



Department of Commerce

Safety & Buildings Division

201 West Washington Avenue

P.O. Box 2658

Madison, WI 53701-2658

Evaluation #

200239-R Revised  
(Replaces 960023-R)

# Wisconsin Building Products Evaluation

Material

Polysteel Form<sup>®</sup> Concrete Wall System

Manufacturer

American Polysteel, LLC  
5150 F Edith NE  
Albuquerque, NM 87107

## SCOPE OF EVALUATION

**GENERAL:** This report evaluates the use of the Polysteel Form<sup>®</sup> Concrete Wall System, manufactured by American Polysteel evaluated as permanent formwork and insulation system for reinforced concrete beams, lintels, exterior and interior walls, and foundation and retaining walls. The Polysteel Form<sup>®</sup> Concrete Wall System was evaluated for safety requirements of the foam plastic and structural requirements for the codes listed below.

This review includes the cited **Comm** code requirements below in accordance with the current **Wisconsin Uniform Dwelling Code (UDC), (for 1 & 2 family dwellings):**

- **Foam Plastic:** The Polysteel Form<sup>®</sup> Concrete Wall System was evaluated in accordance with the fire safety requirements of **s. Comm 21.11**.
- **Structural:** The Polysteel Form Concrete Wall System was evaluated in accordance with the structural requirements of **ss. Comm 21.02, and 21.02(3)(c)**.

This review includes the cited **Comm** code requirements below in accordance with the current **Wisconsin Building and Heating, Ventilating and Air conditioning Code (valid until 6/30/02):**

- **Foam Plastic:** The Polysteel Form<sup>®</sup> Concrete Wall System was evaluated in accordance with the fire safety requirements for combustible nonrated construction in accordance with **s. Comm 51.06(2)**.
- **Structural:** The Polysteel Form<sup>®</sup> Concrete Wall System was evaluated in accordance with **ss. Comm 53.10, 53.11, 53.12, 53.16, 53.40, and 53.316(1)**.



This review includes the cited **International Building Code (IBC)** requirements below in accordance with the **Wisconsin Amended IBC Code (effective 7/01/02)**:

- **Foam Plastic:** The Polysteel Form<sup>®</sup> Concrete Wall System was evaluated in accordance with the fire safety requirements **ss. IBC 2603.1, 2603.2, and 2603.3.**
- **Structural:** The Polysteel Form<sup>®</sup> Concrete Wall System was evaluated in accordance with the requirements of **IBC Chapter 16.**

**Note: Structural calculations shall be submitted (job-to-job basis) in accordance with IBC Chapter 16 for Live, Ground Snow, Roof, Wind, and Seismic Loads.**



**DESCRIPTION AND USE**

**General:** The Polysteel Form Concrete Wall System consists of expanded polystyrene (EPS) forms which are stacked in running bond and serve as forms for either a 6-inch-thick or 8-inch-thick reinforced concrete wall. The EPS forms remain in place to provide insulation for the wall. The reinforced concrete wall system may be used as a foundation wall, basement wall, shear wall, exterior load-bearing wall and lintel section.

The Polysteel EPS forms are 48 inches long and 16 inches high. The 6-inch Polysteel form for 6-inch-thick reinforced concrete walls is 9 1/4 inches wide. The 8-inch Polysteel form for 8-inch-thick reinforced concrete walls is 11 inches wide. The two opposing faces of the forms are connected with 18 gauge expanded steel mesh placed vertically and penetrating the opposing sides a minimum of 1 inch. The exposed penetrated mesh is covered with a folded galvanized sheet steel furring strip No. 30 gauge in thickness and 10 inches in length. The 1-inch strip with the enclosed wire mesh is bent 90 degrees, flush with the form face.

The Polysteel Form Concrete Wall System forms a waffle-shaped cavity which, when filled with concrete, results in vertical concrete columns spaced 12 inches on center and horizontal beams spaced 16 inches on center. Between these columns and beams are webs of concrete with a minimum thickness of 2 inches. The 6-inch form produces oval-shaped concrete columns and beams that are 6 inches thick and the 8-inch form produced oval-shaped columns and beams that are 8 inches thick. See Figure No. 1 for dimensional details.

**Materials:** Polysteel Form Blocks are molded from modified expandable polystyrene beads. Manufacturers include:

| Product   | Manufacturer                |
|---|-----------------------------|
| BF-322, -327, & -422, BFL-322, -327 & -422        | BASF Corporation            |
| Grades 40 and 54                                  | Huntsman Corp.              |
| Types 33M, 35M, M77 and M97                       | Nova Chemicals Incorporated |
| Types MA-500, MB-500, -550, & -590, MC-500 & -590 | Styrochem U.S., LTD.        |

The blocks are manufactured to a nominal density of 1.5 pounds per cubic foot.

**Concrete:** Normal-weight concrete complying with **s. Comm 21.02(3)(b), s. Comm 53.40** and **s. IBC 1903.1** with maximum aggregate size of 3/4 inch and a minimum compressive strength of 2,500 psi.

