

ACTS CONSTRUCTION, LLC PRODUCT EVALUATION

PRODUCT EVALUATED

CROWN ICF 7-INCH

EVALUATION PROPERTY

ICC-ES AC-353

REPORT NUMBER

G104765350MID-001

ORIGINAL ISSUE DATE

08/30/21

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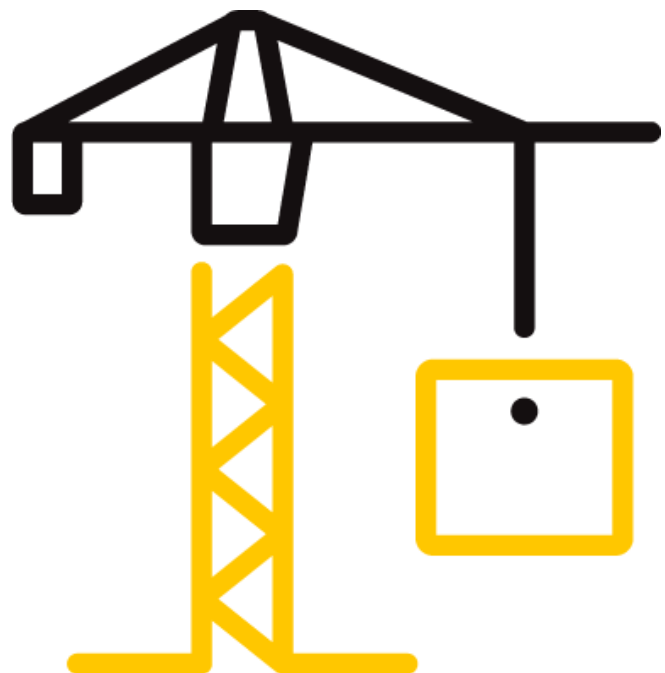
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Date: 08/30/21

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1 Introduction

Intertek Testing Services NA, Inc. (Intertek) has conducted a product evaluation for Acts Construction, LLC on their "Crown ICF 7-Inch" insulating concrete form, to evaluate performance properties as an Insulating concrete form per ICC-ES AC-353 for issuance of an Intertek Code Compliance Research Report to the IBC and IRC.

2 Product and Assembly Description

2.1. Product Description:

Crown ICFs are stay-in-place, foam plastic insulating concrete foams (ICF) system for solid (flat) concrete walls. The Crown ICFs consist of foam plastic panels that are connected by plastic cross-ties, which are embedded in the foam plastic panels. These factory-manufactured forms are for jobsite-constructed solid concrete walls, where the Crown ISFs remain in place after concrete placement. The cross-ties of the Crown ISFs have flanges at the interior and exterior wall surfaces that are utilized at the jobsite to fasten various wall coverings.

Crown ICFs are used as forms to construct structural concrete walls both above and below-grade. These walls are used in both interior and exterior building applications. These solid concrete walls are used in both Type V combustible and Types I, II, III, and IV (non-combustible) construction.

The Crown ICF products allow a 7-inch thick concrete wall with overall ICF thickness of 11.25 inches. Each Straight ICF form is 48 inches long and 16 inches tall. Each Straight ICF contains two EPS foam panels 16" x 48" x 2.125" thick and six plastic cross-ties placed 4 inches from each end and 8 inches on center.

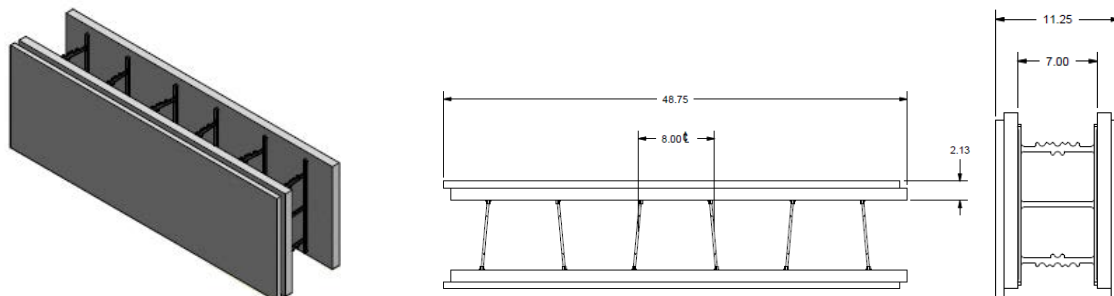


Figure 1

Crown ICF 7-inch Product Traceability:

Intertek has witnessed and documented production and markings of test samples of the ICF forms used for testing as reported in Section 3 of this report and has established verification methods to establish a direct link to the test samples and future production.

2.3. Product Certification:

The Crown ICF 7-inch, based on the findings of this report, are eligible for certification and will be placed in an ongoing surveillance program through Intertek Follow-up inspections. When completed the information will be found in Intertek Listing Report Number Spec ID 62284 "Acts Construction Crown ICF 7-inch". The Intertek Factory Audit Manual to be used for follow-up inspections will be found in subassembly Listing report Spec ID 63064 "Factory Audit Manual - Acts Construction Crown ICF 7-inch." The cross-ties are manufactured for Acts Construction by R&R Plastics, Inc. under a quality program with inspections by Intertek.

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3 Reference Documents

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

- ASTM E2634-18,-15 Standard Specification for Flat Wall Insulating Concrete Form (ICF) Systems”
- ASTM C578 Specification for Rigid Cellular Polystyrene Thermal Insulation
- ASTM E84 Standard Test Methods for Surface Burning Characteristics of Building Materials
- ASTM E119 Standard Test Methods for Fire Tests of Building Construction and Materials
- ASTM D635 Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position
- ASTM E90-09 Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
- ASTM D1761 Standard Test Method for Mechanical Fasteners in Wood
- NFPA 286 Fire Test for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth
- ICC-ES AC353 (Oct 2012, ed. Rev. 2015) Acceptance Criteria for Stay-in-Place Foam Plastic ICF Systems for Solid Concrete Walls
- 2021 and 2018 International Building Code®(IBC)
- International Residential Code®(IRC)
- Intertek Test Plan 104501129MID-001 (2020-12-07) ICC-ES AC 353, Acts Construction’s Crown ICF
- Intertek Report 104588008MID-004 (2021-03-30), ASTM D1929-20 (Cross-tie ignition temp.)
- Intertek Report 104588008MID-005 (2021-03-30), ASTM D635-18 (Cross-tie Rate of Burn)
- Intertek Report M1593.01-106-31 (2021-05-04), ASTM E2634-18 [D638-14 & D732-17] (Tie Tensile and Shear)
- Intertek Report 104588008MID-008 (2021-05-14), ASTM D1622-20 (EPS Density)
- Intertek Report 104588008MID-009 (2021-05-17), ASTM C203-05a (2017) [method I, Proc. B (EPS Flexural)
- Intertek Report 104588008MID-010 (2021-05-14), ASTM D1621-16 (EPS Compressive Strength)
- Intertek Report 104588008MID-006R0 (2021-07-21) ASTM D1761-20 (Fastener Testing)
- ICC-ES ESR-1634, Epsilyte Resources EPS Resin Beads, Grade 7454

4 Evaluation Method

This evaluation plan for this product is based on the Intertek test plan 104501129MID-001 that was created in December of 2020 to comply with the 2018 IBC and the 2020 Florida Building Code.

Not all of the optional tests outlined in the test plan have been performed to date. Not considered at this time are optional fire resistance construction ASTM E119, Sound Transmission Classification ASTM E90-09, or Wind-storm Debris impact for Florida HVHZ TAS 201, 203, and TAS 202.

NOTE: Structural design of the concrete walls is outside of the scope of Intertek certification and report.

