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TO: LATICRETE Technical Sales Representatives

**RE: LATICRETE® Masonry Veneer Installation System™ (MVIS) Test Report**

LATICRETE is pleased to announce another industry first. Attached you will find an independent test report confirming that LATICRETE® MVIS™ performs equally to code approved conventional lath and plaster installation systems for adhered masonry veneers.

Part one of the report (Intertek report # 3196773TOR-009) describes the testing of various thin bed LATICRETE MVIS assemblies. All 18 assemblies, tested in accordance with ASTM E-330-02, met and exceeded the standard range of wall deflections; including the 2009 International Building Code prescribed standard of L/600 (sections 1405.9 [2006] and 1405.10 [2009]).

Part two of the report (NGC-WL -1003) describes the testing of conventional lath and plaster adhered manufactured stone and thin brick assemblies. Both assemblies were tested in accordance with ASTM E330-02 and met the same performance requirements described above.

The testing confirms that the performance of the LATICRETE MVIS assemblies performed equal to existing code approved conventional lath and plaster systems.

LATICRETE has developed adhered masonry veneer installation systems that are permanent, high strength, freeze/ thaw stable and protected from water intrusion. Backed by the LATICRETE® 25 Year System Warranty\*, LATICRETE MVIS allows for increased productivity of adhered masonry veneers.

In the very near future, LATICRETE International, Inc. will secure an International Code Council Evaluation Service Report (ICC-ES) for LATICRETE MVIS. We hope that the attached LATICRETE MVIS test report helps you to secure additional specifications and sales.

Feel free to contact us with any questions or concerns.

Regards,

A handwritten signature in cursive script that reads "Arthur Mintie".

Arthur Mintie CSI, CDT  
Director, Technical Services  
LATICRETE International, Inc.

Cc LATICRETE Sales Representatives

Letter # AM/am 045 – LATICRETE MVIS Test Report Cover Letter [20 October 2010]

\* Please refer to LATICRETE International, Inc. warranty data sheet 025.0 for complete details

**REPORT NUMBER: 3196773TOR-009**  
ISSUE DATE: October 15, 2010

**EVALUATION CENTER**  
Intertek  
6225 Kenway Drive  
Mississauga, Ontario L5T 2L3

**RENDERED TO**

**NATIONAL GYPSUM COMPANY**  
2001 Rexford Road  
Charlotte, North Carolina 06524-3423

and

**LATICRETE INTERNATIONAL INC.**  
One Laticrete Park North, 91 Amity Road  
Bethany, Connecticut 06524-3423

PRODUCT EVALUATED: Wall Assembly Test Frames  
EVALUATION PROPERTY: Structural Performance

**Report for National Gypsum Company of assembly and test witnessing of test frames for structural performance conducted in accordance with a modified ASTM E330-02, "Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference"**

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# 1 Table of Contents

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|           |   |           |
|-----------|---|-----------|
| <b>1</b>  | <b>Table of Contents</b> .....                                  | <b>2</b>  |
| <b>2</b>  | <b>Introduction</b> .....                                       | <b>3</b>  |
| <b>3</b>  | <b>Material Sampling and Assembly and Test Witnessing</b> ..... | <b>3</b>  |
| <b>4</b>  | <b>Sampled Materials</b> .....                                  | <b>4</b>  |
| 4.1.      | CEMENT BOARD .....  | 4         |
| 4.2.      | WATERPROOFING MEMBRANE.....                                     | 4         |
| 4.3.      | MASONRY ADHESIVE .....  | 4         |
| 4.4.      | MASONRY GROUT.....  | 4         |
| <b>5</b>  | <b>Other Notable Materials</b> .....                            | <b>5</b>  |
| 5.1.      | FIBERGLASS-COATED GYPSUM SHEATHING .....                        | 5         |
| 5.2.      | CDX PLYWOOD .....   | 5         |
| 5.3.      | GYPSUM BOARD .....  | 5         |
| 5.4.      | CEMENT BOARD FIBERGLASS TAPE.....                               | 5         |
| 5.5.      | GALVANIZED STEEL STUDS .....                                    | 5         |
| 5.6.      | MASONRY VENEER UNITS .....                                      | 5         |
| <b>6</b>  | <b>Test Sample Assembly</b> .....                               | <b>6</b>  |
| 6.1.      | ASSEMBLY OF BED BASE on WOOD FRAMES.....                        | 6         |
| 6.2.      | ASSEMBLY OF BED BASE on METAL FRAMES .....                      | 6         |
| 6.3.      | ASSEMBLY OF MASONRY VENEER UNITS AND GROUTING .....             | 7         |
| <b>7</b>  | <b>Testing and Evaluation Methods</b> .....                     | <b>8</b>  |
| 7.1       | DEVIATION FROM ASTM E330-02 .....                               | 8         |
| 7.2       | STRUCTURAL PERFORMANCE (UNIFORM LOAD TESTS).....                | 8         |
| <b>8</b>  | <b>Testing and Evaluation Results</b> .....                     | <b>9</b>  |
| <b>9</b>  | <b>Summarized Results</b> .....                                 | <b>12</b> |
| <b>10</b> | <b>Conclusion</b> .....   | <b>13</b> |
|           | <b>Appendix A – Photos</b> .....                                | <b>14</b> |

**Report for National Gypsum Company of assembly and test witnessing of test frames for structural performance conducted in accordance with a modified ASTM E330-02, "Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference"**

## 2 Introduction

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Intertek has witnessed the installation and structural (wind load) testing of various wall assemblies. A total of eighteen wall assemblies were assembled and tested (3 different types of cladding materials, 2 different structural systems, 3 samples of each). The wall components were sampled at various manufacturing locations and then shipped to NGC Testing Services in Buffalo, NY for assembly and testing.

Structural testing of the assemblies was conducted in accordance with the methods of a modified ASTM E330-02, "Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference" and evaluated against International Building Code sections 1405.9 (2006) and 1405.10 (2009). The sampling, assembly and test witnessing dates are outlined below.

