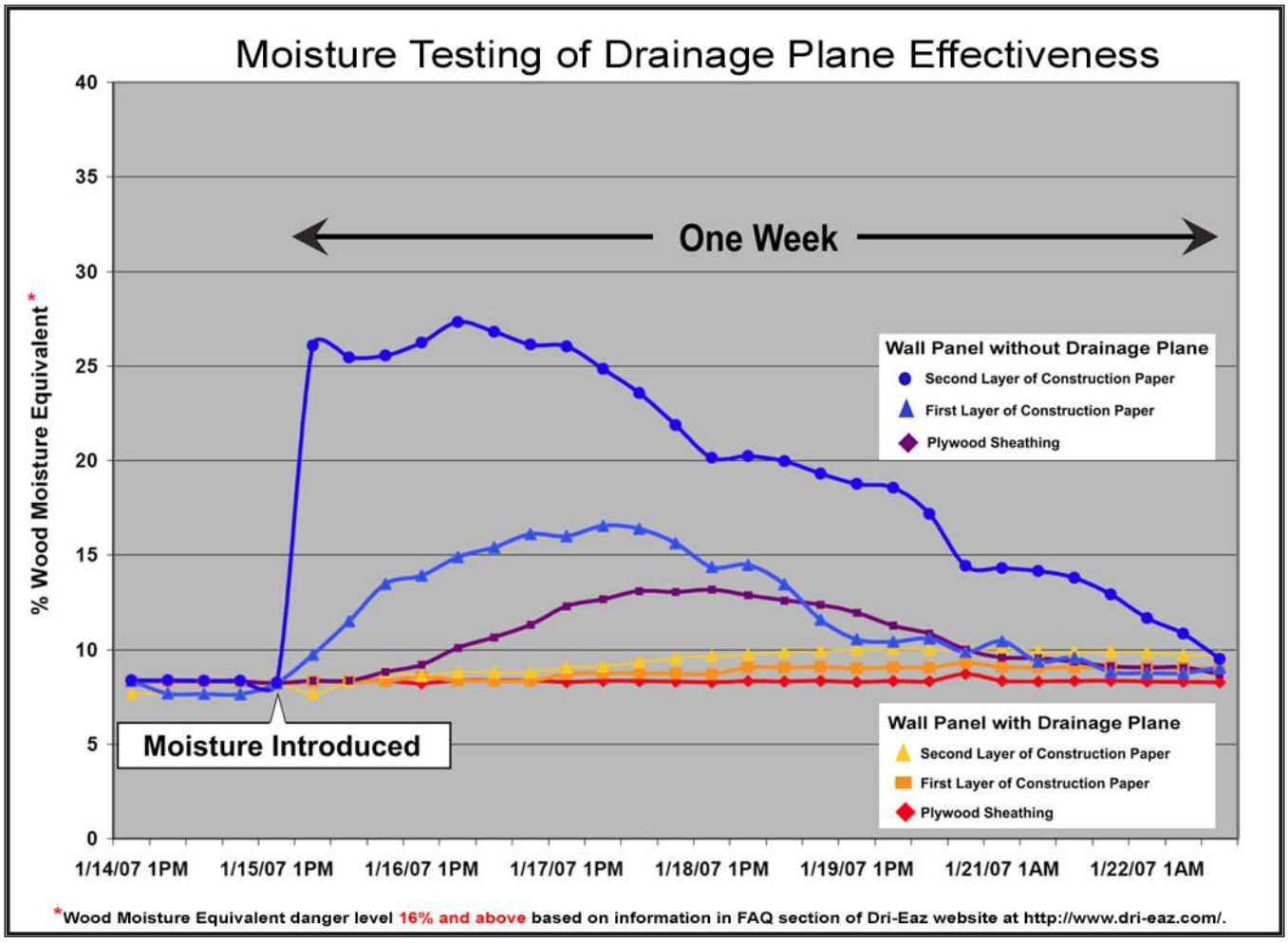
# Moisture Testing
# of
# Sure Cavity Drainage System

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# MOISTURE TESTING OF SURE CAVITY DRAINAGE SYSTEM

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The test results contained in this report pertain only to the samples submitted for testing and not necessarily to all similar products.

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## MOISTURE TESTING OF SURE CAVITY DRAINAGE SYSTEM

### INTRODUCTION:

This report presents the results of water spray tests conducted on wall panels. The testing was authorized by Mr. John Koester of Masonry Technology Incorporated on November 14, 2006. The testing and data analysis were completed on Feb. 26, 2007.

The scope of our work was limited to observing water spray tests on the samples submitted and reporting the results.

### SUMMARY OF RESULTS:

| Maximum Recorded Wood Moisture Equivalent, %, January 15 - January 22, 2007 | | | |
|---|---|---|---|
| | Panel A, Sure Cavity | Panel B, Control | Percent Difference |
| Wood Layer | 8.72 | 13.17 | 4.45 |
| Building Paper Layer 1 | 9.29 | 16.55 | 7.26 |
| Building Paper Layer 2 | 10.06 | 27.34 | 17.27 |

### SAMPLE IDENTIFICATION:

The samples were identified as Panels A1 and B1. Panels were assembled December 12-13, 2006. Construction details are as follows:

Panel A, configuration by layers:

1. Plywood
2. Jumbo Tex Double D Building Paper
3. Jumbo Tex Double D Building Paper
4. Sure Cavity SCMM 2532 drainage plane
5. Metal Lath
6. ½" vented J-Weep Screed
7. ¾" Scratch Coat

Panel B, configuration by layers:

1. Plywood
2. Jumbo Tex Double D Building Paper
3. Jumbo Tex Double D Building Paper
4. Metal Lath
5. ½" vented J-Weep Screed
6. ¾" Scratch Coat

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**CALIBRATED TEST EQUIPMENT:**

Omnisense S-900-1 Wireless Sensors

**UNCALIBRATED TEST EQUIPMENT:**

Omnisense G-900-E Wireless Gateway
Solo 456 compression sprayer
Assorted hand tools
Lumber and general hardware
Fortifiber Jumbotex Two-Ply Construction Paper
Specmix PCL Sand Masonry Mortar

**TEST METHOD:**

The assembly of panels A1 and B1 employed identical construction procedures. The placement of the Sure Cavity drainage plane layer was unique to Panel A1. Nine sensors were distributed on each of the following locations:

W1: On the plywood surface
P1: Between the two Jumbo Tex layers
P2: On top of the two Jumbo Tex layers
SC: On top of the Sure Cavity SCMM 2532 layer (Panel A1 only)

Specifics of the construction process, as carried out between December 12 and December 13, 2006, are detailed below. Construction and spray application were performed by Mike Ollendieck, Terry Gossman and Derek Oyloe.

