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PRODUCT EVALUATION

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EVALUATION CENTER

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RENDERED TO

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PRODUCT EVALUATED

Polycrete® Big Block 1600 Insulating Concrete Forms (ICF) System

EVALUATION PROPERTY

ASTM E2634 -11 (2015)

This evaluation is being conducted solely for the above referenced project. Due to the variables that exist from project to project and the fact that each evaluation requires review of the most current existing data and information, this evaluation is not to be used as justification for any other opinion nor used for any other project, without the express written consent of Intertek. This report should serve as Intertek's opinion regarding the use of the product in the conditions described herein. The materials used on the project, which are applied in compliance with Intertek Design Listings, must bear the Intertek Listing Mark. All certified products must be installed in accordance with the details contained in Intertek's *Directory of Listed Building Products*.

1 Table of Contents

2 Introduction

Intertek Testing Services NA Ltd./Inc. (Intertek) is conducting a product evaluation for Polycrete® International Inc. (Polycrete), to evaluate Big Block 1600 Insulating Concrete Forms (ICF). The evaluation is being conducted to determine if the product meets the requirements per ASTM E2634, Standard Specification for Flat Wall Insulating Concrete Form (ICF) Systems, 2011 (reapproved 2015).

3 Product and Assembly Description

3.1. Assembly Description:

Polycrete Big Block 1600 ICFs are insulated concrete forms that are formed of ASTM C578 Type II expanded polystyrene 2.5 inch panels on each face, connected by steel webbing encased in the EPS form, with continuous steel cross-ties. Polycrete Big Block 1600 ICFs are pre-assembled ICF blocks with a reversible, interlocking connection design. Polycrete Big Block 1600 ICFs come in the following sizes and configurations:

- 5 5/8” (14.3 cm) Straight
- 7 5/8” (19.4 cm) Straight
- 9 5/8” (24.5 cm) Straight
- 11 5/8” (29.5 cm) Straight

3.2. Assembly Traceability:

If further testing is required for the Polycrete Big Block 1600 ICF products to show compliance with ASTM E2634, sampling must be done at the manufacturing facility by an accredited third party inspection agency. An Intertek engineer can perform this task.

3.3. Assembly Certification:

This product is an Intertek certified product and is under Intertek ongoing surveillance through Intertek Follow-up inspections. The Intertek Listing Report Number is SPEC ID: 24263.

Authorities Having Jurisdiction (AHJ) should be consulted in all cases as to the particular requirements covering the installation and use of Intertek certified products, equipment, systems, devices and materials. The AHJ should be consulted before construction. Fire resistance assemblies and products are developed by the design submitter and have been investigated by Intertek for compliance with specific requirements. The published information (product and design listings) cannot always address every construction nuance encountered in the field. When field issues arise, it is recommended the first contact for assistance be the technical service staff provided by the product manufacturer noted for the design. Users of fire resistance assemblies are advised to consult the test standard referenced for each Intertek certified product. The test standard includes specifics concerning alternate materials and alternate methods of construction. Only products which bear Intertek's Mark are considered as certified. The appearance of a company's name or product in Intertek Directory of Listed Building Products does not in itself assure that products so identified have been manufactured under Intertek's Follow-Up Service. Only those products bearing the Intertek Mark should be considered to be Listed and covered under Intertek's Follow-Up Service. Always verify the Mark on the product before using it.

4 Reference Documents

As part of this evaluation, Intertek has directly or indirectly used the following referenced documents:

- ASTM E2634, *Standard Specification for Flat Wall Insulating Concrete Form (ICF) Systems, 2011 (reapproved 2015)*
- ASTM C578, *Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation* (2011)
- ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials (2015)
- ASTM D1761, Standard *Test Methods for Mechanical Fasteners in Wood (2006)*

- ASTM E8/E8M, Standard Test Methods for Tension Testing of Metallic Materials (2015)
- UL 1715, Standard for Fire Test of Interior Finish Material (1997)
- NFPA 286 Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth (2015)
- Styrochem ICC-ES ESR-3155 Reissued June 2014
- Nexkemia Petrochemicals ICC-ES ESR-2949 Reissued June 2015
- Styropeck ICC-ES ESR-1498 Reissued December 2015
- Intertek Listing Report: Spec ID 24263
- Intertek QCM: 100134521TOR-006 revised date: October 30, 2013
  Test report: 2009-12-18 Polycrete 3178559TOR-006B - Big Block Fastener Testing
- Test report: 2010-03-10 Polycrete 3178560TOR-005A - EPS Confirmatory Testing
- Test report: 2010-03-10 Polycrete 3178560TOR-006a - AC353 Compliance Big Block 1600 and Flex 850
- Test report: 2010-06-30 Polycrete 100151304SAT-001B_Rev 1 - Big Block 1600 NFPA 286
- Test report: 2011-03-21 Polycrete 3178559TOR-007a - Big Block Tensile Testing Dec 2010

5 Evaluation Method

This evaluation reviews test reports, drawings, product specifications and on-going quality procedures to determine if the Polycrete Big Block 1600 ICF conforms in accordance with ASTM E2634-11.

