Code Compliance Research Report
CCRR-1005

Issue Date: 01-31-2014
Revision Date: 01-05-2024
Renewal Date: 01-31-2026

DIVISION: 03 00 00 – CONCRETE
Section: 03 11 19 – Insulating Concrete Forming

REPORT HOLDER:
Micro Technologies, LLC
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REPORT SUBJECT:
Celblox® Insulating Concrete Forms (ICFs)

1.0 SCOPE OF EVALUATION

This Research Report addresses compliance with the following Codes:
- 2018, 2015, and 2012 *International Building Code®* (IBC)
- 2018, 2015, and 2012 *International Residential Code®* (IRC)

Note: This report references the 2018 Code sections. Earlier versions of the Code may have different section numbers.

Celblox® ICFs have been evaluated for the following properties:
- Physical properties
- Surface-burning characteristics
- Fire resistance
- Exterior walls in Types I through IV construction
- Attic and crawl space fire evaluation

See Table I for applicable Code sections related to these properties.

2.0 USES

Celblox® Insulating Concrete Forms (ICFs) are used as permanent formwork for cast-in-place reinforced concrete beams; lintels; exterior and interior, above and below grade bearing and nonbearing walls; foundation wall and retaining walls. The forms may be installed in attics and crawl spaces without a covering on the interior side when installed in accordance with Section 4.3.2. The forms may be used in fire-resistance-rated construction, provided installation is in accordance with Section 4.8. The forms may be used in Types I, II, III, or IV (noncombustible) construction provided installation is in accordance with Section 4.9.

3.0 DESCRIPTION

3.1 General:

The Celblox® ICFs are classified as flat ICF wall systems in accordance with IRC Section R608.3.1. The ICFs consist of two expanded polystyrene (EPS) foam plastic panels connected with plastic cross-ties having flanges that are partially embedded into the EPS panels.

The standard forms are 48 inches long, 16 inches high, and the panels are 2.5 inches thick. The cross-ties connect the two panel facings to create cores having widths of 4, 6, 8, 10, and 12 inches. Accessory forms are available in 90-degree, 45-degree, taper top, and brick ledge configurations. The forms have an interlocking mechanism on the top and bottom edges to facilitate interlocking and stacking. See Figures 1 through 5.

3.2 Foam Plastic Panels:

The EPS foam plastic panels have a nominal density of 1.5 pcf and comply with ASTM C578 as Type II. The foam plastic has a flame-spread index of 25 or less and a smoke-developed index of 450 or less when tested in accordance with ASTM E 84.

3.3 Cross Ties:

The plastic cross-ties consist of 1-1/2-inch-wide flanges, which are molded into each panel at 8 inches on center and are connected with plastic hinges. See Figure 6 for an illustration of the cross-ties. A 1/4-inch-wide line on the outside face of the ICF indicates the location of the flanges.

3.4 Concrete:

Celblox® ICF wall concrete to be as specified by the project structural engineer or architect and must comply with applicable Building Codes.

3.5 Reinforcement:

Under the IBC, the deformed steel bars must comply with Section 3.5.3.1 of ACI 318 and IBC Section 1903. If construction is based on the IRC, reinforcement must comply with IRC Sections R404.1.3.3. (foundation walls and retaining walls) and R608.5.2 (for walls).

4.0 INSTALLATION

4.1 General:

Design and installation of Celblox® ICFs must comply with this report, the applicable Code, and the manufacturer's published installation instructions to be made available on project job sites.

4.2 Design:

4.2.1 IBC Method: Solid concrete walls must be designed and constructed in accordance with IBC Chapter 16 and 19, as applicable. Footings and foundations must be designed in accordance with IBC Chapter 18.

4.2.2 Alternative IBC Wind Design Method: Solid concrete walls may be designed and constructed in accordance with the provisions of Section 209 of ICC 600, subject to the limitations found in IBC Section 1609.1.1.1 in accordance with Exception 1 to Section 1609.1.1. Design and construction under the provisions of ICC 600 are limited to resisting wind forces.

4.2.3 IRC Method: Solid concrete walls and foundations must be designed in accordance with IRC Sections R608 and R404.1.3, as applicable for flat wall systems.

4.2.4 Alternative IRC Methods: When used to construct buildings that do not conform to the applicability limits of IRC Sections R404.1.3 and R608, construction must be in accordance with the prescriptive provisions of the 2012 Prescriptive Design of Exterior Concrete Walls (PCA 100), or the structural analysis and design of the concrete must be in accordance with ACI 318 and IBC Chapters 16, 18 and 19.