## 3 Material Sampling and Assembly and Test Witnessing

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| Task                | Product / Test                            | Inspector         | Date                         | Location                           |
|---------------------|---|-------------------|------------------------------|------------------------------------|
| Material Sampling   | PermaBase Cement Board                    | Jeffrey Patterson | February 17, 2010            | Unifix, Bromont, QC                |
| Material Sampling   | Laticrete Masonry Pointing Mortar         | David Obedzinski  | March 25, 2010               | Laticrete, Int'l Inc., Bethany, CT |
| Material Sampling   | Laticrete Masonry Veneer Mortar           | David Obedzinski  | March 25, 2010               | Laticrete, Int'l Inc., Bethany, CT |
| Material Sampling   | Laticrete Hydro Ban                       | David Obedzinski  | March 25, 2010               | Laticrete, Int'l Inc., Bethany, CT |
| Assembly Witnessing | Witness assembly of masonry on test walls | Claudio Sacilotto | April 19, 20, May 14, 2010   | NGC, Buffalo, NY                   |
| Test Witnessing     | Structural test on wall assemblies        | Claudio Sacilotto | May 10, 11, 12, 14, 28, 2010 | NGC, Buffalo, NY                   |

## **4 Sampled Materials**

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### **4.1. CEMENT BOARD**

- PermaBase® Cement Board 1/2"×4'×8'
- Manufacturer – National Gypsum Company
- Lot/Serial No. BRO 02-17-10 09:06

### **4.2. WATERPROOFING MEMBRANE**

- Laticrete Hydro Ban™
- Manufacturer – Laticrete International Inc.
- Lot/Serial No. 372931

### **4.3. MASONRY ADHESIVE**

- Laticrete Masonry Veneer Mortar
- Manufacturer – Laticrete International Inc.
- Lot/Serial No. 371788-001 MFG 03/10
  - 373157-005

### **4.4. MASONRY GROUT**

#### **4.4.1. Laticrete Masonry Pointing Mortar - Gray**

- Manufacturer – Laticrete International Inc.
- Lot/Serial No. 372655-001 MFG 03/10

#### **4.4.2. Laticrete Masonry Pointing Mortar – Almond**

- Manufacturer – Laticrete International Inc.
  - Lot/Serial No. 367073 4 MFG 11/09
-

## **5 Other Notable Materials**

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### **5.1. FIBERGLASS-COATED GYPSUM SHEATHING**

- 5/8" thick

### **5.2. CDX PLYWOOD**

- 1/2" thick

### **5.3. GYPSUM BOARD**

- 5/8" Type X Gypsum Board

### **5.4. CEMENT BOARD FIBERGLASS TAPE**

- 4"×150'

### **5.5. GALVANIZED STEEL STUDS**

- Generic Manufacturer – 6" wide 18 Ga

### **5.6. MASONRY VENEER UNITS**

**5.6.1** Manufactured Stone

**5.6.2** Natural Stone

**5.6.3** Thin Brick

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## 6 Test Sample Assembly

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### 6.1. ASSEMBLY OF BED BASE on WOOD FRAMES

The bed base on wood frames was constructed in the following manner:

- 1/2" thick CDX plywood nailed to 2×4 wood stud frame (16" spacing) with 6d common nails. 6 mil polyethylene sheet was applied between the plywood and studs. The polyethylene sheet overhung the perimeter approximately 12". Nails were spaced 6" around perimeter and 12" on intermediate studs
- 1" thick rimboard was affixed to each end of the test assembly with six #10 screws
- 1/2" thick PermaBase® cement board was screwed onto CDX plywood with 2-1/4" corrosion-resistant screws. Screws were spaced 6" around the perimeter and along intermediate studs. At 8' mark, a second sheet of PermaBase® cement board was butt joined next to full sheet. The joint was treated with veneer mortar (about 1/16" thick) and 4" wide cement board fibreglass tape.
- Two coats of Hydro Ban™ were rolled on covering the PermaBase® cement board and fibreglass tape (0.030" total wet thickness)
- 5/8" gypsum board was placed on back of the assembly and screwed to the studs with 1-1/4" screws and spaced 12" throughout.

### 6.2. ASSEMBLY OF BED BASE on METAL FRAMES

The bed base on steel frames was constructed in the following manner:

- 5/8" thick fibreglass-coated gypsum sheathing was screwed into 6" 18Ga galvanized steel stud frame (16" spacing) with 1-1/4" screws. 6 mil polyethylene sheet was applied between the fibreglass-coated gypsum sheathing and studs. The polyethylene sheet overhung the perimeter approximately 12". Screws were spaced 12" around the perimeter and on intermediate studs.
  - 1" thick rimboard was affixed to each end of the test assembly with six #10 screws
  - 1/2" thick PermaBase® cement board was screwed onto plywood with 2-1/4" corrosion-resistant screws. Screws were spaced 6" throughout. At 8' mark, a second sheet of PermaBase® cement board was butt joined next to full sheet. The joint was treated with veneer mortar (about 1/16" thick) and 4" wide cement board fibreglass tape.
  - Two coats of Hydro Ban™ were rolled on covering the PermaBase® cement board and fibreglass tape (0.030" total wet thickness).
  - 5/8" gypsum board was placed on back of the assembly and screwed to the studs with 1-1/4" screws and spaced 12" throughout.
-

**6.3. ASSEMBLY OF MASONRY VENEER UNITS AND GROUTING**

Three different types of masonry veneer units were applied to the test frames (natural stone, manufactured stone and thin brick.):

**6.3.1. MIXING OF MORTAR**

The mortar was mixed as per the instructions on the bag. 6.25 quarts (5.9 ℓ) of water was added per 40 lbs bag. The mixture was thoroughly mixed and then allowed to slake for approximately 5 minutes and then mixed again.

The grout was also mixed as per the instructions on the bag. 4 quarts (3.8 ℓ) of water was added to each 50 lbs bag).

**6.3.2. ASSEMBLY OF MASONRY VENEER UNITS AND GROUTING**

The masonry veneer units were brushed on the back to remove excessive dust and loose stones. Laticrete Masonry Veneer Mortar was applied to the bed with a square notch trowel (1/2" × 1/2" × 1/2"). The masonry veneer units were laid on the test bed. A spacing of 3/16" separated each masonry unit. Once the veneer mortar cured, the test samples were grouted. The grouting process was conducted with a grout bag and small amounts of water were added as required to wet the grout and ease the grouting process.

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## 7 Testing and Evaluation Methods

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### 7.1 DEVIATION FROM ASTM E330-02

Structural performance testing was conducted in one direction only (negative wind load direction). Deviation from the standard procedure was based on the reasonable assumption that negative wind load testing would be the weakest direction, and therefore positive wind load testing was not evaluated. Because of this, the preload pressure (one-half of the test pressure) was not applied prior to the application of the test pressure.