A 4'x8' sheet of ¾" AC plywood was secured to an upright frame of 2x6 lumber. On the back of the sheet, additional support was provided by two vertical 2x6 studs placed 16" on center. Three additional horizontal 1" x 4" strips were secured to the studs to function as sensor mounting boards. A ¾" x 1 1/4" side board was attached to the top and sides of the face of the sheet. Prior to placement, a bead of caulk was run to prevent water from penetrating the sides of the panel. An additional bead of caulk was run around the inner edge of the border once the side boards were screwed into position.

The face of the plywood was marked with a 3 x 3 grid matrix to establish uniform placement of the sensors. Three horizontal lines were drawn: 16 inches from the top, 49 ½ inches from the top and 12 inches from the bottom. Three lines were drawn vertically: one down the center and two 8 inches in from the left and right sides. The grid dimensions were identical from layer to layer. Using the width of a sensor terminal as a guide, sensor wire positions were marked on the matrix and guide holes were drilled into the face of the plywood. Nine pairs of sensor wires were threaded through the back of the back and fastened in position on the face with duct tape.

**TEST METHOD, Continued:**

The plywood and sensor wires were covered with a layer of Jumbo Tex two-ply type D building paper. Three sheets were placed in position and stapled along the edge of the side board. A bead of caulk was run along the edge of the side board to prevent leakage. The grid pattern and sensor positions were marked in chalk on the paper surface. Sensor contact points were placed 3 inches above the contact points of the plywood layer. Nine pairs of sensor wires were taped in place at the marked contact points. The wires were secured to the surface with duct tape and then threaded through guide holes drilled into the side board. An additional bead of caulk was applied along the border edge to seal the guide holes and prevent water leakage between layers.

A second layer of building paper was applied and stapled in place along the edge of the border. Caulk was applied along the edges and the grid was marked on the surface in chalk. The existing contact points and wire positions were also marked. Nine pairs of sensor wires were taped in place on the paper surface, 3 inches below the positions of the plywood layer contact points. The wires were secured to the surface with duct tape and threaded through guide holes drilled into the side board. Caulk was applied along the boarder edge to seal the guide holes and prevent water leakage between layers. For Panel B1, plastic shims were taped in place adjacent to the bare contact points to prohibit contact with the metal lath layer and the vented J-weep screed was nailed to the bottom edge of the panel.

Next, a layer of Sure Cavity SCMM 2532 was applied to Panel A1. The Sure Cavity layer was applied in three sheets stapled in place over the second layer of building paper, bug screen side up. The grid and previous contact points and wire positions were marked in chalk on the bug screen surface. Sensor locations for the Sure Cavity layer were marked 5 inches above the position of the original plywood sensors. Contact points were taped in place using a sensor terminal as a spacing guide. The wires were secured to the surface with tape and threaded through guide holes drilled in the edges of the side boards. Plastic shims were placed adjacent to the bare contact points to prohibit contact with the metal lath. The J-weep screed was nailed to the bottom edge of the panel and a bead of caulk was run along the inner edge of the side board.

A final layer of metal lath was added to support the scratch coat. Four sheets of lath were nailed in place with care taken to protect the previous contact points and wires. Overlapping sections of lath were secured with wire ties and the surface was inspected to ensure that no sensor wire contact points were touching the metal lath. A final bead of caulk was run along the inner edge of the side board.

Omnisense S-900-1 wireless sensor terminals were anchored to the tops, sides and backs of the panel frames. Each layer was represented by nine sensor terminals. The wires were connected to the terminals and the exposed contacts were wrapped with electrical tape to protect them from exposure to water.

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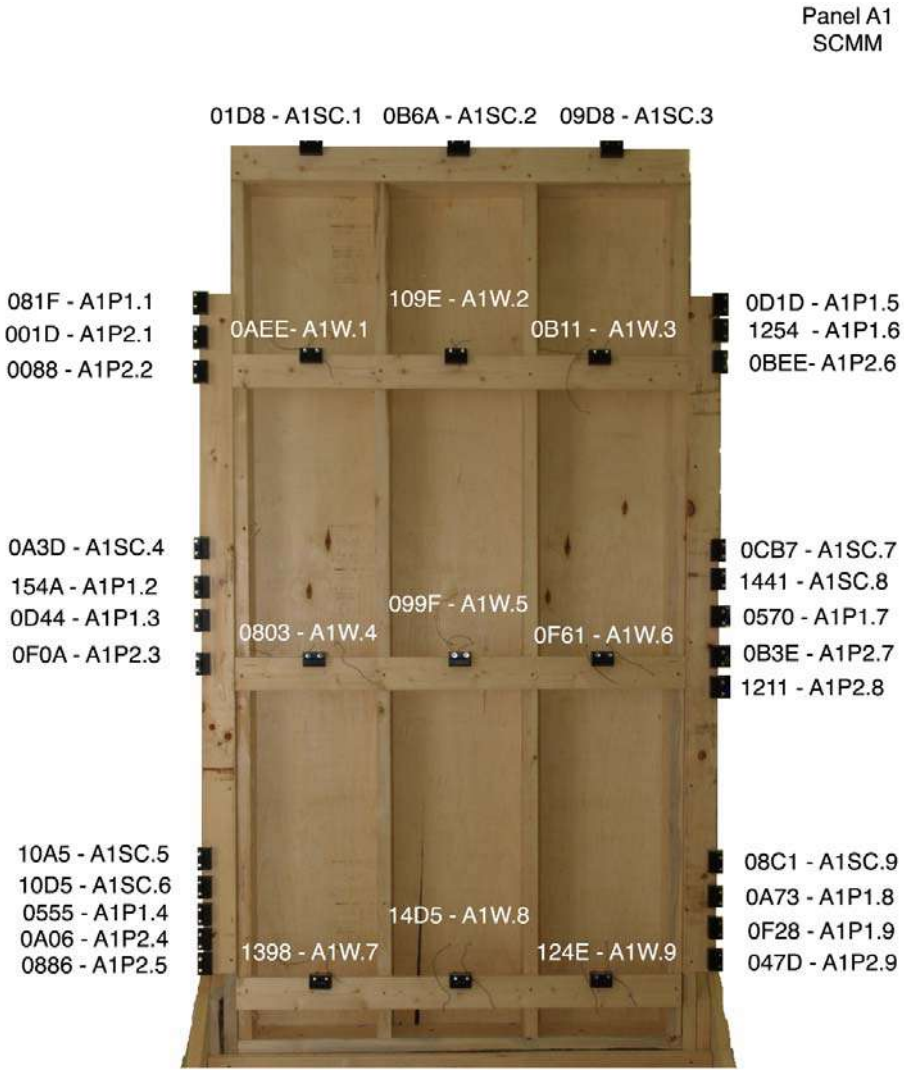
**TEST METHOD, Continued:**

On December 13, 2006, a scratch coat was applied to the metal lath layers. Two batches of SpecMix PCL Sand Masonry Mortar were mixed and combined. The panels were laid horizontally and the mortar was applied. After two hours, the panels were set upright. Finally, the outside seam between the mortar and wood was sealed with caulk to prevent water leakage. Mortar was allowed to cure for a minimum of 28 days.

