

# **PERFORMANCE TEST REPORT**

- REPORT NO.: 2407.01-110-21-R1
- RENDERED TO: TRUE BLUE PRODUCTS Redding, California
- PRODUCT TYPE: Continuous Insulation Mounting Systems

 Test Completion Date:
 6/17/2020

 Report Date:
 7/31/2020

 Revision Date:
 8/04/2020



CLIENT INFORMATION:	TRUE BLUE PRODUCTS	
	4750 Caterpillar Road, Suite E	
	Redding, California 96003	
TEST LABORATORY:	Molimo, LLC	
	1410 Eden Road	
	York, Pennsylvania 17402	
	717-900-6034	

## **PROJECT SUMMARY**:

**PRODUCT TYPE:** Continuous Insulation Mounting Systems

## **PROJECT SUMMARY:**

Molimo, LLC was contracted to perform testing on the above referenced product. Testing was performed to evaluate compression performance of the products. The product description, test procedures, and test results are reported herein. the results are tested values and were secured by using the designated test methods.

## **PROJECT DETAILS:**

**Test Dates**: 6/10/2020 – 6/17/2020

Test Record Retention End Date: 6/17/2024

Test Location: Molimo, LLC test facility in York, Pennsylvania.

**Test Specimen Source**: The test specimens were provided by the client. Representative samples of the test specimens will be retained by Molimo for a minimum of four years from the test completion date.

## WITNESSES:

The following representatives witnessed all or part of the testing.

Name	Company
Dave Simonsen	True Blue Products
Joseph W. Enriquez	Molimo, LLC
Michael D. Stremmel, P.E.	Molimo, LLC
Joe Descheemaeker	Molimo, LLC



## **PRODUCT DESCRIPTION:**

The client provided sections of True Ci H-Girts, True Ci V-Girts, True Ci Clips, True Ci Girts, and Girt Wires for the testing. Also provided were the True CI Locking Pins as well as all hardware that was used to secure the specimens.

**TEST PROCEDURES AND RESULTS**: The test procedures and test results are reported in the following tables.

## FULL SCALE VERTICAL LOAD TESTING

Testing was performed on the True Ci Vertical Girt, True Ci Horizontal Girt (installed vertically), 1" square aluminum tube, and an un-named competitor's product. All specimens were installed onto 16 ga, 6" steel stud walls sheathed with 1/2" Densglass. One specimen of each type was installed for testing. All specimens were spaced off the to simulate the presence of 2" or 4" insulation. All specimens installed to simulate 2" insulation utilized 1/4" diameter x 5" long hex head self-drilling screws (McMaster-Carr Part No. 91324A103) and all specimens installed to simulate 4" insulation utilized 1/4" diameter x 8" long hex head self-drilling fasteners (McMaster-Carr Part No. 91324A105).

The load was applied vertically downward by bolting to the bottom of the vertical rail and pulling downward. The vertical deflection of the rail was measured throughout the load application process. The load was applied at an average speed of 100-150 lb/second. All specimens were loaded using a forklift and come along utilizing a wire rope.

The maximum load achieved, and the corresponding vertical deflection of the rail, is summarized in the following tables. Load deflection charts of all test specimens are presented in Appendix A.

Girt Type	Insulation Depth	Insulation Present During Test	Max Load (lbf)	Maximum Displacement (in)
True Ci Vertical	4"	No	300	1.68
True Ci Vertical	2"	No	623	1.46
True Ci Horizontal (1/4" Leg spacing)	4"	No	266	2.41
True Ci Horizontal (1/2" Leg spacing)	4"	No	355	2.31
1" Square Aluminum Tube	4"	No	359	2.38

## Vertical Rail - 36" Fastener Spacing



## FULL SCALE VERTICAL LOAD TESTING (Continued)

## Vertical Rail - 24" Fastener Spacing

Girt Type	Insulation Depth	Insulation Present During Test	Max Load (lbf)	Maximum Displacement (in)
True Ci Vertical	4"	No	395	1.52
True Ci Vertical	2"	No	902	2.47
True Ci Horizontal (1/4" Leg spacing)	4"	No	423	0.99
True Ci Horizontal (1/2" Leg spacing)	4"	No	510	1.85
1" Square Aluminum Tube	4"	No	476	1.81
Competitor's Product – Test 1	4"	Yes	182	1.17
Competitor's Product – Test 2	4"	Yes	504	2.28
Competitor's Product – Test 3	4"	Yes	983	3.19

## Vertical Rail - 12" Fastener Spacing

Girt Type	Insulation Depth	Insulation Present During Test	Max Load (lbf)	Maximum Displacement (in)
True Ci Vertical	4"	No	576	1.33
True Ci Vertical	2"	No	1306	1.10
True Ci Horizontal (1/4" Leg spacing)	4"	No	610	1.86
True Ci Horizontal (1/2" Leg spacing)	4"	No	693	1.26
1" Square Aluminum Tube	4"	No	727	2.17

Note #1: All testing was stopped when it was observed that the fasteners yielded or bent.

