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Research Center  
13500 Botts Road  
Grandview, MO 64030-2897  
Phone 816-968-5700

# ASTM C 1363

## Thermal Performance Test Report

**Test Number:** 2011-06

**Sponsor:** Bay Insulation Systems Inc.

Long Tab Banded/Filled Cavity System R-25 R-19  
*Banding below purlins, Long tab R-25 faced fiberglass, R-19 unfaced  
fiberglass, and 10" deep purlins*

**Test Date:** 1/17/2011

**Responsible Party:** Mark J. Henry

**Operator:** Larry Krueger

**Witness:** Mark Henry

### Summary of Results:

Thermal Transmittance, U:	0.166 W/m <sup>2</sup> K (0.029 Btu/ hr ft <sup>2</sup> F)
Overall Thermal Resistance, Ru:	6.0 m <sup>2</sup> K/W (34.1 hr ft <sup>2</sup> 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:** 2011-06

**Test Start Date:** 1/17/2011

**Test End Date:** 1/21/2011

**Report Date:** 1/25/2011

### Test Information:

Long Tab Banded/Filled Cavity System R-25 R-19

*Banding below purlins, Long tab R-25 faced fiberglass, R-19 unfaced fiberglass, and 10" deep purlins*

### Test Orientation / Heat Flow Direction:

Normal Roof / 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	37.79 deg C (100.02 deg F)
Average Cold Side Ambient Temperature	9.96 deg C (49.92 deg F)
Average Warm Side Air Velocity	0.35 m/s (68.80 fpm)
Average Cold Side Air Velocity	1.31 m/s (257.42 fpm)

### Summary of Results:

Thermal Transmittance, U:	0.166 W/m <sup>2</sup> K (0.029 Btu/ hr ft <sup>2</sup> F)
Overall Thermal Resistance, Ru:	6.0 m <sup>2</sup> K/W (34.1 hr ft <sup>2</sup> F/Btu)



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

**Panel Type:** MR-24® roof system

**Insulation:** Fiberglass, 2-layers

**Framing System:** Z-purlins

**Specimen Construction:** Construction of the specimen was supervised by Carl Lewis, Bay Insulation Systems Inc. and Hal Robbins, Lamtec Corporation. The construction took place on January 12. The specimen was built to represent a typical field assembly. The steel banding was attached to the inside of face of the test frame. It was set at depth equal to that of the bottom of the purlins. It was then attached to the bottom flange of the purlins with self-drilling screws that are typical of field installations. The banding was perpendicular to the purlins. Double-faced tape was placed on the top flanges of the purlins. Pieces of faced nominal R-25 insulation were cut to eight foot lengths and placed in the cavity between the purlins, and between the purlins and the side of the test frame. The long tabs of the insulation facing extended to the tops of the purlin flanges. The long tabs allowed the fiberglass insulation to press up against the webs of the purlins. Along the perimeter of the test frame the insulation facing was turned up and fastened to the test frame with thin wood strips that were stapled to the test frame. The edge of the facing was taped to the test frame. Pieces of unfaced nominal R-19 insulation were cut to 10 foot lengths and placed over the R-25 insulation and the tops of the purlins. The MR-24 roof system panels were installed in a typical manner. The panel clips were attached to the purlins with standard self-tapping screws. Then 1" x 3" thermal spacer blocks were placed between the panel clips and above the purlins. The MR-24 panels were placed and seamed in a normal manner. The perimeter of the roof panels was taped to the test frame to prevent air leakage.

**Specimen Conditioning:** The insulation was received at the Butler Research Center on January 10. 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.

Material Name	Description
MR-24 Roof Panel	MR-24® roof system panel, 24 gauge, 24 inch wide, Galvalume Plus finish
Thermal Spacer Blocks	1" x 3" extruded polystyrene (FOAMULAR® 250) Nominal R-5 per inch
R-19 Fiberglass	Nominal R-19 unfaced NAIMA 202-96 fiberglass blanket insulation Measured thermal resistance: 22.68 hr ft <sup>2</sup> °F/Btu
R-25 Fiberglass	Nominal R-25 faced NAIMA 202-96 fiberglass blanket insulation Measured thermal resistance: 24.04 hr ft <sup>2</sup> °F/Btu WMP-VR-R Plus facing
Steel Banding	1" wide x 0.022" thick steel banding

**Sources for Materials Used:** Butler Manufacturing supplied the MR-24 roof panels, panel clips, and panel clip fasteners.

Bay Insulation Systems Inc. supplied the faced and unfaced fiberglass insulation, the thermal spacer blocks, the steel banding and the banding fasteners. The original manufacturer of the fiberglass insulation was Knauf Insulation. The original manufacturer of the extruded polystyrene was Owens Corning. The manufacturer of the facing was Lamtec Corporation.