**Sensor Layout, Panel A1**



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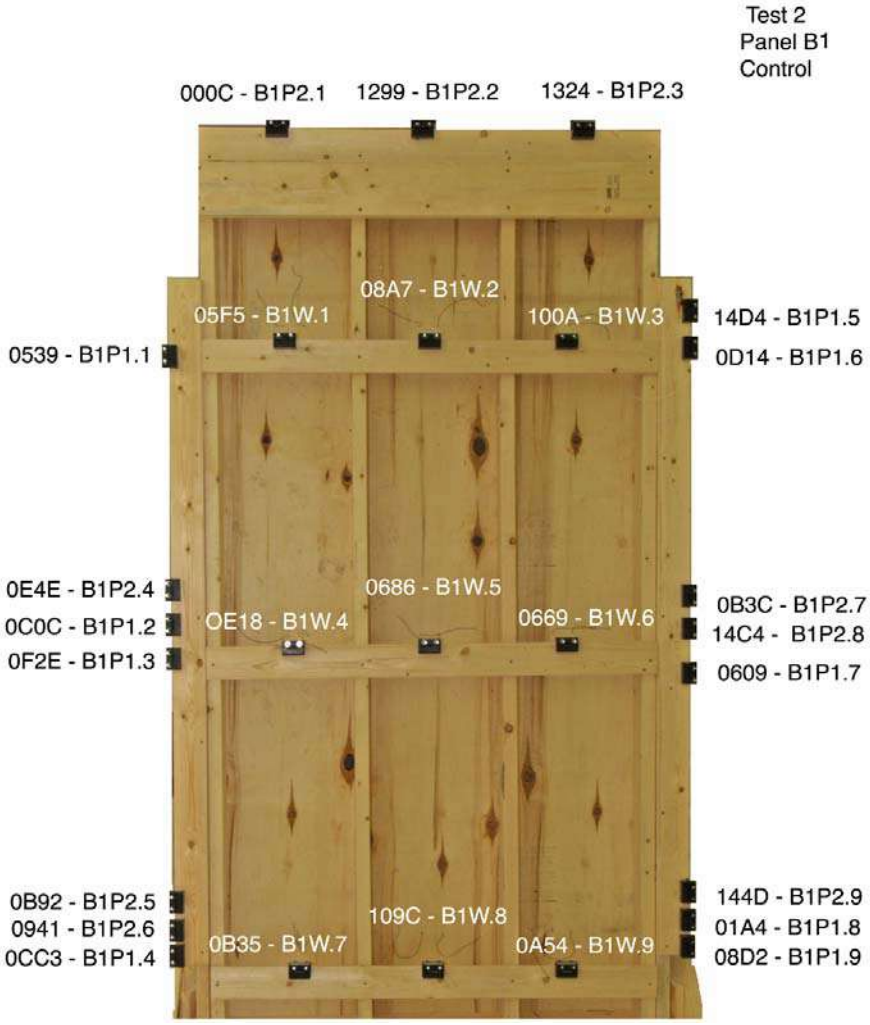
**TEST METHOD, Continued:**

## Sensor Layout, Panel B1



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**TEST METHOD, Continued:**

**WATER SPRAY APPLICATION, JANUARY 15-16, 2007**

Following a cure interval of 31 days, the scratch coat surfaces were saturated with water during the course of two spray applications in a 24 hour period. A single application consisted of three consecutive sprayings with a 10 to 20 minute waiting period between sprayings. At 1:00 pm on January 15, 2007, two Solo 456 compression sprayers were filled with water to a volume of 7.0 liters and then pumped to approximately 45 psi. Commencing at the top right hand corner of each panel, water was applied at a rate of approximately 0.6 liters per minute. Spray nozzles were held 6 to 12 inches from the scratch coat surface and water was sprayed from left to right. The panel surface was divided into three equal sections from top to bottom. Starting from the top section, three complete sprayer passes were applied to the surface and the sprayers were re-pressurized to 45 psi before continuing on to the next section. Following the saturation of the bottom section, technicians returned to the top of the panel and continued spraying the surface from left to right in a single pass until the remaining water volume had been applied.

The process was repeated at 1:34 pm and 2:00 pm, with 10 to 20 minute waiting periods between applications. Inspection of the panels after each spraying showed that no water penetration occurred at the sides or backs of the panels. A comparison of the panels' drainage pans (approximate capacity 3.5 gallons) showed Panel B1's pan to be at capacity and Panel A1's pan to be ¾ full.

Surface conditions of the panels were observed on January 16, 2007 at 11:00 am. Panel A1, containing the Sure Cavity drainage plane, appeared significantly lighter than Panel B1. Following the procedure detailed above, Panels A1 and B1 simultaneously received three consecutive water spray applications at 12:20 pm, 12:40 pm and 1:00 pm, with 10 minute waiting periods between applications. It was observed that the surface of Panel A1 began to lighten immediately following each spraying session while the surface of Panel B1 remained saturated throughout. Between sprayings, no water penetration was observed at the sides or backs of the panels. Moisture levels of all panel layers were monitored remotely via sensor data transmitted to the Omnisense website. Data analysis was performed by comparing moisture levels measured by the sensors occupying the grid center of each layer. Data was collected at six hour intervals from January 14 through January 22, 2007.

