

Section 17

Technical Information

Section 17: Technical Information

TF System® Specification Data

PRODUCT NAME TF System® -- The Vertical Insulated Concrete Form

MANUFACTURER TF System® - The Vertical ICF, Inc.
 3030C Holmgren Way
 Green Bay, WI 54304 USA
 Web: www.tfsystem.com
 Phone: 800-3600-4634
 Fax: 920-983-9962
 E-mail: info@tfsystem.com

PRODUCT DESCRIPTION TF System® is an insulated concrete forming system consisting of expanded polystyrene panels (EPS) held in place by structural vertical studs. When filled with concrete the result is a full width, monolithic concrete walls of exceptional strength and energy efficiency. The stud substructure also serves as a convenient and predictable attachment point for both interior and exterior wall treatments.

APPLICATION STANDARDS TF System® walls are subject to ACI (American Concrete Institute) Chapter 318 (latest revision), which indicates reinforcement requirements for standard poured walls. Because TF System® forms are **NOT** waffle grid or post and beam design, no additional engineering is required except for cases where ACI 318 calls for engineering of specific applications. Essentially, TF System® walls are conventional poured walls with the insulation applied before, rather than after, the pour.

DIMENSIONS	EPS Panels	Width	12-inches
		Height	Variable up to 12 feet
		Thickness	2.5-inches standard (3.0, 3.5, 4.0-inches optional)
	Studs (steel)	Flange Width	2-inches
		Height	Variable up to 12 feet
		Thickness	4, 6, 8, 10, 12, 14, 16, 18, 20, 24-inches (nominal concrete wall width)
	Studs (PVC)	Flange Width	2-inches
		Height	Variable up to 12 feet
		Thickness	4, 6, 8, 10-inches (nominal concrete wall width)

PHYSICAL PROPERTIES

Steel Studs

Content	Galvanized sheet metal
Thickness	0.17 – 0.20 doubled
Shaping Method	Roll forming
Fastening Method	Norlock Technologies double clinch
Screw Pullout Test	# 6 235 lbs. # 8 277 lbs. # 10 307 lbs.

PVC Studs

Content	Recycled PVC
Thickness	0.125
Shaping Method	Extruded

Expanded Polystyrene

Polystyrene insulation used in TF System® is approved by applicable code enforcement agencies. See physical properties table:

Density (minimum)	1.95 lbs. per cubic foot
Compressive Strength	25 psi @ 10% deformation
Flexural Strength	55 psi
Dimensional Tolerance	∇ 0.030 inch/ft. length ∇ 1/16-inch width ∇ 1/16-inch thickness
Thermal Resistance (minimum per inch)	4.2 @ 75° F 4.6 @ 40° F
Oxygen Index (minimum)	24.0
Flame Spread	20 as tested per ASTM E84
Smoke Density	150-300 as tested per ASTM E84
Applicable Code Listings	ICBO PFC568C, SBCCI PST & ESI Report No. 94136D; ICC Evaluation Service, Inc. ESR-1006
Labeling	UL Virgin Certified material (no recycled content)
Termite Resistant Treatment (optional)	PerformGuard® borate treatment (PerformGuard® is a registered trademark of AFM® Corp.)
Resins Permitted	Specified by TF Sysem® - The Vertical ICF Inc.

SOUND TRANSMISSION

TF System® 6-inch concrete wall, uncovered 42 dB STC
 TF System® 6-inch concrete wall, with 5/8 drywall on both sides 55 dB STC

FIRE RATING

Concrete walls have a 2 - 4 hour fire rating depending upon concrete thickness.

AVAILABILITY

International, contact manufacturer for local TF System® representative.

COST

Insulated concrete forms are very cost competitive. TF System® walls provide comparable R-value to conventional poured concrete wall assemblies with 2x6 stud framing, six-inches of fiberglass batt-insulation, and one-inch of exterior sheathed insulation. Contractors find the speed of installation provides labor cost savings. Building owners continually appreciate lower life cycle costs, including lower utility bills, reduced insurance premiums, and higher resale value.

WARRANTY

Refer to Terms and Conditions of Sale Document available from manufacturer.

MAINTENANCE

Maintenance of TF System®, installed per manufacturers instructions, is not required.

TECHNICAL SERVICES

TF System® Installation Manual, available by request or at www.tfsystem.com
 Telephone Support, 800-360-4634
 Jobsite Training, contact manufacturer for availability and rates

ADDITIONAL INFORMATION

www.tfsystem.com

TF System[®] Technical Bulletin

12003-1

TF System[®] Code Compliance

There are three unique types of Insulated Concrete Forming systems currently available in the marketplace. They are the waffle-grid, post and beam, and straight wall designs. The post and beam and waffle-grid systems are designed to reduce the amount of concrete used in a particular wall cavity and as such need to have special code approval or be specifically engineered to ensure correct reinforcement requirements. Straight wall systems are designed to provide a wall that is of the same dimension and cross section as conventionally formed concrete walls. TF System[®] is a straight wall form that was designed to closely mimic conventional plywood, steel, or aluminum forms. As such, **TF System[®] does not require a separate evaluation report.**

TF System[®] is a straight wall type form that results in a full width, monolithic poured concrete wall and is therefore subject to American Concrete Institute 318-05, which spells out reinforcement requirements for poured concrete walls. In addition to ACI 318-05, local codes must be followed as well. Reinforcement within a TF System[®] wall is exactly the same as conventionally formed concrete walls of the same dimension.