4.3 Interior Finish:

4.3.1 General: Except as permitted in Section 4.3.2, ICF units exposed to the building interior must be finished with an approved 15-minute thermal barrier, such as minimum 1/2-inch-thick regular gypsum wallboard complying with ASTM C1396, installed vertically or horizontally. The thermal barrier must be attached to the cross-tie flanges with minimum 1-5/8-inch-long, by 0.136-inch-diameter, Type W, coarse-thread gypsum wallboard screws spaced 12 inches on center vertically and 16 inches on center horizontally. The screws must penetrate a minimum of 1/4 inch through the flange. Gypsum board joints and screw heads must be taped and finished with joint compound in accordance with ASTM C840 or GA216.

4.3.2 Attic and Crawl Space Installations: When used for walls of attic or crawl spaces without a covering applied to that attic or crawl-space side, an ignition barrier complying with IBC Section 2603.4.1.6, or IRC Sections R316.5.3 or R316.5.4, is required, except when all of the following conditions are met:

- Entry to the attic or crawl space is only to service utilities, and no storage is permitted
- There are no interconnected attic or basement areas
- Air in the attic or crawl space is not circulated to other parts of the building
- Under-floor (crawl space) ventilation is provided that complies with IBC Sections 1203.4 or IRC Section R408.1, as applicable
- Attic ventilation is provided when required by IBC Section 1202 or IRC Section R806, as applicable
- Combustion air is provided in accordance with IMC (*International Mechanical Code*) Section 701
- The ICFs must have at least one label as described in Section 7.0 visible in every 160 square feet of wall area

4.4 Exterior Finish:

4.4.1 Above Grade: The outside face of the ICF must be covered with an approved wall covering in accordance with the applicable Code or a current evaluation report. Mechanically attached wall coverings must be attached to the cross-tie flanges with fasteners, described in Table 2, long enough to penetrate through the flange a minimum of 1/4 inch. The allowable withdrawal and lateral capacity of the fasteners are noted in Table 2.

The fastener spacing must be designed to support the gravity loads of the wall covering and to resist the negative wind pressures. The negative wind pressure capacity of the wall covering must not exceed the allowable withdrawal capacity of the fasteners.

4.4.2 Below Grade: Materials used to dampproof or waterproof basement walls must be specified by Micro Technologies, LLC, and must comply with the applicable Code or a current evaluation report and must be compatible with the foam plastic. No backfill may be applied against the wall until the complete floor system is in place, unless the wall is designed as a freestanding cantilever wall that does not rely on the floor system for structural support.

4.5 Foundation Walls:

The ICF system may be used as a foundation stem wall when supporting light-framed construction, provided the structure is supported on concrete footings complying with the applicable Code. For jurisdictions adopting the IRC, compliance with Section R404 is required.

4.6 Retaining Walls:

The ICF system may be used to construct retaining walls, provided reinforcement is designed in accordance with accepted engineering principles, Section 4.2 of this report, and the applicable Code.

4.7 Protection Against Termites:

Protection against termites must be in accordance with IBC Section 2603.8 or IRC Section R318.4, as applicable.

4.8 Fire-resistance-rated Construction:

The ICFs may be used to construct loadbearing and non-loadbearing fire-resistance-rated wall assemblies as described in Intertek Design Listings MTL-ICF 120-01 and MTL-ICF 240-01.

4.9 Use in Buildings Required to be of Types I, II, III, and IV Construction:

4.9.1 General: Exterior walls constructed with the ICFs for use in buildings required to be of Type I, II, III, or IV construction must comply with the applicable conditions cited in Sections 4.9.2 through 4.9.4.

4.9.2 Interior Finish:

4.9.2.1 Buildings of Any Height: The ICFs must be finished on the interior with an approved 15-minute thermal barrier, such as 1/2-inch-thick gypsum board, as required by the IBC. The gypsum board must be installed and attached as described in Section 4.3.1.

4.9.2.2 Alternate Interior Finish for One-story Buildings: For one-story buildings, the interior finish may be in accordance with IBC Section 2603.4.1.4, provided all the conditions in that section are met.

4.9.3 Exterior Finish:

4.9.3.1 Buildings of Any Height: The ICFs must be finished on the exterior with materials described in Sections 4.9.3.1.1, 4.9.3.1.2, and 4.9.3.1.3. The ICFs must have at least one label as described in Section 7.0 visible in every 160 square feet of wall area prior to applying the wall covering.

