Force Engineering & Testing, Inc.
19530 Ramblewood Drive
Humble, Texas 77338
Phone: (281) 540-6603
Fax: (281) 540-9966
www.forceengineeringtesting.com

Test Number : 456-0311T-11A & B

Test Report Date : March 12, 2012

Test Material : Riverclack 55 Standing Seam Roof System
0.027" (0.7 mm) Aluminum, 21.653" (550 mm) Coverage

Test Procedure : ASTM E 1680-95 (Reapproved for 2003) Standard Test Method For: Rate of Air Leakage Through Exterior Metal Roof Panel System

ASTM E 1646-95 (Reapproved for 2011) Standard Test Method For: Water Penetration of Metal Roof Panel Systems by Uniform Static Air Pressure Difference

Test Location : Force Engineering & Testing, Inc.
19530 Ramblewood Drive
Humble, TX 77338

Report by:

Brandon Jasek, P.E.

Reviewed by:

Terrence E. Wolfe, P.E.

ACCREDITED LABORATORY TL-417 — ACCREDITED LABORATORY — MIAMI-DADE COUNTY APPROVED — ACCREDITED LABORATORY — TEXAS DEPARTMENT OF INSURANCE ACCREDITED LABORATORY

Project Number: 456-0311T-11A & B

PURPOSE:

The purpose of this test was to determine the air infiltration and water penetration on the roof panel system.

TEST DATE:

February 21, 2012

TEST SPECIMEN:

Manufacturer:	ISCOM SPA Via Belvedere, 78-37026 Pescantina-Verona-Italy
Panel Description:	Riverclack 55, 0.027" (0.7mm) thick Mill Finish Aluminum (H18-5754), 1.81" (46mm) tall standing seam rib with integrated drainage channel, 21.65" (550mm) coverage,
Panel Properties:	Fy = 41.1 ksi (283375 kN/m^2), 0.0260" (0.66mm) Coated thickness per Tensile Test (See Appendix)
Panel Clip:	Reinforced Polyamide Fixed Clip, 4 1/8" (105mm) wide x 1 15/16" (50mm) long x 1 ½" (38.5mm) tall, NO sealant.
Clip Fastener:	Two #12-14 x 1 ½" (38.1mm) Pancake Self driller.
Panel Sealant:	No sealant in panel seam.
Panel Laps:	Four panel side laps and NO panel end laps.
Panel Length:	8'-11" (2718mm)
Panel Span:	One span at 5'-0" (1524mm), One span at 3'-9" (1143mm)
Panel Ends:	Both panel ends including the internal drain gutter filled with gun grade sealant.

TESTING APPARATUS:

High Pressure Blower:	New York Blower.
Test Chamber:	8' (2438mm) x 9' (2743mm) steel chamber.
Mounting Frame:	16-ga. Zee Interior, Steel Channel Perimeter
Pressure Indicator:	Digital Pressure Indicator
Flowmeter:	Meriam Laminar Flow Element

PANEL INSTALLATION:

The panels were installed on the interior Zee with the panel fasteners. The perimeter was sealed with tape sealant and then fastened to the steel frame. Weather stripping was installed on the panel ends to allow ½" (13mm) of water ponding.

Project Number: 456-0311T-11A & B

ASTM 1680 Rate of Air Leakage Test Procedure:

1. A positive preload of 15 psf (718.2 Pa) was applied to the panels and held for 10 seconds and then released and allowed to recover for 2 minutes. Repeated 2 times for a total of 3 cycles.

2. A negative preload of 30 psf (1436.4 Pa) was applied to the panels and held for 10 seconds and then released and allowed to recover for 2 minutes. Repeated 2 times for a total of 3 cycles.

