BlueScope Buildings North America, Inc.
Research Center
13500 Botts Road
Grandview, Missouri 64030

ASTM C 1363
Thermal Performance Test Report

Test Number: 2011-60
Sponsor: Bay Insulation Systems, Inc.

Wall Filled Cavity- R-25/R-16 System with Thermal Tape
Varco Pruden Vee Rib panels, 2 girts, 1/8" foam tape, nominal R-16 unfaced fiberglass insulation, nominal R-25 faced fiberglass insulation, 8-1/2" girts

Test Date: 9/30/2011

Responsible Party: Mark J. Henry
Operator: Larry Krueger
Witness: Mark Henry

Summary of Results:

Thermal Transmittance, U:	0.224 $W/m^2 K$ (0.039 Btu/ hr ft^2 F)
Overall Thermal Resistance, Ru:	4.5 $m^2 K/W$ (25.3 hr ft^2 F/Btu)

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ASTM C 1363 Thermal Performance Test Report Summary

Prepared For:
Bay Insulation Systems, Inc
2929 Walker Drive
Green Bay, Wisconsin 54311

Test Number: 2011-60
Test Start Date: 9/30/2011
Test End Date: 10/5/2011
Report Date: 10/12/2011

Test Information:
Wall Filled Cavity- R-25/R-16 System with Thermal Tape
Varco Pruden Vee Rib panels, 2 girts, 1/8" foam tape, nominal R-16 unfaced fiberglass insulation, nominal R-25 faced fiberglass insulation, 8-1/2" girts

Test Orientation / Heat Flow Direction:
Vertical Wall / Inside to Outside

Specimen Size:
2.44 m x 3.05 m (8.00 ft x 10.00 ft)

Test Procedure: The Thermal Transmittance (U) and Thermal Resistance (Ru) were determined in general accordance with ASTM C 1363-05, *Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus.*

ASTM Exceptions, if any:

Summary of Test Setup:

Average Warm Side Ambient Temperature	37.81 deg C (100.06 deg F)
Average Cold Side Ambient Temperature	9.97 deg C (49.95 deg F)
Average Warm Side Air Velocity	0.30 m/s (58.45 fpm)
Average Cold Side Air Velocity	1.33 m/s (261.45 fpm)

Summary of Results:

Thermal Transmittance, U:	0.224 $W/m^2 K$ (0.039 Btu/ hr ft^2 F)
Overall Thermal Resistance, Ru:	4.5 m^2 K/W (25.3 hr ft^2 F/Btu)

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Specimen Size: 2.44 m x 3.05 m (8.00 ft x 10.00 ft)
Panel Type: Varco Pruden Vee Rib wall panel
Insulation: Fiberglass, 2-layers
Framing System: Z-girt

Specimen Construction: The construction was supervised by Carl Lewis, Bay Insulation Systems Inc, and by Hal Robbins, Lamtec Corporation.

The girts were installed in the test frame. Two rows of 1" steel banding were attached to the inside of the test frame. The foam tape was attached to the outside flanges of the girts. Double stick tape was applied to the inside flange of the girts. One edge of the nominal R-25 insulation facing was adhered to the tape. Another layer of tape was adhered to the facing, and then the edge of the facing from the adjacent piece of insulation was adhered. At all four sides of the test frame the insulation facing was turned toward the exterior of the wall and was fastened to the test frame with small wood cleats. The turned up edge of the facing was taped to the sides of the test frame. The nominal R-16 insulation was draped over the girts and over the R-25 insulation. The wall panels were installed using typical field installation methods. Foam end closures were installed at each end of the panels. The perimeter of the panels and the side laps were taped to prevent air leakage.

Specimen Conditioning: The assembly was built at the BlueScope Buildings Research Center and remained there until it was tested. The insulation was unrolled and was in environmental conditions for at least 12 hours before being enclosed in the test assembly. The insulation was "fluffed" in a manner similar to the NAHB procedure for quality testing of faced insulation, in order to promote the recovery of the insulation thickness. The average measured thickness of the R-16 insulation was 4.9 inches, and of the R-25 insulation was 6.6 inches.

Materials Used:

Material Name	Description
Wall Panel	Varco Pruden Buildings Vee Rib wall panel, 26 gauge, Painted Cool Cotton White finish
Foam Tape	VentureTape® 9108 White finish 1/8" x 3" polyethylene foam tape Adhesive coated on two sides
R-16 Fiberglass	Nominal R-16 unfaced fiberglass blanket insulation Measured thermal resistance: 16.49 hr ft^2 F/Btu
R-25 Insulation	Nominal R-25 faced fiberglass blanket insulation Measured thermal resistance: 23.2 hr ft^2 F/Btu

Sources for Materials Used: BlueScope Buildings North America supplied the girts.
Varco Pruden Buildings supplied the wall panels and fasteners.
Bay Insulation Systems Inc. supplied the insulation. The original manufacturer of the R-16 fiberglass was Owens Corning, and of the R-25 fiberglass was CertainTeed Corporation.
The foam tape was from Venture Tape Corporation.

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Measured Test Data

Test Times	
Test Start Time	9/30/2011 1:12 PM
Test End Time	10/5/2011 7:37 AM
Time Required to Reach Steady State	91.8 Hours
Steady State Start Time	10/4/2011 9:02 AM
Steady State End Time	10/4/2011 4:57 PM

Test Information	
Metered Area	10.48 m^2 (112.75 ft^2)
Specimen Area	7.43 m^2 (80.00 ft^2)
Average Warm Side Ambient Temperature	37.81 deg C (100.06 deg F)
Average Cold Side Ambient Temperature	9.97 deg C (49.95 deg F)

Input	**68.39 watts (233.35 Btu/hr)**
Warm Side Heaters	61.08 watts (208.41 Btu/hr)
Warm Side Fans	6.05 watts (20.65 Btu/hr)
Warm Side AVT & RH Sensor Power	1.26 watts (4.29 Btu/hr)

Loss	**22.02 watts (75.14 Btu/hr)**
Surround Panel Loss	19.85 watts (67.73 Btu/hr)
Specimen Flanking Loss	2.19 watts (7.47 Btu/hr)
Meter Wall and Flanking Loss	-0.02 watts (-0.06 Btu/hr)
Thermopile Voltage (E)	-0.233 mV
Thermopile Null (E_0)	-0.2418 mV
Thermopile Slope (m)	-1.8296

Total Heat Flow Through Test Specimen	**46.37 watts (158.21 Btu/hr)**

Calculated Thermal Properties	
Specimen Thermal Transmittance (U)	0.224 W/m^2 K (0.039 Btu/ hr ft^2 F)
Specimen Overall Thermal Resistance (Ru)	4.5 m^2 K/W (25.3 hr ft^2 F/Btu)

The estimated uncertainty of the results is ± 7.3 %

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Measurements were taken to determine the depth of the insulation. They were taken on the inside from a reference line behind the test frame to the insulation facing. The reference line was 7-7/16" from the inside of the test frame. The inside of the panel rib of the wall panel was flush with the outside of the test frame. The test frame is 11-5/8" deep. So the measurement subtracted from (11-5/8" + 7-7/6") is the depth of the insulation from the panel rib. The measurements were taken at 6" increment across the width of the specimen. The measurements were taken when the assembly was vertical. Vertical locations are measured from the centerline of the inside flange of the girt.

