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Legacy report on the 1997 Uniform Building Code™, the 2000 International Building Code® and the 2000 International Residential Code®

DIVISION: 03—CONCRETE
Section: 03130—Permanent Forms

ARXX HIGH PERFORMANCE WALL SYSTEM

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1.0 SUBJECT

Arxx High Performance Wall System.

2.0 DESCRIPTION

2.1 General:

The Arxx High Performance Wall System is expanded polystyrene (EPS) foam plastic units that serve as formwork for concrete load-bearing and nonload-bearing walls, shear walls, beams and lintels, foundation stemwalls, and basement walls. When the EPS units are stacked in a running bond pattern, they create concrete formwork that remains in place after concrete curing. The Arxx High Performance Wall System is a flat ICF (insulating concrete form) wall system that forms a solid, flat concrete wall and is limited to combustible construction. The interior of a building constructed with an Arxx wall system shall be separated from the foam plastic insulation with an approved thermal barrier, such as a 1/2-inch-thick (12.7 mm) regular gypsum wallboard installed in accordance with Section 2.5 of this report, and the exterior surface shall be covered with an approved weather-resistant barrier and exterior wall covering.

Arxx insulated concrete forms (ICFs) are an alternative to forms described in Section 1906 of the 1997 Uniform Building Code™ (UBC) and the 2000 International Building Code® (IBC). Arxx ICFs comply with Sections R611.3 and R404.4 of the 2000 International Residential Code® as flat ICF form wall systems.

2.2 Materials:

2.2.1 Arxx High Performance Wall System Form Units:

The form units are molded from expandable polystyrene beads recognized in a current evaluation report and specified in the approved quality control manual. The foam plastic has a nominal density of 1.5 pcf (24 kg/m³), complies with ASTM C 578 as Type II, and has a maximum flame-spread rating and a smoke-density rating of 25 and 450, respectively, when tested in accordance with UBC Standard 8-1 (ASTM E-84).

The face shell interconnecting cross ties, which are made of high-density polypropylene plastic, with flanges located at the surface of the EPS or 1/2 inch (12.7 mm) below the EPS surface. The plastic cross ties hold the two EPS boards together, and provide a means of supporting reinforcing steel rebar inside the EPS units prior to placement of concrete; and the cross tie flanges provide a mechanism for attaching interior and exterior wall coverings.

The EPS units are available in four standard sizes: nominal 4-, 6-, 8-, and 10-inch core-width units. The 4-inch core-width (102 mm) standard-sized units are 16 3/4 inches (425 mm) high and 48 inches (1219 mm) long, with nominal 2-inch-thick (51 mm) EPS shells interconnected with six plastic web members spaced 8 inches on center. The 6-, 8-, and 10-inch (152, 203, and 254 mm) core-width standard-sized units are 16 3/4 inches (425 mm) high and 48 inches (1219 mm) long, with nominal 2 1/2-inch-thick (63.5 mm) EPS face shells interconnected with six plastic web members spaced at 8 inches (203 mm) on center. The clear distance between face shells is 4, 6 1/4, 7 7/8, and 9 7/8 inches (102, 159, 200, and 251 mm) for the 4-, 6-, 8-, and 10-inch (102, 152, 203, and 254 mm) core-width units, respectively. In addition to the standard block units, there are also corner units, adjustable corner units, tapered top units, extended brick ledger units and end caps.

2.2.2 Concrete: Concrete shall be normal-weight concrete complying with UBC or IBC Chapter 19, with a 28-day minimum compressive strength of 2,000 pounds per square inch (13.78 MPa). Maximum aggregate size is 3/8 inch (19.1 mm) for use in the 4-inch-wide (102 mm) and 6 1/4-inch-wide (159 mm) form units. Maximum aggregate size is 3/4 inch (19.1 mm) in the 8-inch-wide (203 mm) and 10-inch wide (254 mm) units. If construction of the Arxx wall system is based on the 2000 IRC, concrete shall comply with Section R611.6.1 and R404 of the IRC.

2.2.3 Reinforcement: Deformed steel reinforcement bars shall have a minimum yield stress of 40 ksi (275 kPa), and

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shall comply with Section 1903.5 of the UBC, or Section 3.5.3.1 of ACI 318-99 as referenced in the IBC. If construction of the Arxx Wall System is based on the 2000 IRC, reinforcing steel shall comply with Sections R611.6.2 and R404.4.6 of the IRC.

2.2.4 Other: When required by the building official, wood members in contact with concrete for plates or window and door framing shall be preservative-treated with an approved wood preservative, and shall be attached with corrosion-resistant steel fasteners in accordance with UBC Section 2304.3, IBC Section 2304.9.5 or IRC Section R323.3. Materials other than wood, such as vinyl, are permitted for window and door framing if approved by the building official.

2.3 Design:

2.3.1 UBC or IBC Method: Concrete members formed by the Arxx wall system shall be designed and constructed in accordance with Chapters 16 and 19 of the UBC or the IBC, as applicable. Footings and foundations are designed and constructed in accordance with Chapter 18 of the UBC or IBC, as applicable.