4.9.3.1.1 Exterior Finish – EIFS and One-coat Stucco: EIFS and one-coat stucco wall coverings may be applied over the ICF, provided the wall covering system is recognized in a current evaluation report and is recognized for use in Types I, II, III, and IV construction. The wall covering system must be installed in accordance with the respective evaluation report and the maximum mass per wall surface area [lbs/ft^2] qualified in the wall covering evaluation report must be greater than 0.312 lbs/ft^2 (which is the mass of the EPS panel on the exterior side of the concrete wall). Acceptable EIFS wall coverings include STO Corp., StoTherm Essence, Classic and Premier EIFS (ICC-ES ESR-1720).

4.9.3.1.2 Exterior Plaster: Exterior plaster must comply with the applicable Code, and the exterior plaster must be a minimum of 7/8 inch thick. The lath must be attached to the flanges of the cross-ties with fasteners described in Section 4.4.1.

4.9.3.1.3 Exterior Finish – Brick Veneer: Anchored brick veneer must be attached to the flanges of the cross-ties with fasteners as described in Section 4.4.1. The 4-inch-thick brick veneer must comply with the IBC and must be installed with a minimum 1-inch air gap between the face of the exterior EPS panel and the brick. The brick must be installed with a steel shelf angle attached to the concrete and installed at each floor line and at the top of each window and door opening.

4.9.4 Fireblocking: Foam plastic on the interior side of exterior walls and on both sides of interior walls must be discontinuous at floor lines. The intersections must be constructed to prevent the passage of flame, smoke and hot gases from one floor to another.

4.10 Special Inspection:

4.10.1 IBC: Special inspection is required as noted in IBC Section 1705. When an EIFS wall covering is applied, special inspection is required in accordance with the evaluation report on the EIFS and with IBC Sections 1704 and IBC Section 1705.16.

4.10.2 IRC: For walls designed in accordance with Section 4.2.3 or PCA 100 (Section 4.2.4), special inspection is not required. When walls are designed in accordance with the IBC, as described in Section 4.2.4, special inspection is required as described in Section 4.10.1.

5.0 CONDITIONS OF USE

The Micro Technologies, LLC Celblox® Insulating Concrete Forms described in this Research Report comply with, or are suitable alternatives to, what is specified in those Codes listed in Sections 1.0 of this report, subject to the following conditions:

5.1 The ICFs must be manufactured, identified, and installed in accordance with this Research Report, the manufacturer's published installation instructions, and the applicable Code. The provisions in this report take precedence over the provisions in the manufacturer's instructions.

5.2 When required by the Code official, calculations showing compliance with the general design requirements of the applicable Code must be submitted to the building official for approval, except where calculations are not required under IRC Section R608.1. The calculations and details must be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.

5.3 When required by the Code official, calculations and details showing compliance with IRC Sections R608.5.3 and R404.1.3.3.6 must be submitted, establishing that the ICFs provide sufficient strength to contain concrete during placement

and the cross-ties are capable of resisting the forces created by fluid pressure of fresh concrete. The calculations and details must be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.

5.4 The ICFs must be separated from the building interior with an approved 15-minute thermal barrier, except for attic and crawl space construction as detailed in Section 4.3.2.

5.5 Use of the ICF system in Types I, II, III, and IV construction must be as described in Section 4.9.

5.6 The plastic cross-ties must be stored indoors away from direct sunlight.

5.7 Special inspection must be provided in accordance with Section 4.10 of this report.

5.8 The Celblox® ICFs are manufactured by Micro Technologies, LLC in Reedsburg, Wisconsin under a quality control program with inspections conducted by Intertek Testing Services NA Inc.

6.0 SUPPORTING EVIDENCE

6.1 Reports of tests in accordance with ASTM E119.

6.2 Data in accordance with the ICC-ES Acceptance Criteria for Stay-In-Place, Foam Plastic Insulating Concrete Forms (ICF) Systems for Solid Concrete Walls (AC 353), dated October 2012, editorially revised October 2015.

6.3 Intertek Listing Report Celblox® Insulating Concrete Forms (ICFs).

7.0 IDENTIFICATION

The Celblox® Insulating Concrete Forms are identified by a label bearing the report holder's name (Micro Technologies, LLC), the manufacturing location, manufacturing date, lot number, the Intertek Mark, and the Code Compliance Research Report number (CCRR-1005).