**Reinforcement:** The concrete is reinforced with Nos. 3, 4, and 5 deformed steel reinforcing bars, Type A615, Grade No. 40, with a minimum yield strength of 40,000 psi. All steel reinforcement shall be in accordance with **s. Comm 53.316** or **s. IBC 1903.5**.

Each pallet of Polysteel forms bear a label with the manufacturer's name, and the quality control inspection agency (Omega Point Laboratories, NER-QA337).

## **TESTS AND RESULTS**

The tests and results listed below cover both the current WI Building Code **Comm** and future **IBC** requirements.

EPS used to make the Polysteel Form Blocks is manufactured by the companies listed in the DESCRIPTION AND USE section of this approval. The EPS has a maximum flame-spread rating of 25 and a maximum smoke-developed rating of 450. Testing was done in accordance with ASTM E 84.

For crawl space applications, a full-scale fire test was conducted in accordance with **s. Comm 51.06(4)(c)3.d**.

Signed and sealed structural calculations (design concept) are on file with the department. Design calculations are based upon equivalent rectangular columns and beams detailed in the American Polysteel Forms Manual.

### **LIMITATIONS OF APPROVAL**

The limitations below are in accordance with the current **Wisconsin Uniform Dwelling Code (UDC)**, (for 1 & 2 family dwellings):

- **Foam Plastic:** The ICF wall system is approved for use with a thermal barrier to separate the blocks from interior spaces in accordance with **s. Comm 21.11(1)**. Where a 1-inch thickness of masonry does not separate the polystyrene blocks from the building interior, including at the top of the wall, a thermal barrier, which has a finish rating of at least 15 minutes, shall be provided.
  1. Polysteel Form Blocks are approved for use in combustible non-rated construction in accordance with **s. Comm 21.11**. In one- or two-family dwellings, thermal barriers shall be provided to separate the forms from the occupied space of the dwellings per **s. Comm 21.11**.
  2. The exterior face of the blocks shall be finished with an approved weather covering and must be protected from ultraviolet light.
- **Structural:** The Polysteel Form Blocks are approved as structural building elements.
  1. The units are approved for use as concrete forms for basement walls and exterior walls when the resulting concrete core thickness satisfies **Table 21.18-A** for one- or two-family dwellings, or when structural calculations for the product are submitted for review.
  2. Walls shall be anchored to all floors and roofs. Walls shall be interconnected at corners by embedding and lapping the reinforcement.
  3. Structures are **limited** to two stories in height.
  4. The forms are approved for use as concrete forms for basement walls, exterior walls and retaining walls when structural calculations are submitted to the department by a Wisconsin registered professional engineer or architect.
  5. Below grade walls shall be damp-proofed when required by the local building department.
  6. Damp-proofing and water-proofing materials shall be approved by American Polysteel, Inc., and the local building official, and shall be free of solvents that will adversely affect the EPS foam.

**NOTE:** The Polysteel Form Concrete Wall System was **not** evaluated for compliance with the thermal requirements of **Subchapter VI, ss. Comm 22.20, 22.21, 22.23, 22.25, 22.27, 22.28, and 22.31**. of the current UDC.

Building Code Applicable to Projects Submitted for Review Prior to July 1, 2002: The **Comm** limitations below are in accordance with the current **Wisconsin Building and Heating, Ventilating and Air Conditioning Code**:

- **Foam Plastic:** The ICF wall system is approved for use with a thermal barrier to separate the blocks from interior spaces in accordance with **s. Comm 51.06(3)**. Where a 1-inch thickness of masonry does not separate the polystyrene blocks from the building interior, including at the top of the wall, a thermal barrier, which has a finish rating of at least 15 minutes, shall be provided.
  1. Polysteel Form Blocks are approved for use in noncombustible 0-hour rated construction in accordance with **s. Comm 51.06(4)(c)**. A thermal barrier per **s. Comm 51.06(3)** and noncombustible cladding per **s. Comm 51.06(4)(c) 3**. shall be provided.
  2. Polysteel Form Blocks are approved for use in combustible non-rated construction in accordance with **s. Comm 51.06(3) d**. Thermal barriers and noncombustible cladding shall be provided per **s. Comm 51.06(3) d.**, where applicable.
  3. The exterior face of the blocks shall be finished with an approved weather covering and must be protected from ultraviolet light in accordance with **s. Comm 51.06(5)(f)**.

4. Polysteel Form Blocks may remain uncovered on the interior side of crawl space walls provided: the floor between the crawl space and the occupied space consists of at least ¾-inch tongue and groove plywood sheathing or equivalent. The crawl space shall not be used for storage or air handling purposes, there are no interconnected basement areas and entry to the crawl space is only for service of utilities.
- **Structural:** The Polysteel Form Blocks are approved as structural building elements. Minimum reinforcement for walls shall conform to **s. Comm 53.316**.
    1. Structures are **limited** to two stories in height.
    2. These forms are approved for use as concrete forms for basement walls, exterior walls and retaining walls when structural calculations are submitted to the department by a Wisconsin registered professional engineer or architect.
    3. Below grade walls shall be damp-proofed when required by the local building department.
    4. Damp-proofing and water-proofing materials shall be approved by American Polysteel, Inc., and the local building official, and shall be free of solvents that will adversely affect the EPS foam.