### 7.2 STRUCTURAL PERFORMANCE (UNIFORM LOAD TESTS)

A modified Uniform Load Deflection test was conducted in accordance with ASTM E-330-02 "Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference," Procedure A. The test sample was installed into NGC's Structural Performance Test Frame apparatus. The NGC Structural Performance Test Frame apparatus is set up such that the ends of the sample are fixed against the apparatus. Only one deflection point (at the center of the test sample) is set up at the center. (An assumption is made to ensure that there are no net deflections at the ends of the specimen).

The sample was sealed to the test apparatus. A negative wind load test pressure was applied to the sample until a deflection outlined below was achieved. The test pressure was measured after maintaining the load for 10 seconds. The test sample was observed (through the portholes) and inspected for cracking of the mortar or deterioration of the test sample.

| Test span: 120 inches | Deflection |        |
|-----------------------|------------|--------|
| 1.                    | Span/960   | 0.125" |
| 2.                    | Span/840   | 0.143" |
| 3.                    | Span/720   | 0.167" |
| 4.                    | Span/600   | 0.200" |
| 5.                    | Span/480   | 0.250" |
| 6.                    | Span/360   | 0.333" |

After two minutes with the pressure released, the residual deflection of the test sample assembly was recorded. Once complete, the samples were subjected to a pressure that corresponded to the next deflection level.

The deflection measurement of the test sample was measured on the interior side of the gypsum board. Simultaneous measurements of the sample were also recorded at the back of the fiberglass-coated gypsum sheathing/plywood on the exterior side of the steel/wood studs.

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**NATURAL STONE ON METAL STUDS**

|                         |                         |            |
|-------------------------|-------------------------|------------|
| Test                    | Natural Stone (Granite) |            |
| 1                       | Metal Studs             |            |
| Frame ID: 9, Span: 120" |                         |            |
| Test Date               | Temp (°F)               | Humidity   |
| 14-May-10               | 61.9                    | 60%        |
| Failure                 |                         |            |
| Max                     | 31.5                    | 163.9 7846 |

| Load Applied |      |      | Assembly Deflection |        |      | Assembly Residual Defl. |      |  |
|--------------|------|------|---------------------|--------|------|-------------------------|------|--|
| WC           | psf  | Pa   | L                   | inches | mm   | inches                  | mm   |  |
| 7.1          | 36.9 | 1769 | 960                 | 0.125  | 3.18 | 0.015                   | 0.38 |  |
| 7.7          | 40.1 | 1918 | 840                 | 0.143  | 3.63 | 0.018                   | 0.46 |  |
| 9.1          | 47.3 | 2267 | 720                 | 0.167  | 4.24 | 0.021                   | 0.54 |  |
| 10.2         | 53.1 | 2541 | 600                 | 0.200  | 5.08 | 0.025                   | 0.65 |  |
| 12.4         | 64.5 | 3089 | 480                 | 0.250  | 6.35 | 0.031                   | 0.79 |  |
| 15.9         | 82.7 | 3961 | 360                 | 0.333  | 8.46 | 0.041                   | 1.04 |  |
|              |      |      |                     |        |      |                         |      |  |
|              |      |      |                     | 0.835  |      |                         |      |  |

| Back of Panel Deflection |       | Back of Panel Residual Defl. |      |
|--------------------------|-------|------------------------------|------|
| inches                   | mm    | inches                       | mm   |
| 0.142                    | 3.61  | 0.022                        | 0.56 |
| 0.165                    | 4.19  | 0.026                        | 0.66 |
| 0.195                    | 4.95  | 0.030                        | 0.76 |
| 0.238                    | 6.05  | 0.036                        | 0.91 |
| 0.304                    | 7.72  | 0.044                        | 1.12 |
| 0.402                    | 10.21 | 0.054                        | 1.37 |
|                          |       |                              |      |
|                          |       |                              |      |

Comments: no failures observed

|                         |                         |            |
|-------------------------|-------------------------|------------|
| Test                    | Natural Stone (Granite) |            |
| 2                       | Metal Studs             |            |
| Frame ID: 7, Span: 120" |                         |            |
| Test Date               | Temp (°F)               | Humidity   |
| 14-May-10               | 61.9                    | 60%        |
| Failure                 |                         |            |
| Max                     | 29.2                    | 151.9 7273 |

| Load Applied |      |      | Assembly Deflection |        |      | Assembly Residual Defl. |      |  |
|--------------|------|------|---------------------|--------|------|-------------------------|------|--|
| WC           | psf  | Pa   | L                   | inches | mm   | inches                  | mm   |  |
| 5.2          | 27.1 | 1295 | 960                 | 0.125  | 3.18 | 0.025                   | 0.64 |  |
| 5.4          | 28.1 | 1345 | 840                 | 0.143  | 3.63 | 0.031                   | 0.78 |  |
| 6.2          | 32.3 | 1544 | 720                 | 0.167  | 4.24 | 0.035                   | 0.88 |  |
| 7.0          | 36.4 | 1744 | 600                 | 0.200  | 5.08 | 0.040                   | 1.00 |  |
| 10.1         | 52.5 | 2516 | 480                 | 0.250  | 6.35 | 0.049                   | 1.23 |  |
| 13.6         | 70.8 | 3388 | 360                 | 0.333  | 8.46 | 0.063                   | 1.60 |  |
|              |      |      |                     |        |      |                         |      |  |
|              |      |      |                     | 0.820  |      |                         |      |  |

| Back of Panel Deflection |       | Back of Panel Residual Defl. |      |
|--------------------------|-------|------------------------------|------|
| inches                   | mm    | inches                       | mm   |
| 0.145                    | 3.68  | 0.032                        | 0.81 |
| 0.171                    | 4.34  | 0.039                        | 0.99 |
| 0.197                    | 5.00  | 0.043                        | 1.09 |
| 0.237                    | 6.02  | 0.049                        | 1.24 |
| 0.295                    | 7.49  | 0.060                        | 1.52 |
| 0.400                    | 10.16 | 0.078                        | 1.98 |
|                          |       |                              |      |
|                          |       |                              |      |