2.3.2 Alternate Design Method: In lieu of calculations required by Section 2.3.1 of this report, the structural design of reinforced concrete formed by Arxx wall system units 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 in that document. The PCA document shall be made available to the building official upon request. Buildings constructed with the Arxx wall system and designed in accordance with this section (Section 2.3.2) shall not exceed a height of two stories plus a basement, where the maximum unsupported wall height is 10 feet (3048 mm).

2.3.3 IRC Method: Insulated concrete walls formed by the Arxx wall system comply with Figure R611.3 of the IRC as flat insulating concrete wall forms. Wall design, construction and materials shall comply with Section R404.4 or R611 of the IRC as applicable to flat insulating concrete form wall systems.

2.4 Installation:

The Arxx wall system shall be supported on concrete footings complying with Chapter 18 of the UBC or IBC, or Chapter 4 of the IRC. Vertical rebars, embedded in the footing, shall extend a minimum of 24 inches or a length required by structural design into the concrete wall in accordance with Section 1912 of the UBC or Chapter 12 of ACI 318-99 (IBC and IRC). The form units are installed in a running bond pattern.

The amount of reinforcing, placement and spacing required shall be determined for each project, based on the approved plans and the applicable code. Additional reinforcement around doors and windows is required to be described in the approved drawings. Concrete quality, mixing and placement must comply with Section 1905 of the UBC, Chapter 5 of ACI 318-99 (IBC), or Section R611.6.1 and R404 of the IRC.

Window and door openings are 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 pouring of the concrete. Anchor bolts used to connect wood plates or ledgers to the concrete shall be cast in place, with the bolts sized and spaced as required by design. See Figures 1 through 6 for typical installation details.

Wood ledgers are attached to the concrete wall by removing sections of the face shell of the form units, and

installing anchor bolts at a spacing that complies with the design. Wood plates are anchored to the top of the wall. Anchor bolts used to connect the wood ledgers or plates to the concrete are cast in place, with the bolts sized and spaced as required by the code or design.

Compliance with the foundation drainage requirements of Chapter 18 of the UBC or IBC, or Section R405 of the IRC, is necessary. Basement walls designed to retain soil shall not be backfilled until the concrete has cured and the complete floor system is in place.

2.5 Interior Finish:

Arxx form units exposed to the building interior shall be finished with minimum 1/2-inch-thick regular wallboard installed vertically and attached to the plastic bridging flanges with minimum 1 1/4-inch-long, Type S drywall screws spaced 16 inches on center horizontally and 12 inches on center vertically.

2.6 Exterior Finish:

2.6.1 Above Grade: Arxx form units shall be covered on the exterior with an approved weather-resistive barrier as required by Section 1402 of the UBC, water-resistive barrier as required by Section 1403 of the IBC, or weather-resistant sheathing paper as required by Section R703 of the IRC. This barrier or paper is installed in accordance with either the applicable code or a current evaluation report.

The water-resistive barrier and exterior wall covering are installed in accordance with either the applicable code or an evaluation report, and are attached to the plastic cross tie flanges with No. 8 coarse-thread drywall screws spaced in accordance with the applicable code or an evaluation report. The screws shall be corrosion-resistant and have sufficient length to penetrate through the flange portion of the plastic webs at least 1 inch (25 mm). When installed in accordance with this evaluation report, fasteners have a pullout capacity of 44 pounds. Negative wind pressure capacity of the exterior finish material is recognized in the applicable code for generic materials or in a current evaluation report for proprietary materials.

2.6.2 Below Grade: Wall surfaces below grade shall be waterproofed or dampproofed when required by the applicable code. Waterproofing and dampproofing materials shall be specified by Arxx Building Products Inc., and shall comply with the applicable code or an evaluation report, and shall be compatible with the foam plastic units. Applicable damp-proofing and waterproofing requirements are in Appendix Chapter 18 of the UBC, Section 1806 of the IBC, and Section R406 of the IRC. Compliance with drainage requirements in Section 1804.7 of the UBC, Section 1806.4 of the IBC, or Section R406.1 of the IRC, is necessary.

2.7 Foundation Walls:

The Arxx wall system is permitted to 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 when regulation is by the UBC. Installation of Arxx walls as foundation walls shall comply with Section R404 of the IRC.

2.8 Retaining Walls:

The Arxx wall system is permitted to be used as a retaining wall with reinforcement designed in accordance with accepted engineering principles and Section 2.3.1 of this report.

2.9 Crawl Spaces:

Arxx wall system with a solid concrete core is permitted to be used as walls of crawl spaces without a covering, subject to the following conditions:

1. Entry to the attic or 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 complying with Section 2306.7 of the UBC, Section 1202.3 of the IBC, or Section R408.2 of the IRC is provided.

2.10 Fire-resistant Construction:

2.10.1 UBC Only: Concrete walls formed by the Arxx wall system have the fire-resistive ratings set forth in Table 7-B of the UBC, provided the conditions of the table in the code are met.

