

8.1 – TECHNICAL SPECIFICATIONS

(CSI Specifications for LOGIX are available at www.logixicf.com)

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LOGIX INSULATED CONCRETE FORMS SPECIFICATIONS SHEET

This document is intended for general information purposes only regarding specifications for Logix Insulated Concrete Forms (herein referred to as Logix ICF). Technical specification sheet, as per Construction Specifications institute (CSI) formatting, can be downloaded at www.logixicf.com.

1 PRODUCT DESCRIPTION

- Logix ICF consists of two flame-resistant EPS boards separated by polypropylene webs.
- Logix ICF consists of solid form units or knock-down forms (Logix Knock-down Forms) or a combination of both Logix solid form units and Logix Knock-down forms, referred to as LOGIX Hybrid Forms.
- The EPS foam boards are a minimum 70 mm (2.75 inch) thick, and can range in thickness of 70 (2.75 inches), 102 (4 inches), 127 (5 inches), 152 (6 inches), 178 (7 inches) and 203 mm (8 inches), which gives a total EPS foam board thickness of 140 (5.50 inches), 203 (8 inches), 254 (10 inches), 305 (12 inches), 356 (14 inches) and 406 mm (16 inches), respectively.
- The webs separate the EPS boards to form 102 mm (4 inch), 159 mm (6.25 inc), 203 mm (8 inch), 254 mm (10 inch) and 305 mm (12 inch) cavities, which create the concrete wall thicknesses.
- The webs are spaced every 203 mm (8 inch) on centre horizontally and 406 mm (16 inch) on centre vertically, and contain a 32 mm (1.25 inch) wide furring strip that extends the height of each ICF block. The furring strips shall facilitate fasteners for attachment of both exterior and interior finishes.
- A furring strip is located in the corners of corner forms. The furring strip consists of both a vertical and horizontal component. The vertical component extends nearly the full height of the form, extends a minimum of 64 mm (2.5 inches) from both sides of the corner, and a minimum of 5 mm (0.2 inches) thick. The horizontal component is a minimum 51mm (2 inches) in height, extend a minimum of 152 mm (6 inches) from both sides of the corner, and a minimum of 5 mm (0.2 inches) thick.
- The webs facilitate rebar placement in accordance with CAN/CSA A23.1, and ACI 318

2 CODE/CERTIFICATION APPROVALS

- International Code Council Evaluation Report No. 1642
- CCMC Report No. 13110-R
- City of Los Angeles Research Report No. 25518
- Miami-Dade County Approval No.03-0319.01
- State of Florida Certification of Approval No.FL2931
- Wisconsin Building Products Evaluation No.200266-I

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- City of New York Materials and Equipment Acceptance – MEA 273-04-M
- ULC listed. File no. R22350.
- UL listed. Fire resistance directory 3LXZ

3 DESIGN/PERFORMANCE OF LOGIX ICF

A brief description of each test is outlined in the attached Appendix. Test reports are available upon request.

Test Description	Result	Pass/Fail Criteria	Referenced Standard Test Method
R-Value (Thermal Resistance) per inch (per 25.4mm)	R 4.13 (RSI 0.72)	Min. R 4.00 (RSI 0.70)	ASTM C518
Water Absorption	0.18%	Max. 3.0%	ASTM D2842
Water Vapor Presence	94.0ng/Pa-s-m ² (1.64perm-in.)	Max. 201 ng/Pa-s-m ² (3.5perm-in.)	ASTM E96
Compressive Strength	165kPa (23.9psi)	Min. 104kPa (15.0psi)	ASTM D1621 & ASTM C165
Flexural Strength	365kPa (53.0psi)	Min. 240kPa (35.0psi)	ASTM C203
Dimensional Stability – Thermal & Humid Aging	0.5%	Max. 2.0%	ASTM D2126
Density	27.5kg/m ³ (1.72pcf)	Min. 22 kg/m ³ (1.35pcf)	ASTM C1622 & ASTM C303
Dimensions	Min. length variation = 0.0% Max. length variation = 0.4% Min. width variation = 0.1% Max. width variation = 0.4% Min. thickness variation = -0.3mm Max. thickness variation = 0.9mm Max. squareness = 3mm	Min. -0.2% Max. 0.4% Min. -0.2% Max. 0.4% Max. -2mm Max. 4mm Max. 3mm	ASTM C303
Limiting Oxygen Index	29.1%	Min. 24.0%	ASTM D2863
Formaldehyde Emission	No formaldehyde detected	N/A*	AATTC-112
Fungi Resistance	No fungal growth detected	N/A*	ASTM G21
Flame Spread Rating	< 25	N/A*	ASTM E84/CAN ULC S102
Smoke Developed Rating	< 450	N/A*	ASTM E84/CAN ULC S102
Fire Endurance Test	See Fire Resistance Rating table	N/A*	ASTM E119/CAN ULC S101
Standard Room Fire Test	w/in acceptable limits	Met conditions required for exposure to fire for 15 minutes.	UBC 26-3/CAN ULC 1715
Concrete Pour-in-place	Observations of deflection recorded.	N/A*	CCMC Masterformat 03131
Sound Transmission	STC 56 for 6.25" Logix wall system (2 layers of 5/8" drywall & 2x2 wood strips on one side, 1/2" drywall on the other side)	N/A*	ASTM E90