Comments: no failures observed

|                         |                         |            |
|-------------------------|-------------------------|------------|
| Test                    | Natural Stone (Granite) |            |
| 3                       | Metal Studs             |            |
| Frame ID: 8, Span: 120" |                         |            |
| Test Date               | Temp (°F)               | Humidity   |
| 14-May-10               | 61.9                    | 60%        |
| Failure                 |                         |            |
| Max                     | 29.2                    | 151.9 7273 |

| Load Applied |      |      | Assembly Deflection |        |       | Assembly Residual Defl. |      |  |
|--------------|------|------|---------------------|--------|-------|-------------------------|------|--|
| WC           | psf  | Pa   | L                   | inches | mm    | inches                  | mm   |  |
| 6.8          | 35.4 | 1694 | 960                 | 0.125  | 3.18  | 0.000                   | 0.00 |  |
| 7.8          | 40.6 | 1943 | 840                 | 0.143  | 3.63  | 0.000                   | 0.00 |  |
| 9.2          | 47.9 | 2292 | 720                 | 0.167  | 4.24  | 0.000                   | 0.01 |  |
| 11.0         | 57.2 | 2740 | 600                 | 0.200  | 5.08  | 0.001                   | 0.03 |  |
| 12.7         | 66.1 | 3163 | 480                 | 0.250  | 6.35  | 0.007                   | 0.19 |  |
| 15.9         | 82.7 | 3961 | 360                 | 0.333  | 8.46  | 0.023                   | 0.58 |  |
|              |      |      |                     |        |       |                         |      |  |
|              |      |      |                     | 0.640  | 16.26 |                         |      |  |

| Back of Panel Deflection |       | Back of Panel Residual Defl. |      |
|--------------------------|-------|------------------------------|------|
| inches                   | mm    | inches                       | mm   |
| 0.148                    | 3.76  | 0.006                        | 0.15 |
| 0.169                    | 4.29  | 0.008                        | 0.20 |
| 0.196                    | 4.98  | 0.009                        | 0.23 |
| 0.235                    | 5.97  | 0.015                        | 0.38 |
| 0.300                    | 7.62  | 0.019                        | 0.48 |
| 0.405                    | 10.29 | 0.037                        | 0.94 |
|                          |       |                              |      |
|                          |       |                              |      |

Comments: Top screws at base sheared off

**NATURAL STONE ON WOOD STUDS**

|                         |                         |           |
|-------------------------|-------------------------|-----------|
| Test                    | Natural Stone (Granite) |           |
| 1                       | Wood Studs              |           |
| Frame ID: 6, Span: 120" |                         |           |
| Test Date               | Temp (°F)               | Humidity  |
| 11-May-10               | 60.4                    | 48%       |
| Failure                 |                         |           |
| Max                     | 16.0                    | 83.2 3985 |

| Load Applied |      |      | Assembly Deflection |        |       | Assembly Residual Defl. |      |  |
|--------------|------|------|---------------------|--------|-------|-------------------------|------|--|
| WC           | psf  | Pa   | L                   | inches | mm    | inches                  | mm   |  |
| 2.7          | 14.0 | 673  | 960                 | 0.125  | 3.18  | 0.006                   | 0.14 |  |
| 2.9          | 15.1 | 722  | 840                 | 0.143  | 3.63  | 0.011                   | 0.27 |  |
| 3.3          | 17.2 | 822  | 720                 | 0.167  | 4.24  | 0.050                   | 1.26 |  |
| 3.2          | 16.6 | 797  | 600                 | 0.200  | 5.08  | 0.057                   | 1.44 |  |
| 3.2          | 16.6 | 797  | 480                 | 0.250  | 6.35  | 0.083                   | 2.11 |  |
| 4.5          | 23.4 | 1121 | 360                 | 0.333  | 8.46  | 0.124                   | 3.16 |  |
|              |      |      |                     |        |       |                         |      |  |
|              |      |      |                     | 1.350  | 34.29 |                         |      |  |

| Back of Panel Deflection |      | Back of Panel Residual Defl. |      |
|--------------------------|------|------------------------------|------|
| inches                   | mm   | inches                       | mm   |
| 0.130                    | 3.30 | 0.001                        | 0.03 |
| 0.147                    | 3.73 | 0.005                        | 0.13 |
| 0.180                    | 4.57 | 0.031                        | 0.79 |
| 0.193                    | 4.90 | 0.037                        | 0.94 |
| 0.238                    | 6.05 | 0.054                        | 1.37 |
| 0.310                    | 7.87 | 0.084                        | 2.13 |
|                          |      |                              |      |
|                          |      |                              |      |

Comments: cracking of mortar joint at 16.0 "WC, no catastrophic failure

|                         |                         |           |
|-------------------------|-------------------------|-----------|
| Test                    | Natural Stone (Granite) |           |
| 2                       | Wood Studs              |           |
| Frame ID: 9, Span: 120" |                         |           |
| Test Date               | Temp (°F)               | Humidity  |
| 11-May-10               | 60.4                    | 48%       |
| Failure                 |                         |           |
| Max                     | 19.0                    | 98.8 4733 |

| Load Applied |      |      | Assembly Deflection |        |       | Assembly Residual Defl. |      |  |
|--------------|------|------|---------------------|--------|-------|-------------------------|------|--|
| WC           | psf  | Pa   | L                   | inches | mm    | inches                  | mm   |  |
| 2.2          | 11.4 | 548  | 960                 | 0.125  | 3.18  | 0.003                   | 0.08 |  |
| 2.5          | 13.0 | 623  | 840                 | 0.143  | 3.63  | 0.005                   | 0.13 |  |
| 2.6          | 13.5 | 648  | 720                 | 0.167  | 4.24  | 0.008                   | 0.19 |  |
| 3.2          | 16.6 | 797  | 600                 | 0.200  | 5.08  | 0.014                   | 0.36 |  |
| 3.8          | 19.8 | 947  | 480                 | 0.250  | 6.35  | 0.026                   | 0.66 |  |
| 4.9          | 25.5 | 1221 | 360                 | 0.333  | 8.46  | 0.049                   | 1.24 |  |
|              |      |      |                     |        |       |                         |      |  |
|              |      |      |                     | 1.650  | 41.91 |                         |      |  |

| Back of Panel Deflection |      | Back of Panel Residual Defl. |      |
|--------------------------|------|------------------------------|------|
| inches                   | mm   | inches                       | mm   |
| 0.032                    | 0.81 | 0.007                        | 0.18 |
| 0.051                    | 1.30 | 0.009                        | 0.23 |
| 0.076                    | 1.93 | 0.013                        | 0.33 |
| 0.112                    | 2.84 | 0.020                        | 0.51 |
| 0.170                    | 4.32 | 0.034                        | 0.86 |
| 0.265                    | 6.73 | 0.061                        | 1.55 |
|                          |      |                              |      |
|                          |      |                              |      |