Concrete exerts a significant amount of pressure as it is poured into formwork and until it acquires the strength to support itself. In this regard, TF System[®] has been field and laboratory tested to determine the strength of its individual components. TF System[®] crossties were determined to have a tension value of 850 pounds. The EPS planks (2.5 inches thick, 1.95 lbs/cu. ft. density) have a capacity of 525 psf.

Using these figures, we recommend a pour rate of four feet per hour in conjunction with adequate bracing (as shown in our TF System[®] Installation Manual). Consolidation of the poured concrete inside the form system is encouraged if done in a proper manner.

The expanded polystyrene component of TF System[®] is fully code approved and meets all flame spread and smoke development ratings.

TF System[®] Technical Bulletin 12003-2

TF System[®] Fastener Pullout Testing

In many applications TF System[®] walls will be covered with a variety of treatments including, but not limited to, drywall, vinyl siding, wood siding, fiber cement siding, paneling, and brick or stone veneer. These treatments will need to be attached to the walls by means of installing screws through the treatment (or in the case of brick and stone through the wall ties) and into metal flange of the TF System[®] I-Beam.

TF System[®] I-Beams were subjected to screw pullout testing and the following average results were achieved:

1. Self-tapping steel fasteners

#6	235 lbs.
#8	277 lbs.
#10	307 lbs.

2. Sharp point light metal/wood screws

#8	286 lbs.
#10	313 lbs.

Always follow manufacturers recommendations or accepted construction practices to determine pattern and frequency of fasteners. Use corrosion resistant fasteners in applications exposed to the elements.

TF System[®] Technical Bulletin

12003-3

TF System[®] Sound Transmission Characteristics

Above grade residential, multi family, and, in many instances, commercial structures need to be designed to achieve a certain level of sound attenuation. Insulated concrete walls naturally provide a high level of sound control. This sound control ability is measured in STC (Sound Transmission Classification), and is determined through testing room sized wall section in an approved sound testing laboratory.

A TF System[®] wall section was tested on September 8th, 1999 at Riverbank Laboratory in Geneva, Illinois. This wall section had a 6-inch concrete core with five/eighths inch thick drywall screw attached to both sides. An STC of 55 was established for this particular wall.

This level of sound control is considered to be an excellent rating for most applications. In all cases where specific STC levels are required, it is the responsibility of the project design team to determine the components necessary to achieve these levels.

TF System[®] Technical Bulletin 12003-4

TF System[®] Wall Assembly calculated R-value

In most applications TF System[®] walls will use 2½” thick polystyrene panels on both sides of the concrete wall. In this case the calculated R-value would be as follows:

EPS polystyrene (R 4.6 per inch @ 40°F x 5” thickness)	= R-23
Concrete (R 1.1 @ 8” thickness)	= R-1.1
Drywall (R .45 @ ½” thickness)	= R-.45
Exterior Surface Resistance	= R-.68

Total R-value of a standard TF System[®] wall assembly = R-25.23

R-value of TF System[®] walls may be increased by using thicker polystyrene panels on either one or both sides of the concrete wall. These panels can be custom ordered and may require additional delivery time.

An example using 4” thick polystyrene panels and the resulting R-value follows:

EPS polystyrene (R-4.6 per inch @ 40°F x 8” thickness)	= R-36.8
Concrete (R 1.1 @ 8” thickness)	= R-1.1
Drywall (R .45 @ ½” thickness)	= R-.45
Exterior Surface Resistance	= R-.68

Total R-value of TF System[®] with optional 4” thick poly = R-39.03

Several ICF companies claim inflated R-values based upon thermal mass and other alleged characteristics of insulated concrete walls. We claim only the values assigned to building materials that can be proven beyond doubt.

BITTNER ENGINEERING, INC.

113 SOUTH 10TH STREET, ESCANABA, MICHIGAN 49829 • 906-789-1511 • FAX 906-789-9977



September 24, 1999

Mr. Don Rudolph
Wisconsin Thermo-Form, Inc.
185 East Walnut
Sturgeon Bay, WI 54235

RE Design Basis
Thermo-Form Walls

Dear Don:

In reply to your inquiry, I design the walls, lintels, and the occasional column all in accordance with the American Concrete Institute building code (ACI-318, latest revision). This code covers building concrete materials, methods, reinforcing, and design; and is adopted by reference by every building code in the United States and many other countries.

The design of the concrete sections and reinforcing is independent of the forming materials used and would be unchanged if steel or wood removable forms are used. Since a great number of your projects are residential, frequently the loading is so light that non-reinforced concrete is acceptable. In these cases, the design is still covered under ACI-318 for plain concrete. A few nominal reinforcing rods are added to minimize any shrinkage cracking.

Please call me if you have any questions.

Sincerely,

Harvey G. Johnson, P.E.
Civil/Structural Engineer

HGJ:lah

Monday, April 12, 1999

Mr. Don Rudolph
Wisconsin Thermoform, Incorporated
185 E. Walnut Street
Sturgeon Bay, WI 54235

Re.: Special Strength Testing of Concrete Form Assembly Components
Revised Report

Dear Mr. Rudolph:

We have completed the above testing on the various sections of concrete form assembly components submitted to us Wednesday, October 21, 1998 and Tuesday, November 10, 1998 via Spee-Dee Delivery Service. A concrete "ladder" form assembly joint was tested in tension and a concrete steel/foam form assembly was tested in compression, both on an Instron tensile testing machine.

