.

4.2.5 Foundation Walls: The ICF wall system is permitted to be used as a foundation stem wall when supporting wood-framed construction provided the forms are supported by approved concrete footings complying with the applicable code. Compliance with UBC Table 18-1-C is mandatory in jurisdictions adopting the UBC. When regulation is by the IRC, installation of the Amvic ICF system as foundation walls shall comply with IRC Sections R320.4 and R404.

4.2.6 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 and 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.

4.2.7 Installation in Buildings Required to be of Noncombustible Construction: For the purposes of this report, noncombustible construction is defined as Type I, II, III or IV under the IBC; Type 1, 2, 3 or 4 under the BNBC; Type I, II, III, IV or V under the SBC; or Type I or II under the UBC. The Amvic forms are recognized for use in buildings of noncombustible construction provided the Amvic forms are used to form solid concrete walls and comply with the following:

4.2.7.1 Exterior Walls of Buildings of any Height: The walls shall have an exterior wall covering complying with Section 4.2.7.1.1 of this report, and an interior wall covering complying with Section 4.2.7.1.2 of this report, and shall have fire blocking complying with Section 4.2.7.1.3 of this report:

4.2.7.1.1 EIFS and One-coat Stucco—Exterior Finish: The following EIFS and one-coat stucco lamina shall be installed over the exterior of the forms using the reinforced fabric or lath, base coat and finish coat materials described in their respective evaluation reports, as follows:

- Dryvit Systems, Inc., Outsulation EIFS as described in ESR-1232.
- Senergy, Inc., Senerflex EIFS as described in ER-3850.
- Finestone EIFS as described in ER-4455.
- Sonowall Stucco Systems Sonoborn Flex Wall Stucco Systems as described in ER-5678.

4.2.7.1.2 Interior Finish: The forms shall be finished on the interior with an approved 15-minute thermal barrier, such as 1/2-inch-thick (12.7 mm) gypsum board, as required by the applicable code. The gypsum board shall be installed vertically and attached to the flanges of the plastic webs with No. 6, 1⁵/₈-inch-long (41 mm), Type W, 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 on the perimeter.

4.2.7.1.3 Fireblocking: Foam plastic on the interior shall be discontinuous at floor lines. Floor-to-wall intersections shall be constructed to prevent the passage of flame, smoke and hot gasses from one floor to another.

4.2.7.2 One-story Buildings: The following conditions apply:

4.2.7.2.1 Fire Sprinklers: The building shall be equipped throughout with an automatic sprinkler system in accordance with the applicable code.

4.2.7.2.2 Exterior Finish: The exterior of the foam wall shall be covered with metal of a thickness of not less than 0.032 inch (0.81 mm), or aluminum or corrosion-resistant steel having a base-metal thickness of 0.016 inch (0.41 mm).

4.2.7.2.3 Interior Finish: The forms shall be finished on the interior with an approved 15-minute thermal barrier such as

1/2-inch-thick (12.7 mm) gypsum board, as required by the applicable code. The gypsum board shall be installed as described in Section 4.2.2 of this report.

4.2.7.2.4 Fireblocking: Foam plastic on the interior shall be discontinuous at floor lines. Floor-to-wall intersections shall be constructed to prevent the passage of flame, smoke and hot gasses from one floor to another.

4.2.8 Special Inspection:

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

4.2.8.2 IRC: For walls designed 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 R301.1.2, special inspection in accordance with Section 4.2.8.1 of this report is required.

4.2.8.3 UBC: Special inspections are 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 shall be placed in accordance with UBC Section 1905.10.5.
3. Installation shall be by installers approved by Amvic.
4. Half the allowable stresses or loads permitted by the UBC are used for design of the walls.
5. Installation instructions indicate methods used to verify proper placement of concrete.

4.2.8.4 BNBC: Special inspections are required as noted in BNBC Section 1705.4, and shall 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.

4.2.8.5 SBC: Special inspections are required as noted in SBC Section 1707.1, and shall 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.

5.0 CONDITIONS OF USE

The Amvic Insulated Concrete Formwork 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 published installation instructions. If there is a conflict between the manufacturer's published installation instructions and this report, this report shall govern.

5.2 When required by the code official, calculations showing compliance with the general design requirements of Chapter 16 of the applicable code shall be submitted to the code official for approval, except calculations are not required when the building design is based on Section 4.1.3 or 4.1.4 of this evaluation report.

5.3 The forms shall be separated from the building interior with an approved 15-minute thermal barrier, except for crawl space construction as described in Section 4.2.4 of this report.

- 5.4** Amvic Insulated Concrete Formwork shall be limited to buildings of combustible [Type V (IBC and UBC), Type 5 (BNBC) and Type VI (SBC)] construction, except as described in Section 4.2.7 of this report.
- 5.5** When used in buildings required to be of noncombustible construction, one label as described in Section 7.0 of this report shall be visible in every 160 square feet (14.9 m²) of wall area.
- 5.6** Special inspections shall be required as described in Section 4.2.8 of this report.
- 5.7** The forms are produced by Amvic Incorporated in Toronto, Ontario, Canada, under a quality control program with inspections by Intertek Testing Services NA, Ltd.—Warnock Hersey (AA-688).
- 6.0 EVIDENCE SUBMITTED**
- 6.1** Manufacturer's published installation instructions.
- 6.2** Data in accordance with the ICC-ES Acceptance Criteria for Concrete Floor, Roof and Wall Systems and Concrete Masonry Wall Systems (AC15), dated June 2003 (editorially revised March 2005).
- 6.3** Data in accordance with the ICC-ES Acceptance Criteria for Foam Plastic Insulation (AC12), dated October 2004, including reports of comparative crawl space fire tests and a report of room corner fire test in accordance with UL 1715 and UBC Standard 26-3.
- 6.4** Reports of fastener withdrawal and lateral load tests.
- 6.5** A quality control manual.
- 7.0 IDENTIFICATION**
- Each pallet of forms shall be labeled with the Amvic name and/or trademark, the product name, the inspection agency name and/or trademark (Intertek Testing NA Ltd.—Warnock Hersey) and the evaluation report number (ESR-1269). Additionally, one form on each pallet shall be labeled on both sides of the form with the same information.