Note #2: Testing of the competitor's product did not result in yielding or bending of the fastener. However, the insulation suffered a bearing failure as a result of the applied load.



## COMPRESSION TESTING ON TRUE CI H-GIRTS AND V-GIRTS

One specimen for each of the 2-1/2" and 5-1/2" TRUE Ci H-GIRT sizes were tested at the 2" and 4" insulation thicknesses. Also, one specimen at the 2" and 4" insulation thicknesses was tested for the TRUE Ci V-GIRT. All specimens were attached to a 12" x 12" wall section fabricated from 16 ga., 6" steel studs sheathed with Densglass. All specimens were tested without insulation between the Girt and the Densglass. All specimens installed to simulate 2" insulation utilized 1/4" diameter x 5" long hex head self-drilling screws and all specimens installed to simulate 4" insulation utilized 1/4" diameter x 8" long hex head self-drilling fasteners.

The specimens were loaded into a Test Resources universal test machine Model 312 Series Frame with a Q Controller (Asset #00217). A vertically downward load was applied at a rate of 0.10 inches per minute utilizing a 5-1/4" by 2" by 5/16" steel plate that was affixed into a 5600 lbf load cell (Asset #00226). In order to distribute load onto each specimen, a 10-1/4' by 1/2" by 1/2" flat steel bar was used for the TRUE Ci H-GIRT specimens and a 4-1/2" by 1" by 5/8" flat steel bar was used for the TRUE Ci V-GIRT specimens.

Girt Type	Insulation Depth	Max Load (lbf)	Displacement at Max Load (in)
2-1/2" TRUE Ci H	2"	211.65	0.9538
2-1/2" TRUE Ci H	4"	121.79	1.3865
5-1/2" TRUE Ci H	2"	224.12	0.9321
5-1/2" TRUE Ci H	4"	112.80	1.4903
TRUE Ci V	2"	303.54	0.6474
TRUE Ci V	4"	167.31	1.0774

Each specimen had a pre-load applied between 5.0 lbf and 8.0 lbf in order to stabilize each specimen. The machine was then zeroed out and the testing was started. Testing was terminated once the bolts were determined to have yielded significantly.



## COMPRESSION TESTING ON TRUE CLIP AND GIRT

Two specimens for each of the TRUE Ci CLIP AND GIRT and Clip ONLY configurations were tested. All specimens were attached to a 12" x 12" wall section fabricated from 16 ga., 6" steel studs sheathed with Densglass. All specimens were tested without insulation between the Girt and the Densglass.

The specimens were loaded into a Test Resources universal test machine Model 312 Series Frame with a Q Controller (Asset #00217). A vertically downward load was applied at a rate of 0.10 inches per minute utilizing a 5-1/4" by 2" by 5/16" steel plate that was affixed into a 5600 lbf load cell (Asset #00226). In order to distribute load onto each specimen a 4-1/4" by 3-1/2" by 3/8" flat steel plate was placed on the loading face of each specimen.

Each specimen had a pre-load applied between 5.0 lbf and 8.0 lbf in order to stabilize each specimen. The machine was then zeroed out and the testing was started. Testing was terminated once the maximum load was achieved.

Specimen ID.	Insulation Depth	Maximum Load (lbf)	Displacement at Max Load (in)
Clip and Girt - 1	4"	1305.23	0.4623
Clip and Girt - 2	4"	1617.39	0.5608
Clip ONLY - 1	3"	691.86	0.5508
Clip ONLY - 2	3"	770.89	0.6683



## TRUE CI HOLDING WIRE TEST

Three TRUE Ci V-GIRT specimens were prepared by inserting the fastener and securing it with the Locking Pins. Each specimen was then secured to the base plate of a Test Resources universal test machine Model 312 Series Frame with a Q Controller (Asset #00217). Load was manually applied utilizing an M16-2.0 x 30 socket cap screw affixed into a 5600 lbf load cell (Asset #00226).

Prior to each test, the tip of the fastener was snugged up to the socket cap screw so that no movement could take place with light pressure. Once snug, the load was manually increased slowly until movement of the bolt was initially observed. Once the movement of the bolt was recorded, the load was then increased to 200 lbf. Finally, the load was slowly returned to zero and the wire was observed to see if it returned to its original resting state. Upon full release of the test load, the wire was visually observed to determine if there was any deformation that had occurred.