Concrete "Ladder" Form Assembly Data

One of the eight swaged "T" joints was tested in tension to failure. The maximum load just before failure was 868 pounds-force.

Concrete Steel/Foam Form Assembly Data

A 4' x 1' x 13" steel/foam concrete form assembly was tested in compression with the 1' dimension direction vertical. The assembly was loaded to a maximum load of 13,580 pounds-force in compression. At 12,560 pounds-force, extensive deformation occurred in the assembly with no increase in the load (approximating the "yield" point).

These figures equate to 52 to 57 p.s.i., 7,536 to 8,148 p.s.f., or 3,140 to 3,395 pounds per linear foot of 8" wall before concrete is poured into the form. Using the lower ("yield" strength) figures and dividing by a safety factor (usually about 2.5) is recommended for design.

Since the weight of wet concrete averages 156.48 pounds per cubic foot, the concrete exerts a force of 835 pounds per linear foot of wall (on an 8 foot high wall), largely on the lowest portion of the wall. This represents a safety factor of 3.76 in the most highly stressed region of the wall. The safety factor will be even higher in the upper portions of the wall.

Certification

We hereby certify to the above testing and analysis. Tensile testing was done according to A.S.T.M. (American Society for Test-

ing and Materials) A-370 and E-8 as well as S.A.E. (Society of Automotive Engineers) J416.

Respectfully submitted,

A handwritten signature in black ink that reads "Alan M. Gerner". The signature is written in a cursive style with a large initial "A" and a long, sweeping underline.

Alan M. Gerner
Dipl.-Ing.
Metallurgical Engineer

Emerald City Metallurgical Engineering
2020 Hawthorne Heights Drive
De Pere, WI 54115-9241

Phone: (920) 339-8808 or (800) 424-METL -6385)
FAX: (920) 339-3288

Design Options.

Cost effective design is among the highest priorities for industrial, packaging, and construction applications. Foam-Control EPS products are available in a range of Types necessary to provide control of structural integrity, thermal resistance (R-value), and cost effectiveness.

Thermal Performance.

The R-value of Foam-Control EPS remains constant and does not suffer from R-value loss. The closed cell structure of Foam-Control EPS contains air and not blowing agents which deplete over time.

Exposure to Water and Water Vapor.

The mechanical properties of EPS are unaffected by moisture. Exposure to water or water vapor does not cause swelling.

Temperature Exposure/Flame Retardants.

EPS is able to withstand the rigors of temperature cycling, assuring long-term performance.

Although flame retardants used in the manufacture of EPS provide an important margin of safety, all EPS products must be considered combustible.

The maximum recommended long-term exposure temperature for Foam-Control EPS is 165°F (74°C).

Adhesives, Coatings, and Chemicals.

Solvents which attack EPS include esters, ketones, ethers, aromatic, and aliphatic hydrocarbons and their emulsions, among others. If EPS is to be placed in contact with materials (or their vapors) of unknown composition, pretest for compatibility at maximum exposure temperature.

Do not install or use EPS with coal tar pitch, highly solvent-extended mastics, or solvent-based adhesives without adequate separation.

Quality Assurance/Building Code Compliance.

Foam-Control EPS meets or exceeds the requirements of ASTM C578, "Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation." Foam-Control EPS is monitored for Quality Control and Listed by Underwriters Laboratories Inc. The International Code Council Evaluation Service recognizes Foam-Control EPS for building code compliance. Please see ICC ES ESR-1006.



Note: Local Building Codes must be followed regarding thermal barriers.

Resistance to Termites, Mold, and Mildew.

Foam plastic insulations have been shown to become termite infested under certain exposure conditions. Foam-Control EPS with Perform Guard® provides resistance to termite infestation. Please review literature on Foam-Control EPS with Perform Guard for complete information.



EPS will not decompose and will not support mold or mildew growth. EPS provides no nutrient value to plants or animals.

Weathering.

Long-term exposure to sunlight causes yellowing and a slight embrittlement of the surface due to ultraviolet light. This has little effect on mechanical properties. If stored outdoors, cover EPS with opaque polyethylene film, tarps, or similar material.

Warranty.

Foam-Control EPS Licensees offer a product warranty ensuring thermal performance, physical properties, and termite resistance.



For further information about

Foam-Control EPS

visit www.achfoam.com



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FC02-04/07-ACH



**CONTROL,
NOT COMPROMISE.**

FOAM CONTROL EPS

Foam-Control™ EPS (expanded polystyrene) rigid board foam plastic is for all types of industrial, packaging, and construction uses. Foam-Control EPS is manufactured in conformance with numerous standards.