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Test Description	Result	Pass/Fail Criteria	Referenced Standard Test Method
	STC 50 for 4" Logix wall system (½" drywall & 2x2 wood strips on one side, ½" drywall on the other side)		
UPITT Toxicity	Pass	LC50 < 19.7g	University of Pittsburgh Toxicity Test

*Code body or referenced test standard required reporting test results only - no Pass/Fail criteria specified.

Tests Conducted on Polypropylene Web

Test Description	Result	US Requirements	Referenced Standard Test Method
Flammability	Flame Front Distance = 100mm (4") Avg. Linear Burn Rate = 17.9mm/min (0.70in/min)	Max. linear burn rate = 40.0mm/min (1.57in/min) for Flame Front Dist. = 100mm (4")	ASTM D635
Smoke Density Rating	19.1%	Max. 75%	ASTM D2843
Average Lateral Fastener Resistance of Drywall Screws	1.63kN (367lbs)	N/A*	ASTM D1761
Average Withdrawal Fastener Resistance of Drywall Screws	0.75kN (169lbs)	N/A*	ASTM D1761
Shear Strength of Polypropylene Web	26.1MPa (37.9psi)	N/A*	ASTM D732, CCMC Masterformat 03131
Average Tensile Strength of Polypropylene Web	3.75kN (842lbs)	N/A*	ASTM D638
Average Withdrawal Resistance of Staples 1.59mm 16ga.	105N (24lbs)	N/A*	ASTM D1761 (under cyclic temperatures)
Average Withdrawal Resistance of Plane Shank 1.5" long, 3/8" head	155N (35lbs)	N/A*	ASTM D1761 (under cyclic temperatures)
Average Withdrawal Resistance of Ring Shank 1.5" long, 3/8" head	431N (97lbs)	N/A*	ASTM D1761 (under cyclic temperatures)
Average Withdrawal Resistance of Spiral Shank 1.5" long, 3/8" head	135N (30lbs)	N/A*	ASTM D1761 (under cyclic temperatures)
Average Lateral Resistance of Staples 1.59mm 16ga.	169N (38lbs)	N/A*	ASTM D1761 (under cyclic temperatures)
Average Lateral Resistance of Plane Shank 1.5" long, 3/8" head	520N (117lbs)	N/A*	ASTM D1761 (under cyclic temperatures)

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Test Description	Result	US Requirements	Referenced Standard Test Method
Average Lateral Resistance of Ring Shank 1.5" long, 3/8" head	378N (85lbs)	N/A*	ASTM D1761 (under cyclic temperatures)
Average Lateral Resistance of Spiral Shank 1.5" long, 3/8" head	200N (45lbs)	N/A*	ASTM D1761 (under cyclic temperatures)
Average Withdrawal Resistance of Corrosion Resistance No.8-18 x 0.323 HD x 1.5/8"	567N (127lbs)	N/A*	ASTM D1761
Average Withdrawal Resistance of Corrosion Resistance 6d (0.113" shank x 0.267 HD x 2" long)	93N (21lbs)	N/A*	ASTM D1761
#6 Coarse Drywall Screw, 1-5/8" long**	787N (177lbs)	N/A*	ASTM D1761
#6 Fine Drywall Screw, 1-5/8" long**	765N (172lbs)	N/A*	ASTM D1761
16ga. Staple, 1-1/2" long**	124N (28lbs)	N/A*	ASTM D1761
Galvanized Ringed Wallboard Nail, 1-1/2" long**	462N (104lbs)	N/A*	ASTM D1761
Hot-dipped Galvanized Spiral Nail, 2" long**	226N (51lbs)	N/A*	ASTM D1761
#8 Wood Screw, 2" long**	920N (207lbs)	N/A*	ASTM D1761
#8 Exterior Deck Screw, 2" long**	934N (210lbs)	N/A*	ASTM D1761
#10 Wood Screw, 2" long**	880N (198lbs)	N/A*	ASTM D1761