**NOTE :** The Polysteel Form Concrete Wall System was **not** evaluated for compliance with the thermal requirements of **s. Comm 63.17** of the current Wisconsin Building and Heating, Ventilating and Air Conditioning Code.



The **IBC** limitations below are in accordance with the **Wisconsin Amended IBC 2000 Code (effective 7/01/02):**

- **Foam Plastic:** The ICF wall system is approved for use with a thermal barrier to separate the blocks from interior spaces in accordance with **s. IBC 2603.4**.
  1. In accordance with **s. IBC 2603.4.1.6**, when the Polysteel ICF is used within the attic or crawl space where entry is made only for service utilities, the foam plastic insulation shall be protected against ignition by 1-1/2" thick mineral fiber insulation, a ¼" thick wood structural panel, particleboard or hardboard, gypsum wallboard, corrosion-resistant steel or other approved material installed so that the foam plastic is not exposed.
  2. The protective covering shall be consistent with the requirements for the type of construction.
  3. The exterior face of the blocks shall be finished with an approved weather covering and must be protected from ultraviolet light.
  4. The crawl space shall not be used for storage or air handling purposes, there are no interconnected basement areas and entry to the crawl space is only for service of utilities.
- **Structural:** Design of concrete formed by Polysteel Forms must comply with **IBC Chapter 19** with the following requirements:
  1. \*The forms are approved for use as concrete forms for basement walls, exterior walls and retaining walls when structural calculations are submitted to the department by a Wisconsin registered professional engineer or architect.
  2. \*Design calculations of walls must comply with **s. IBC 1901.2**. Use of the empirical design approach specified in **s. 2109.1 [Comm 62.2109(1)]** is prohibited.
  3. Design of lintels shall comply with the applicable provisions of **IBC Chapter 16**.
  4. Wall loading shall be in accordance with **IBC Chapter 16**.
  5. Minimum wall reinforcement shall conform to **s. IBC 1901.2**. When the code requires that vertical and horizontal reinforcement be spaced no further apart than 18 inches or three times the wall

thickness, whichever is less, the maximum concrete wall thickness along the length of the wall is permitted to be used to determine rebar spacing.

6. Walls shall be anchored to floors and roofs in accordance with **s. IBC 1604.8.2**. Walls shall be interconnected at corners by embedding and lapping reinforcement in accordance with the code.
7. Design of shear walls shall be in accordance with **ss. IBC 1901.2 and 1910**.
8. Structures are **limited** to two stories in height plus a basement.
9. Below grade walls shall be damp-proofed when required by the local building department, water-proofed in accordance with **s. IBC 1806**.
10. Damp-proofing and water-proofing materials shall be approved by American Polysteel, Inc., and the local building official, and shall be free of solvents that will adversely affect the EPS foam.
11. Special inspection is required as noted in **s. IBC 1704**, for placement of reinforcing steel and concrete, and for concrete cylinder testing, except that special inspection is not required for foundation stem walls conforming to **Table 1805.4.2** of the **IBC**. Additionally, when the building official approves, special inspection is not required when all of the following conditions are met:
  - a) Wall systems are a maximum of 8 feet high and are limited to use in single-story construction of Group R-3, or Group U Occupancies.
  - b) Maximum height of a concrete pour is 48 inches. Succeeding lifts must be placed in accordance with **s. IBC 1905.10**.
  - c) Installation is by properly trained installers approved by American Polysteel, Inc.
  - d) The installation instructions indicate methods used to verify proper placement of concrete.
12. Walls constructed with Polysteel (ICF) Forms are considered Type V Construction.

**\*Alternate Design:** In lieu of calculations, the structural design of reinforced concrete formed by Polysteel Form<sup>®</sup> Concrete Wall System insulated concrete form blocks 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). Buildings constructed with the Polysteel Form<sup>®</sup> Concrete Wall System insulated concrete form system and designed in accordance with the alternate design, will not exceed a height of two stories plus a basement, where the maximum unsupported wall height is 10 feet.

**NOTE:** The Polysteel Form Concrete Wall System was **not** evaluated for compliance with the thermal requirements of **s. Comm 63.1018**.



**Identification:** Each package bears a label specifying the name and address of the manufacturer (American Polysteel, Inc.; Albuquerque, New Mexico). Additionally, product labels indicate the Wisconsin Building Product Evaluation Number (200239-R), and the name and logo of the quality control agency (Omega Point Laboratories).

This approval will be valid through December 31, 2007, unless manufacturing modifications are made to the product or a re-examination is deemed necessary by the department. The Wisconsin Building Product Evaluation number must be provided when plans that include this product are submitted for review.

**DISCLAIMER**

The department is in no way endorsing or advertising this product. This approval addresses only the specified applications for the product and does not waive any code requirement not specified in this document.

Revision Date: October 9, 2002  
Approval Date: August 12, 2002

By: \_\_\_\_\_

Lee E. Finley, Jr.  
Product & Material Review  
Integrated Services Bureau

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