- ASTM C 578 (Thermal Insulation)
- ASTM E 2430 (EIFS boards)
- ICC ES AC12 (Foam Plastic Insulation)

Foam-Control EPS Properties

Property		ASTM C578						
		Type XI	Type I	Type VIII	Type II	Type IX	Type XIV	Type XV
Nominal Density	lb/ft ³ (kg/m ³)	0.75 (12)	1.00 (16)	1.25 (20)	1.50 (24)	2.00 (32)	2.50 (40)	3.00 (48)
Density ¹ , min.	lb/ft ³ (kg/m ³)	0.70 (12)	0.90 (15)	1.15 (18)	1.35 (22)	1.80 (29)	2.40 (38)	2.85 (46)
Design Thermal Resistance per 1.0 in. thickness	25°F °F.ft ² .h/Btu (°K.m ² /W)	3.60 (0.63)	4.35 (0.77)	4.55 (0.80)	4.76 (0.84)	5.00 (0.88)	5.00 (0.89)	5.10 (0.90)
	40°F °F.ft ² .h/Btu (°K.m ² /W)	3.43 (0.60)	4.17 (0.73)	4.25 (0.75)	4.55 (0.80)	4.76 (0.84)	4.76 (0.84)	4.85 (0.85)
	75°F °F.ft ² .h/Btu (°K.m ² /W)	3.22 (0.57)	3.85 (0.68)	3.92 (0.69)	4.17 (0.73)	4.35 (0.77)	4.35 (0.77)	4.45 (0.78)
Thermal Resistance ¹ , min per 1.0 in. thickness	25°F °F.ft ² .h/Btu (°K.m ² /W)	3.45 (0.61)	4.20 (0.74)	4.40 (0.77)	4.60 (0.85)	4.80 (0.84)	4.80 (0.84)	4.90 (0.86)
	40°F °F.ft ² .h/Btu (°K.m ² /W)	3.30 (0.58)	4.00 (0.70)	4.20 (0.74)	4.40 (0.77)	4.60 (0.81)	4.60 (0.81)	4.70 (0.83)
	75°F °F.ft ² .h/Btu (°K.m ² /W)	3.10 (0.55)	3.60 (0.63)	3.80 (0.67)	4.00 (0.70)	4.20 (0.74)	4.20 (0.74)	4.30 (0.76)
Compressive Strength ¹ @ 10% deformation, min.	psi (kPa)	5.0 (35)	10.0 (69)	13.0 (90)	15.0 (104)	25.0 (173)	40.0 (276)	60.0 (414)
Flexural Strength ¹ , min.	psi (kPa)	10.0 (69)	25.0 (173)	30.0 (208)	35.0 (242)	50.0 (345)	60.0 (414)	75.0 (517)
Water Vapor Permeance ¹ of 1.0 in. thickness, max., perm		5.0	5.0	3.5	3.5	2.5	2.5	2.5
Water Absorption ¹ by total immersion, max., volume %		4.0	4.0	3.0	3.0	2.0	2.0	2.0

Foam-Control EPS has a flame spread index of 20 and a smoke developed index of 150-300 when tested in accordance with ASTM E84/UL 723 for densities from 0.7 - 2.0 lb/ft³. Please refer to Foam-Control EPS UL certificates.

¹ See ASTM C578 Standard for test methods and complete information.



R-Control® EPS Warranty

SECTION I - Conditions and Limits

The following R-Control EPS Licensed Manufacturer

Facility Name:

Location:

Warrants to Owner:

R-Control EPS Systems, including Contour Taper Tile, Perform, and WSG, are subject to the terms, conditions, and limitations stated in this Limited Warranty. R-Control EPS Licensed Manufacturer will repair or replace, at R-Control EPS Licensed Manufacturer's option, R-Control EPS manufactured by the Licensed Manufacturer shown on this warranty when the R-Control EPS, which is installed in the system described in this Warranty, fails to meet the minimum R-Value for 20 years hence, as stated in Section II.

Liability under this Warranty is limited to the replacement of defective R-Control EPS, not to exceed the original sales price of the R-Control EPS supplied. This Warranty may be enforced for any system, only if the R-Control EPS has been installed per R-Control and system manufacturer's recommended specifications, code compliance reports and limitations of use.

SECTION II - Minimum R-Value Standard

R-Control EPS Licensed Manufacturer warrants that the R-Control EPS Insulation will maintain 100% of the minimum R-Value as identified in ASTM C 578 (Type supplied), or CAN/ULC-S701-97 (Type supplied) for Canada. This R-Value Warranty will be in effect for 20 Years from its issuance date. All R-Control EPS will bear an UL AFM Certificate mark. R-Values shall be tested according to ASTM C 518 procedures and shall meet the minimum stated R-Values within reasonable limits of experimental error. Such tests will be conducted at three separate areas, yielding three 12" X 12" X 1" samples. The samples shall be conditioned to as manufactured density meeting requirements of ASTM C578. Tests on these samples will be conducted at 75° F mean temperature in accordance with ASTM C518 procedures, with the results being averaged. The tests will be performed by an independent laboratory selected by the R-Control EPS licensed manufacturer.