3. The panel joints/ribs were taped and an initial reading was taken. The tape was then removed for a final reading.

ASTM 1646 Water Penetration Test Procedure:

1. The Panels were preloaded during the Air Leakage test therefore no preloading is required.

Test Conditions:

Ambient air temperature before testing: 59.8° F (15.4°C)
Ambient air temperature during testing: 65.2° F (18.4°C)
Panel Surface temperature before testing: 61.0° F (16.1°C)
Panel Surface temperature during testing: 70.6° F (21.4°C)
Water depth on panel during testing: ½" (13mm)

SUMMARY OF TEST RESULTS

Test	Leakage
Air Infiltration @ 1.57 psf (75 Pa)	0.014 cfm/sf (0.072 l/sm²) 0.028 cfm/lf (0.043 l/sm)
Air Infiltration @ 4.00 psf (192 Pa)	0.033 cfm/sf (0.166 l/sm²) 0.064 cfm/lf (0.099 l/sm)
Air Infiltration @ 15.0 psf (718 Pa)	0.094 cfm/sf (0.479 l/sm²) 0.185 cfm/lf (0.286 l/sm)
Water Penetration @ 12.00 psf (575 Pa)	No Water Leakage

MAR 16 2012

Test Notes:

1) During the Air Leakage and water penetration tests, the panel ends including the internal drainage gutter was filled with sealant to make it air and water tight. See pictures.

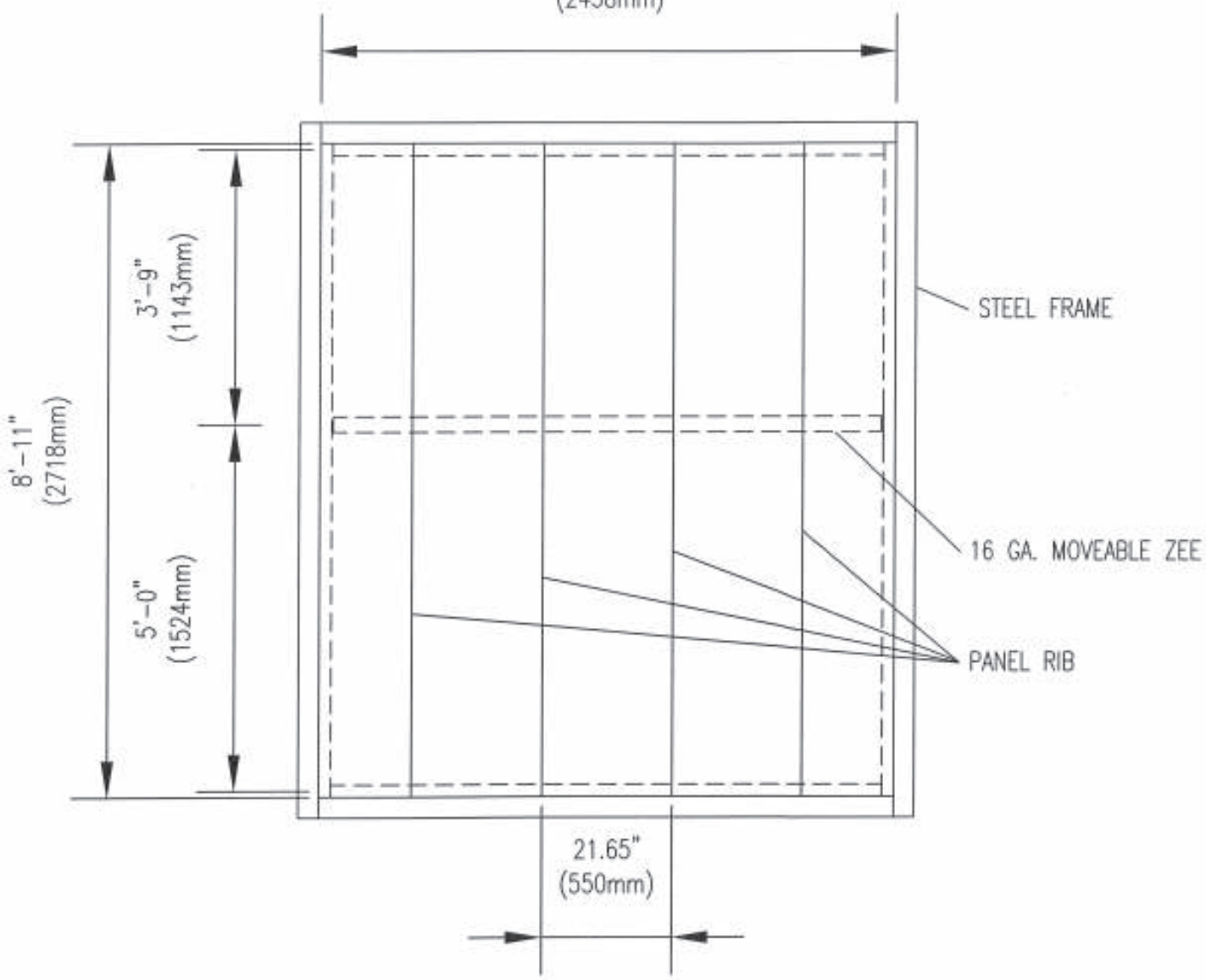
STATEMENT OF INDEPENDENCE:

Force Engineering & Testing, Inc. or any persons employed by them do not have any financial interest in ISCOM SPA.

Force Engineering & Testing, Inc. is not owned, operated or controlled by ISCOM SPA.

Appendix

PANEL LAYOUT

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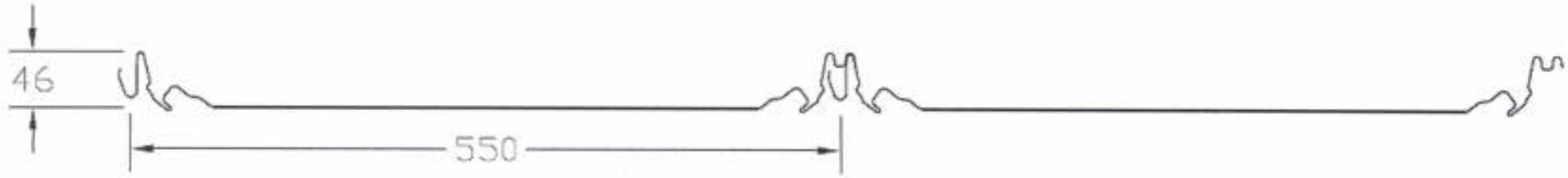
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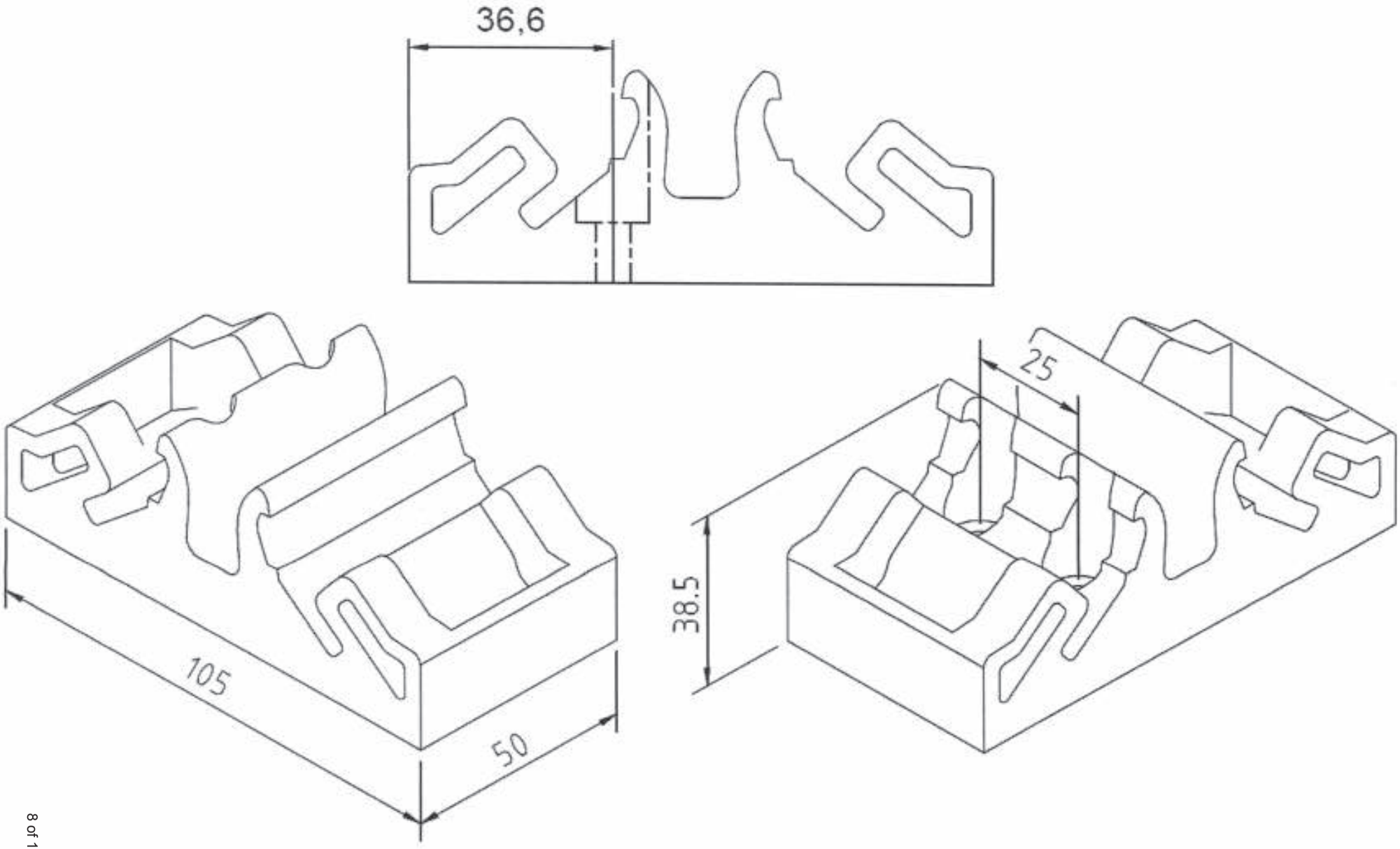
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RIVERCLACK