*Code body or referenced test standard required reporting test results only - no Pass/Fail criteria specified.

**Applicable to corner web only.

Fire Resistance Rating

Form Size (Concrete Wall Thickness)	Rating with 1/2" drywall
100mm (4")	2hrs
159mm (6.25")	3hrs (4hrs if 5/8" drywall used)
203mm (8") and above**	4hrs

*Bearing load applied to wall = 360,000lbs (360kips)

**100mm (4"), 159mm (6.25"), 203mm (8"), 254mm (10"), and 305mm (12") knockdown forms will be available in 2008.





4 MANUFACTURED UNITS

Logix ICF is available in 5 block sizes: 102 (4 inch), 159 (6.25 inch), 203 (8 inch), 254 (10 inch), and 305 mm (12 inch). The following table lists the available Logix ICF products and web furring strip dimensions.

Logix ICF products consists of:

1. Logix solid forms
2. Logix Knock-down forms
3. LOGIX XRV panels (Logix ICF Knock-down forms with EPS panels greater than 70 mm (2.75 inches)

Logix ICF Products		Availability	
Product	Description	Solid Form Units	Knock-down Forms
Standard	16 inches tall by 48 inches long. Range of thickness is 2.75, 4, 5, 6, 7, and 8 inches	4, 6.25, 8, and 10 inch	6.25, 8, 10, and 12 inches
Brick Ledge	16 inches tall by 48 inches long by 2.75 inches thick. Brick ledge extends 5.875 inches from face of concrete.	6.25, 8, and 10 inch	6.25, 8, 10, and 12 inches
Transition	16 inches tall by 48 inches long by 2.75 inches thick. Corbel ledge extends 3.75 inches from face of concrete.	6.25 and 8 inch	6.25, 8, 10, and 12 inches
Taper Top	16 inches tall by 48 inches long by 2.75 inches thick. At tapered end concrete extends 1.75 inches from face of concrete.	4, 6.25, 8, and 10 inch	6.25, 8, 10, and 12 inches
90° Corner	16 inches tall by 2.75 inches thick. Length of corner forms varies based on concrete core thickness.	4, 6.25, 8, and 10 inch	6.25, 8, 10, and 12 inches
45° Corner	16 inches tall by 2.75 inches thick. Length of corner forms varies based on concrete core thickness.	4, 6.25, and 8 inch	n/a
Half Height Standard	8 inches tall by 48 inches long. Range of thickness is 2.75, 4, 5, 6, 7, and 8 inches	4, 6.25, and 8 inch	n/a
Half Height 90° Corner	8 inches tall by 2.75 inches thick. Length of corner forms varies based on concrete core thickness.	4, 6.25, and 8 inch	n/a
Half Height 45° Corner	8 inches tall by 2.75 inches thick. Length of corner forms varies based on concrete core thickness.	4, 6.25, and 8 inch	n/a
Height Adjuster	4 inches tall by 24 inches long by 2.75 inches thick.	n/a	n/a
End Cap	16 inches tall by 2.25 inches thick.	4, 6.25, 8, 10 and 12 inch	4, 6.25, 8, 10 and 12 inch
Pilaster	16 inches tall by 2.75 inches thick. Provides a pilaster 16 inches wide, and can extend a maximum of 10.7 inches from face of concrete.	n/a	n/a

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Furring Strip Dimensions

	Block Size				
	100mm (4")	159mm (6.25")	203mm (8")	254mm (10")	305mm (12")*
Height (full height blocks)	362mm (14.25")	362mm (14.25")	362mm (14.25")	362mm (14.25")	362mm (14.25")
Height (half height blocks)	159mm (6.25")	159mm (6.25")	159mm (6.25")	n/a	n/a
Width	32mm (1.25")	32mm (1.25")	32mm (1.25")	32mm (1.25")	32mm (1.25")
Thickness	4.8mm (0.1875")	4.8mm (0.1875")	4.8mm (0.1875")	4.8mm (0.1875")	4.8mm (0.1875")