ASTM C 578 Excerpt (R-Value - 1" Thickness)

Type	I	VIII	II	IX
Density				
Minimum, PCF	0.90	1.15	1.35	1.80
Min. R-Value @ 75° F	3.60	3.80	4.00	4.20
Min. R-Value @ 40° F	4.00	4.20	4.40	4.60

CAN/ULC-S701-97 Excerpt (R-Value - 25 mm Thickness)

Type	1	2	3
Min. R-Value @ 24° C (SI)	0.65	0.70	0.74
Min. R-Value @ 24° C (Imperial)	3.69	3.7	4.20

LIMITED WARRANTY TERMS AND CONDITIONS

SECTION III - Exceptions and Limitations

In addition to all other exceptions set forth herein, this Warranty Agreement shall not cover any failure of the R-Control EPS to meet the R-Value due to:

1. Excessive heat beyond design considerations, or fire.
2. The effect of any solvent on the R-Control EPS.
3. The effect of coal tar pitch on the R-Control EPS.
4. Moisture resulting from improper installation and application of the R-Control EPS. Moisture resulting from a malfunction or failure of other system components, systems or construction.
5. The effect of building movement.
6. The effect of insect, vermin or animal intrusion.
7. The effect of ultraviolet light attack.
8. The effect of equipment traffic or other compressive loads that exceed the design limits of the R-Control EPS.
9. The effect of other external forces not under the control of R-Control.

SECTION IV - Additional Terms, Conditions and Limitations

Owner shall notify R-Control EPS Licensed Manufacturer in writing at the address in Section I within sixty (60) days after the owner of the warranted R-Control EPS becomes aware of any R-value deterioration.

This Warranty shall not be enforceable if, in the judgment of R-Control EPS Licensed Manufacturer, any of the following shall occur:

1. The R-Control EPS is damaged by any natural cause including, but not limited to, lightning, strong wind, hurricane, tornado, hail, earthquake, or flood.
2. The R-Control EPS is damaged by any act of negligence, including overexposure to the elements, any accident or any intentional or unintentional misuse.
3. Metal work or other material used in the system which causes loss of physical properties in the R-Control EPS.
4. If, after installation of the R-Control EPS, there are any alterations, or repairs made on or through the R-Control EPS, or if anything is placed upon or attached to the R-Control EPS not in compliance with R-Control recommended details.
5. Failure to use reasonable care in maintaining the R-Control EPS and the system.
6. The owner of the warranted R-Control EPS fails to comply with any of the obligations stated in this Warranty Agreement.

During the term of this Warranty, the R-Control EPS Licensed Manufacturer or its designated representative shall have free access to inspect the installed R-Control EPS during regular business hours.

The owner will be obligated to pay for all sample test cuts conducted by the independent laboratory as stated in Section II. If a justifiable claim under the Warranty is determined by testing, the R-Control EPS Licensed Manufacturer will reimburse the owner for the cost of the test cuts, as part of the repair or the replacement costs, not exceeding the limits of liability stated in Section I.

R-Control EPS Licensed Manufacturer shall not be obligated under the terms of this Limited Warranty until:

The party (or parties) contracting for the R-Control EPS and materials has paid, in full, all invoices and charges for materials, installation and services due and owing.

Original or copies of invoices and bills showing the cost of the R-Control EPS shall be submitted along with any claims under this Warranty Agreement.

R-Control EPS Licensed Manufacturer's failure at any time to enforce any terms or conditions stated herein shall not be construed to be a waiver of its right to enforce that term or condition.

For additional information, consult R-Control EPS series of Technical Bulletins available from www.R-Control.com.

Disclaimers
THERE ARE NO WARRANTIES, INCLUDING WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, WHICH EXTEND BEYOND THE WARRANTIES SET FORTH IN THIS WARRANTY, AND IN NO EVENT SHALL THE R-CONTROL EPS LICENSED MANUFACTURER OR AFM CORPORATION BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES OR LOSSES ARISING OUT OF OR IN ANY WAY RELATING TO THIS WARRANTY OR ANY DESIGN OR MANUFACTURING DEFECT, EVEN IF AFM LICENSED MANUFACTURER OR AFM CORPORATION HAS BEEN ADVISED OF THE POSSIBILITY THEREOF. NO OTHER WARRANTIES, EXPRESSED OR IMPLIED, ARE PROVIDED BEYOND THE TERMS, CONDITIONS, REMEDIES AND LIMITS SET FORTH IN THIS WARRANTY. NO EMPLOYEE, REPRESENTATIVE OR AGENT OF THE AFM LICENSED MANUFACTURER OR AFM CORPORATION MAY AUTHORIZE CHANGES TO THIS WARRANTY, OR OTHERWISE ALTER THE TERMS, CONDITIONS, REMEDIES AND LIMITS SPECIFICALLY SET FORTH IN THIS WARRANTY FORM.

R-Control EPS products are produced exclusively by Licensed Facilities of AFM Corporation.

Perform, R-Control, Contour Taper Tile, WSG and AFM are registered trademarks of AFM Corporation.



MATERIAL SAFETY DATA SHEET

I - PRODUCT INFORMATION

CONTACT:

ACH Foam Technologies, LLC

800-236-5377

www.achfoam.com

PRODUCT:

R-Control® EPS, Contour Taper Tile®, Perform®, WSG®, Fabri-tech® and EPS Geofoam

CAS REGISTRY NO:

9003536

SYNONYMS:

Expanded Polystyrene

CAS NAME:

Ethenylbenzene Homopolymer

PRODUCT GRADES:

Type XI, I, VIII, II, IX, WSG, EPS12, EPS15, EPS19, EPS22, and EPS29

FORMULA:(C₈H₈)_N**CHEMICAL FAMILY:**

Polystyrene Thermoplastic

TSCA INVENTORY STATUS:

Listed

Hazard Rating:	2=Moderate	HEALTH	0
0=Minimal	3=Serious	FIRE	2
1=Slight	4=Severe	REACTIVITY	0