Comments: cracking of mortar joint at 19.0 "WC, no catastrophic failure

|                         |                         |            |
|-------------------------|-------------------------|------------|
| Test                    | Natural Stone (Granite) |            |
| 3                       | Wood Studs              |            |
| Frame ID: 8, Span: 120" |                         |            |
| Test Date               | Temp (°F)               | Humidity   |
| 11-May-10               | 60.4                    | 48%        |
| Failure                 |                         |            |
| Max                     | 26.4                    | 137.3 6576 |

| Load Applied |      |      | Assembly Deflection |        |      | Assembly Residual Defl. |      |  |
|--------------|------|------|---------------------|--------|------|-------------------------|------|--|
| WC           | psf  | Pa   | L                   | inches | mm   | inches                  | mm   |  |
| 2.7          | 14.0 | 673  | 960                 | 0.125  | 3.18 | 0.007                   | 0.18 |  |
| 3.0          | 15.6 | 747  | 840                 | 0.143  | 3.63 | 0.011                   | 0.27 |  |
| 3.4          | 17.7 | 847  | 720                 | 0.167  | 4.24 | 0.015                   | 0.38 |  |
| 3.9          | 20.3 | 971  | 600                 | 0.200  | 5.08 | 0.021                   | 0.54 |  |
| 4.6          | 23.9 | 1146 | 480                 | 0.250  | 6.35 | 0.031                   | 0.78 |  |
| 5.8          | 30.2 | 1445 | 360                 | 0.333  | 8.46 | 0.044                   | 1.12 |  |
|              |      |      |                     |        |      |                         |      |  |
|              |      |      |                     |        |      |                         |      |  |

| Back of Panel Deflection |      | Back of Panel Residual Defl. |      |
|--------------------------|------|------------------------------|------|
| inches                   | mm   | inches                       | mm   |
| 0.125                    | 3.18 | 0.008                        | 0.20 |
| 0.145                    | 3.68 | 0.012                        | 0.30 |
| 0.172                    | 4.37 | 0.018                        | 0.46 |
| 0.209                    | 5.31 | 0.025                        | 0.64 |
| 0.262                    | 6.65 | 0.035                        | 0.89 |
| 0.352                    | 8.94 | 0.050                        | 1.27 |
|                          |      |                              |      |
|                          |      |                              |      |

Comments: no failures observed

## 9 Summarized Results

---

### Negative Wind Load Pressure Test

| Masonry Veneer     | Sheathing material                 | Stud wall construction | Ultimate Load (psf) |        |        |
|--------------------|------------------------------------|------------------------|---------------------|--------|--------|
|                    |                                    |                        | Test 1              | Test 2 | Test 3 |
| Manufactured Stone | CDX Plywood                        | 2x4 Wood studs         | 96.8                | 102.0  | 67.1   |
| Natural Stone      | CDX Plywood                        | 2x4 Wood studs         | 83.2                | 98.8   | 137.3* |
| Thin Brick         | CDX Plywood                        | 2x4 Wood studs         | 117.6               | 82.7   | 149.8* |
| Manufactured Stone | Fiberglass-coated gypsum sheathing | 16 Ga steel studs      | 139.4*              | 127.5* | 151.9* |
| Natural Stone      | Fiberglass-coated gypsum sheathing | 16 Ga steel studs      | 163.9*              | 151.9* | 151.9  |
| Thin Brick         | Fiberglass-coated gypsum sheathing | 16 Ga steel studs      | 95.7*               | 133.2* | 153.5  |

*\*includes a maximum obtainable load in which failure was not reached*

---

## 10 Conclusion

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A total of 18 test walls were witnessed for installation and subsequent structural testing. All observations and test results are reported herein.

At the deflection of L/600, there were no mortar cracks, no mortar failures or any wall system failures observed. The wall assemblies were also tested to a more rigorous deflection of L/360 at which there were no mortar cracks, no mortar failures or any wall system failures observed.

All tested wall assemblies witnessed by Intertek and reported herein were tested to meet the standard range of wall deflections, including a deflection of L/600 which is required for adhered masonry veneer installations per International Building Code sections 1405.9 (2006) and 1405.10 (2009).

**INTERTEK**

Components verified, construction witnessed, test supervised and reported by:

  
\_\_\_\_\_  
Claudio Sacilotto  
**Physical Testing Services**

Reviewed by:   
\_\_\_\_\_  
Ryan Huynh  
**Physical Testing Services**

---

## **Appendix A – Photos**

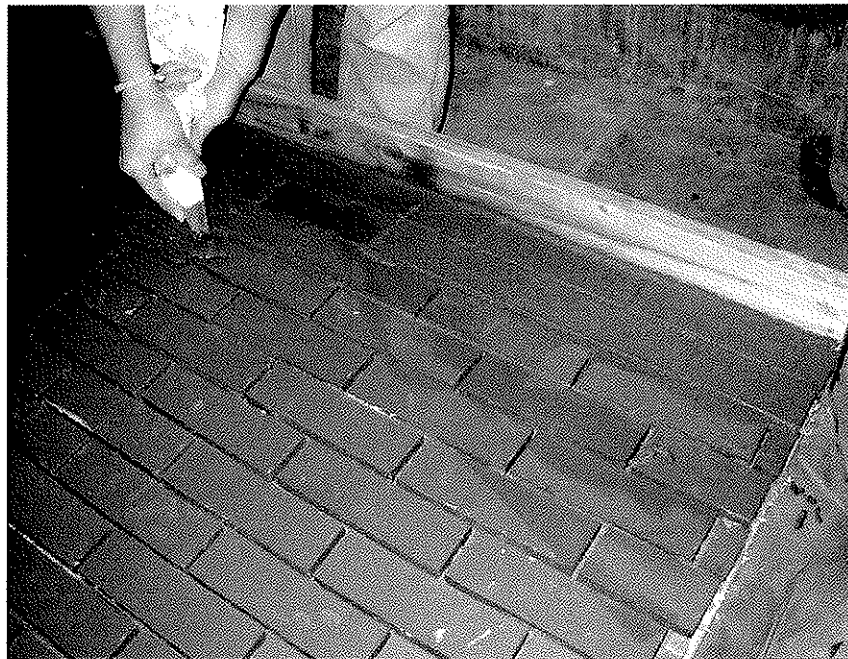
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(Photos – 2 Pages)