Location		0.5'	1.0'	1.5'	2.0'	2.5'	3.0'	3.5'	4.0'	4.5'	5.0'	5.5'	6.0'	6.5'	7.0'	7.5'
15" above	Meas.	9.31	9.19	9.88	8.94	8.31	8.13	7.69	7.56	7.63	7.69	8.13	8.69	9.88	9.38	9.75
upper girt	Depth	9.75	9.88	9.19	10.13	10.75	10.94	11.38	11.50	11.44	11.38	10.94	10.38	9.19	9.69	9.31
15" below	Meas.	9.19	9.06	9.25	7.38	7.94	7.81	7.75	7.69	7.69	7.94	8.00	8.50	10.38	9.00	9.19
upper girt	Depth	9.88	10.00	9.81	11.69	11.13	11.25	11.31	11.38	11.38	11.13	11.06	10.56	8.69	10.06	9.88
45" below	Meas.	9.56	9.44	9.25	8.63	8.06	7.56	7.56	7.38	7.50	7.75	8.06	8.69	9.44	9.13	9.69
upper girt	Depth	9.50	9.63	9.81	10.44	11.00	11.50	11.50	11.69	11.56	11.31	11.00	10.38	9.63	9.94	9.38
15" above test	Meas.	9.69	9.50	10.13	9.06	8.69	8.50	8.38	8.25	8.44	8.50	8.88	9.19	9.88	9.50	9.75
frame	Depth	9.38	9.56	8.94	10.00	10.38	10.56	10.69	10.81	10.63	10.56	10.19	9.88	9.19	9.56	9.31

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Specimen Surface Temperatures.

		Avg. Deg C	Avg. Deg F			Avg. Deg C	Avg. Deg F
Climate	#11	10.50	50.89	Meter	#49	37.43	99.38
Climate	#12	10.91	51.64	Meter	#50	37.34	99.20
Climate	#13	11.76	53.17	Meter	#51	37.35	99.24
Climate	#14	10.95	51.71	Meter	#52	37.09	98.76
Climate	#15	11.07	51.93	Meter	#53	37.12	98.81
Climate	#16	12.75	54.95	Meter	#54	37.15	98.86
Climate	#17	10.51	50.91	Meter	#55	36.39	97.50
Climate	#18	10.60	51.08	Meter	#56	36.40	97.52
Climate	#19	10.27	50.48	Meter	#57	37.12	98.81
Climate	#20	10.33	50.60	Meter	#58	37.28	99.10
Climate	#21	10.32	50.58	Meter	#59	37.25	99.05
Climate	#22	10.31	50.55	Meter	#60	37.27	99.09
Climate	#23	10.85	51.53	Meter	#61	36.85	98.32
Climate	#24	10.49	50.88	Meter	#62	36.86	98.35
Climate	#25	12.16	53.89	Meter	#63	36.66	98.00
Climate	#26	10.62	51.11	Meter	#64	36.57	97.83
Climate	#27	10.45	50.80	Meter	#65	36.57	97.83
Climate	#28	10.47	50.85	Meter	#66	35.97	96.75
Climate	#29	10.25	50.45	Meter	#67	36.03	96.85
Climate	#30	10.12	50.22	Meter	#68	36.88	98.38

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Accreditations:

Test Specification	Description	Accredited By
ASTM C 1363-05	Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus	International Accreditation Service, Inc.

Latest Apparatus Calibration Date: August 2010

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Mark J. Henry
Senior Research Engineer

Attachments:

Revision Log

Rev #	Date	Page(s)	Revision(s)
Original	10/12/2011	All	
Rev. 1	12/16/2014	Cover page, 1, 3	Revised thermal properties values, U and Ru