The structural design of the solid concrete walls is to be in accordance with IBC chapters 16 and 19, as applicable. Foundations and footings that are formed with the Crown ICFs shall be designed and constructed in accordance with IBC Chapter 18 or prescriptive provisions of the IRC.

The Crown ICF system is intended for use with reinforced concrete with 3/4-inch stone mix poured at a 5.5-inch to 6.5 inch slump with a 28 day strength of 3,000 to 4,000 pounds.

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Below is a summary of the results of testing performed and establishes product uses and limitations to be included in an Intertek Code Compliance Research Report.

Summary of Test Data						
Report	Test	Standard	Results		Requirement	
Expanded Polystyrene (EPS) Panel Properties per ASTM E2534 and ICC-ES AC 353						
104588008MID-010	Compressive strength	ASTM C165 Procedure A, or ASTM D1621	24.1 psi		ASTM C578 Classification verified with evaluation report by resin supplier ESR 1634 Grade 7454 Bead "C" C ≥ 15, D ≥ 1.35, F ≥ 35	Pass
104588008MID-008	Density	ASTM D1622	1.59 lbs./ft ³			Type II
104588008MID-009	Flexural strength	ASTM C203-05A(2017), Method 1 proc. B	58.3 psi.			
ICC-ESR 1634 Epsilyte, LLC Grade 54 Modified Bead Size "C"	Surface Burning Characteristics of EPS Panels	ASTM E84	FS ≤ 25 SD ≤ 450		Flame Spread ≤ 75, Smoke-developed Index ≤ 450 for Type V construction. FS ≤ 25 and SD ≤ 450 for Types I-IV construction	Pass Types I-IV and V
Plastic Cross-Tie Properties per ASTM E2634 and ICC-ES AC353						
104588008MID-004	Self-Ignition Temperature	ASTM D1929	Flash ignition temp 356° C Self-Ignition Temp 352° C		Minimum 662°F (350°C)	Pass
104588008MID-005	Rate of Burn	ASTM D635	Burn Rate 19.7 mm/min. Meets criteria for CC2 per IBC Section 2606.4		Classification of CC1 or CC2 as defined in IBC Section 2606.4	Pass
M1593.01-106-31	Tensile Strength of Cross-Tie ASTM D638	Sec. 6.2.5 of ASTM E2634.	Tensile Load 3.05 kN		Minimum 2.67 kN	Pass
M1593.01-106-31	Shear Strength of Cross-tie. ASTM D732	Sec. 6.2.6 of ASTM E2634	21.6 MPa		Minimum 2.47 MPa, calculated per Section 6.2.6 of E2634	Pass
Fastener Strength per ASTM E2634 and ICC-ES AC 353 requirements						
104588008MID-006	Average Ultimate Withdrawal Strength	Fastener type ¹ : 308 lbf Fastener type ² : 90 lbf Fastener type ³ : 242 lbf Fastener type ⁴ : 241 lbf Fastener type ⁵ : 286 lbf	Allowable Design Load Average ultimate load with Safety Factor of 5.			¹ 61.6 lbf ² 18.0 lbf ³ 48.4 lbf ⁴ 48.2 lbf ⁵ 57.2 lbf
Fastener Testing Per ASTM D1761	Lateral Load Strength	Ultimate Load Fastener type ¹ : 485 lbf Fastener type ² : 168 lbf Fastener type ³ : 265 lbf Fastener type ⁴ : 258 lbf Fastener type ⁵ : 487 lbf	Proportional limit ¹ 298 lbf ² 124 lbf ³ 231 lbf ⁴ 166 lbf ⁵ 313 lbf	75% Proportional ¹ 224 lbf ² 93 lbf ³ 173 lbf ⁴ 125 lbf ⁵ 235 lbf	Allowable lateral strength of test reports per Section 4.1.3.2.2. of ICC-ES AC 353 [see next page for calculation]	Allowable Load ¹ 151 lbf ² 52 lbf ³ 40 lbf ⁴ 75 lbf ⁵ 152 lbf
¹ Coated Cabinet Screw # 10 × 2-1/2", T20 Star drive head ² Ring Shank Framing Nail 2-3/8" × 0.113" (Clipped Head) ³ Coarse Thread Drywall Screw # 6 × 1-5/8" (#2 Phillips drive head) ⁴ Fine Thread Drywall Screws # 6 × 1-5/8" (#2 Phillips drive head) ⁵ Coated Deck Screw # 9 × 2" (combo-head #2 Phillips / #2 Square drive)						