2.10.2 Fire-resistant-rated Load-bearing Wall Assembly—2- and 4-Hour: The Arxx wall system forming minimum 6¹/₄-inch-wide (159 mm) cores shall be installed in accordance with the manufacturer's instructions, filled with minimum 3,000 psi (20 700 kPa) concrete and reinforced with minimum Grade 40, No.5 (10M), deformed bars spaced 16 inches (400 mm) on center vertically and 16³/₄ inches (425 mm) on center horizontally. For a 4-hour fire-resistive rating, the concrete shall include 0.6 pound (0.27 kg) of 1/2-inch-long (12.7 mm) polypropylene fiber reinforcement per cubic yard of concrete. The interior and exterior face of the wall shall be covered with minimum 1/2-inch-thick (12.7 mm) regular gypsum wallboard attached to the flanges of polypropylene webs used as fastener strips. The minimum 1/2-inch-thick (12.7 mm) regular gypsum wallboard shall be installed vertically and attached to the plastic flange fastener strips with 0.152-inch-diameter-by-1.5-inch-long (3.9 mm by 38 mm) coarse thread gypsum wallboard screws spaced 16 inches (425 mm) on center vertically and 8 inches (200 mm) on center horizontally. Seams between drywall panels are treated with joint tape and compound. Walls exposed to the exterior shall be finished with a weather resistive barrier, and an approved exterior wall covering.

Fire exposure may be from either side of the wall. The wall is rated for 30,000 pounds per linear foot (437,817 N/m).

When installation is as an exterior wall with a horizontal fire separation distance of greater than 5 feet (1.50 m), the exterior gypsum wallboard may be omitted.

2.11 Special Inspection:

2.11.1 UBC: Special inspection is required as noted in Section 1701 of the UBC for placement of reinforcing steel and concrete, and for concrete cylinder testing. When approved by the building 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 lift is 48 inches (1219 mm). Succeeding pours must be placed in accordance with Section 1905.10.5 of the UBC.
3. Installation is by installers approved by Arxx Building Products Inc.
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.

2.11.2 IBC: Special inspection is required as noted in Section 1704 of the IBC for placement of reinforcing steel and concrete, and for concrete cylinder testing. When approved by the building official, special inspection may be waived for

construction of Group R, Division 3, or Group U Occupancies under the limitations established by the building official. Quality assurance plans for seismic resistance and wind requirements shall be prepared in accordance with Sections 1705 and 1706 of the IBC, respectively, when required.

2.11.3 IRC: For walls designed in accordance with Section 2.3.3, special inspection is not required. For walls designed in accordance with the IBC, as permitted by Sections R104.11 and R301.1.2 of the IRC, special inspection in accordance with Section 2.11.2 of this report is required.

2.12 Identification:

Each bundle or pallet of form units bears a label, listing the name and address of Arxx Building Products Inc., and one of the block molders that is an additional listee specified in this report; the evaluation report number (ER-5119); the smoke and flame-spread ratings; and the name of the quality control agency (Intertek)

3.0 EVIDENCE SUBMITTED

Data in accordance with the ICC-ES Interim Criteria for Foam Plastic Insulation (AC12), dated July 2002; data in accordance with the ICC-ES Interim Criteria for Concrete Floor, Roof and Wall Systems and Concrete Masonry Wall Systems (AC15), dated June 2003; data in accordance with UBC Standard 26-3 (UL 1715); and quality control manuals.

4.0 FINDINGS

That the Arxx High Performance Wall System described in this report complies with the 1997 *Uniform Building Code*[™] (UBC), the 2000 *International Building Code*[®] (IBC), and the 2000 *International Residential Code*[®] (IRC), subject to the following conditions:

- 4.1 Foam blocks are manufactured, identified and installed in accordance with this report and the Arxx Building Products Inc. installation instructions.
- 4.2 Concrete walls formed by the units are limited to combustible construction as defined in Chapter 6 of the UBC or IBC, as applicable.
- 4.3 When required by the building official, calculations showing compliance with the general design requirements of Chapter 16 of the UBC or IBC and Section 2.3.1 of this report are submitted to the building official for approval, except that calculations are not required when the building design is based on Section 2.3.2 or 2.3.3 of this evaluation report.
- 4.4 The EPS foam blocks are separated from the building interior with an approved thermal barrier, such as minimum 1/2-inch-thick (12.7 mm) regular gypsum wallboard installed as specified in this report. Other thermal barriers, having an index of 15, are acceptable, provided they are recognized in a current ICC-ES evaluation report.
- 4.5 Special inspection is provided in accordance with Section 2.11 of this report.
- 4.6 When regulation is under the IRC, compliance with Section R324.4 shall be demonstrated.
- 4.7 Form units are manufactured by the companies shown as additional listees in this report, at the locations noted in Table 1, with quality control inspections conducted by Intertek Testing Services NA Ltd. (AA-647-2).

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

TABLE 1—MANUFACTURING LOCATIONS

MANUFACTURER	LOCATION
PSC Moulding Corporation	Cobourg, Ontario
Tuscarora Inc.	Colorado Springs, Colorado
	Conyers, Georgia
	Hayward, California
	Pardeeville, Wisconsin
	Sallisaw, Oklahoma
	Sterling Virginia
	Wilsonville, Oregon