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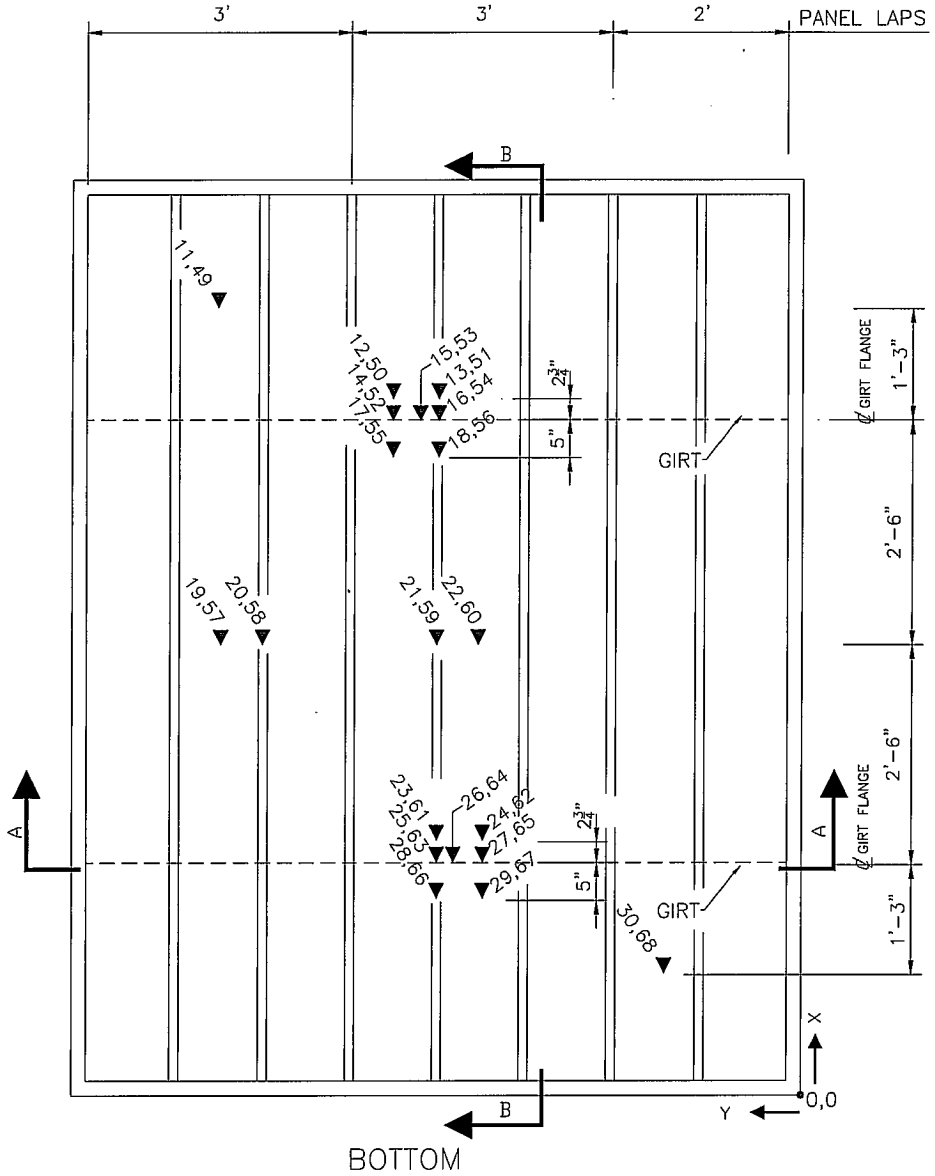
DRAWING A – ELEVATION
WALL FILLED CAVITY R–25/R–16 SYSTEM THERMAL TAPE



NOTES

(TC) 11 THUR 30 ARE ON THE CLIMATE SURFACE
(TC) 49 THRU 68 ARE ON THE METER SIDE
▼## INDICATES LOCATION OF THERMO COUPLES (TC)

TEST 2011–60

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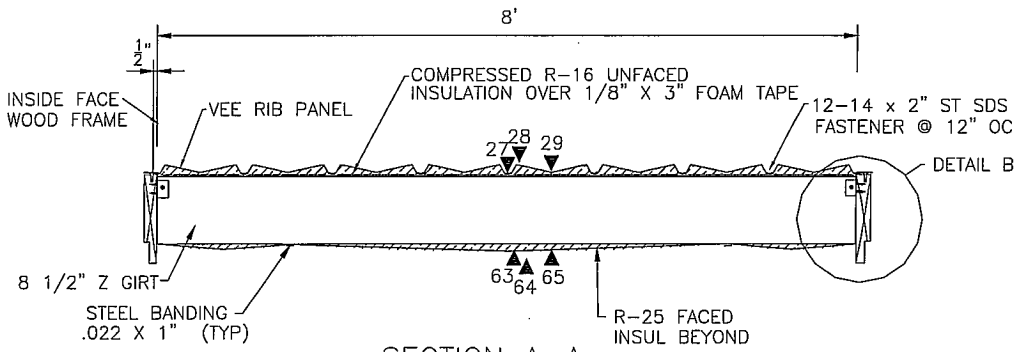
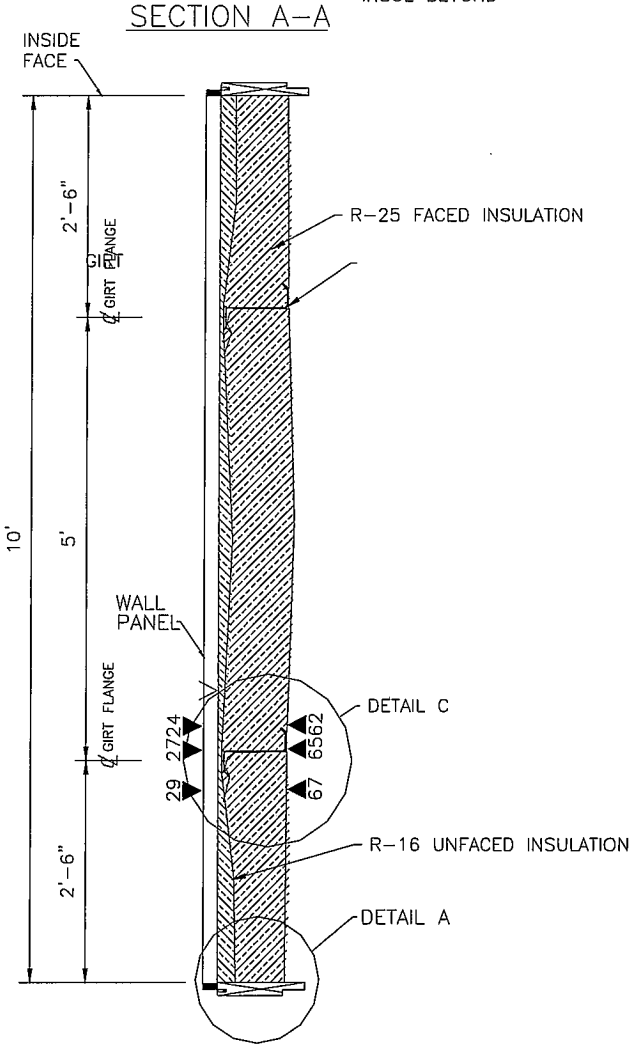
DRAWING B – SECTIONS THRU TEST FIXTURE
WALL FILLED CAVITY R–25/R–16 SYSTEM THERMAL TAPE



SECTION A–A



SECTION B–B

NOTES

▲ # INDICATES LOCATION OF THERMO COUPLES (TC)