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Masonry application on to test frame

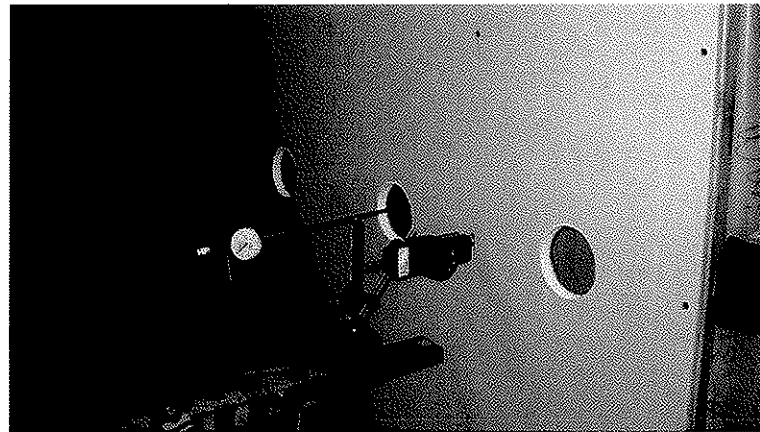


Grouting of masonry units





Structural performance test frame with wall assembly installed



Gage locations on test wall assembly. One gage on back of wall assembly and one gage on back of plywood/eXP® sheathing



Structural Testing  
Laboratory



## TEST REPORT

### Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure – ASTM E 330-02 Procedure B

Test Date: May 27, 2010

Report Issue Date: June 16, 2010

Reissued Date: October 22, 2010

Report Number: WL-1002

Project Number: J-131-N

Prepared For:

National Gypsum Company

2001 Rexford Road

Charlotte, North Carolina 28211-3498

And

Laticrete International Incorporated

One Laticrete Park North, 91 Amity Road

Bethany, Connecticut 06524-3423

Prepared By:

NGC Testing Services™

1650 Military Road

Buffalo, New York 14150

The results reported in this document apply to specific samples submitted for measurement.  
No responsibility is assumed for performance of any other specimen.  
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The laboratory's test reports in no way constitutes or implies product certification, approval  
or endorsement by this laboratory.



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## TABLE OF CONTENTS

|                                 |      |   |
|---------------------------------|------|---|
| 1. INTRODUCTION                 | PAGE | 3 |
| 2. TEST APPARATUS               | PAGE | 3 |
| 3. DESCRIPTION OF WALL ASSEMBLY | PAGE | 4 |
| 4. TEST PROCEDURE               | PAGE | 5 |
| 5. DESCRIPTION OF TEST RESULTS  | PAGE | 5 |
| 6. TEST DATA PAGES              | PAGE | 7 |
| 7. PHOTOGRAPHS                  | PAGE | 8 |



## 1. INTRODUCTION

On May 27, 2010, NGC Testing Services™ conducted vertical negative load tests for National Gypsum Company of Charlotte, NC. Panel assemblies were constructed with 2 in. by 4 in. nominal wood framing members, 16 in. on centers. A single layer of 1/2 in. CDX plywood was nailed onto the framing members. A double layer of 15 lb. felt paper was stapled to the face of the plywood. Metal lath was then nailed over the felt paper. A scratch coat of Type S mortar was applied over the lath. A layer of either, manufactured stone, natural stone or tin brick was applied over the scratch coat with Laticrete masonry veneer mortar. The joints were finished with Laticrete pointing mortar. The panel assemblies measured 4 ft wide by 10 ft long. The panels were tested in accordance to ASTM E 330 - 02 Standard Test Method. The total loads achieved for each specimen is detailed in the data pages.

Construction of all framing and panel assemblies was performed by NGC Testing Services™ personnel on site. All Stone work was performed by Buffalo Tile employees. Stone work was witnessed by Greg Sherwood, a representative of Laticrete. Testing was performed on three like wall panel assemblies.

Testing was conducted by Steven Armenia, Test Technician, and Andrew Heuer, Test and Quality Engineer, both of NGC Testing Services™.

## 2. TEST APPARATUS

The test apparatus utilized met the criteria outlined in test standard ASTM E 330 - 02 for negative wind load testing. The test chamber has one open side from which to mount and seal the test specimen. A pressure tap is mounted into back of chamber to measure the pressure difference across the test specimen. The air supply inlet is located such that it does not impinge on the test specimen directly with any significant velocity. A window is placed on the side of the test chamber to make viewing of the exposed side of the sample possible. The test chamber can accommodate samples up to 4 feet wide and up to 16 feet long. Air was exhausted from the chamber with a Variac controlled 6.5 HP vacuum and pressure readings were measured utilizing a differential pressure transmitter with a digital meter. Lateral deflections were recorded at the test sample horizontal and vertical center lines via a dial indicator and at the vertical centerline at a framing member via a digital indicator.



### 3. DESCRIPTION OF WALL ASSEMBLIES

Three like test specimens consisted of nominal 2 in. x 4 in. SPF wood studs spaced 16 inches on center. The studs were attached to nominal 2 in. x 4 in. wooden plates. The studs were nailed in to the plates with two (2) 16d common nails. There was no center stud. A single layer of 15/32 in. CDX plywood was nailed onto the framing members with 8d common nails. The nail spacing was 6 in. on center around the perimeter and 12 in. on center along the intermediate studs. A double layer of 15 Lb. felt paper was stapled onto the plywood, with an overlap between the layers. Each layer was stapled 12 in. on center. 3.4 Lb. Metal lath was nailed over the felt paper. A 1 in. overlap was used at every occurring overlap. The lath was nailed 6 in. on center with 1-1/2 in. roofing nails. A scratch coat of Type S mortar was applied over the metal lath, nominally 3/8 in. thick. A single layer of 5/8 in. gypsum wallboard was attached to the back side of the assembly to prevent stud twisting during testing. The gypsum was attached with 1-1/4 in. coarse thread bugle headed screws 12 in. on center. The samples were 48 in. wide x 120 in. high. Average specimen weight was found to be 270 pounds without the stone toppings applied. A continuous sheet of 4 mil polyethylene was placed over the entire assembly and sealed to the test frame to aid in creating an airtight chamber and to ensure uniform application of test loads. A single test panel was made with one of the three possible coverings; manufacture stone, natural stone or thin brick. One of each was tested, for a total of three assemblies.