*100mm (4"), 159mm (6.25"), 203mm (8"), 254mm (10"), and 305mm (12") knockdown forms will be available in 2008

90° Corner Furring Strip Dimensions (full height blocks)

	Block Size				
	100mm (4")	159mm (6.25")	203mm (8")	254mm (10")	305mm (12")*
Height (Vertical Strip)	362mm (14.25")	362mm (14.25")	362mm (14.25")	362mm (14.25")	362mm (14.25")
Height (Horizontal Strip)	50mm (2")	50mm (2")	50mm (2")	50mm (2")	50mm (2")
Width (Vertical Strip – one side of corner)	48mm (1.875")	48mm (1.875")	48mm (1.875")	48mm (1.875")	48mm (1.875")
Width (Horizontal Strip – one side of corner)	147mm (5.75")	147mm (5.75")	147mm (5.75")	147mm (5.75")	147mm (5.75")
Thickness	4.8mm (0.1875")	4.8mm (0.1875")	4.8mm (0.1875")	4.8mm (0.1875")	4.8mm (0.1875")

*100mm (4"), 159mm (6.25"), 203mm (8"), 254mm (10"), and 305mm (12") knockdown forms will be available in 2008



5 DESIGN PROPERTIES OF STEEL

Property	Value
Yield Stress, f_y	Min. 276Mpa (40ksi)

6 DESIGN PROPERTIES OF CONCRETE

Properties	Value for each Block Size				
	100mm (4")	159mm (6.25")	203mm (8")	254mm (10")	305mm (12")*
28day Compressive Strength	20Mpa (2900psi)	20Mpa (2900psi)	20Mpa (2900psi)	20Mpa (2900psi)	20Mpa (2900psi)
Recommended Max. Aggregate Size	9.5mm (0.375")	19mm (0.75")	19mm (0.75")	19mm (0.75")	19mm (0.75")
Recommended Slump	127-178mm (5 – 7in.)	127-178mm (5 – 7in.)	127-178mm (5 – 7in.)	127-178mm (5 – 7in.)	127-178mm (5 – 7in.)
Min. Concrete Cover Attainable	25mm (1in.)	25mm (1in.)	25mm (1in.)	25mm (1in.)	25mm (1in.)

*100mm (4"), 159mm (6.25"), 203mm (8"), 254mm (10"), and 305mm (12") knockdown forms will be available in 2008

7 QUALITY ASSURANCE

Manufacturers of Logix ICF are certified under UL carrying the UL and ULC labels. Unannounced quality control inspections are conducted by UL at least 4 times a year to ensure strict compliance with established quality control procedures.

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APPENDIX

TEST DESCRIPTIONS

To be read in reference to the tabulated test results in Section 3





Compressive Strength – indication of the amount of pressure required to compress the EPS to its yield point or by 10% of its original dimension, whichever occurs first.

Concrete Pour-in-place – assembly of a Logix ICF wall in which observations were recorded visually for the behaviour of the ICF wall during concrete pouring. Deflections before, during and after the pour were recorded. In addition, the form was structurally inspected to check for any structural damage caused to the ICF form during the pour. Using 203mm (8in) Logix ICF blocks, the wall size was 3.66m (12ft) high by 2.44m (8ft) wide.

Density – a measure of the weight of EPS per unit volume.

Dimensions – length, width and thickness of full size (finished product) EPS panels measured to ensure the final dimensions are within acceptable tolerances.

Dimensional Stability, Thermal & Humid Aging – a measure of dimensional change in EPS after exposure to hot and cold temperatures at high relative humidity for seven days. The EPS is normally exposed to temperatures of 70°C (158°F) and -40°C (-40°F) for seven days at 97% or ambient humidity. After exposure the dimensions of the EPS samples are measured at room temperature. The tabulated value is expressed as a percent change in dimensions before and after exposure. The smaller the percent change the smaller the change in dimensions.