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PRODUCTS

Roof & Facade Cladding

- RIVERCLACK
  - RIVERCLACK® System
  - The Drainage Channel
  - Fixing System
  - Certification
  - Span Table
- RIVERGRIP
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- ON SITE ROLL FORMING
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- ELIOS
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Green Solutions

- RIVERGREEN

RIVERCLACK

THE RIVERCLACK® SYSTEM - THE SOLUTION FOR FLAT-LOW SLOPE ROOFS

The flat roof metal covering RIVERCLACK® is the solution, in industrial as well as in civil building, which complies with the latest architectural trends.

Thanks to its essential shape, aesthetic, constructive economies and outstanding technical properties, RIVERCLA CK is the perfect balance between technology and appearance.

Riverclack is a concealed fixing standing seam roofing system, worldwide patented by ISCOM, and it's the result of constant research and testing which have seen it used in pan-European large-scale projects for over twenty years.

Bringing together the structural performance levels of high tensile metals and truly innovative geometry, its unique drainage joint is guarantee of full waterproofing whilst its original fixing system allows an incredible installation speed, free thermal movements and an electric and thermal break between the roof and the below structure.

The panels 550mm wide are manufactured in customized continuous lengths both in the factory and on site.

GENERAL FEATURES

The flat roof metal covering RIVERCLACK® is the solution, in industrial as well as in civil building, which complies to the latest architectural trends.
Thanks to its essential shape, aesthetic, constructive economies and outstanding technical properties, RIVERCLACK® is the perfect balance between technology and appearance.

RIVERCLACK system in seven points

1 • FULL WATERPROOF

Thanks to the sealants and gaskets-free draining joint, this roof system is fully watertight even if it is submerged.

2 • PERFORATIONS–LESS LOCKING SYSTEM

Metal sheets are fixed on the below support structure without any through holes, thus allowing a free thermal expansion. Sheets more than 100 m long can be used.

3 • DURABILITY

Aluminium, copper or stainless steel sheets are unchangeable in time and have a hundred-year durability. All elements are 100% recyclable.

4 • WALK–ABILITY

It is guaranteed in every sheets area and does not leave any deflection even after several carelessness trampies.