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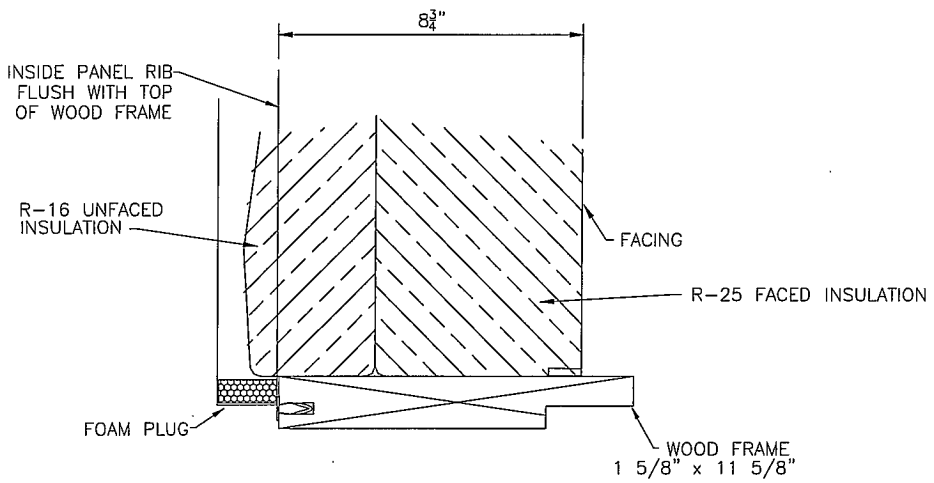
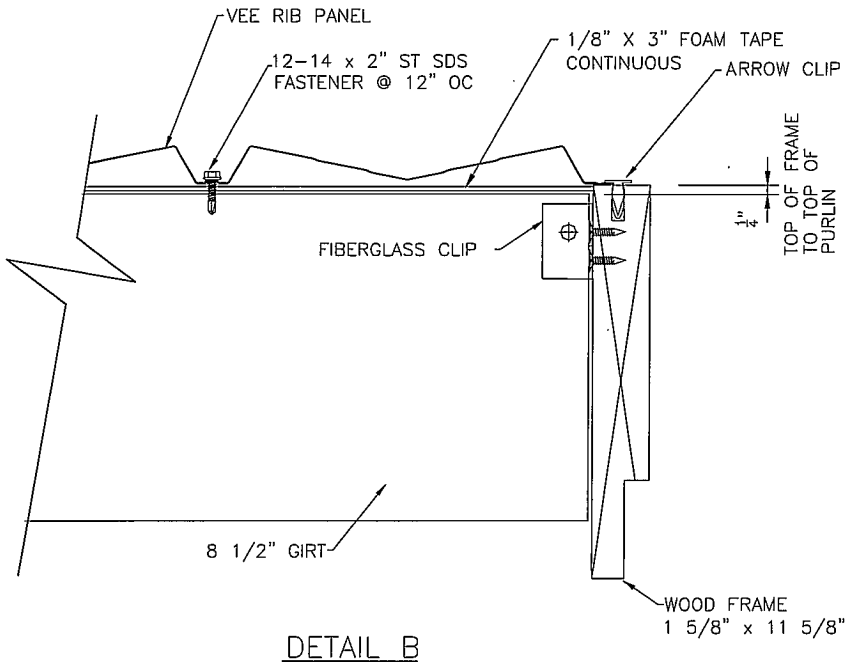
DRAWING C – DETAILS

WALL FILLED CAVITY R–25/R–16 SYSTEM THERMAL TAPE



DETAIL A



DETAIL B

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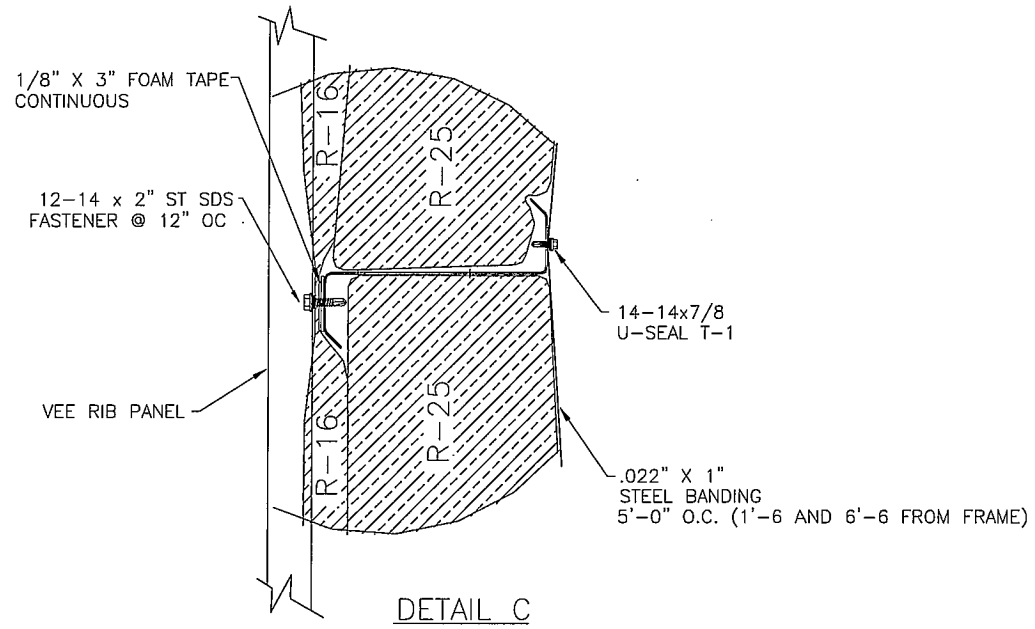
DRAWING D – DETAILS
WALL FILLED CAVITY R–25/R–16 SYSTEM THERMAL TAPE



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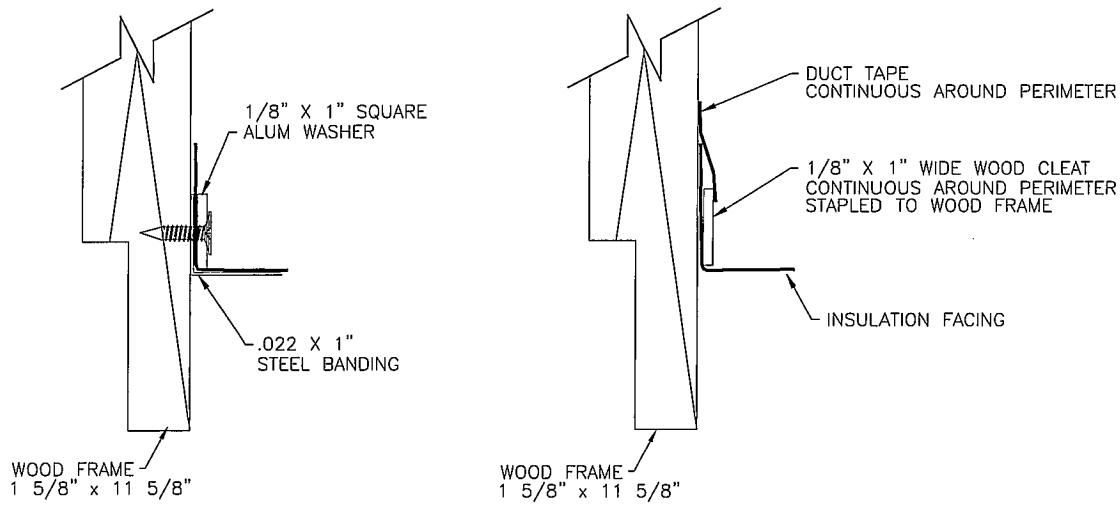