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## Measured Test Data

### Test Times

Test Start Time	1/17/2011 11:38 AM
Test End Time	1/21/2011 7:15 AM
Time Required to Reach Steady State	85.5 Hours
Steady State Start Time	1/21/2011 1:00 AM
Steady State End Time	1/21/2011 6:55 AM

### Test Information

Metered Area	10.48 m <sup>2</sup> (112.75 ft <sup>2</sup> )
Specimen Area	7.43 m <sup>2</sup> (80.00 ft <sup>2</sup> )
Average Warm Side Ambient Temperature	37.79 deg C (100.02 deg F)
Average Cold Side Ambient Temperature	9.96 deg C (49.92 deg F)

### Input

**54.20 watts (184.94 Btu/hr)**

Warm Side Heaters	49.46 watts (168.77 Btu/hr)
Warm Side Fans	3.48 watts (11.88 Btu/hr)
Warm Side AVT & RH Sensor Power	1.26 watts (4.29 Btu/hr)

### Loss

**19.77 watts (67.46 Btu/hr)**

Surround Panel and Flanking Loss	19.79 watts (67.53 Btu/hr)
Side of Test Specimen Frame Adjustment	0.00 watts (0.00 Btu/hr)
Meter Wall and Flanking Loss	-0.02 watts (-0.06 Btu/hr)
Thermopile Voltage ( <i>E</i> )	-0.244 mV
Thermopile Null ( <i>E<sub>0</sub></i> )	-0.2536 mV
Thermopile Slope ( <i>m</i> )	-1.8550

### Total Heat Flow Through Test Specimen

**34.43 watts (117.48 Btu/hr)**

### Calculated Thermal Properties

Specimen Thermal Transmittance ( <i>U</i> )	0.166 W/m <sup>2</sup> K (0.029 Btu/ hr ft <sup>2</sup> F)
Specimen Overall Thermal Resistance ( <i>R<sub>u</sub></i> )	6.0 m <sup>2</sup> K/W (34.1 hr ft <sup>2</sup> F/Btu)

The estimated uncertainty of the results is ± 5 %



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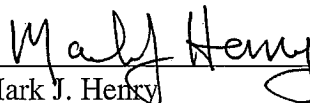
**Accreditations:**

Test Specification	Description	Accredited By
ASTM C 1363-05	ASTM C 1363-05	International Accreditation Service, Inc.

**Latest Apparatus Calibration Date:** August 2010

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For Butler Manufacturing

  
 \_\_\_\_\_  
 Mark J. Henry  
 Senior Research Engineer

Attachments:

**Revision Log**

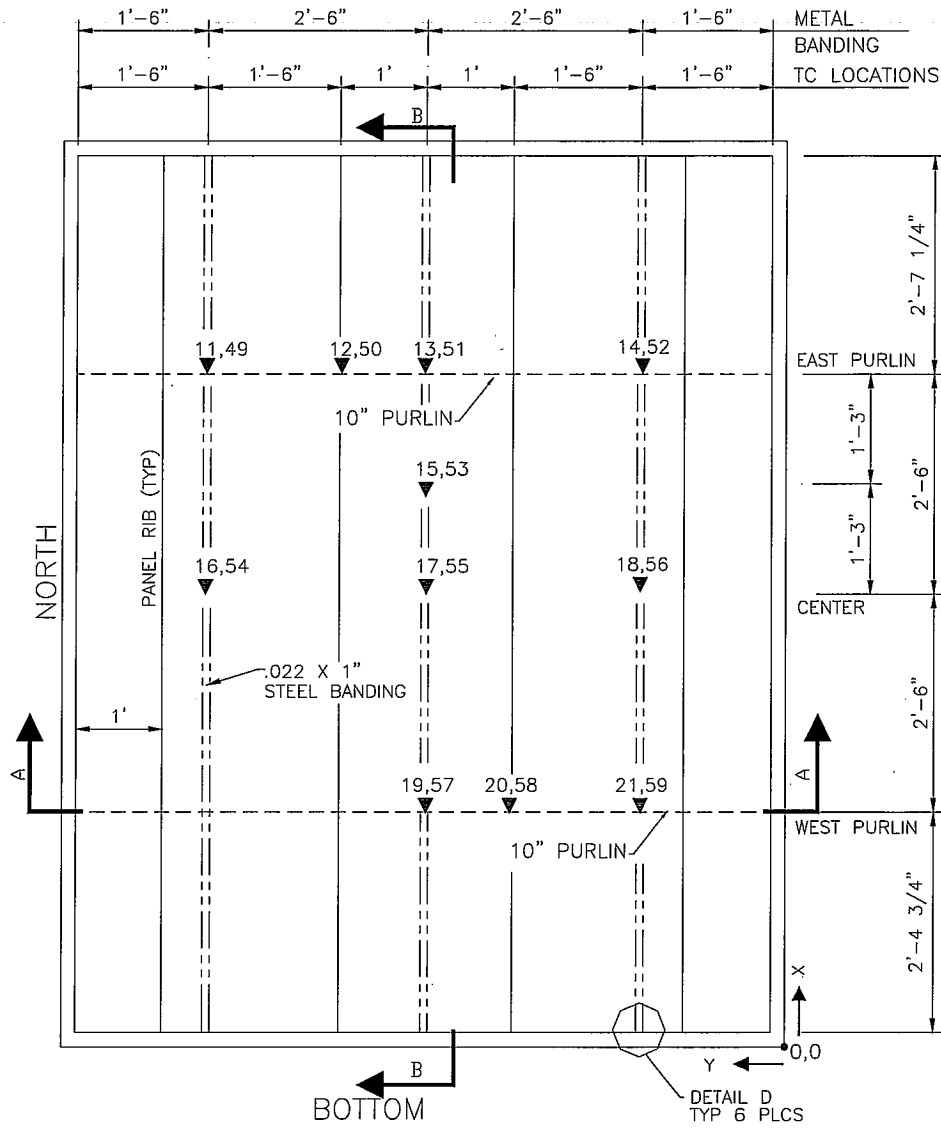
Rev #	Date	Page(s)	Revision(s)
Original	1/25/2011	All	