5 • EASY INSTALLATION

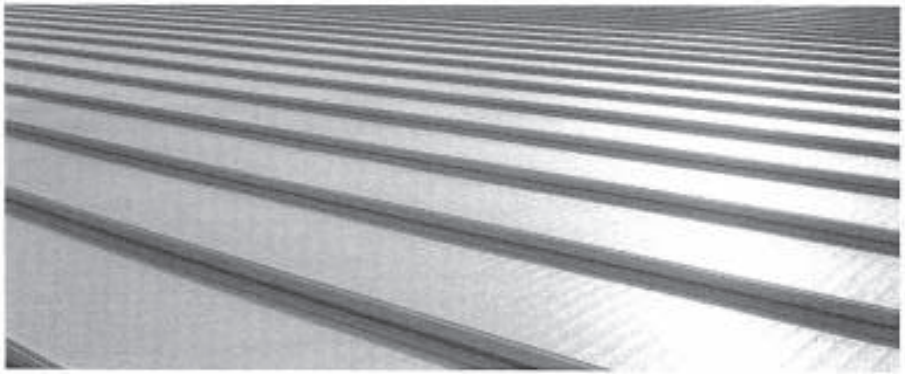
Installation is quick, mark out free, and easy even for non skilled staff.

6 • COST EFFECTIVE

Long-life, no maintenance and installation quickness are the properties that make Riverclack system cost effective both for big and small works.

7 • SELFBENDING

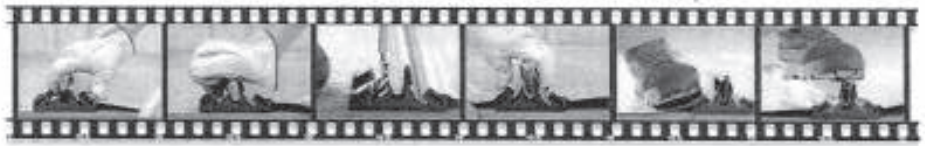
RIVERCLACK sheets can self curve down to a 25 m minimum radius (mill finish aluminium thickness 0.7), simply by fixing the system while following the curve shape of the below structure.



EASE OF INSTALLATION

The system is characterized by an exceptional ease of installation, with no sealants, gaskets or through perforations. Fasten system is made by reinforced polyamide brackets to be placed along each spacer. They allow free thermal movement preventing in the same time thermal bridges or electro corrosion between RIVERCLACK® and the below structure.
The system is installed using simple foot pressure onto the purpose designed polyamide bracket fixed to the spacer by two screws.

RIVERCLACK sheet installation in 6 steps.



RIVERCLACK

PRODUCTS

RIVERCLACK

SHAPE AND FIXING SYSTEM

The system is characterized by an exceptional ease of installation, free of any seal, gasket or through perforations.

Fasten system is made by reinforced polyamide brackets to be placed along each spacer.
They allow free thermal movement without any sheet to sheet friction preventing in the same time thermal bridges or electro corrosion between RIVERCLACK and the under structure.

The system is installed using simple foot pressure onto the purpose designed polyamide bracket fixed to the spacer by two screws.

RIVERCLACK® sheet installation in 6 steps.

Click to enlarge

ISCOM

METALS USED

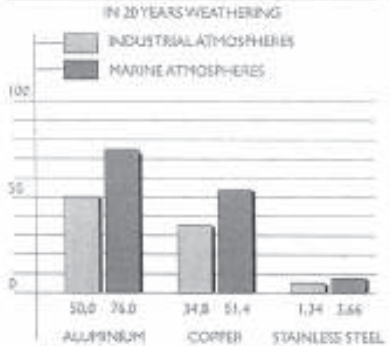
RIVERCLACK METALS

The high RIVERCLACK® demanded performance has taken to the necessary choice of long-life and strong environment-against (such as acid rains, industrial pollution, etc.) materials. Aluminium, copper and stainless steel are the system safety and reliability warranty, showing up its structural performances.

GALVANIC BEHAVIOURS

As everybody knows, it is advisable to avoid contacts between different metals in order to prevent electrochemical corrosions (galvanic couple). With the RIVERCLACK® system, stainless steel accessories can be used for elements in aluminium or copper without any compatibility problem between different metals.