When use is in buildings required to be of Type I, II, III, or IV construction, one label must be visible in every 160 square feet of wall area.

When the forms are used in attics or crawl spaces without an ignition barrier, the exposed inside face of the ICF must be labeled with the phrase "Suitable for use in attics and crawl spaces". The label must be visible in every 160 square feet of wall area.

8.0 OTHER CODES

This section is not applicable.

9.0 CODE COMPLIANCE RESEARCH REPORT USE

9.1 Approval of building products and/or materials can only be granted by a building official having legal authority in the specific jurisdiction where approval is sought.

9.2 Code Compliance Research Reports shall not be used in any manner that implies an endorsement of the product by Intertek.

9.3 Reference to the https://bpdirectory.intertek.com is recommended to ascertain the current version and status of this report.

TABLE I – PROPERTIES EVALUATED

PROPERTY	IBC SECTION	IRC SECTION
Physical properties	NA	R404.1.3.3.6.1 [R404.1.2.3.6.1] and R608.4.4
Surface Burning Characteristics	2603.4	R316.3
Fire resistance	703.2	R302.1
Exterior walls in Types I – IV construction	2603.5	NA
Attic and crawl space applications	2603.4.1.6 and 2603.9, [2603.4.1.6 and 2603.10 2012]	R316.5.3, R316.5.4 and R316.6

TABLE 2 – ALLOWABLE WITHDRAWAL AND LATERAL CAPACITIES OF FASTENERS IN CROSS-TIE FLANGES

FASTENER[1]	ALLOWABLE LOAD CAPACITY (lbf)	
	Lateral	Withdrawal
No. 6, Fine-thread drywall screw	85	41
No. 8, Coarse-thread drywall screw	106	52
No. 6, Coarse-thread drywall screw	79	41
8d Ringed deck framing nail	61	21

[1]Fasteners must be corrosion resistant and of sufficient length to penetrate through the flange a minimum of ¼ inch.