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DRAWING A - PLAN VIEW  
LONG TAB BANDED/FILLED CAVITY SYSTEM



NOTES

- (TC) 49 THRU 59 ARE ON THE METER SIDE
- (TC) 11 THRU 21 ARE ON THE CLIMATE SIDE
- ▲ # INDICATES LOCATION OF THERMO COUPLES (TC)

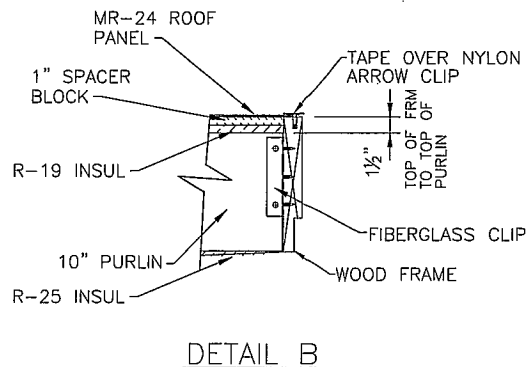
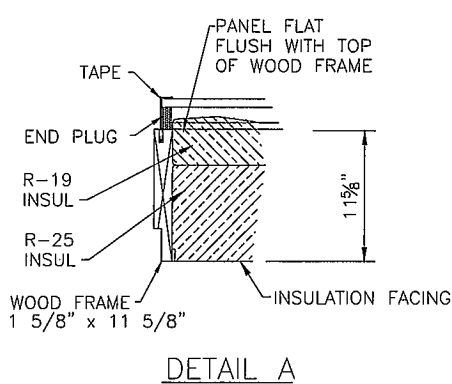
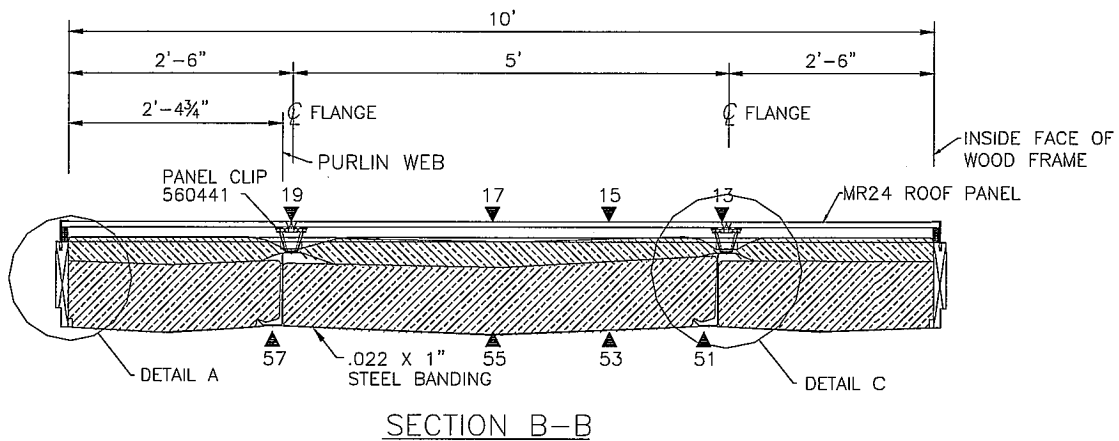
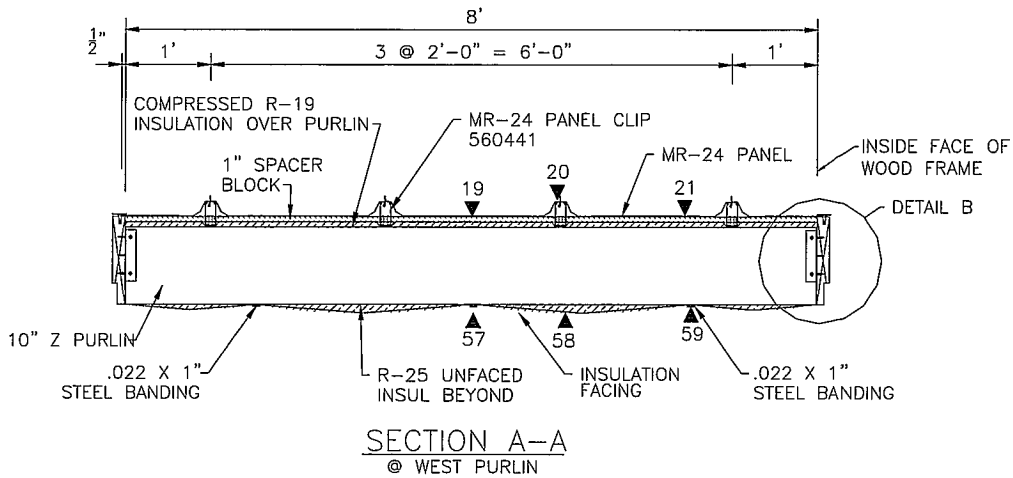
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### DRAWING B - SECTIONS THRU TEST FIXTURE LONG TAB BANDED/FILLED CAVITY SYSTEM