Thickness loss in microns

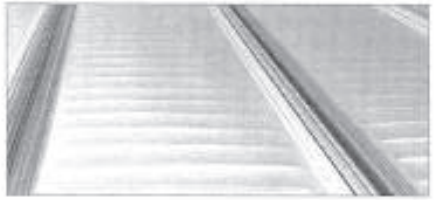


DIFFERENCE BETWEEN ALLOYS 5000 AND ALLOYS 3000.

Aluminium alloy 5754 used for RIVERCLACK® has got mechanical and chemical characteristics far above the normal alloys 3000 used generally for metal roofing. The use of alloy 5754 is advised in the UNI 10372 norm, related to metal roofing design, for the use in marine as well as in industrial environments, rather than other alloys. The high hardening degree (H18), together with other features of the alloy 5754, with high magnesium content, used for RIVERCLACK® system, represent the right choice to have a light and resistant roof covering.

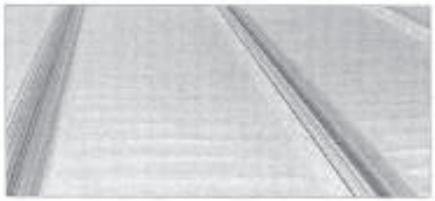
MATERIAL ALLOY	ALUMINIUM Alloy 5754 H18	COPPER Cu-DHP UNI 5649 raw	TITAN ZINC	STAINLESS STEEL UNI x 5 CrNi 18 10-AISI 304	GALVANIZED STEEL
DENSITY g/cm³	2,72	8,9	7,2	8,04	8,06
MELTING POINT °C	650 ÷	1080 ÷	418	1450 ÷	1450 ÷
COEFFICENT OF EXPANSION mm/m °C	0,0140	0,0172	0,0220	0,0161	0,0161
ELASTIC MODULUS kg/mm2	6900	12000/13500	8000	19700	19700
ELOGATIONS	5 ÷	2 ÷	40 ÷	40 ÷	40 ÷
TENSILE STRENGHT N/mm2	300 ÷	400 ÷	260	550/700	550/700
BRINNEL HARDNESS HB	90	120	40	150	130

Type of hardening	grade	Element in alloy	Content (in %)	Additional element	Strenght Rm (in MPa) up to
Hardening by plastic deformation	1000	Nothing		Cu	160
	3000	Manganese	0,5 ÷ 1,5	Mg, Cu	240
	5000	Magnesio	0,5 ÷ 5	Mn, Cr	350
	8000	Ferro e Silicio	Si: 0,3 ÷ 1 Fe: 0,6 ÷ 2		190



ALUMINIUM ALLOY 5754

Light, best relation between durability and cost, it is the best acid rain-proof. It is used in the physical state H18/19 which grants an extraordinary mechanic resistance to the metal



PRE-PAINTED ALUMINIUM ALLOY 5754

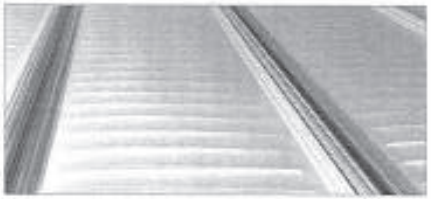
In addition to the own features of the metal, pre-painting adds aesthetics specification following the architectural needs

COPPER

It is a noble metal, with a unique reflection feature and it is the typical answer for any aesthetic

ZINC TITANIUM

Prestigious material whose surface aesthetic value is given by the natural shade change. The metal mechanical features require a rigid back support.



STAINLESS STEEL

It is an unchangeable material, it does not thin in time

PRE-PAINTED GALVANIZED STEEL

In addition to the own features of the metal, pre-painting adds aesthetics specification following the architectural needs

METALLURGICAL ENGINEERING SERVICES, INC.

Consulting • Failure Analysis • Laboratory Testing

March 13, 2012

REPORT OF: Tensile Testing

REPORT TO: Force Engineering & Testing, Inc.
Gianna Willits
19530 Ramblewood Drive
Humble, Texas 77338

DATE APPROVED: March 9, 2012

IDENTIFICATION: 1 ea. Metal Roof Panel identified as:
A) Job #445-0311T-11; ISCOM SPA; Riverclack

PROCEDURES: Tensile testing was performed per ASTM E8-09 on the panel sample using a Satec Systems Model Apex 22EMF, S/N: 1017, calibration due 5/24/12.