II - INGREDIENTS

HAZARDOUS COMPONENTS:

Pentane

Halogen Flame Retardants

CAS REGISTRY NO:

109660

N/A

APPROX. WEIGHT PERCENTAGE:

1% Maximum

.9% Maximum

NON-HAZARDOUS COMPONENTS

Polystyrene

CAS REGISTRY NO:

9003536

APPROX. WEIGHT PERCENTAGE:

98% Minimum

III - PHYSICAL DATA

FORM:

Rigid cellular foam blocks, boards & shapes

BOILING POINT:

N/A

VAPOR PRESSURE:

N/A

VAPOR DENSITY:

N/A

COLOR:

White

MELTING POINT:

Softens at 175° F. to 220° F.

VOLATILES BY VOLUME:

<4% (pentane and water)

EVAPORATION RATE:

None

ODOR:

Very slight hydrocarbon odor

SOLUBILITY IN WATER:

Insoluble

DENSITY:

0.6 pcf to 3.0 pcf

IV - FIRE & EXPLOSION DATA

FLASH PT., AND METHOD USED:

610° F. Min.(ASTM D 1929)

AUTO IGNITION TEMPERATURE:

850° F. Minimum

SPECIAL FIRE FIGHTING INSTRUCTIONS:

Use approved self-contained breathing apparatus respirator and personal protective clothing. (Turn out gear).

UNUSUAL FIRE AND EXPLOSION HAZARDS:

May produce dense black smoke. Smoke consists of carbon (soot), carbon monoxide, carbon dioxide and water. Dust generated by fabrication, i.e., sanding, sawing, etc., will increase fire hazard and should be handled accordingly.

EXTINGUISHING MEDIA:

Water fog, carbon dioxide, dry chemical, and foam.

V - REACTIVITY DATA

STABILITY (CONDITIONS TO AVOID):

Stable. Avoid fire and high temperatures.

HAZARDOUS DECOMPOSITION:

Carbon monoxide, carbon dioxide, carbon, water, hydrogen halide.

INCOMPATIBILITY (MATERIALS TO AVOID):

Will dissolve in most organic solvents and some insecticides, aldehydes and amines.

HAZARDOUS POLYMERIZATION:

None

VI – HEALTH HAZARDS & FIRST AID

PRINCIPAL HEALTH HAZARDS & SIGNS AND SYMPTOMS OF EXPOSURE:	FIRST AID:
<p>EYE CONTACT: Dust or particles may cause mechanical eye irritation and/or injury.</p> <p>INHALATION: Dust from mechanical fabrication may cause upper respiratory irritation. Fumes from hot wire cutting can also cause upper respiratory irritation.</p> <p>SKIN CONTACT: None. May produce slight skin irritation in a few individuals.</p> <p>INGESTION: Biologically inert. May act as an obstruction if swallowed.</p> <p>CARCINOGENICITY: None</p>	<p>EYES: Rinse with clean water. Remove foreign particles with clean, lint-free cloth. Obtain medical attention if pain, blinking, tears or redness persists.</p> <p>INHALATION: If overcome by exposure, move to fresh air. Provide oxygen and artificial respiration. Get medical attention.</p> <p>SKIN: Not expected to present skin hazard. Wash exposed areas with mild soap and water. Consult physician if irritation persists.</p> <p>INGESTION: Not expected to present significant ingestion hazard. Consult physician if swallowed.</p>

VII – EMPLOYEE PROTECTION

<p>PERSONAL PROTECTIVE EQUIPMENT: RESPIRATORY PROTECTION: Use approved dust mask when sawing or sanding.</p> <p>SKIN PROTECTION: None required. Wear gloves and/or sleeves, if sensitivity noted.</p> <p>EYE PROTECTION: Use approved safety glasses/goggles when sawing or sanding.</p>	<p>SAFETY PRECAUTIONS: Use positive ventilation. Mechanical fabrication, sanding, etc., requires the use of safety glasses/goggles and dust mask.</p>
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VIII – SPILL OR LEAK PROCEDURES

<p>SPILL, LEAK OR RELEASE PROCEDURES: Normal good housekeeping should be observed. Material can be swept or picked up and placed into a suitable container for disposal.</p>	<p>REPORTABLE QUANTITY: None</p> <p>DISPOSAL METHOD: Recycle, incinerate (WTE) or landfill per local and state regulations.</p>
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IX – SPECIAL PRECAUTIONS

<p>STORAGE AND HANDLING: Expanded Polystyrene, although it contains a fire retardant additive, is considered to be combustible and adequate protection from sources of ignition should be taken.</p>	<p>TRANSPORTATION REQUIREMENTS: Not a D.O.T. "Hazardous Material."</p>
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The information contained herein is provided as a general reference. Your R-Control EPS Supplier believes the data set forth herein is accurate and is given in good faith. Your R-Control EPS Supplier makes no guarantee or warranty and does not assume any liability with respect to the accuracy or completeness of such information.

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UNDERWRITERS LABORATORIES INC.