#### NOTES

▲ # INDICATES LOCATION OF THERMO COUPLES (TC)

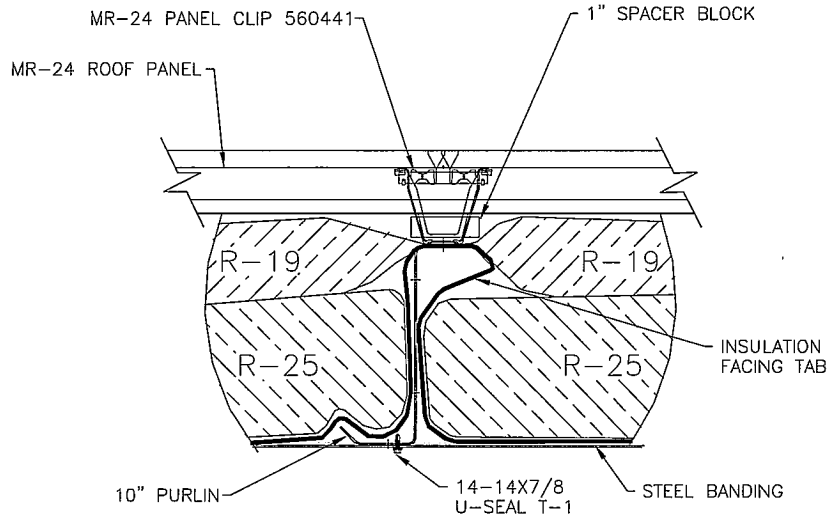
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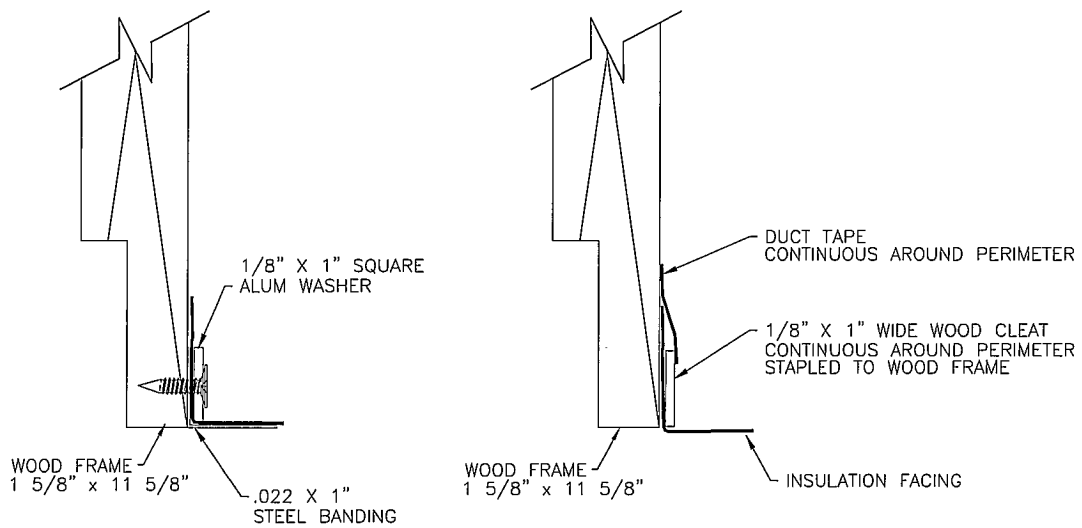
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DRAWING C - FOAM BOARD LAYOUT  
LONG TAB BANDED/FILLED CAVITY SYSTEM