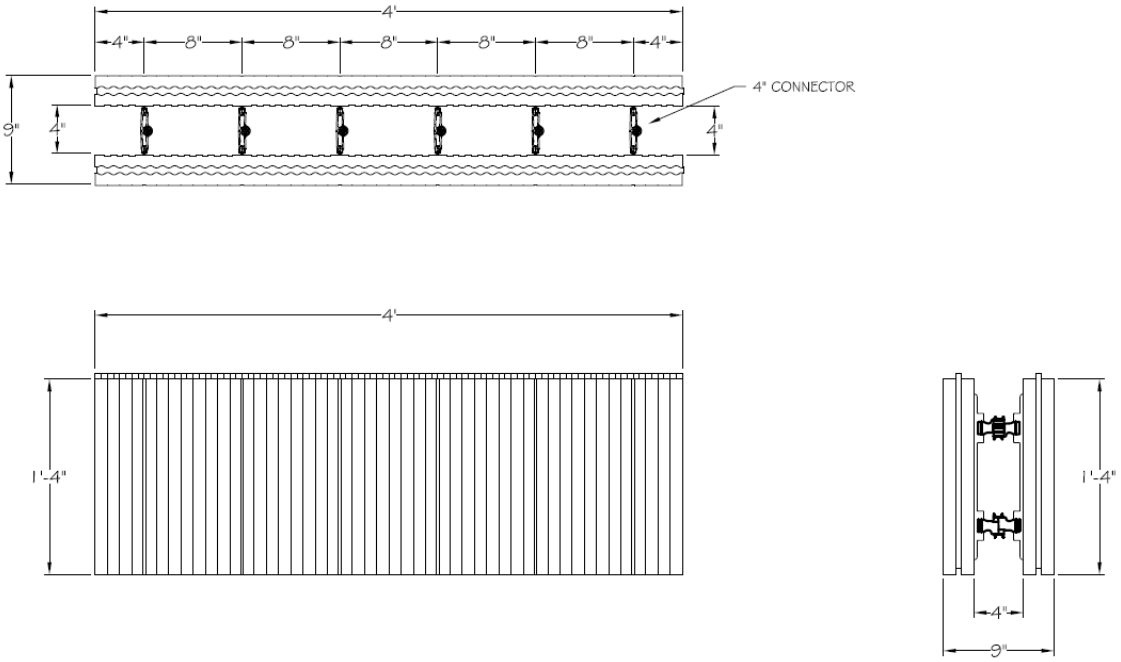

FIGURE 1 - CELBLOX® 4" STRAIGHT BLOCK

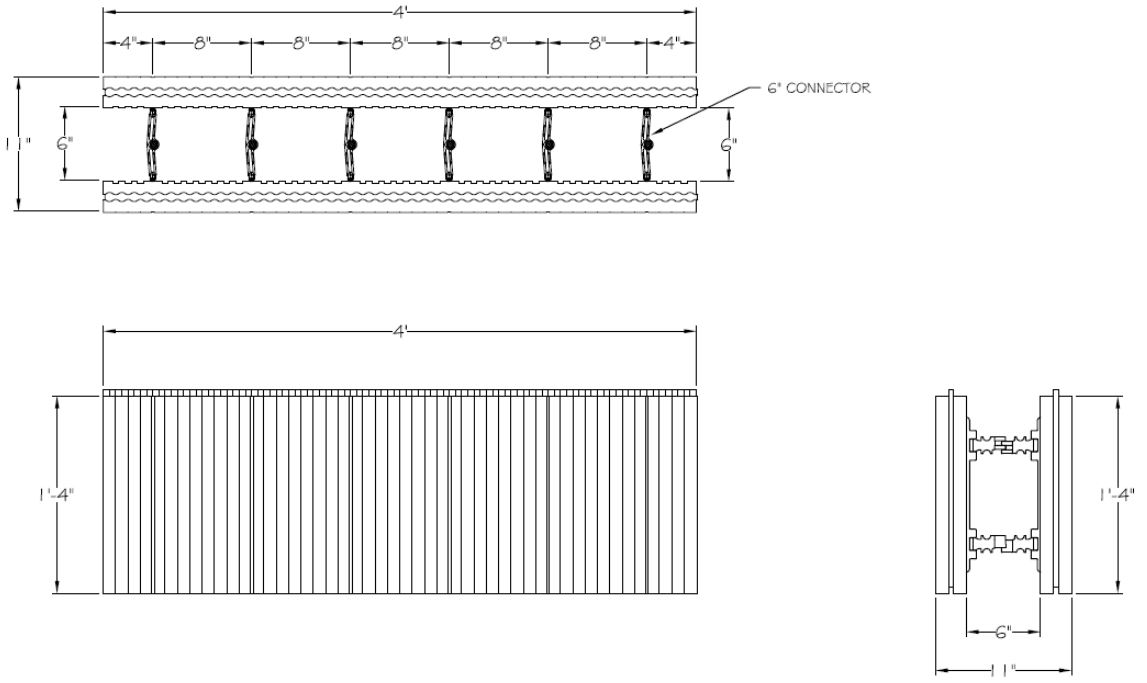

FIGURE 2 - CELBLOX® 6" STRAIGHT BLOCK