- A layer of natural stone was applied over the scratch coat with Laticrete masonry veneer mortar. Each tile was back buttered around the perimeter and placed into a wet mortar bed. The tiles measured 12 in. x 12 in. by 3/8 in. thick. Sample weight was 6.9 PSF.
- A layer of manufactured stone was applied over the scratch coat with Laticrete masonry veneer mortar. Each stone was back buttered around the perimeter and placed into a wet mortar bed. The stones were of various lengths and widths and depths. Sample weight varied due to sizes and shapes of stones.
- A layer of thin red brick was applied over the scratch coat with Laticrete masonry veneer mortar. Each brick was back buttered around the perimeter and placed into a wet mortar bed. The bricks measured 2-1/4 in. x 7 in. by 5/8 in. thick. Sample weight was 6.0 PSF.



#### 4. TEST PROCEDURE

Testing was conducted in accordance to ASTM E 330 - 02 procedure B. Any construction material that was not to be used or installed in or on a building unit was removed prior to testing. The specimens were inserted into the test frame and seated. The specimens were secured to a top plate only via a 2 in. by 10 in. wooden board and six (6) 2-1/4 in. long coarse threaded bugle head screws. The sample was taped to the outside of the test frame to create an air tight chamber. The poly sheeting was bunched so that it would not restrict the sample from reaching maximum deflection during testing. Six incremental deflections were tested. Increments were; L/960, L/840, L/720, L/600, L/480 and L/360. At the correct decimal reading, the timer was started and held for a ten second period and the pressure was recorded then released. The system was then allowed to stabilize for two minutes prior to the next load in the program.

A dial indicator was placed at wall vertical and horizontal center points to measure the lateral deflection of the specimen under live load and the set after the release of the load. A separate digital indicator was placed at the vertical centerline on a framing member to record the lateral deflection of the entire assembly. Both indicators were detached from the test frame. A small pre-load of (-1) in. of water was applied to the assembly, and then the load was released, allowing the assembly to rest until all set deflections stabilized. The indicators were again zeroed and the test commenced.

A total of three tests for each assembly type was conducted in according to the above mentioned procedure.

#### 5. DESCRIPTION OF TEST RESULTS

The failure mode for all wall panel assemblies tested was not definitively determined. The test assemblies held up throughout the above mentioned testing protocol. The assembly failure could not be determined since the test frame itself was becoming the limiting factor. The tests were stopped before ultimate failure occurred to assemblies to prevent any further damage to the test chamber itself. The values reached are not the ultimate failure values, but rather a stopping point of the test due to the tester's discretion.



Tested and witnessed by:

A handwritten signature in black ink, appearing to read "Steven M. Armenia", written over a horizontal line.

Steven M. Armenia  
Test Technician

Reviewed by:

A handwritten signature in black ink, appearing to read "Robert J. Menchetti", written over a horizontal line.

Robert J. Menchetti  
Director NGC Testing Services

A handwritten signature in black ink, appearing to read "Andrew Heuer", written over a horizontal line.

Andrew Heuer  
Test and Quality Engineer

Attachments:



6. Test Data Pages

| Assignment No.    |  | J-131-N   | Assembly | Lath and Scratch Coat | L-Value, in. | Height, in. | Deflection, in. |
|-------------------|--|-----------|----------|-----------------------|--------------|-------------|-----------------|
| Date              |  | 3/14/1900 |          | PermaBase, Plywood    | 120          | 900         | 0.125           |
| Temperature, DegF |  | 69        |          | Wood Studs            | 120          | 840         | 0.143           |
| Humidity, % R.H.  |  | 58%       |          | Manufactured Stone    | 120          | 720         | 0.167           |
|                   |  |           |          |                       | 120          | 600         | 0.200           |
|                   |  |           |          |                       | 120          | 480         | 0.250           |
|                   |  |           |          |                       | 120          | 300         | 0.333           |

| Assembly Number    | Deflection, in. | Start               |               |              | Set                 |               |
|--------------------|-----------------|---------------------|---------------|--------------|---------------------|---------------|
|                    |                 | Deflection (inches) |               |              | Deflection (inches) |               |
|                    |                 | Assembly            | Back of Panel | Load Applied | Assembly            | Back of Panel |
| Manufactured Stone | 0.125           | 0.134               | 0.140         | 2.8          | 0.095               | 0.009         |
|                    | 0.143           | 0.150               | 0.160         | 3.1          | 0.011               | 0.025         |
|                    | 0.167           | 0.170               | 0.185         | 3.5          | 0.015               | 0.019         |
|                    | 0.200           | 0.214               | 0.222         | 4.2          | 0.021               | 0.020         |
|                    | 0.250           | 0.257               | 0.265         | 4.8          | 0.031               | 0.036         |
|                    | 0.333           | 0.354               | 0.383         | 6.5          | 0.049               | 0.054         |
|                    | Failure         |                     |               |              |                     |               |

Comments: A small initial preload was applied to the assembly to check for leaks and proper setting of panels in test chamber.  
The Load was applied and held for 10 seconds, readings taken, then load was released. Readings taken again after a 2 minute cool period.  
Failure of topping: No visible failure  
Catastrophic Failure

| Assignment No.    |  | J-131-N   | Assembly | Lath and Scratch Coat |
|-------------------|--|-----------|----------|-----------------------|
| Date              |  | 6/27/2010 |          | PermaBase, Plywood    |
| Temperature, DegF |  | 76.6      |          | Wood Studs            |
| Humidity, % R.H.  |  | 60%       |          | Natural Stone         |

| Assembly Number | Deflection, in. | Start               |               |              | Set                 |               |
|-----------------|-----------------|---------------------|---------------|--------------|---------------------|---------------|
|                 |                 | Deflection (inches) |               |              | Deflection (inches) |               |
|                 |                 | Assembly            | Back of Panel | Load Applied | Assembly            | Back of Panel |
| Natural Stone   | 0.125           | 0.122               | 0.054         | 2.5          | 0.000               | 0.000         |
|                 | 0.143           | 0.144               | 0.125         | 2.6          | 0.000               | 0.000         |
|                 | 0.167           | 0.172               | 0.195         | 2.8          | 0.000               | 0.002         |
|                 | 0.200           | 0.221               | 0.241         | 3.0          | 0.020               | 0.000         |
|                 | 0.250           | 0.310               | 0.330         | 3.6          | 0.023               | 0.000         |
|                 | 0.333           | 0.354               | 0.290         | 4.5          | 0.035               | 0.045         |
|                 | Failure         |                     |               |              |                     |               |