DETAIL D

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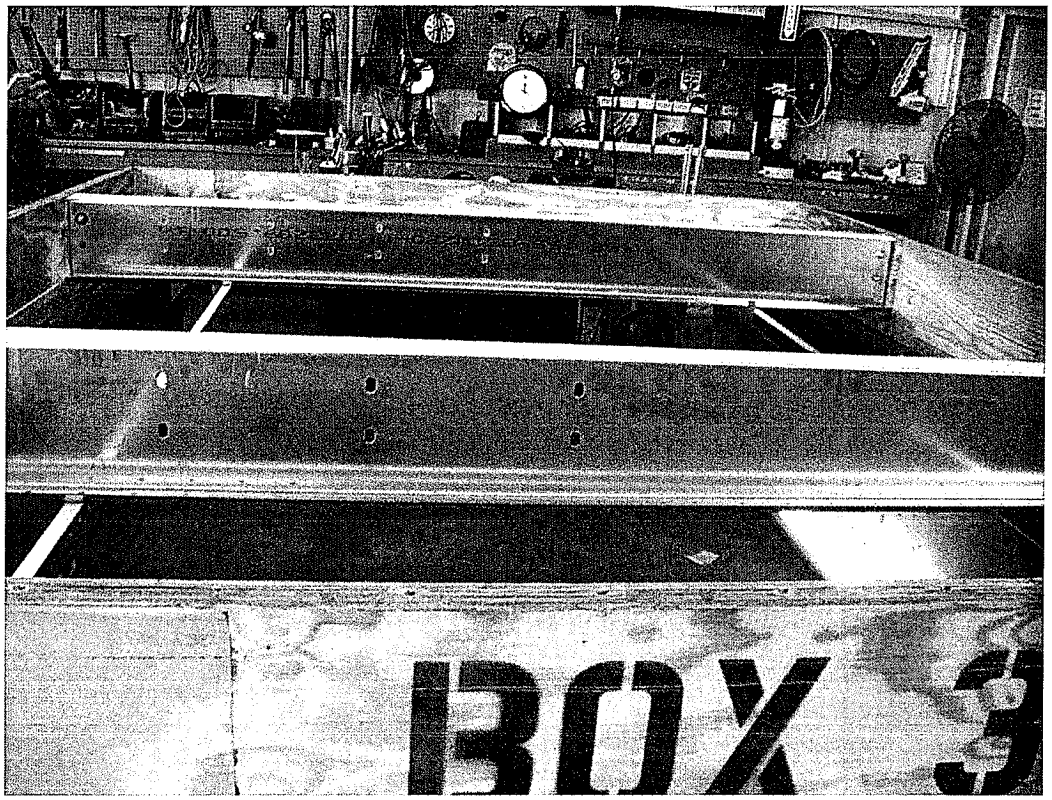