TABLE 1—ALLOWABLE PULLOUT AND LATERAL LOAD CAPACITIES OF SCREWS

SCREW TYPE	ALLOWABLE CAPACITY (POUNDS)	
	Withdrawal	Lateral Load
No. 6, Type S, fine-thread, corrosion-resistant drywall screw	27	39
No 6, Type W, coarse-thread, corrosion-resistant drywall screw	29	42

For **SI**: 1 pound = 4.45 N.

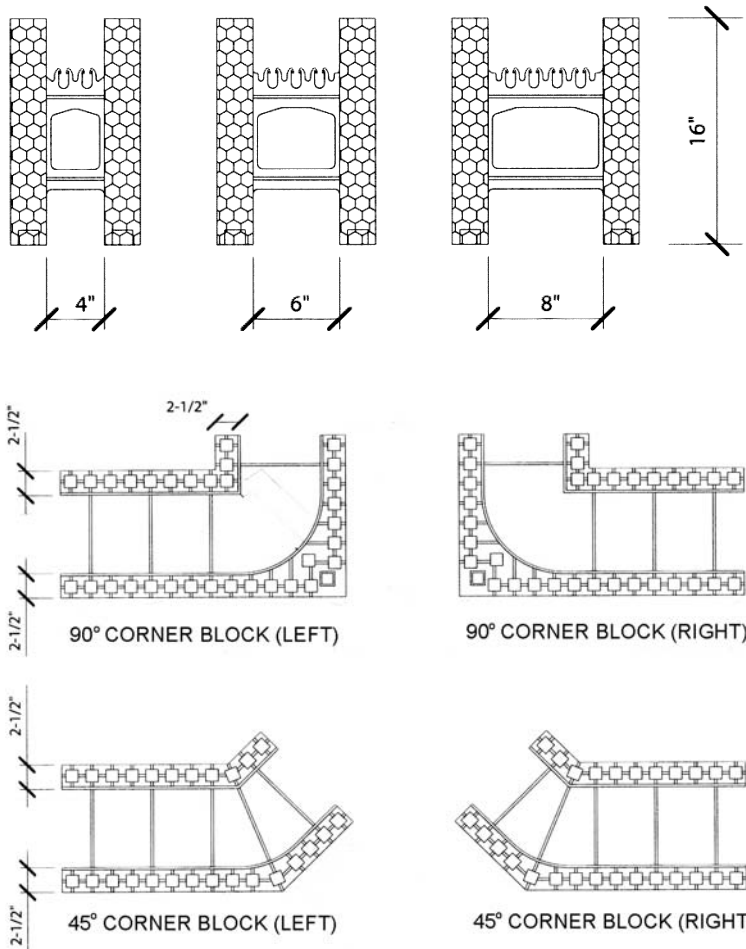
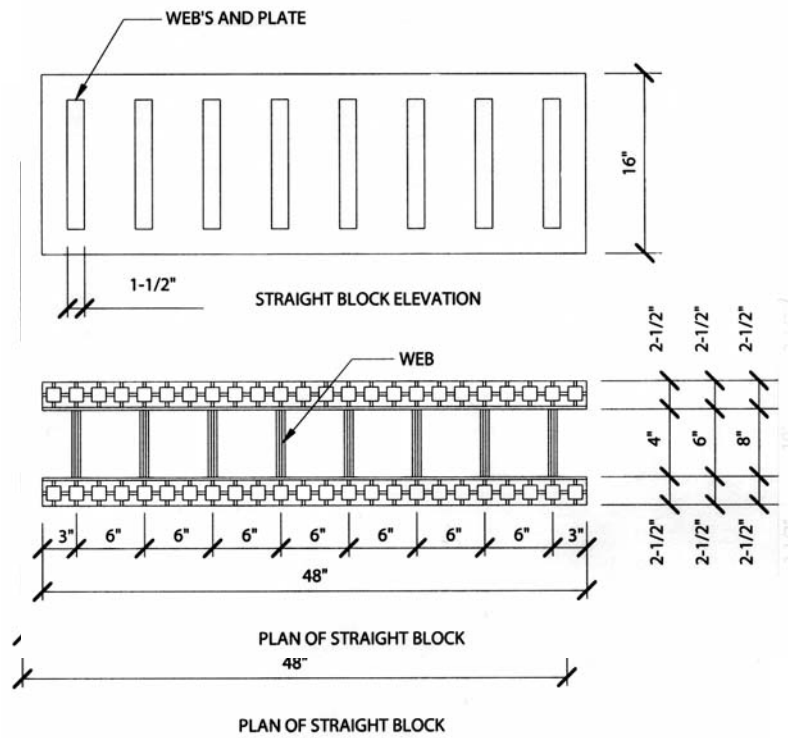


FIGURE 1—FORM SHAPES