Comments: Failure of topping: No visible failure  
Catastrophic Failure

| Assignment No.    |  | J-131-N   | Assembly | Lath and Scratch Coat |
|-------------------|--|-----------|----------|-----------------------|
| Date              |  | 6/27/2010 |          | PermaBase, Plywood    |
| Temperature, DegF |  | 77.5      |          | Wood Studs            |
| Humidity, % R.H.  |  | 58%       |          | Thin Red Brick        |

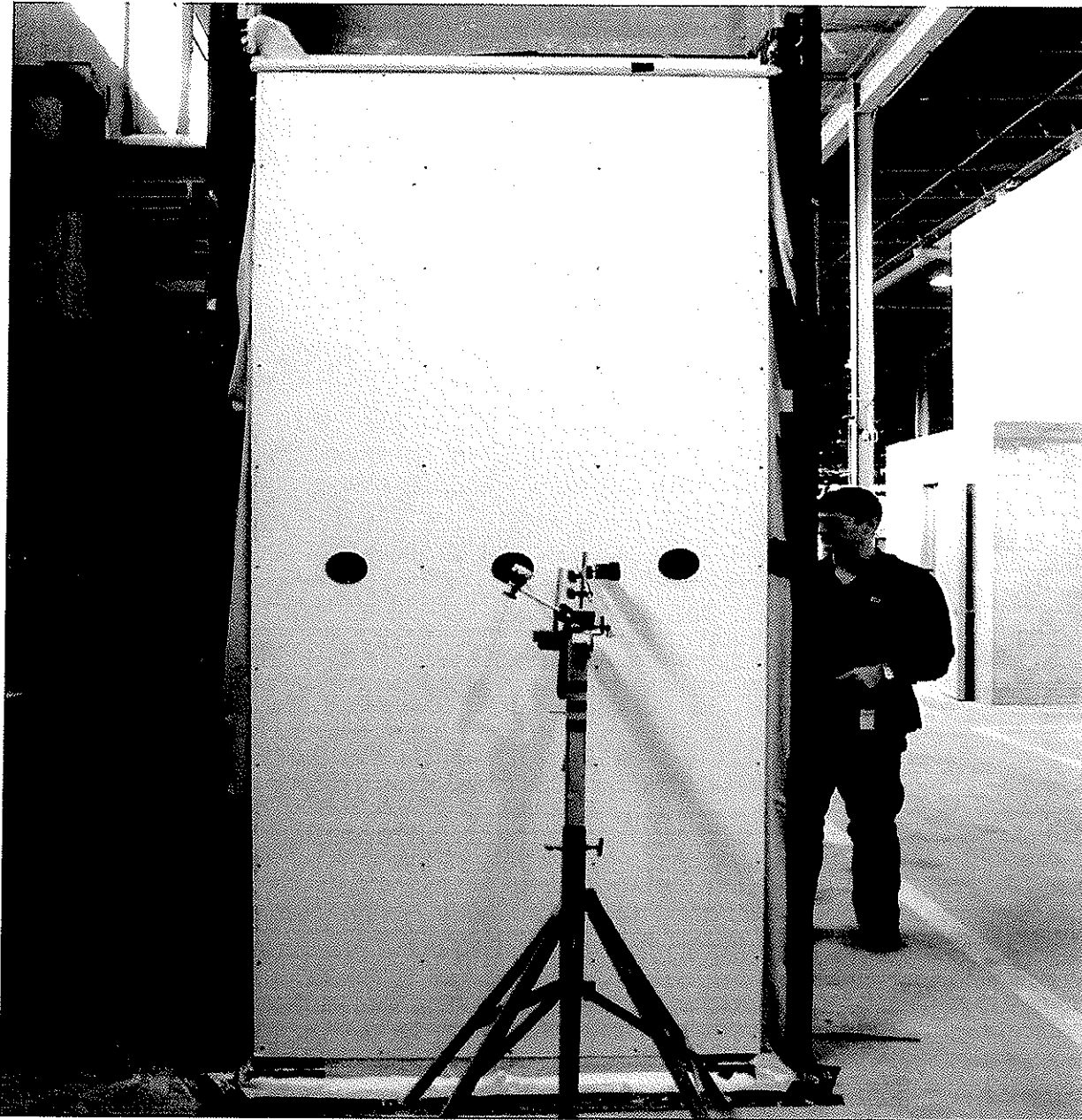
| Assembly Number | Deflection, in. | Start               |               |              | Set                 |               |
|-----------------|-----------------|---------------------|---------------|--------------|---------------------|---------------|
|                 |                 | Deflection (inches) |               |              | Deflection (inches) |               |
|                 |                 | Assembly            | Back of Panel | Load Applied | Assembly            | Back of Panel |
| Thin Brick      | 0.125           | 0.138               | 0.155         | 2.3          | 0.017               | 0.002         |
|                 | 0.143           | 0.151               | 0.137         | 2.7          | 0.021               | 0.070         |
|                 | 0.167           | 0.185               | 0.209         | 2.8          | 0.020               | 0.072         |
|                 | 0.200           | 0.215               | 0.275         | 3.2          | 0.035               | 0.060         |
|                 | 0.250           | 0.280               | 0.285         | 3.7          | 0.093               | 0.103         |
|                 | 0.333           | 0.361               | 0.360         | 4.2          |                     |               |
|                 | Failure         |                     |               |              |                     |               |

Comments: Failure of topping: No visible failure  
Catastrophic Failure



## 7. PHOTOGRAPHS

### PHOTO #1 Typical Test Assembly Setup





WL-1002  
National Gypsum Company  
6/16/2010

**PHOTO # 2 Manufactured Stone Assembly**



**PHOTO # 3 Thin Brick Stone Assembly**





WL-1002  
National Gypsum Company  
6/16/2010

**PHOTO # 4** Natural Stone Assembly