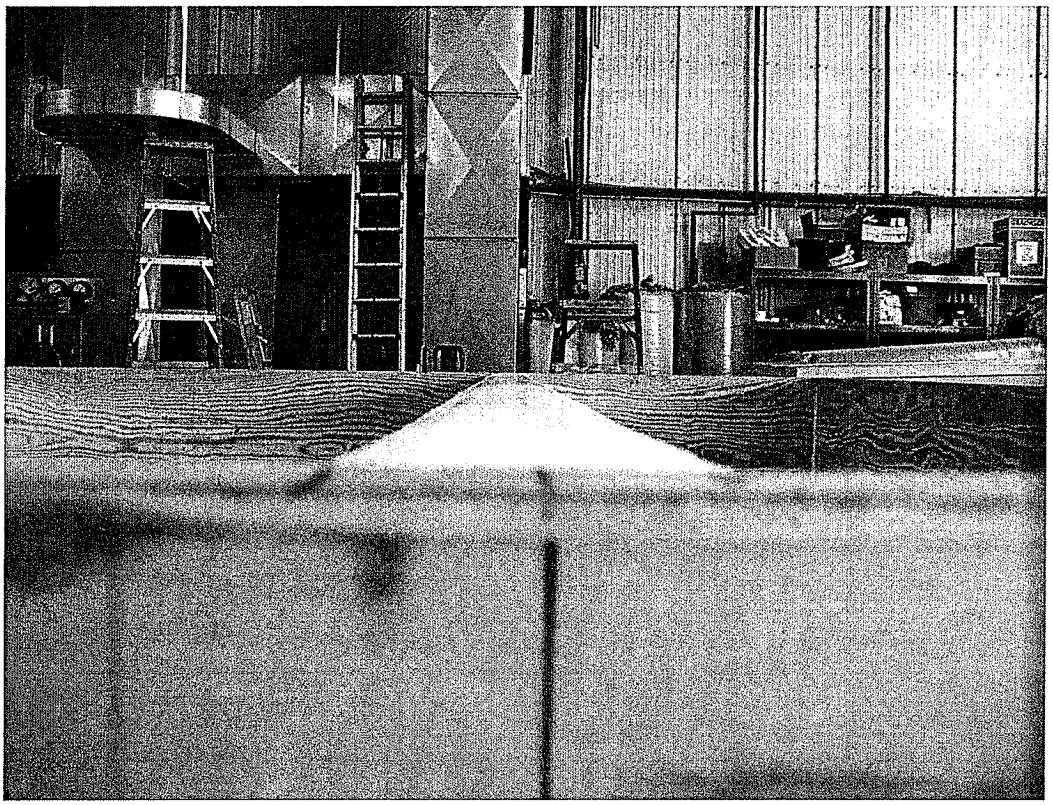

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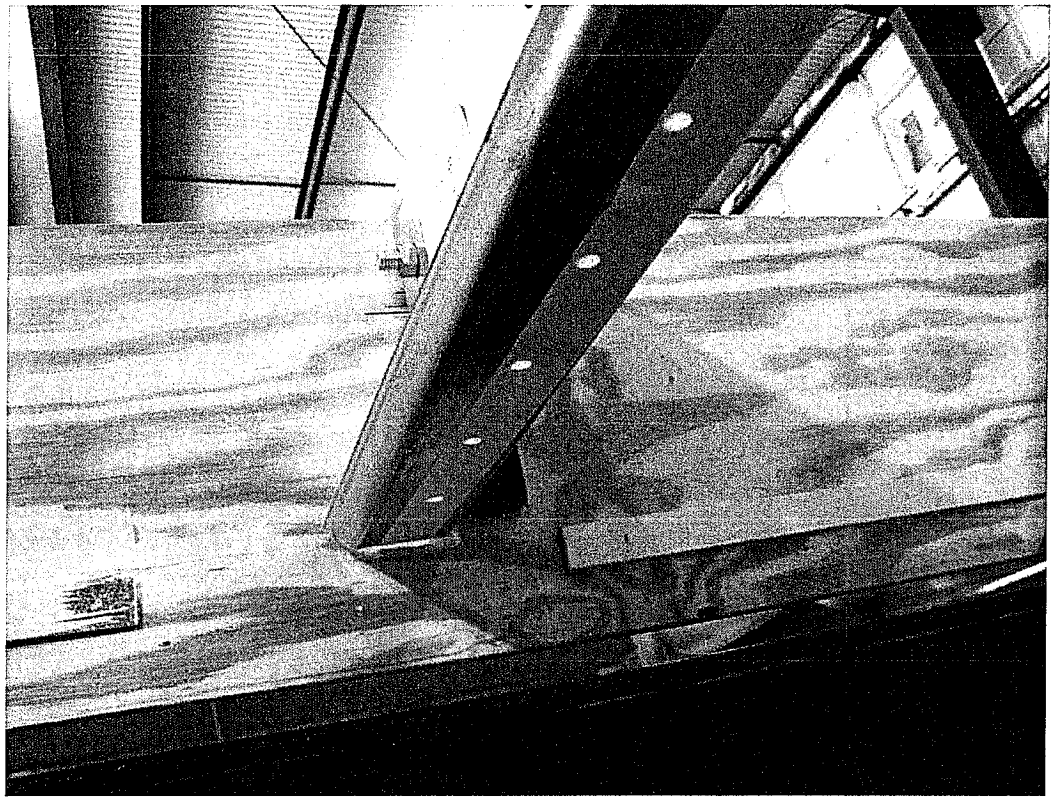