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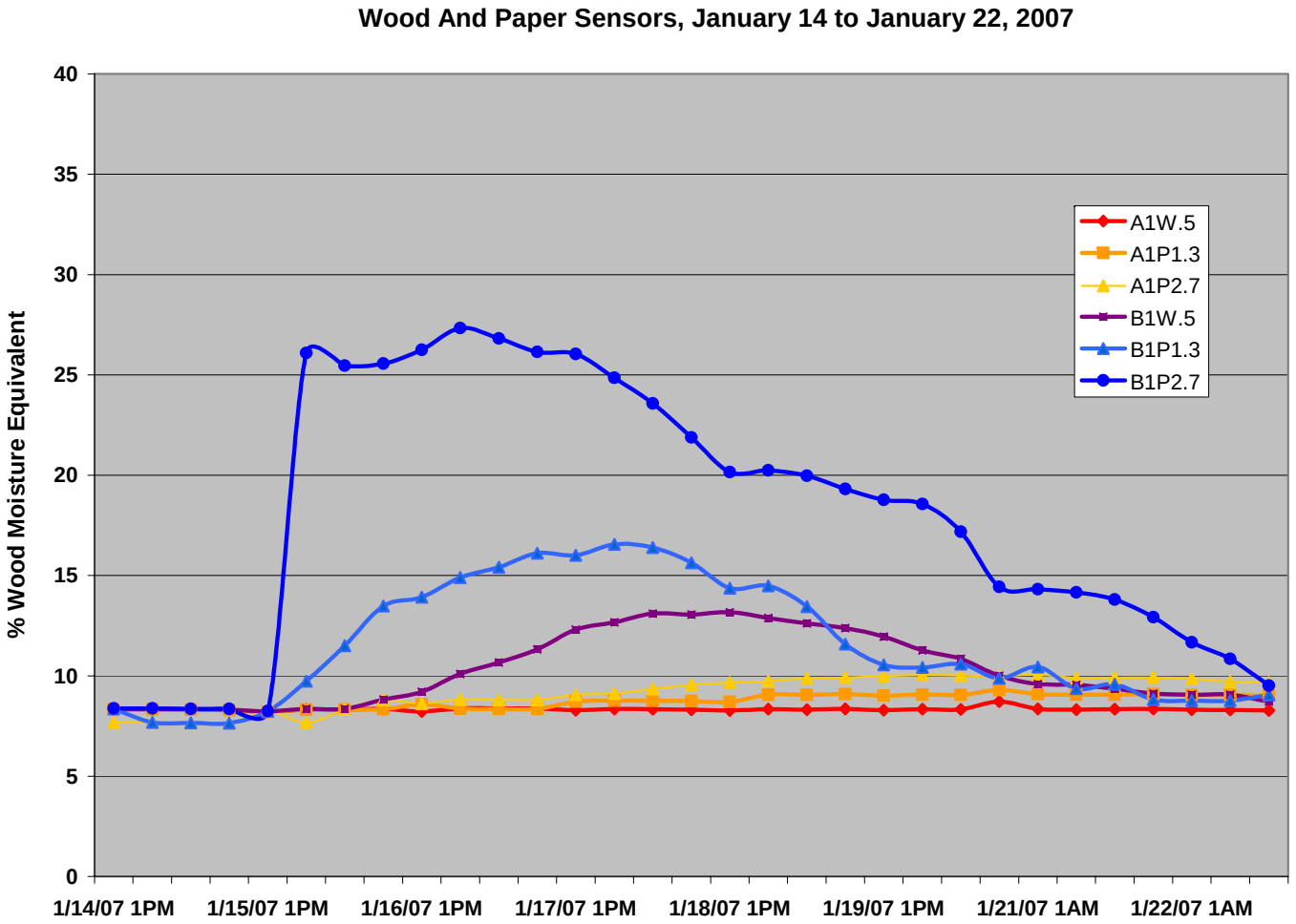
**TEST DATA:**



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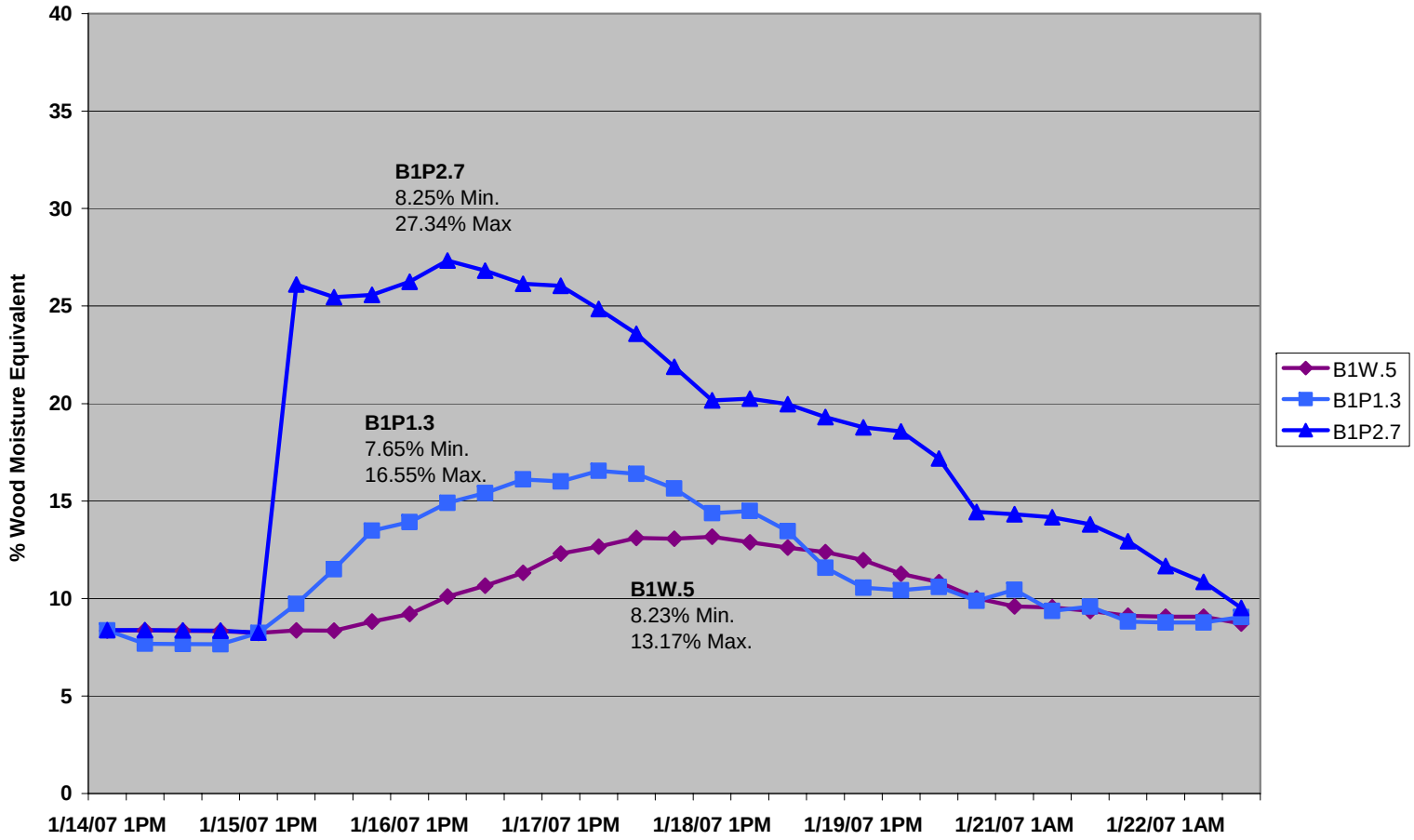
## TEST DATA, Continued:

**Control Panel Sensors, January 14 to January 22, 2007**



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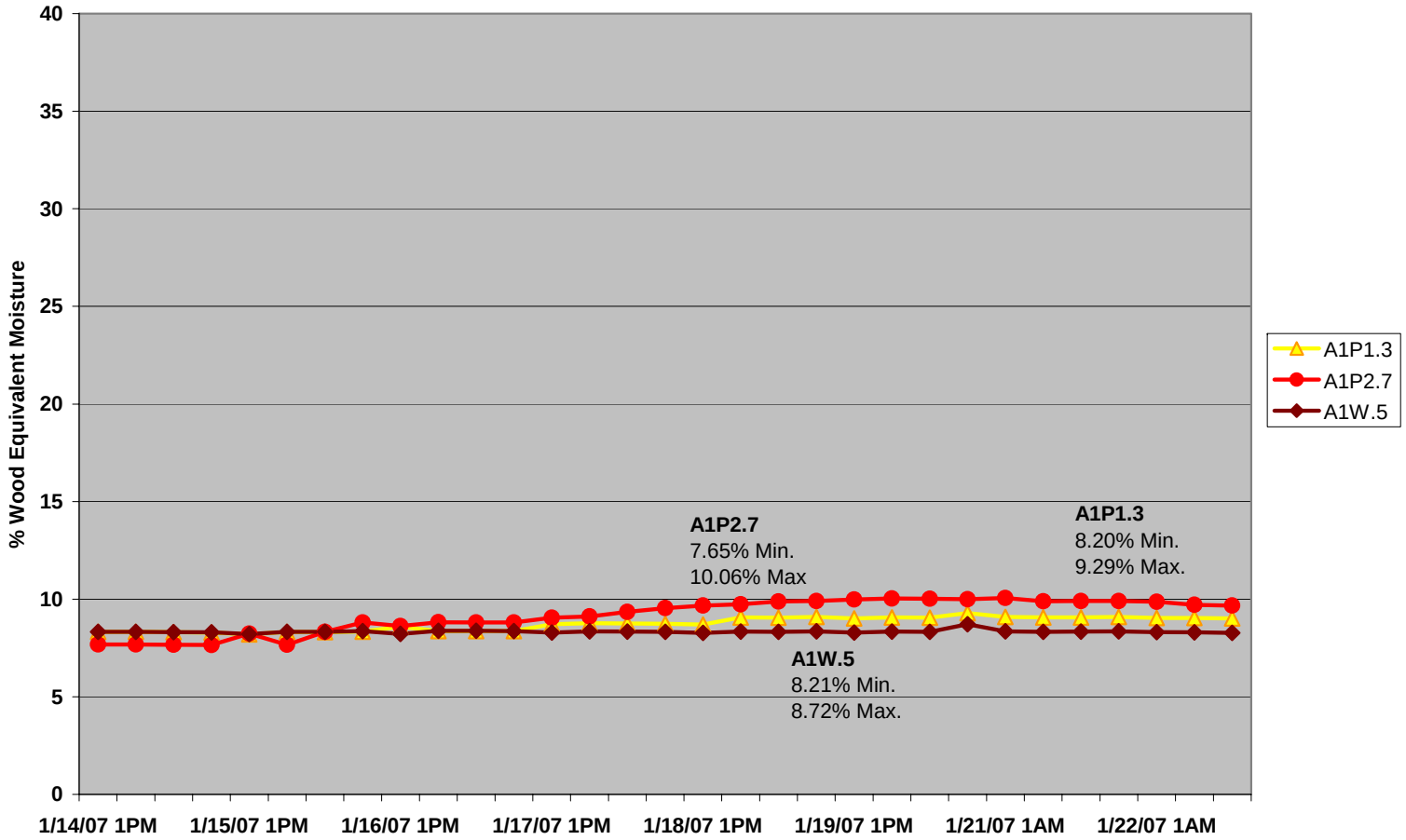
## TEST DATA, Continued:

**Panel A Sensors, January 14 to January 22, 2007**



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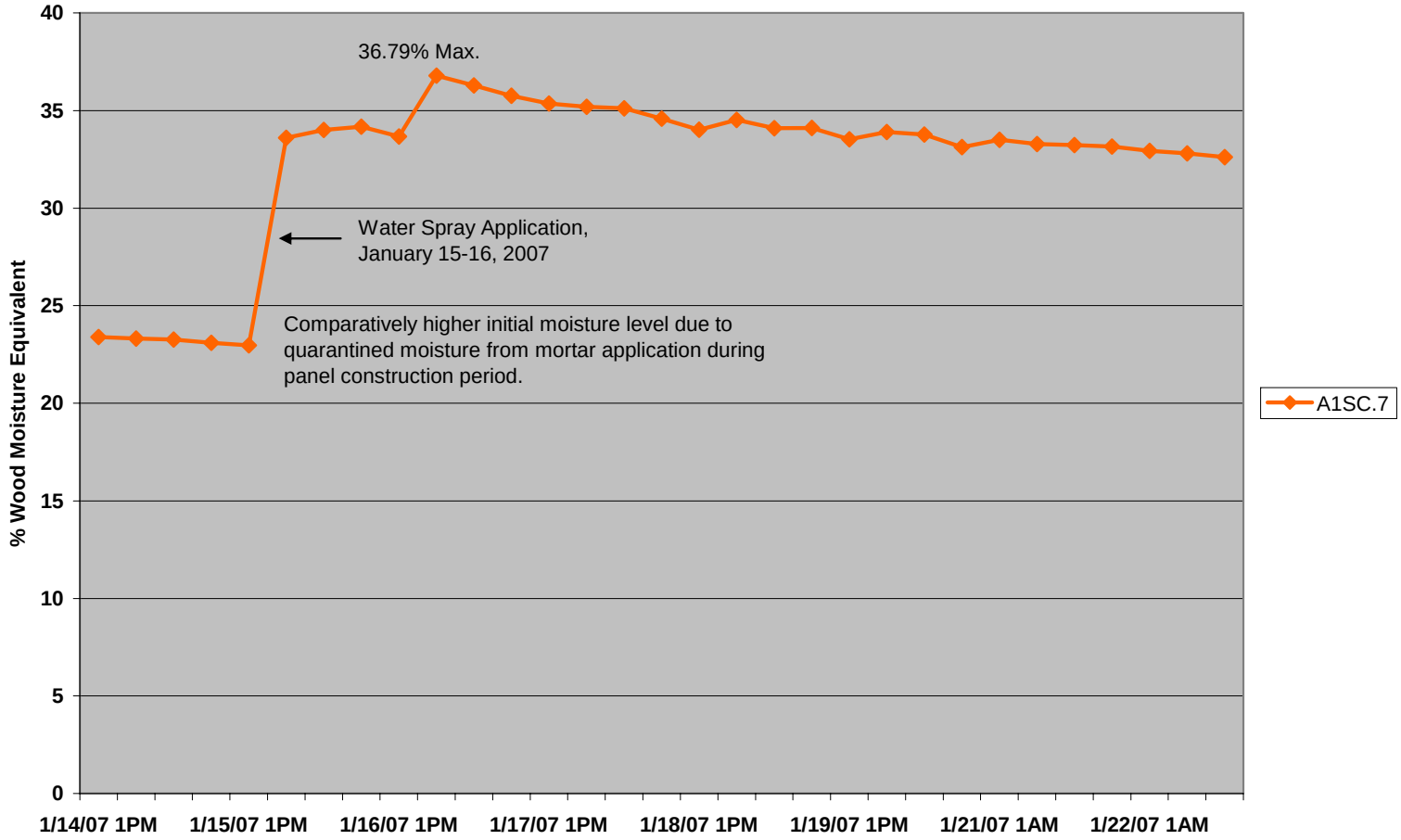
**TEST DATA, Continued:**