DETAIL C



DETAIL D

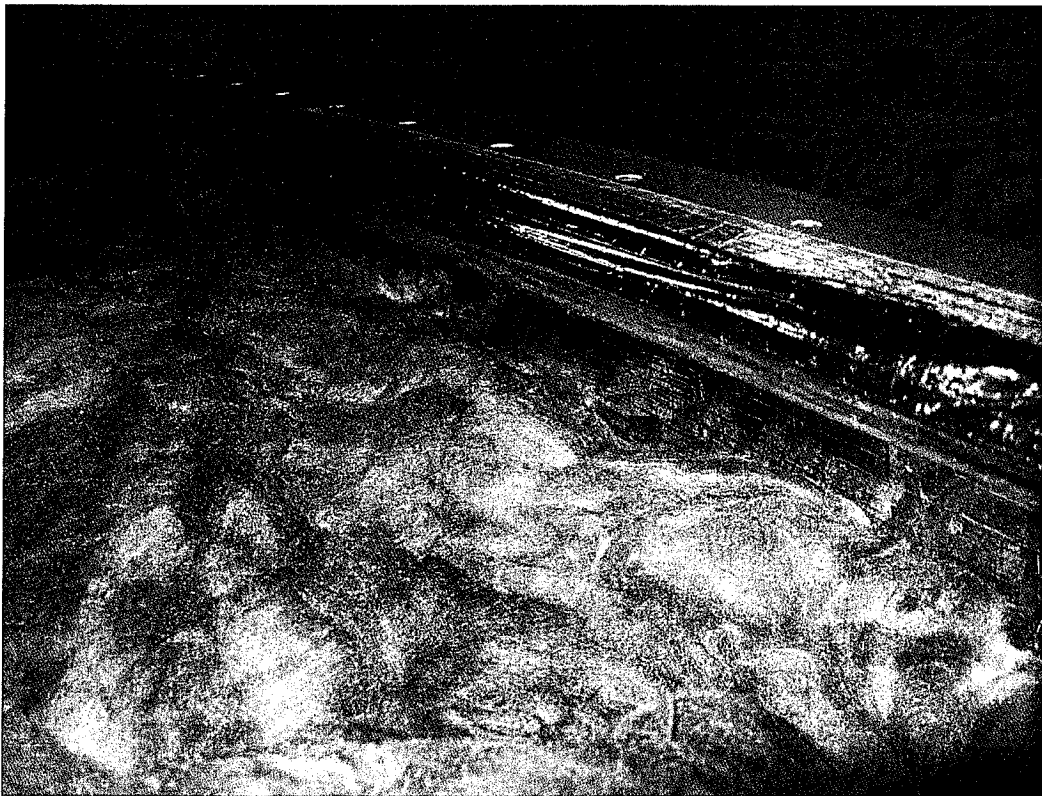
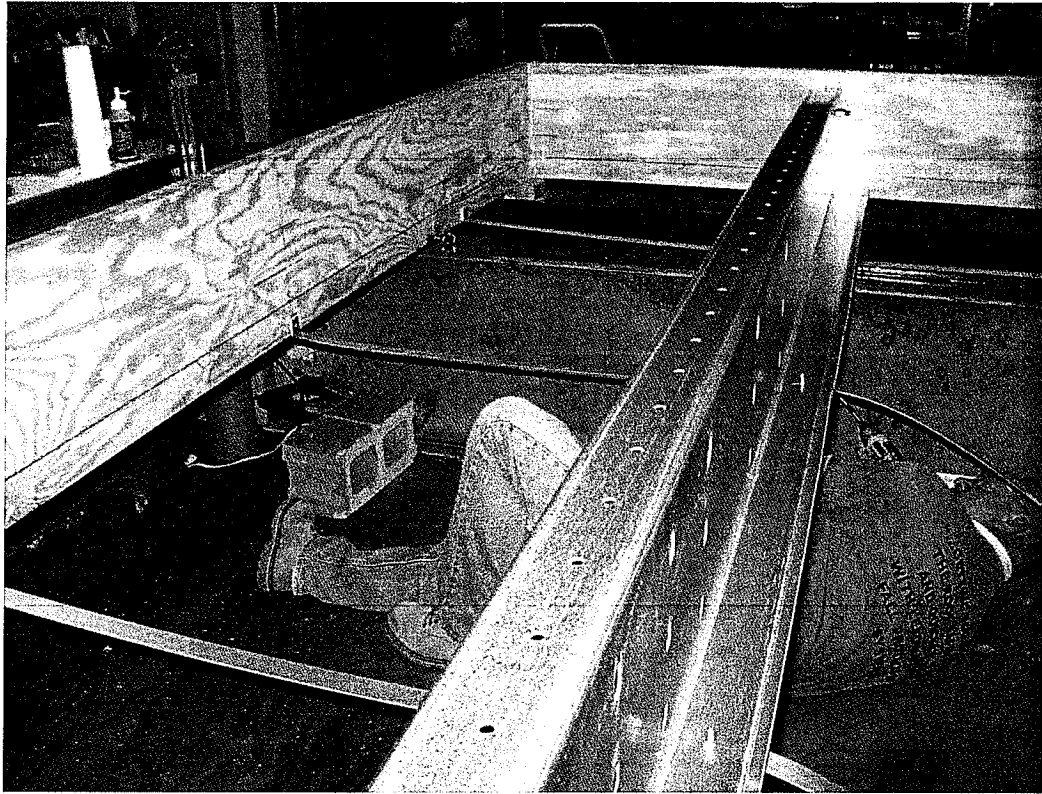
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