Table 1 Summary of Results

Calculation of Allowable Lateral Load

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Allowable lateral strength of test reports per Section 4.1.3.2.2. of ICC-ES AC 353. The allowable lateral load strength shall not exceed 75 % of the average proportional load limit or the average ultimate load divided by a factor of 3.2, whichever is lower.

The COV is required to be 15% or lower to use the average ultimate load factored at 3.2. When the COV is greater than 15 percent, the allowable load is calculated by formula: $F_{all} = F [1-2COV/2.24]$

	Ultimate Load	Ult. Load COV	Ult. load /3.2	Proportional load	75% Proportional	Allowable Lateral Load
Lateral Load [COV ≤ 15%]	Fastener type ¹ : 485 lbf	0.062	151 lbf	¹ 298 lbf	¹ 224 lbf	151 lbf
	Fastener type ² : 168 lbf	0.060	52 lbf	² 124 lbf	² 93 lbf	52 lbf
	Fastener type ³ : 265 lbf	-	-	³ -	³ -	-
	Fastener type ⁴ : 258 lbf	-	-	⁴ -	⁴ -	-
	Fastener type ⁵ : 487 lbf	0.033	152 lbf	⁵ 313 lbf	⁵ 235 lbf	152 lbf
Lateral Load [COV > 15%]	Fastener type ¹ : 485 lbf	-	-	¹ -	¹ -	-
	Fastener type ² : 168 lbf	-	-	² -	² -	-
	Fastener type ³ : 265 lbf	0.332	40 lbf	³ 231 lbf	³ 173 lbf	40 lbf
	Fastener type ⁴ : 258 lbf	0.174	75 lbf	⁴ 166 lbf	⁴ 125 lbf	75 lbf
	Fastener type ⁵ : 487 lbf	-	-	⁵ -	⁵ -	-

F_{all} Fastener type 3 = $F [1-2COV/2.24] = 265 [1- 0.664/2.24] = 265[0.15] = 39.75$

F_{all} Fastener type 4 = $F [1-2COV/2.24] = 258 [1- 0.348/2.24] = 258[0.29] = 75.0$

Table 2 Lateral Load

Based on the above the allowable withdrawal and lateral load capacities are per table will be reported

FASTENER	ALLOWABLE LOAD CAPACITY (lbf)	
	Lateral	Withdrawal
Grip Fast Pro Coated Cabinet Screw # 10 × 2-1/2", T20 Star drive head	151	61
Ring Shank Framing Nail 2-3/8"× 0.113" (Clipped Head)	52	18
Coarse Thread Drywall Screw # 6 × 1-5/8" (#2 Phillips drive head)	40	48
Fine Thread Drywall Screws # 6 × 1-5/8" (#2 Phillips drive head)	75	48
Coated Deck Screw # 9 × 2" (combo-head #2 Phillips / #2 Square drive)	152	57

Allowable lateral load capacity by methods of Section 4.1.3.2.2. of ICC-ES AC 353.

Allowable withdrawal capacity established by dividing the ultimate load by a factor of 5.

Table 3 Fastener Allowable Loads

Surface burning characteristics

Per 2603.3 of the IBC, foam plastic insulation must have a flame spread index of 75 or less and smoke-developed index of not more than 450. The Crown ICFs comply with FS not greater than 25 and a smoke developed index of not greater than 450.

A thermal barrier is required in all Types of construction (Types I, II, III, IV and V) except in one story buildings complying with 26034.1.4 or where qualified by testing in accordance with 2603.5.