**Panel A Sure Cavity Layer, January 14 to January 22, 2007**



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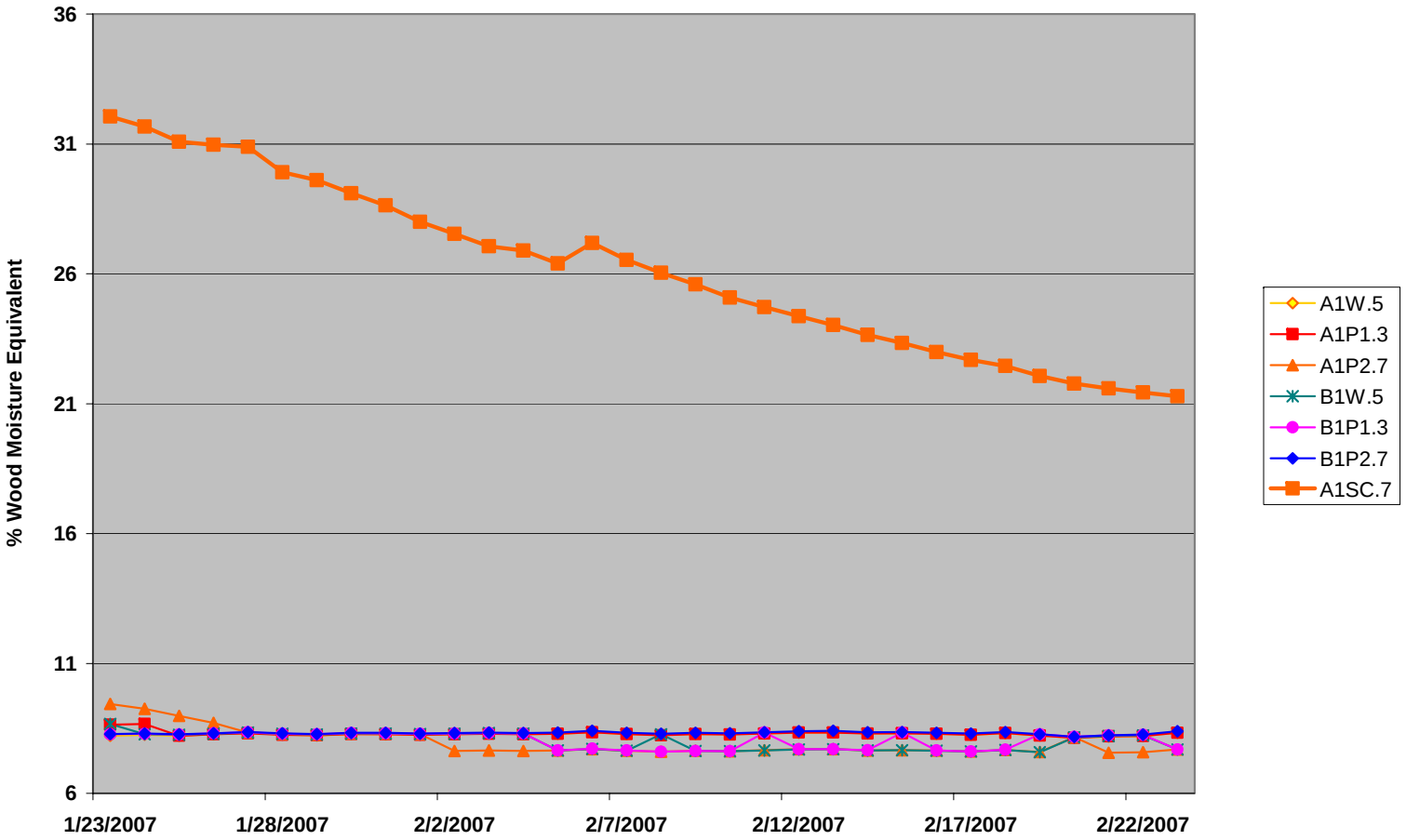
**TEST DATA, Continued:**