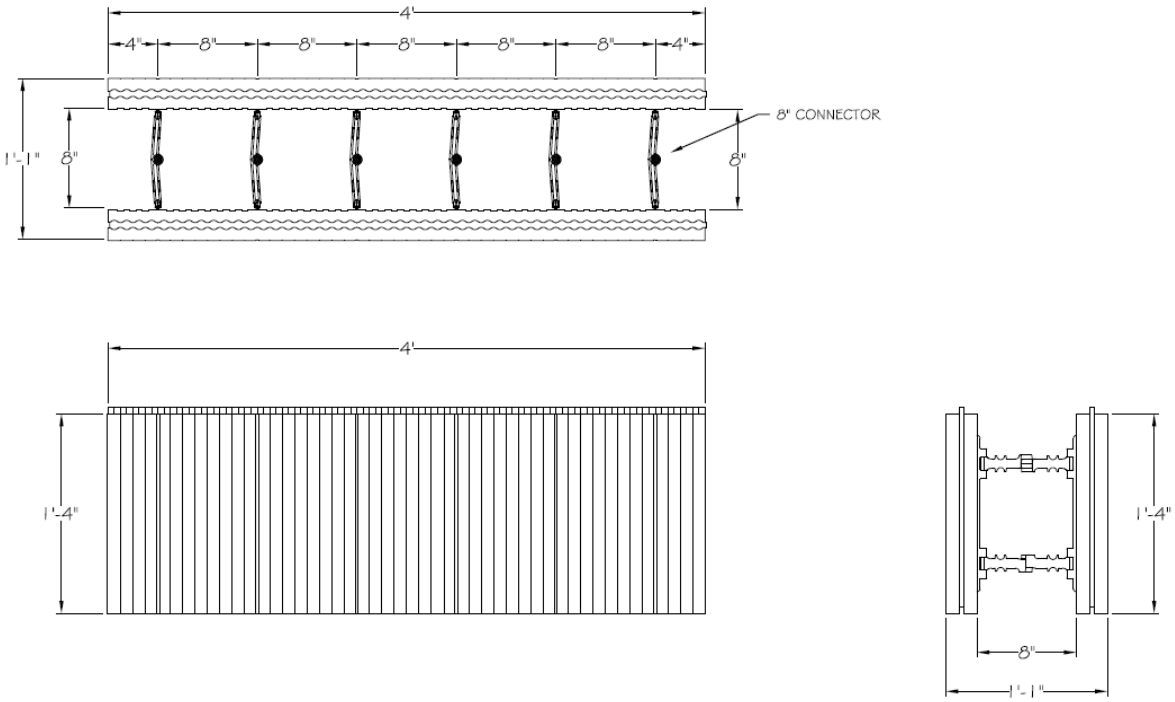

FIGURE 3 - CELBLOX® 8" STRAIGHT BLOCK

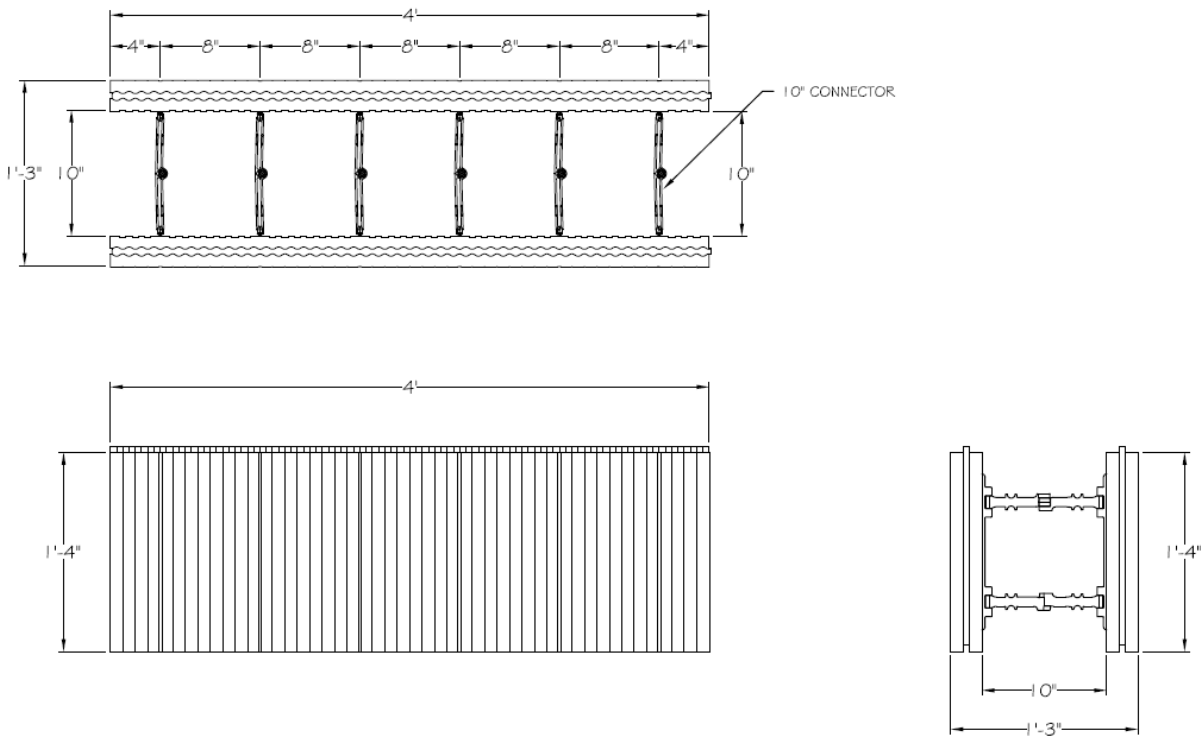

FIGURE 4 - CELBLOX® 10" STRAIGHT BLOCK