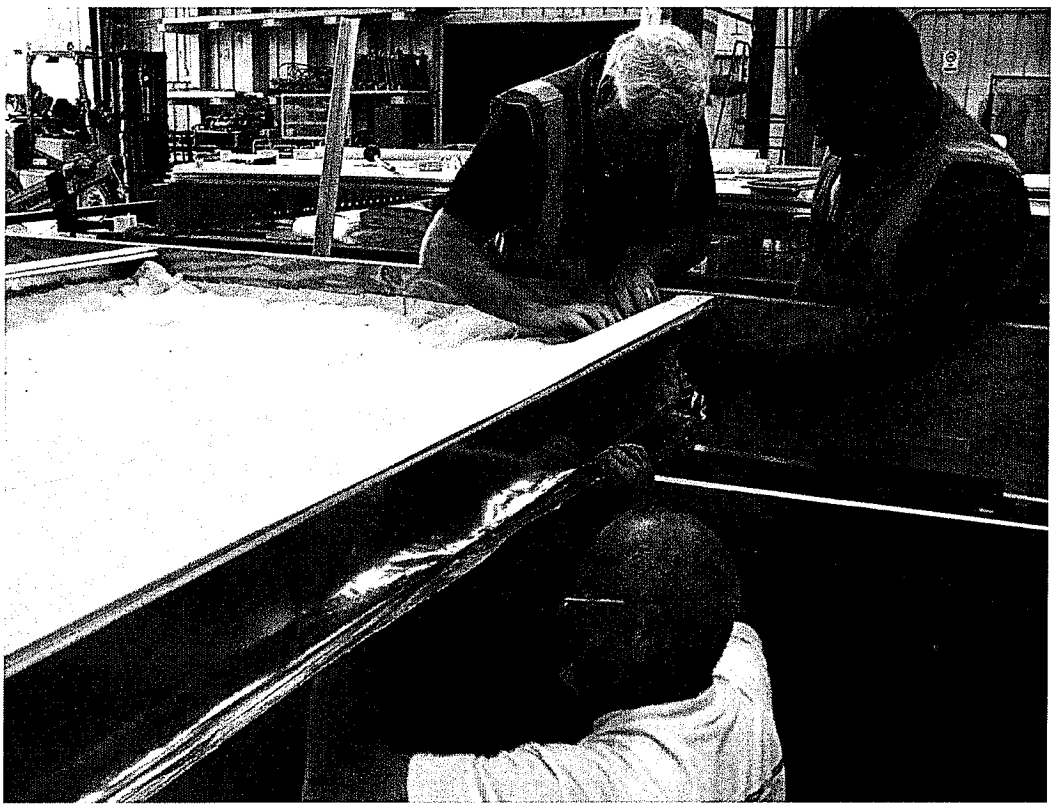

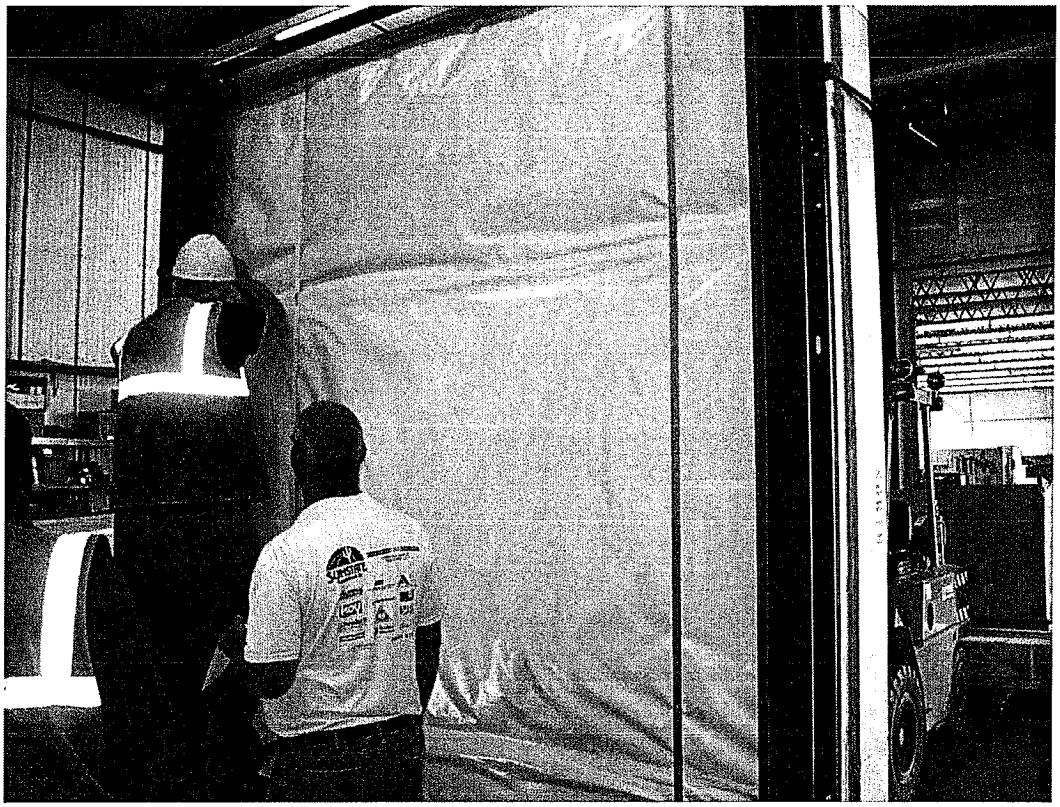

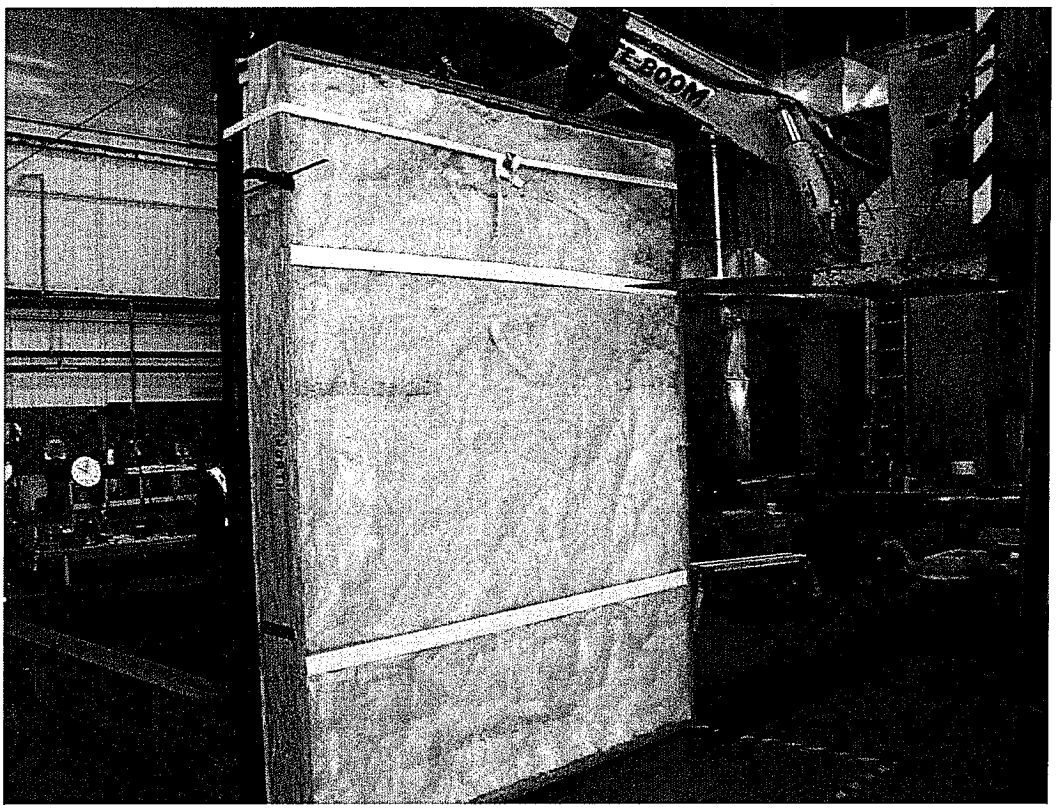
T-800M

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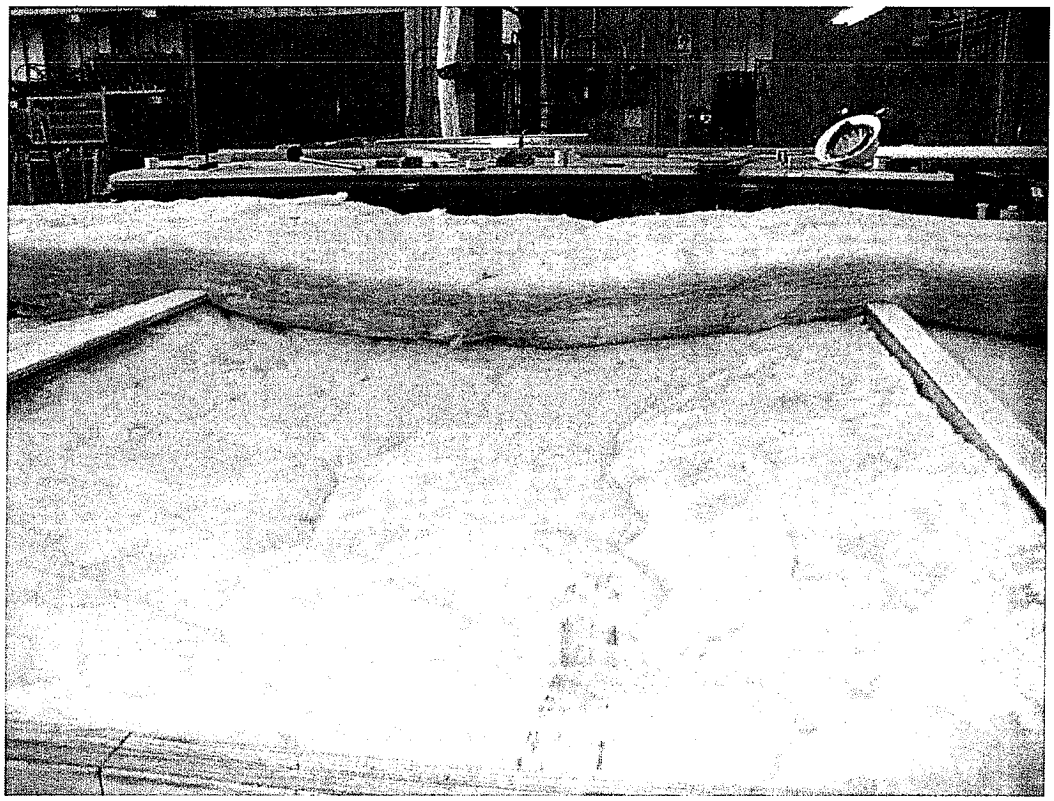