NORTHBROOK, IL • MELVILLE, NY • SANTA CLARA, CA • RESEARCH TRIANGLE PARK, NC

CERT. AFM-1

an independent, not-for-profit organization testing for public safety

The manufacturer whose name appears below is qualified under the Classification Service of Underwriters Laboratories Inc., as furnishing FOAMED PLASTIC in the form of POLYSTYRENE BOARDS CLASSIFIED AS SHOWN BELOW. This manufacturer is therefore authorized to issue this certificate for the bulk shipment of material described below as its representation that such material is manufactured in compliance with the requirements established by Underwriters Laboratories Inc. for this class of product.



File: R11812

Material: Foam-Control EPS (Expanded Polystyrene)

Manufactured by:

Plant ID:

a participating plant in AFM Corporation.

NOTE: To determine that panels received are Classified, make sure each panel is marked: See Cert. AFM-1

1)

**FOAMED PLASTICS
70PS
SURFACE BURNING CHARACTERISTICS**

1/2 - 5in. Max. Thick⁺

FLAME SPREAD 20[#]

SMOKE DEVELOPED 150-300[#]

+ -Installed in a thickness, or stored in an effective, as indicated, for a density of 1.0 to 2.0 lb/ft³

-Flame spread and smoke developed recorded while material remained in the original test position. Ignition of molten residue on the furnace floor resulted in flame travel equivalent to calculated flame spread index of 180 and smoke developed index of over 500.

2)

FOAMED PLASTIC FOR
ROOFING SYSTEMS
AS TO EXTERNAL FIRE
EXPOSURE ONLY.
SEE UL ROOFING MATERIALS AND
SYSTEMS DIRECTORY

3)

FOAMED PLASTIC FOR
ROOFING SYSTEMS
AS TO UPLIFT RESISTANCE.
SEE UL ROOFING MATERIALS AND
SYSTEMS DIRECTORY.

5)

**POLYSTYRENE THERMAL INSULATION, RIGID CELLULAR
TYPE I, TYPE VIII, TYPE II, and TYPE IX
IN ACCORDANCE WITH ASTM C578**

	TYPE I	TYPE VIII	TYPE II	TYPE IX
Density, min (lbs/ft ³)	0.90	1.15	1.35	1.8
Compressive Resistance, min. (psi)	10.0	13.0	15.0	25.0
Flexural Strength, min. (psi)	25.0	30.0	35.0	50.0
Thermal Resistance 1 in. @ 75°F, min. (*F * ft ² * h/Btu)	3.6	3.8	4.0	4.2
Water Vapor Permeance, max (perms)	5.0	3.5	3.5	2.0
Water Absorption, max (vol. %)	4.0	3.0	3.0	2.0
Dimensional Stability, max. (%)	2.0	2.0	2.0	2.0
Oxygen Index, min. (vol. %)	24.0	24.0	24.0	24.0

Unlimited Thickness

4)

FOAMED PLASTIC AS ROOF DECK
CONSTRUCTION MATERIAL WITH
RESISTANCE TO AN INTERNAL
FIRE EXPOSURE ONLY.
FOR USE IN CONSTRUCTION NO(S),
219, 237, 458
SEE UL ROOFING MATERIALS AND
SYSTEMS DIRECTORY

6)

CELLULAR POLYSTYRENE (EPS)
IN THE FORM OF BLOCKS OR
BOARDS, IN ACCORDANCE WITH
ANSI/ASTM E2430

Manufacturer's statement: "These numerical flame spread and smoke ratings are not intended to reflect hazards presented by this material under actual fire conditions."

FASTENER PERFORMANCE TEST REPORT



Wind-lock Corporation
1055 Leisz's Bridge Road
Leesport, PA. 19633
800 872 6625
800 854 6814 (fax)
www.wind-lock.com

Report No: 06004
Date of test: 8/11/06
Report date: 8/18/06

PURPOSE OF TEST:

Determine pull out strength of various threaded fasteners installed into Wisconsin Thermo-Form ICF Plastic Crosstie.

MATERIALS TESTED:

Plastic ICF Cross Tie, identified as Wisconsin Thermo-Form Corp 1008 Polymer I-Beam.
(See fig. 1)

Threaded Fastener - #6 x 2" Drywall screw
.140 Major Thread Dia., twin
lead,
16 pitch, sharp point, bugle head.
Source - Home Depot

Threaded Fastener - #7 x 1 5/8" Wood/Lite Metal
screw
Hi-Lo Thread, sharp point, bugle
head.
Major Dia. of Hi Thread = .156
18 pitch
Source - Wind-lock Corp., part
Number WLM-1

Threaded Fastener - #8 x 2" Wood/Lite Metal screw
Hi-Lo Thread, sharp point, bugle head.
Major Dia. of Hi Thread = .168
18 pitch
Source - Wind-lock Corp., part Number WLM-2

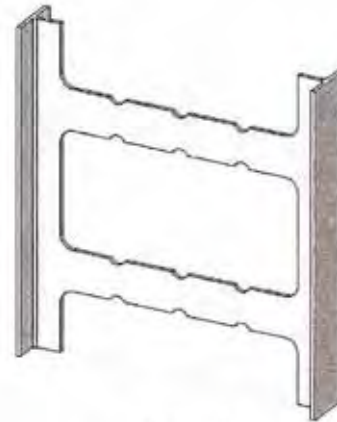


Figure 1

EQUIPMENT USED:

Dillon motorized tensile test machine, model MWD-5KNE
Dillon Advanced Force/Torque Indicator – 1 to 1100 pound force capacity. A copy of the certificate of calibration is included in the appendix of this report.
2500 RPM cordless screw gun
Test fixtures and adapters of Wind-lock design

RESULTS:

Pullout

#6 x 2" long Drywall screw

Test No.	Ultimate (failure) Load (pounds)
1	319.6
2	292.3
3	278.6
4	280.8
5	286.6
Average	291.6

#7 x 1 5/8" long Hi-Lo thread

Test No.	Ultimate (failure) Load (pounds)
1	249.5
2	255.7
3	279.7
4	273.5
5	279.3
Average	267.5

#8 x 2" long Hi-Lo thread

Test No.	Ultimate (failure) Load (pounds)
1	298.9
2	298.0
3	330.0
4	292.5
5	271.3
Average	298.1

PROCEDURE:

Each sample was cut to a length and width that allowed it to be placed into the tensile test fixture.

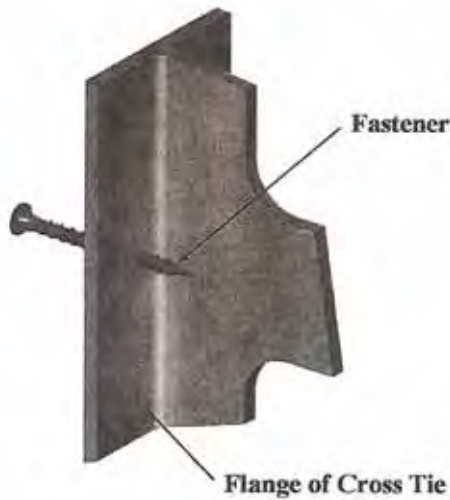


Figure 2

Fasteners were driven through the flange(s) at a point approximately 1/4" to 3/8" from the central web. Each fastener was driven to a depth that its point protruded approximately 1/2" through the flange material. A #10 flat washer was included about the head of the fastener. This allowed the gripping chuck of the tensile tester to grip the head of the fastener. (See fig. 2)

The assemblies were allowed to age 24 hours prior to testing.

The assembled strip was loaded into the tensile tester as shown in figure 3.

A uniform rate of pull (crosshead travel) of .10 inches per minute was applied to the specimen.

Peak load was observed on the digital readout of the force gauge, and recorded. This was repeated five times for each fastener type and flange configuration.

Note: Rate of crosshead travel is in accordance with ASTM D1761 and D6117. Age time after assembly is in accordance with ASTM D6117.

Qualification:

Results shown herein were obtained under laboratory conditions, using the specific items and procedures listed. Variations in components or methods may affect the results obtained.

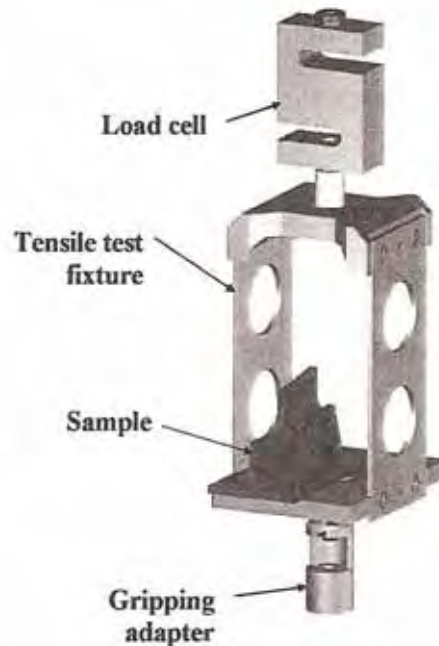



Figure 3

For Wind-Lock Corporation:


Eric Schmura

Warranty and Damages

(a) **Warranty:** Thermo-Form warrants that its Products will be free from defects in workmanship and materials under normal use and service, for a period of 12 months from the date of their initial installation **(BUT NOT FOR MORE THAN 18 MONTHS FROM THE DATE OF DELIVERY PURSUANT TO SECTION 2 OF THESE TERMS AND CONDITIONS OF SALE)**. Any warranty is void in cases of damage in transit, negligence, abuse, abnormal usage or storage, misuse, accidents, or improper installation or maintenance or failure to use or maintain in accordance with Thermo-Form's or any supplier's instructions or manuals. Any warranty is void if the Products are not covered in accordance with instructions or manuals to prevent sunlight degradation. Thermo-Form makes no warranty regarding installation services provided by subcontractors of Thermo-Form or any other party. Any defects arising from or relating to Buyer's specifications are not covered by Thermo-Form's warranty. Thermo-Form makes no warranty regarding water infiltration in below grade applications, and Thermo-Form makes no warranty for applied coatings or other interior or exterior treatments. Thermo-Form makes no warranty regarding parts or products manufactured or supplied by third parties. Buyer shall be responsible for promptly notifying Thermo-Form of any warranty claims as described above.

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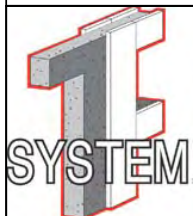
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ABOUT THIS MANUAL

This manual is intended to assist the contractor by illustrating techniques commonly used to erect walls using TF System insulated concrete forms. A basic knowledge of construction terms and skills, and concrete pouring techniques will help to ensure a successful project. Project specifications must meet or exceed local, state, or national codes and/or regulations.

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