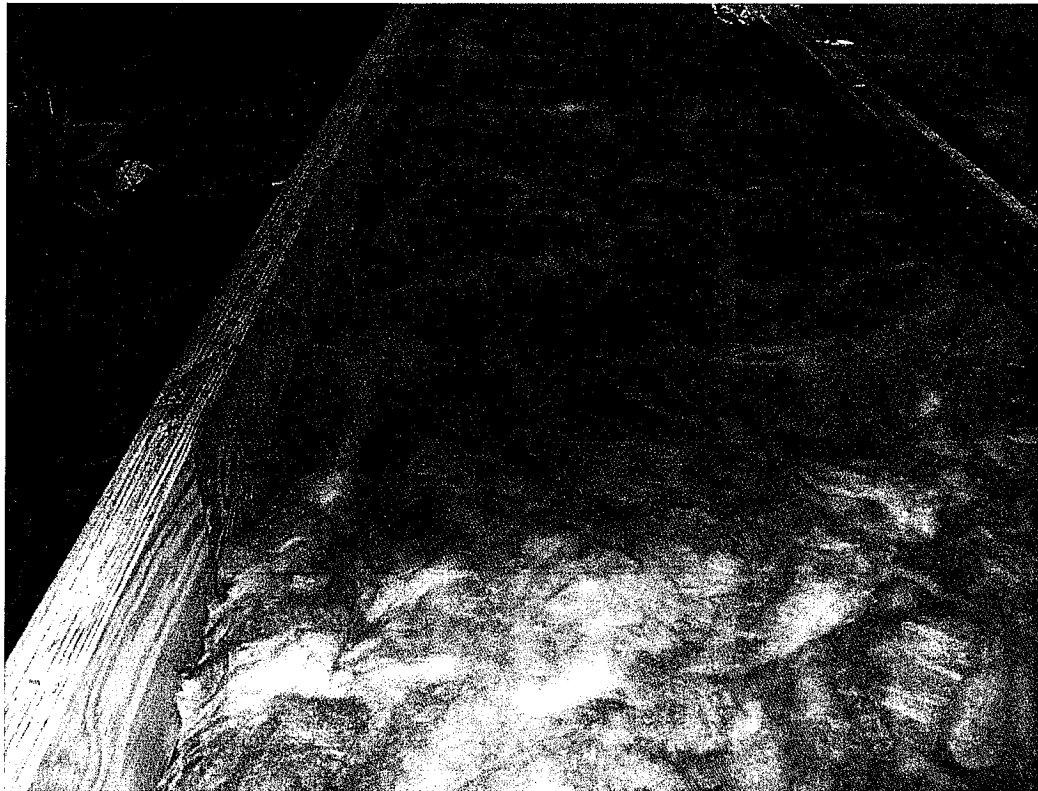
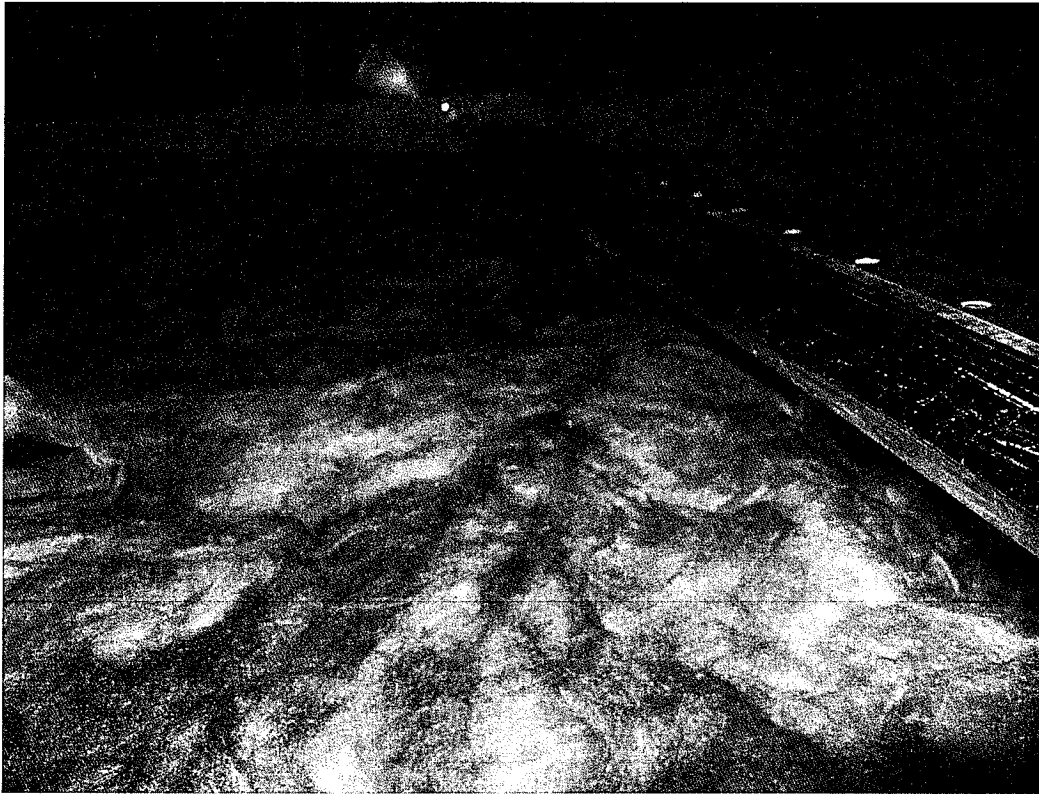
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