RESULTS: ***Tensile Test*** - 2" Gage Length, 0.2% Offset

SQR Dimensions Inches			Ultimate Strength		Yield Strength		Elong
Width	Thickness	Area, in^2	Load, Lbs	PSI	Load, Lbs	PSI	%
0.5010	0.0260	0.0130	592	45,500	534	41,100	5.7

These results are based on the tests performed and are subject to change upon the receipt of new or additional information.

Respectfully submitted,

METALLURGICAL ENGINEERING SERVICES, INC.
Firm Registration No. F-2674

Daniel A. Stolk, P.E.
President

Karen Goldstein
Quality Assurance Assistant

Purchase Order No. 445-0311T-11

Lab No. 26970_A, Revision 1 (3/13/12)
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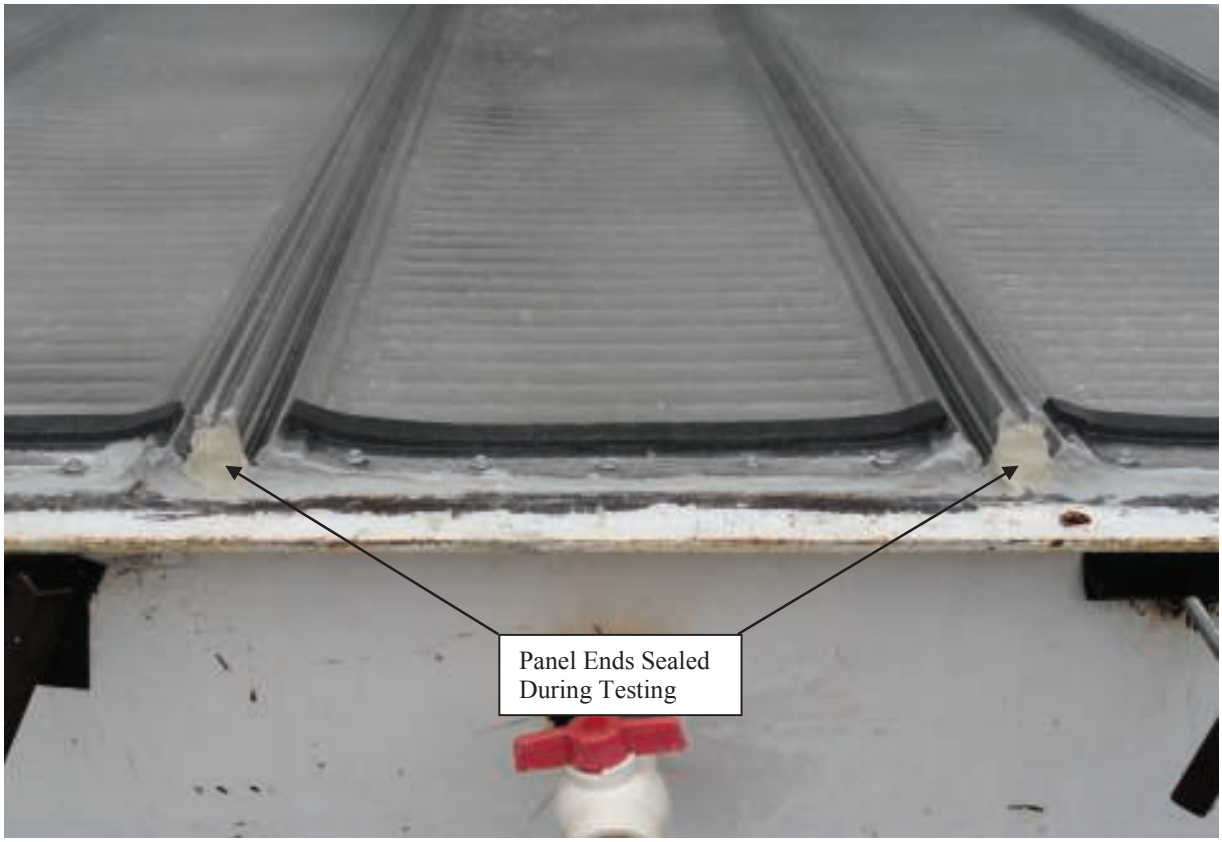
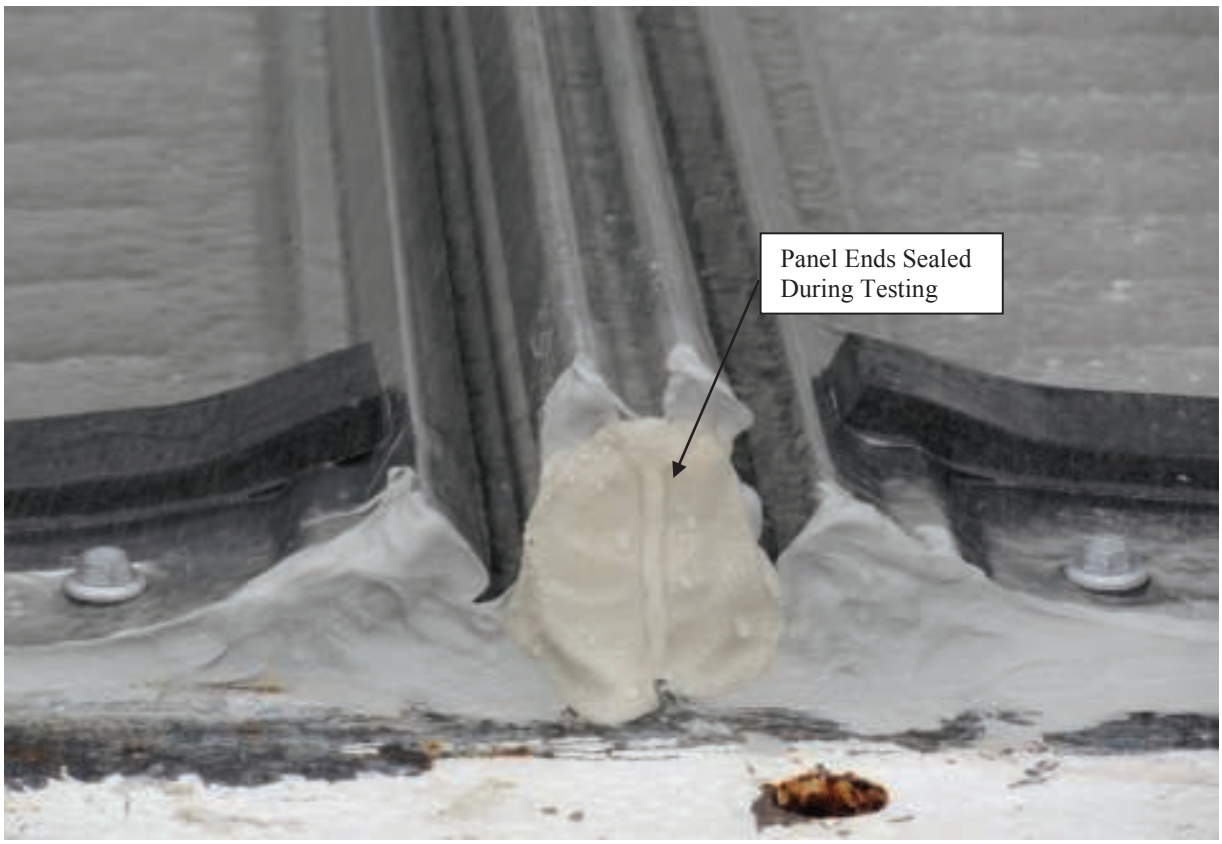
Photos



PANEL ENDS INCLUDING THE INTERNAL DRAINAGE GUTTER SEALED CLOSED FOR BOTH AIR AND WATER TESTS



PANEL ENDS INCLUDING THE INTERNAL DRAINAGE GUTTER SEALED CLOSED FOR BOTH AIR AND WATER TESTS

PANELS DURING WATER TEST