Exterior walls in Type I, II, III and IV construction

Per section 2603.5 of the IBC exterior walls of Types I, II, III, and IV construction require foam plastic insulation to

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be separated from the building interior by a thermal barrier unless special approval based on large scale testing is performed. Approved Thermal barriers per Section 2603.4 are 1/2-inch gypsum wallboard, heavy timber per Section 602.4 or other materials meeting the acceptance criteria of NFPA 275 for temperature transmission and Integrity. A thermal barrier is not required in single story buildings required to be of Types I, II, III or IV construction under the conditions in Section 2603.4.1.4.

Per section 2603.5.5 multi-story buildings required to be of Types I, II, III or IV construction with insulation that has flame spread index of not more than 25 and have a limited maximum airspace between in insulation and the concrete of 1 inch are not required to be tested in accordance with NFPA 285 for vertical and lateral fire propagation. **Use of the Crown ICF will be limited to Type V construction except where the exterior face is covered by not less than 1-inch thickness of masonry or concrete.**

Label requirements to be per section 2603.5.6 for walls including foam plastic used in exterior walls.

Testing for Ignition per 263.5.7 is required but it typically performed by the manufacturer of the exterior wall covering.

Attic and Crawl Space Applications

ICC-ES ESR-1634 includes special use recognition for foam plastic panels produced from the Epsilyte, Grade 54 beads may be used on walls of attics and crawl spaces without ignition barrier covering applied to the attic or crawl space providing conditions of use with in ESR-1634.

The plastic foam panels of the Crown ICF complies with ESR-1634 4.2 item 6, maximum density and thickness condition of use. The Crown panel has a thickness of 2.125 inches and the foam produced has a density of 1.7 PCF, this would result in less density-thickness when compared to either 2 pcf density at a thickness of 2 inches or 1 psf material at thickness of 4 inches allowed. Therefore, the Crown ICFs may be installed in attics and crawl spaces without the prescriptive ignition barrier required in IBC Section 2603.4.1.6 and IRC Sections R316.5.3 and R316.5.4.

PROPERTY	IBC SECTION	IRC SECTION
Physical Properties	1903.4	R404.1.3.3.6.1, R608.4.4
Surface-burning Characteristics	2603.3	R316.3
Exterior Walls in Type I-IV Construction	2603.5	NA
Attic and Crawl Space Applications	2603.4.1.6, 2603.9	R3165.3, R316.5.4, R316.6

Table 4 Properties Evaluated

Intertek Listing documents will be created based on the information contained in this report, including applications of use and limitations as previously determined in Intertek Test Plan 104501129MID-001, and in compliance with the code sections of Table 4 of this report.

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5 Conclusion

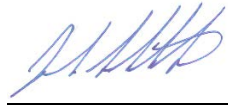
Intertek has conducted this product evaluation for Acts Construction, LLC, on their "Crown ICF 7-inch" insulating concrete form, to evaluate performance properties as required for an insulating concrete form per ASTM E2634-15 and ICC-ES AC353 for issuance of an Intertek Code Compliance Research Report to the 2018 IBC and IRC.

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

- Acts Construction Crown ICF 7-inch has been evaluated as an Insulating concrete form with properties in accordance with the applicable codes and based on information provided in Section 4 of this report may be included in an Intertek Listing and Code Compliance Research Report under the 2018 IBC and IRC with applicable applications, limitations, and ratings.
- Testing in accordance with Section 6.4.2 of ASTM E2634-18 will be required for compliance with the 2021 IBC and IRC.
- Testing in accordance with E2634-18, Section X1.2 for use without a water-resistive barrier, and Section X1.3 for use as an air barrier, if such recognition is sought.

INTERTEK TESTING SERVICES NA INC.

Reported by:



John Schachtner
Project Engineer, Evaluation Services

Reviewed by:



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Certification Services



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DATE	SUMMARY	REPORTER	REVIEWER
August 30, 2021	Original	J Schachtner	M. Beaton