Specimen ID.	Force at Which Fastener Movement was Initially Observed (lbf)	Observations After 200 lbf
1	150-155	Locking Pins returned to resting position with no deformation
2	150-155	Locking Pins returned to resting position with no deformation
3	150-155	Locking Pins returned to resting position with no deformation



## **GIRT WIRE FORCE TEST**

Three girt wires were tested at 8" and 12" lengths. All specimens were attached to a 12" x 12" wall section fabricated from 16 ga., 6" steel studs sheathed with Densglass.

The specimens were loaded into a Test Resources universal test machine Model 312 Series Frame with a Q Controller (Asset #00217). Load was manually applied utilizing a 15-1/2" long wood 2x4 that was affixed to a 250 lbf load cell (Asset #00228). The cross head with the wood 2x4 attached was lowered and the girt wire was screwed into the girt of the system. The crosshead was then manually raised until the wire was secure at the 12" mark or the full extension of the wire. The load was then zeroed out and the crosshead was raised to 1". The maximum force was recorded, and the crosshead was moved to 2", 3", and then finally 3-1/2".

Since the girt wires showed no signs of deformation, the wall section was moved so as to apply the load at the 8" mark of the wire. This process was repeated for each subsequent wire that was tested.

Specimen ID	Force at 1" (lbf)	Force at 2" (lbf)	Force at 3" (lbf)	Force at 3.5" (lbf)
Wire 1 – 12"	0.800	1.573	2.562	3.143
Wire 1 – 8"	2.163	4.024	6.150	7.444
Wire 2 – 12"	0.757	1.341	2.031	2.564
Wire 2 – 8"	1.995	4.201	7.344	N/A
Wire 3 – 12"	1.167	2.098	3.069	3.581
Wire 3 – 8"	2.130	4.355	6.767	8.203



A copy of this report, detailed drawings, datasheets, representative samples of test specimens, or other pertinent project documentation will be retained by Molimo, LLC for the entire test record retention period. At the end of this retention period, the service life of this report will expire.

Results obtained are tested values and were secured by using the designated test methods. This test report does not constitute certification of this product nor an opinion or endorsement by this laboratory. It is the exclusive property of the client so named herein and relates only to the specimen(s) tested. This report may not be reproduced, except in full, without the written permission of Molimo, LLC.

For MOLIMO, LLC:

Joseph Descheemaeker Technician Michael D. Stremmel, P.E. Senior Project Engineer

MDS:dro

Attachments (pages): This report is complete only when all attachments listed are included. Appendix-A: Photographs (9) Appendix-B: Load Deflection Charts (14) Appendix C: Universal Tester Datasheets (11)

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# **Revision Log**

Rev. #	Date	Page(s)	Revision(s)
1	08/04/2020	3, 6, Appendix C	Added Part Numbers to screws on Page 3, added column for insulation depth on Page 6, changed the word "Bolt" to "Screw" on Appendix C Instron charts.



Appendix A

Photographs





Photo No. 1 - 3" TRUE CI H-GIRT (Typical Setup)



Photo No. 2 - 3" TRUE CI H-GIRT (Typical Failure)





Photo No. 3 - 6" TRUE CI H-GIRT (Typical Setup)



Photo No. 4 - 6" TRUE CI H-GIRT (Typical Failure)





Photo No. 5 - TRUE CI V-GIRT (Typical Setup)



Photo No. 6 - TRUE CI V-GIRT (Typical Failure)





Photo No. 7 - TRUE CLIP AND GIRT (Typical Setup)



Photo No. 8 - TRUE CLIP AND GIRT (Specimen #1 - Failure)





Photo No. 9 - TRUE CLIP AND GIRT (Specimen #2 – Failure)



Photo No. 10 - TRUE CLIP AND GIRT Clip ONLY (Typical Setup)





Photo No. 11 - TRUE CLIP AND GIRT Clip Only (Specimen #1 – Failure)



Photo No. 12 - TRUE CLIP AND GIRT Clip ONLY (Specimen #2 – Failure)





Photo No. 13 – Typical Full-Scale Test Setup (True Ci Vertical Girt Shown)



Photo No. 14 – Full-Scale Test Setup (True Ci Horizontal Girt Shown)





Photo No. 15 – Full-Scale Test Setup (Competitor's Product Shown)





Photo No. 16 – Indentation of the Insulation - Full-Scale Test (Competitor's Product Test #2 Shown)