Fire Endurance Test – fire test of a wall assembly, with cast-in-place concrete. The non-fire exposed side of the wall has no cover or protective barrier; the fire exposed side is covered with 25.4mm (1/2") drywall over the EPS. The wall assembly is subjected to a bearing load of 360kips while exposed to fire until a certain temperature on the wall is reached. The time to reach that temperature including observations are recorded. After the fire test the wall assembly is subjected to the impact, cooling and erosion effects of a hose stream – the hose stream test.

Flammability – fire test on the polypropylene web to determine the burning characteristics of the web material. With the web supported in a horizontal position, a flame is applied at one end. The flame front distance is the distance the flame travels from the applied end to the point the flame goes out. The linear burn rate is the rate it takes to travel the flame front distance.

Flame Spread & Smoke Developed Rating – flame spread and smoke developed rating is determined from a fire test. Flame spread and smoke developed rating is a surface burning characteristic of a material and is not related to the fire resistance of a material. Flame spread rating is an indication of how fast fire will spread over the EPS from the original flame source. Smoke developed rating is an indication of how much smoke is generated during the fire test. The tabulated values are relative numbers based on calculations from the fire test results. The number is compared to asbestos and red oak, which have a rating of 0 and 100, respectively. Flame spread ratings provide an indication, particularly useful for fire officials, of how fast fire may spread in a building based on the building's materials. The National Fire Protection Agency (NFPA) classifies a material's suitability for use in construction based on its flame spread index.

Flexural Strength – measured as the amount of pressure it takes to reach the breaking load of EPS samples in bending. Samples are supported at the ends and a concentrated load is applied at the mid-span of the samples. The load is gradually increased until the samples fail.

Formaldehyde Emission – a measure of the amount of formaldehyde released from the EPS when heated to 120°F (49°C).



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Fungi Resistance – a measure of the amount of fungi growth on the EPS when exposed to certain types of fungi.

Lateral Fastener Resistance – test to determine the lateral strength of Type S and Type W drywall screws fastened to the web. A concentrated load is applied perpendicular to the axis of the screw, which is fastened to the web. The load is gradually increased and tested to failure. Deflections are recorded during the duration of the tests.

Limiting Oxygen Index – a measure of the EPS to sustain a flame. The measurement is described as the amount of oxygen required (expressed as a percentage) to just support flaming combustion of the EPS when exposed to a flowing mixture of nitrogen and oxygen. The tabulated value is the amount of oxygen in the nitrogen/oxygen mixture required to just keep the EPS aflame.

Shear Strength – test to determine the shear strength of the polypropylene web.

Smoke Density Rating – a measure of the relative amount of smoke produced by the burning of the polypropylene web. The tabulated value is the amount of loss of light transmission through the smoke produced from the burning of the web, expressed as a percentage.

Smoke Developed Rating – see Flame Spread Rating.

Standard Room Fire Test – fire test of a room assembly where one corner of the room is built with Logix ICF blocks with cast-in-place concrete, and covered with ½” drywall. The room is exposed to a column of fire originating in the corner of the room adjacent to the ICF. The ICF is exposed to the fire for 15 minutes and observations recorded. The tabulated value is based on observations that showed melting of the EPS did not extend outside of the column of fire, smoke generated was not excessive, and since there was no damage to the concrete the structural integrity of the wall remained in place. Using 159mm (6.25in) ICF blocks, the size of the corner built with ICF was 2.44m (8ft) long in one direction, 2.44m (8ft) long in the other direction, and 2.44m (8ft) high.

Tensile Strength – test to determine the tensile strength of the polypropylene web.

Thermal Resistance – a measure of a materials resistance to heat flow through the EPS. The higher the R-value the greater the resistance to heat flow, the better the insulator.

Water Absorption – a measure of the ability of the EPS to absorb water. The tabulated value is a ratio of the weight of water absorbed by the EPS to the weight of the EPS dry, expressed as a percentage. The smaller the value the less water absorbed by the EPS.

Water Vapour Permeance – the rate at which water vapour will pass through the EPS. During the test, a vapour pressure difference between the two sides of the EPS is produced. The tabulated value is the rate at which the vapour passes through the EPS. The smaller the value the lower the water vapour permeance of the EPS.

Withdrawal Fastener Resistance – test to determine the withdrawal strength (or pullout strength) of Type S and Type W drywall screws fastened to the web. A concentrated load was applied parallel to the axis of the screw, which is fastened to the web. The load is gradually increased and tested to failure.