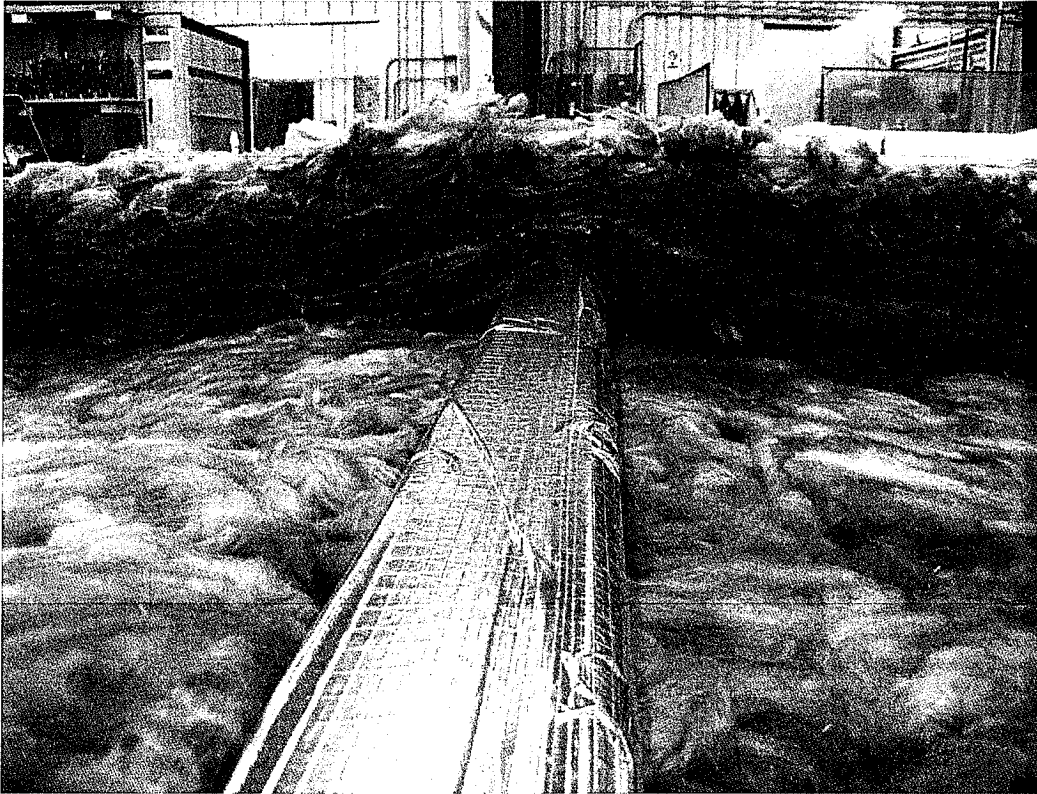
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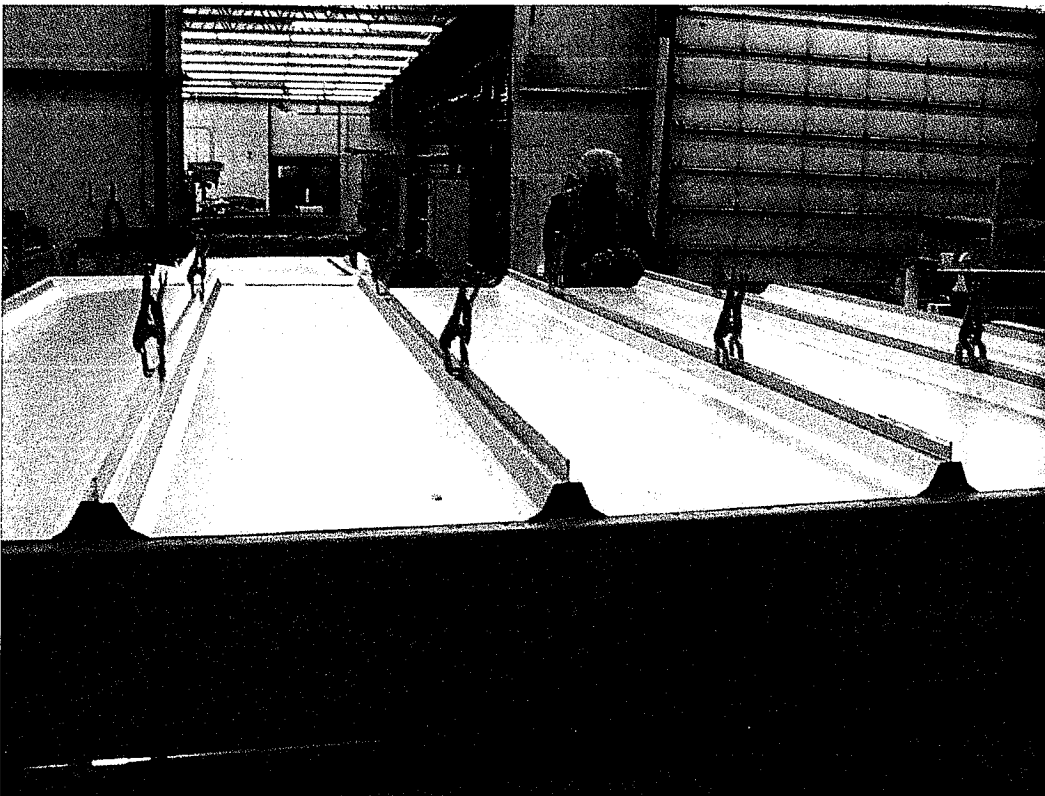
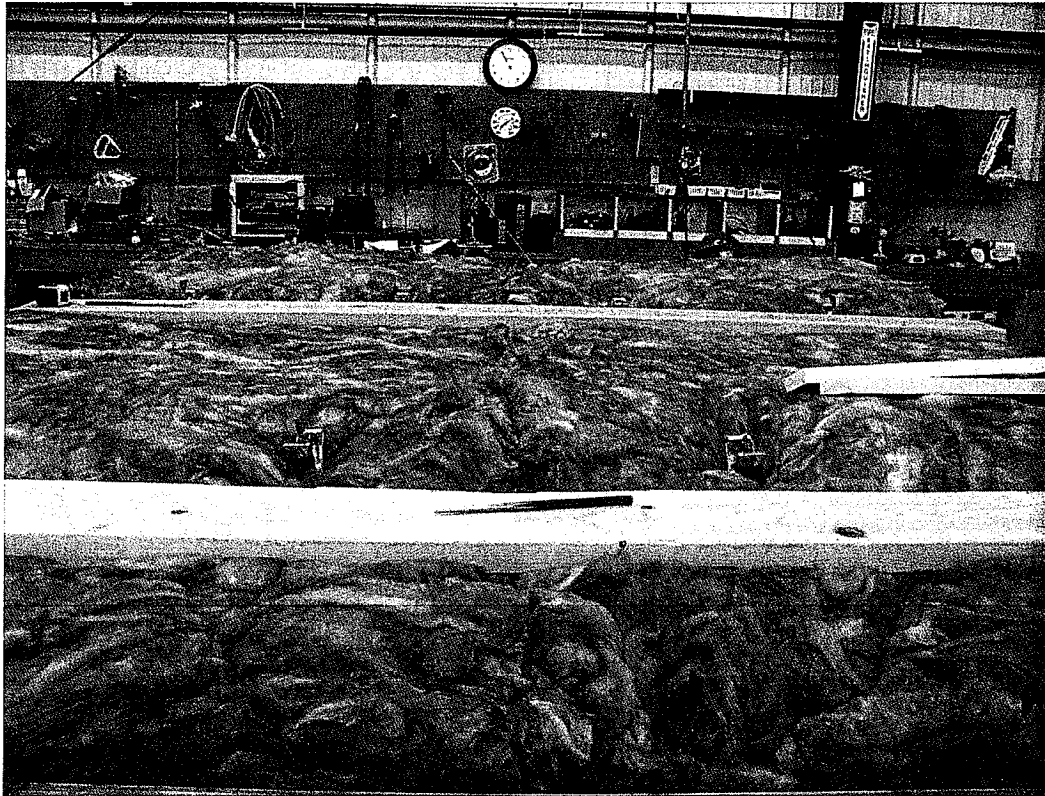