# Appendix B

Load Deflection Charts































Appendix C

**Universal Tester Datasheets** 



Date: Time: Specimen ID#: Direction: Specimen Type:	06/11/20 13:20:42 3-2 COMPRESSION None
Status: MAXIMUM LOAD	PASS
Result(Lbf):	211.65,
Disp1(in):	0.0000
Disp2(in): LOAD AT BREAK	0.0000
Result(Lbf): DISP AT BREAK	211.65,
Result(in):	0.9538,

Load at 0.125": 47 lbf



Date: Time: Specimen ID#: Direction: Specimen Type	06/11/20 14:20:12 4-6 COMPRESSION e: None
Status: MAXIMUM LO	PASS
Result(Lbf):	121.79,
Disp1(in):	0.0000
Disp2(in): LOAD AT BRE	0.0000 AK
Result(Lbf): DISP AT BREA	121.73, K
Result(in):	1.3865,

Load at 0.125": 17 lbf



Date: Time: Specimen ID#: Direction: Specimen Type:	06/11/20 09:47:02 1-2 COMPRESSION None
Status: MAXIMUM LOAD	PASS
Result(Lbf):	224.12,
Disp1(in):	0.0000
Disp2(in):	0.0000
LOAD AT BREAK	
Result(Lbf):	224.12,
Load at 0.125": 42	lbf



Date: Time: Specimen ID#: Direction: Specimen Type:	06/11/20 10:51:21 2-4 COMPRESSION None	
Status: MAXIMUM I QAD	PASS	
Result(Lbf):	112.80,	
Disp1(in):	0.0000	
Disp2(in):	0.0000	
LOAD AT BREAK		
Result(Lbf):	112.80,	
DISP AT BREAK Result(in):	1.4903,	
Load at 0.125": 15 lbf		



Date: Time: Specimen ID#: Direction: Specimen Type:	06/11/20 15:28:30 5-2 COMPRESSION None
Status: MAXIMUM LOAD	PASS
Result(Lbf):	303.54.
Disp1(in):	0.0000
Disp2(in):	0.0000
LOAD ÀT BREAK	
Result(Lbf):	300.26,
DISP AT BREAK	
Result(in):	0.6486,

Load at 0.125": 57 lbf



Date: Time: Specimen ID#: Direction: Specimen Type:	06/11/20 15:50:07 6-4 COMPRESSION None
Status: MAXIMUM LOAD	PASS
Result(Lbf):	115.10,
Disp1(in):	0.0000
Disp2(in):	0.0000
LOAD AT BREAK	
Result(Lbf):	115.10,
DISP AT BREAK	
Result(in):	0.4763,

Load at 0.125": 41 lbf



Date: Time: Specimen ID#: Direction: Specimen Type:	06/11/20 15:56:52 6-4 COMPRESSION None
Status: MAXIMUM LOAD	PASS
Result(Lbf):	167.31,
Disp1(in):	0.0000
Disp2(in):	0.0000
LOAD AT BREAK	
Result(Lbf):	167.31,
DISP AT BREAK	
Result(in):	1.0774,



Date: Time: Specimen ID#: Direction: Specimen Type:	06/16/20 15:09:01 8-1 COMPRESSION None
Status: MAXIMUM LOAD	PASS
Result(Lbf):	1305.23,
Disp1(in):	0.0000
Disp2(in):	0.0000
LOAD AT BREAK	
Result(Lbf):	899.07,
DISP AT BREAK	
Result(in):	0.6969,

Load at 0.125": 561 lbf



Date: Time: Specimen ID#: Direction: Specimen Type:	06/17/20 11:37:03 8-1 COMPRESSION None
Status:	PASS
Result(Lbf):	1617.39.
Disp1(in):	0.0000
Disp2(in):	0.0000
LOAD AT BREAK	
Result(Lbf):	1013.19,
DISP AT BREAK	0.5700
Result(in):	0.5798,
Load at 0.125": 531 lbf	



Date: Time: Specimen ID#: Direction: Specimen Type:	06/17/20 14:13:09 9-1 COMPRESSION None
Status: MAXIMUM LOAD	PASS
Result(Lbf):	691.86,
Disp1(in):	0.0000
Disp2(in):	0.0000
LOAD AT BREAK	
Result(Lbf):	668.11,
DISP AT BREAK Result(in):	0.7839,

Load at 0.125": 266 lbf



Date: Time: Specimen ID#: Direction: Specimen Type:	06/17/20 14:47:22 9-2 COMPRESSION None
Status:	PASS
Result(Lbf):	770.89.
Disp1(in):	0.0000
Disp2(in):	0.0000
LOAD AT BREAK	
Result(Lbf):	667.98,
DISP AT BREAK	
Result(in):	0.7802,
Load at 0.125": 251 lbf	