**All Panel Layers, Post Test Period, January 23 to February 23, 2007**



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**PHOTOS:**

## PANEL CONSTRUCTION OVERVIEW: Plywood Layer

**Figure 1: Panels A and B; Front view**

**Figure 2: Rear view of frame construction**

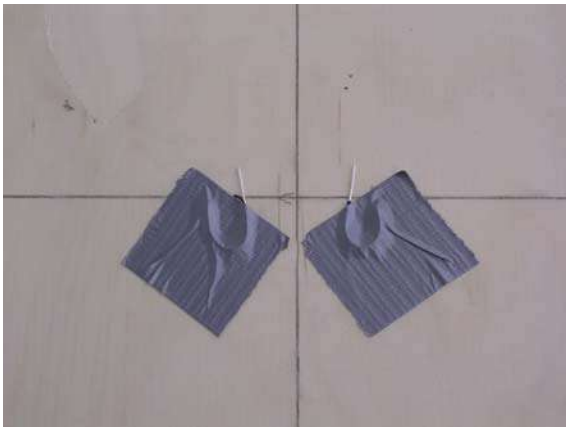

**Figure 3: Plywood Layer sensor contact points.**

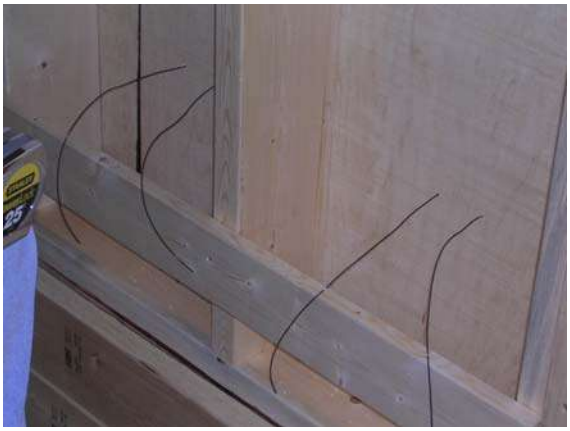

**Figure 4: Plywood Layer sensor wires, rear view**

**Figure 5: Plywood Layer completed.**

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**PHOTOS, Continued:**

## PANEL CONSTRUCTION OVERVIEW: Paper Layer 1 (P1)

**Figure 6: Construction paper placement**

**Figure 7: Marking grid pattern**

**Figure 8: Sensor wire guide hole placement**

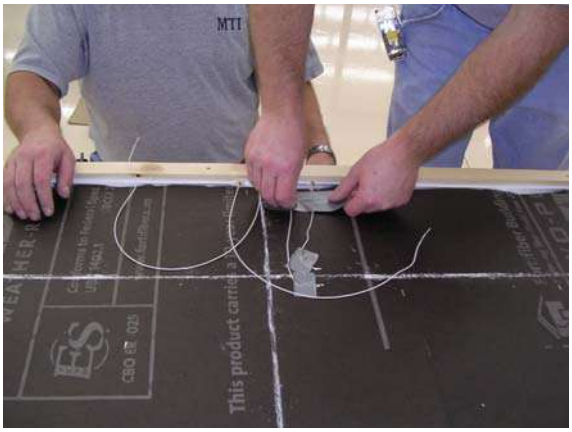

**Figure 9: Attaching sensor wires**

**Figure 10: Sealing paper edge**

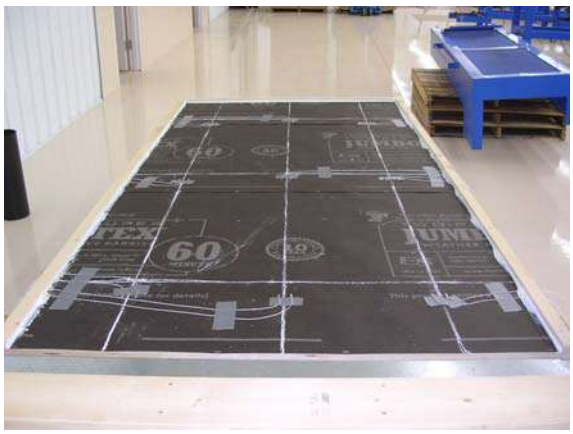

**Figure 11: Paper Layer 1 completed**

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**PHOTOS, Continued:**

## PANEL CONSTRUCTION OVERVIEW: Paper Layer 2 (P2)


**Figure 12: Installation of second paper layer**

**Figure 13: Drilling sensor wire guide holes**


**Figure 14: Affixing sensor wires**

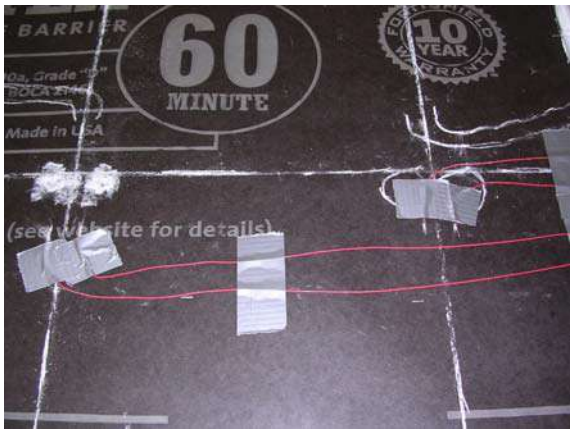


**Figure 15: Sensor contact points**


**Figure16: Sealing P2 edge**


**Figure 17: Paper Layer 2 completed**

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**PHOTOS, Continued:**

## PANEL CONSTRUCTION OVERVIEW: Sure Cavity Layer (SC), Panel A

**Figure 18: Sure Cavity layer placement**

**Figure 19: Weep screed installation**

**Figure 20: Marking sensor contact points**

**Figure 21: Securing sensor wires**

**Figure 22: Sensor contact points with shim**

**Figure 23: Sure Cavity layer completed**

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**PHOTOS, Continued:**