This evaluation is being conducted solely for the above referenced project or use or both. Due to the variables that exist from project to project and the fact that each evaluation requires review of the most current existing data and information, this evaluation is not to be used as justification for any other opinion nor used for any other project, without the express written consent of Intertek. This report should serve as Intertek's opinion regarding the use of the certified product in the conditions described herein. The materials used on the project, which are applied in compliance with Intertek Design Listings, must bear the Intertek listing mark. All certified products must be installed in accordance with the details contained in Intertek's Directory of Listed Building Products.

Intertek has reviewed all of the applicable requirements of ASTM E2634 as they apply to the Polycrete Bigblock 1600 ICF and have summarized them in the table below.

Test Type	Test Method Standards	Requirements
EPS QUALIFICATION		
Physical	ASTM C578	Type II
Surface Burning Characteristics	ASTM E84	Maximum Flame Spread Index value of 75 Maximum Smoke Developed Index value of 450 Tested at the density and thickness intended for use.
CROSS TIE QUALIFICATION		
Lateral Load Strength	ASTM D1761	Allowable Lateral load strength of metal cross ties shall be determined in accordance with AISI NAS-01, Chapter F. Test should be conducted with the fastener screwed into the cross tie flange in a manner representative of the end use configuration.
Withdrawal Load Strength	ASTM D1761	The allowable withdrawal load strength of the connection shall be determined based on the average ultimate load divided by a safety factor of 5.

Test Type	Test Method Standards	Requirements
CROSS TIE QUALIFICATION		
Tensile Strength	ASTM E8/E8M (Metal Ties)	Minimum tensile strength of the metal cross tie assembly shall be equivalent to 675 lb/ft^2 of wall surface determined by modified test methods E8/E8M modified to test the actual cross tie assembly with load rate of 25 mm (1 in.) per minute. **Exception:** Where the manufacturer can substantiate satisfactory concrete formwork capability through analysis or testing, a reduced minimum tensile strength may be accepted.
SYSTEM QUALIFICATION		
Dimensions and Permissible Variations	ASTM E2634, Section 7	ICFs shall be within the following tolerances: Length: ± 4.2 mm/m (0.05 in/ft) Height: ± 1.6 mm (0.06 in) Cross Tie Centre to Centre spacing: ± 6.4 mm (0.25 in.) Mold Ejection Damage: Indentation 4.8 mm (0.19 in.), Protrusion 1.6 mm (0.06 in.)
Workmanship. Finish, and Appearance	ASTM E2634, Section 8	ICFs and Crossties shall be free from damage and defects in workmanship, including but not limited to: Warping must be limited to 6.4 mm (0.25 in.) Number of voids on the EPS panels shall not exceed an average of 1 per 0.93 m^2 (1 per ft^2) with none exceeding dimensions of 3.3 x 3.3 x 3.3 mm (0.13 x 0.13 x 0.13 in.). EPS panels shall have no crushed surface area exceeding 3.3 mm (0.13 in.) in depth on more than 10% of total area. All panels shall have a proper fit between the top and bottom interlocking mechanism.
Room Corner Fire Test	UL 1715 NFPA 286	The tested thermal barrier must stay in place after 15 minutes of exposure. During the 40 kW exposure flames from interior finish shall not spread to the ceiling. During the 160 kW exposure, the interior finish shall comply with the following: (a) Flame shall not spread to the outer extremity of the sample on any wall or ceiling. (b) Flashover, as defined in NFPA 286 shall not occur. During the entire test, the interior finish shall comply with (a) The peak rate of heat release throughout the NFPA 286 test shall not exceed 800 kW. (b) The total smoke released throughout the NFPA 286 test shall not exceed 1000 m^2.

The following test data has been used to show compliance with the above requirements for the Polycrete Big Block 1600 ICF.

EPS

Intertek QCM 100134521TOR-006 revised date: October 30, 2013 identifies the following EPS resin suppliers used by Polycrete in making the ASTM C578 Type II EPS panels:

- Styrochem MA, MB, MC Series, ESR-3155
- Nexkemia Petrochemicals M Series, ESR-2949
- Styropeck BF and BFL Series, ESR-1498

Per Section 6.1.3 of ASTM E2634, if the EPS resin supplier has demonstrated compliance with ASTM C578, the end user needs to only perform confirmatory testing for density and flexural strength. All EPS resin suppliers, as shown above, have valid code reports showing compliance with ASTM C578. Testing conducted under Intertek project 3178560 confirmed conformance of the Big Block 1600 EPS blocks to the ASTM C578 Type II requirements for density, flexural strength and compressive strength.