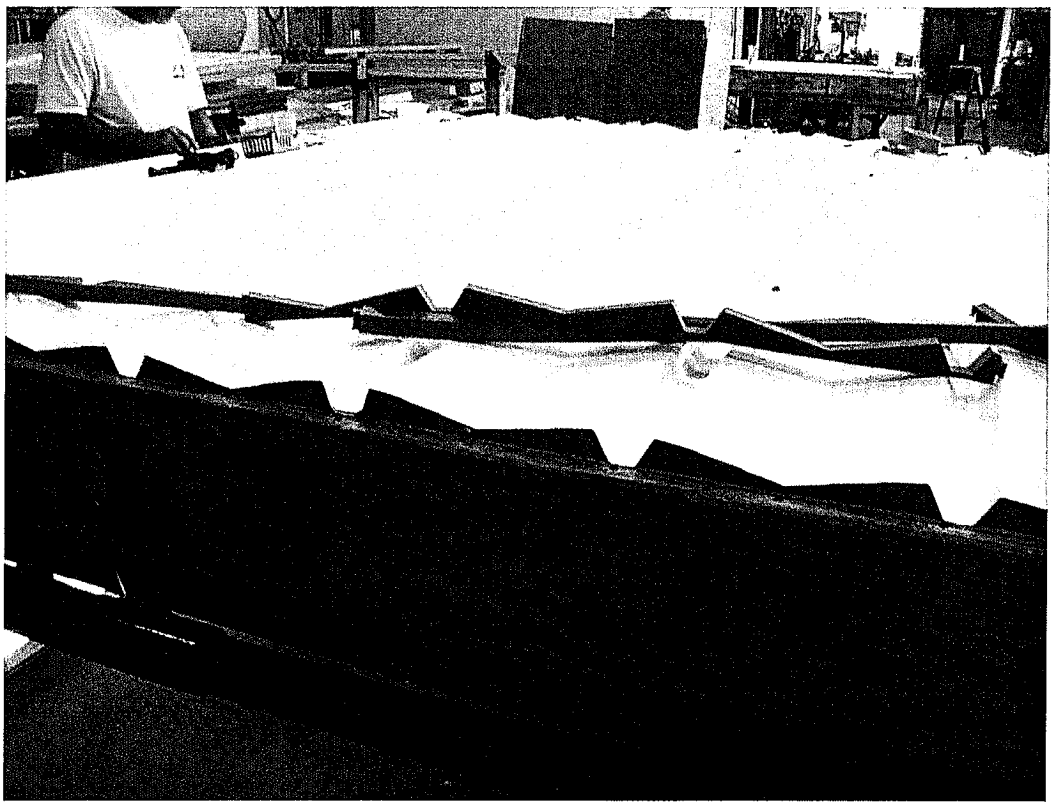

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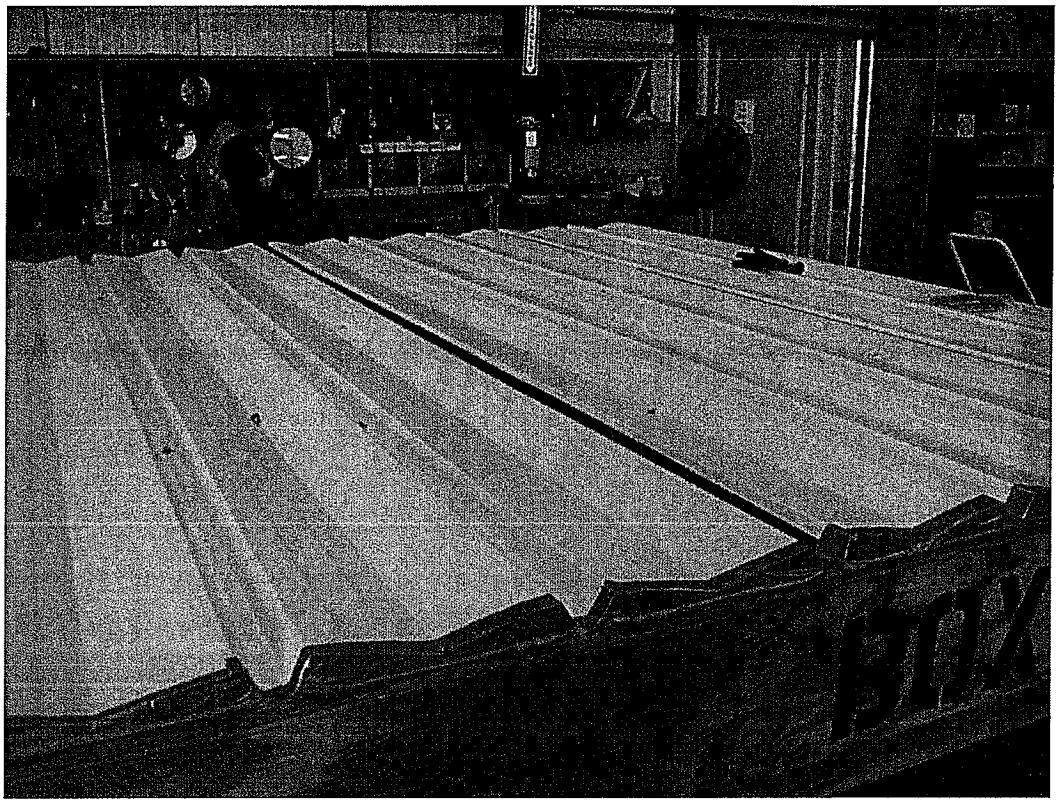

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