## PANEL CONSTRUCTION OVERVIEW: Metal Lath Layer

**Figures 24: Installation of metal lath, Panel A**

**Figure 25: Installation of metal lath, Panel B**

**Figure 26: Installation of metal lath**

**Figure 27: Metal Lath Layer completed**

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**PHOTOS, Continued:**

## PANEL CONSTRUCTION OVERVIEW: Sensor Connection

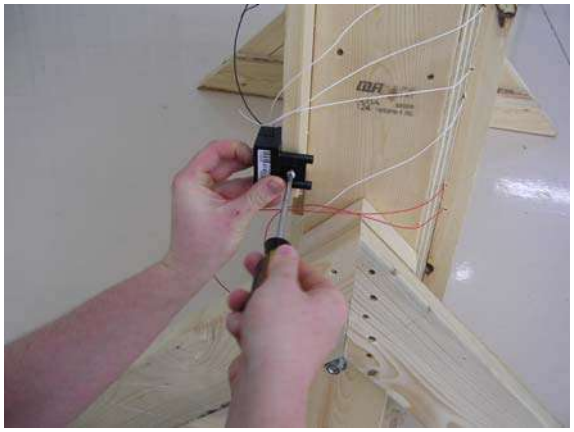

**Figure 28: Fastening sensor to panel frame**

**Figure 29: Sensor attachment**

**Figure 30: Sensor attachment**

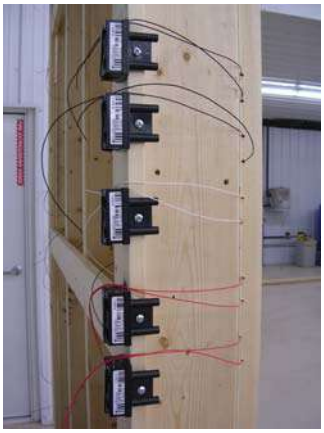

**Figure 31: Sensor attachment**

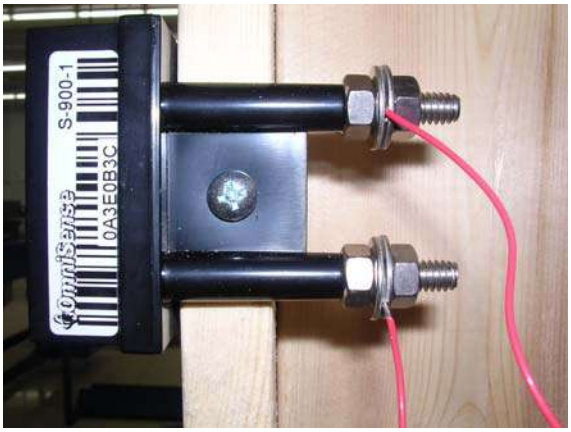


**Figure 32: Sensor wires connected**


**Figure 33: Terminals with electrical tape**

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**PHOTOS, Continued:**

## PANEL CONSTRUCTION OVERVIEW: Scratch Coat Application

**Figure 34: Mortar preparation**

**Figure 35: Mortar application**

**Figure 36: Mortar application**

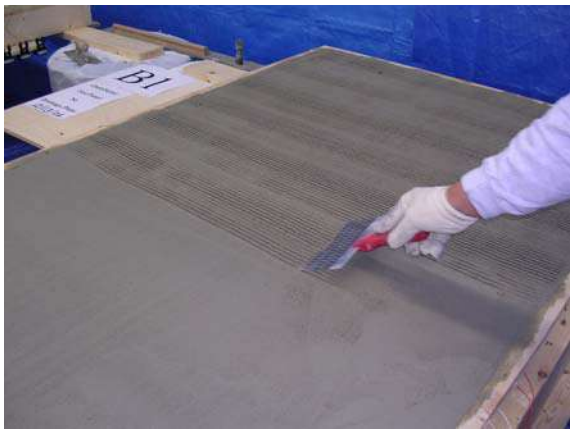

**Figure 37: Mortar application**

**Figure 38: Sealed mortar edge**

**Figure 39: Scratch coat completed**

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**PHOTOS, Continued:**

## WATER SPRAY APPLICATION, JANUARY 15-16, 2007


**Figure 40**


**Figure 41**


**Figure 42**

**Figure 43**

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**PHOTOS, Continued:**

**WATER SPRAY APPLICATION, JANUARY 15-16, 2007**


**Figure 44: Panel A surface, 21 hours after spray application #1**


**Figure 45: Panel B surface, 21 hours after spray application #1**

**REMARKS:**

The test materials were retained at the customer site.

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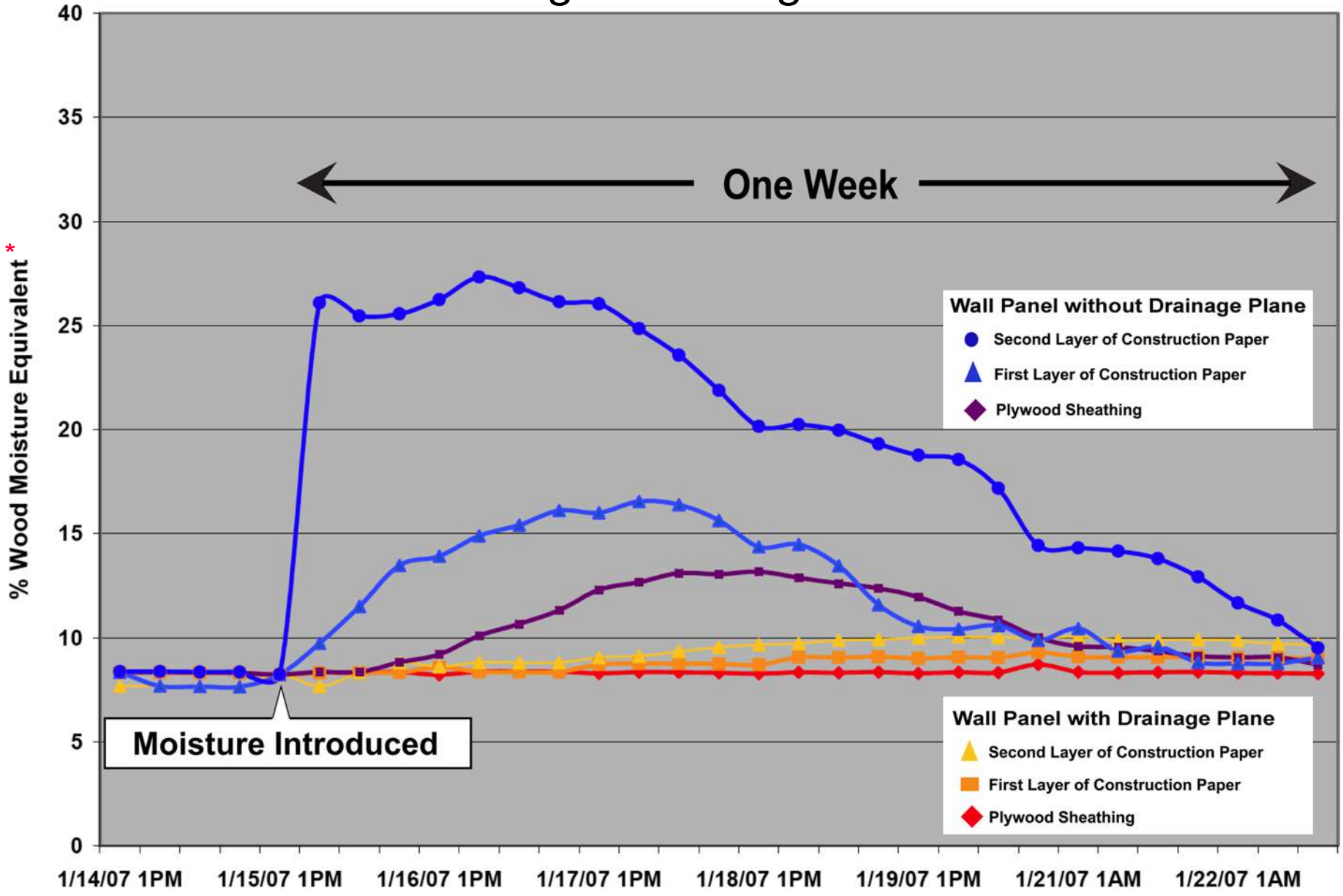
# Moisture Testing of Drainage Plane Effectiveness




*Wood Moisture Equivalent danger level 16% and above based on information in FAQ section of Dri-Eaz website at http://www.dri-eaz.com/.