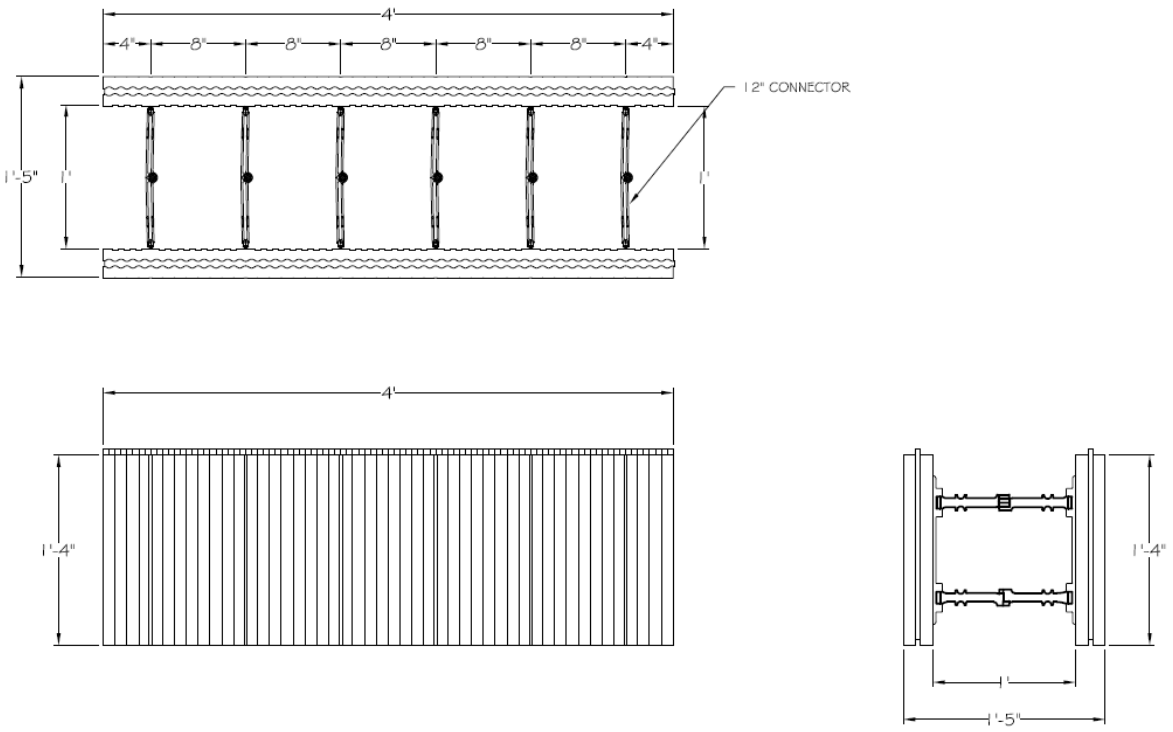

FIGURE 5 - CELBLOX® 12" STRAIGHT BLOCK

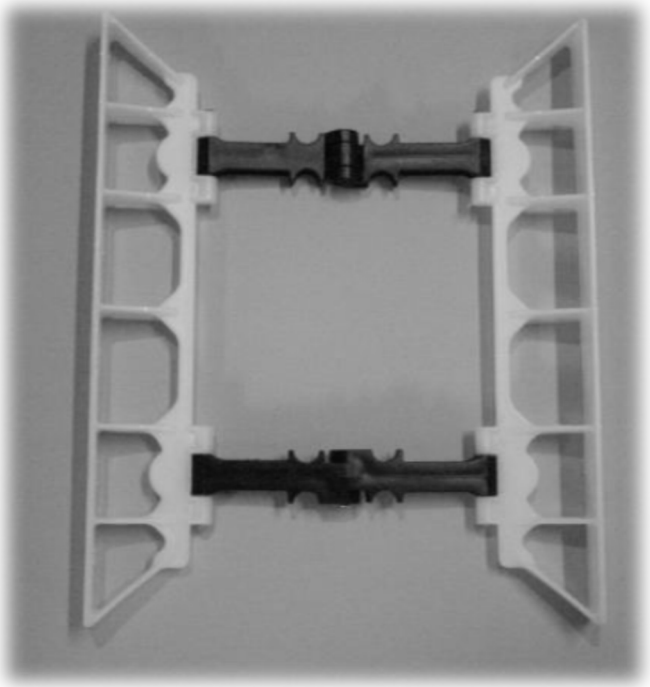

FIGURE 6 - TIE ASSEMBLY