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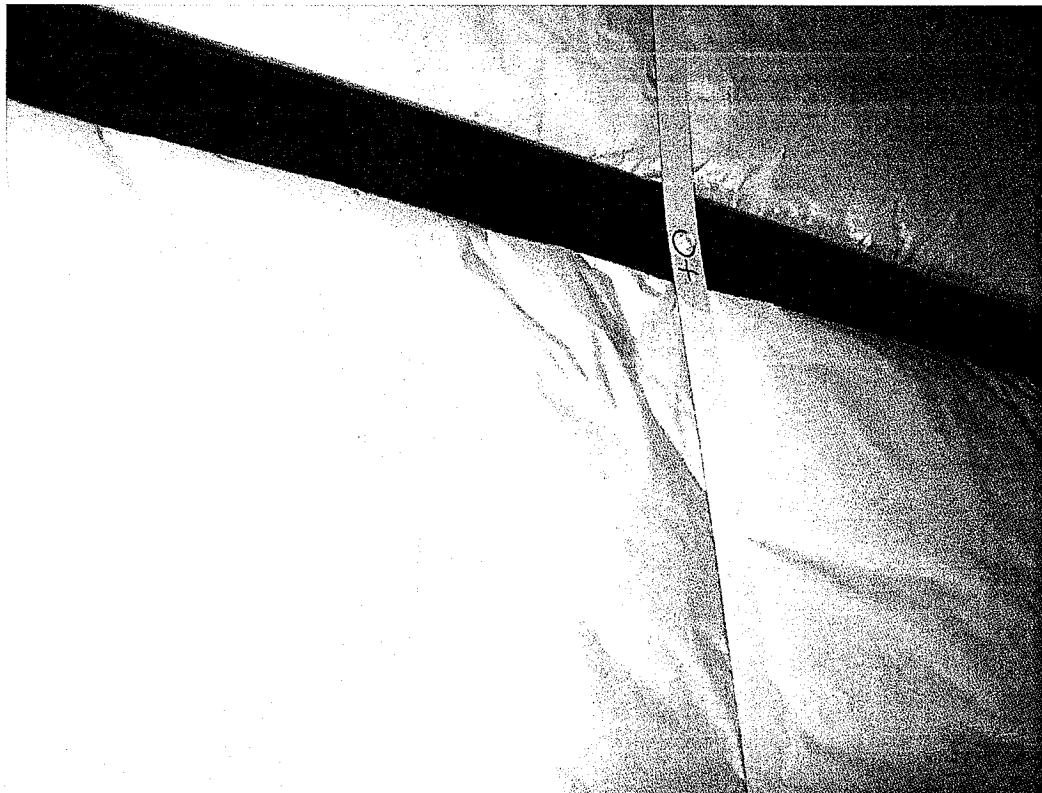
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