CROSS-TIES

The Polycrete Big Block ICF steel mesh cross ties were tested under Intertek projects 3178559TOR-006 and 3178559TOR-007a, and achieved the following results:

- Withdrawal Ultimate Load of 311 lbf and Allowable Load of 62 lbf,
- Lateral Load Strength of 375 lbf, Ultimate Load / 3.2 of 117 lbf, Proportional Limit Load of 120 lbf, Proportional Limit x 75% load of 90 lbf with a resulting Allowable Load of 90 lb.,
- Ultimate Tensile Load of 1851 lbf.

The lateral load strength allowable load was established based on the 6.2.4.2 (1) plastic ties analysis and not the (2) metal Cross ties provision. For metal ties, load adjustments are done according to AISI NAS-01, Chapter F. The adjustment factors for metal are of smaller than for plastic.

The tensile strength testing was conducted using a universal testing machine. The method should have conformed to a modified ASTM E8/8M. The degree of modification is extensive and the results obtained by Intertek are considered as representative.

The Big Block 1600 cross-tie strength testing conducted by Intertek indicates conformance to ASTM E2634 requirements.

ROOM CORNER FIRE TEST

The Big Block 1600 ICF system with ½" drywall was tested to NFPA 286 under Intertek project 100151304. The sample displayed low levels of heat release, and low upper level temperatures. The heat flux on the floor did not reach flashover levels. The sample did not spread flames to the ceiling during the 40 kW exposure. The flames did not spread to the extremities of the left 12-foot wall, and the rear 8 ft wall during the test. The sample did not exhibit flashover conditions during the test. Smoke measurements were well below 1000m^2. The sample satisfied the ASTM E2634 requirements.

DIMENSIONS and PERMISSIBLE VARIATIONS

The Bigblock 1600 length specification of 96.25'' +0, -0.25'' from QCM 100134521TOR-006 complies with the ASTM E2634 requirement of ± 4.2 mm/m (0.05 in/ft) which allows ± 0.40" of the intended length.

The height specification from the Bigblock 1600 QCM is 12.125" +0, -0.125"' and 24.25" +0, -0.25" which does not comply with the ± 1.6mm (0.06") ASTM E2634 requirement.

Missing from the Bigblock QCM are requirements for the following:

- Cross Tie Centre to Centre spacing: ± 6.4 mm (0.25 in.)
- Mold Ejection Damage:
  - Indentation 4.8 mm (0.19 in.),
  - Protrusion 1.6 mm (0.06 in.)

WORKMANSHIP, FINISH, and APPEARANCE

Missing from the Bigblock QCM are requirements for the following:

- Warping must be limited to 6.4 mm (0.25 in.)
- Number of voids on the EPS panels shall not exceed an average of 1 per 0.93 m2 (1 per ft2) with none exceeding dimensions of 3.3 x 3.3 x 3.3 mm (0.13 x 0.13 x 0.13 in.).
- EPS panels shall have no crushed surface area exceeding 3.3 mm (0.13 in.) in depth on more than 10% of total area.
- All panels shall have a proper fit between the top and bottom interlocking mechanism**.**

Based on the findings of this evaluation, Intertek can conclude that the Big Block 1600 ICFs comply with ASTM E2634 (2011 (Re-approved 2015)) subject to completing the following:

1. **Updating of Quality Control Manual**
   The additional Dimensional and Permissbile Variations, Workmanship, Finish, and Appearance requirements outlined in this evaluation need to be added to the Quality Control Manual and Polycrete needs to demonstrate that they can make the product within these tolerances.

2. **Updating of Listing Report**
   Once the QCM is completed, Intertek will update the Polycrete listing including the addition of ASTM E2634 as a certification criterion.

6 Conclusion

Intertek has conducted this engineering evaluation for Polycrete International Inc. on their Bigblock 1600 Insulating Concrete Forms (ICFs) to evaluate product conformance. The evaluation was conducted to determine if the products conform with the requirements of ASTM E2634, *Standard Specification for Flat Wall Insulating Concrete Form (ICF) Systems (2011 (Re-approved 2015)).*

Based on the information contained and referenced herein, it is Intertek's professional judgment based on sound engineering principles that the following is true:

- The physical property requirements per Section 6 of ASTM E2634 have been satisfied
- Additional information is needed to satisfy Sections 7 and 8 of ASTM E2634
- The Quality Control Manual will need to be updated to include dimension variations and workmanship requirements.

INTERTEK TESTING SERVICES NA LTD.

Reported by: _____
Joe DeRose, P. Eng
Project Engineer

Reviewed by: _____
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7 LAST PAGE & REVISION SUMMARY

DATE	SUMMARY
April 25, 2016	Original