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# MOLD AND MOISTURE TECHNOLOGIES, INC.
# TEST REPORT

**SCOPE OF WORK**
ICC-ES AC212 AND ASTM E2570 EVALUATION OF MMT-SEALER AS A WATER RESISTANT BARRIER

**REPORT NUMBER**
K2772.01-106-31 R0

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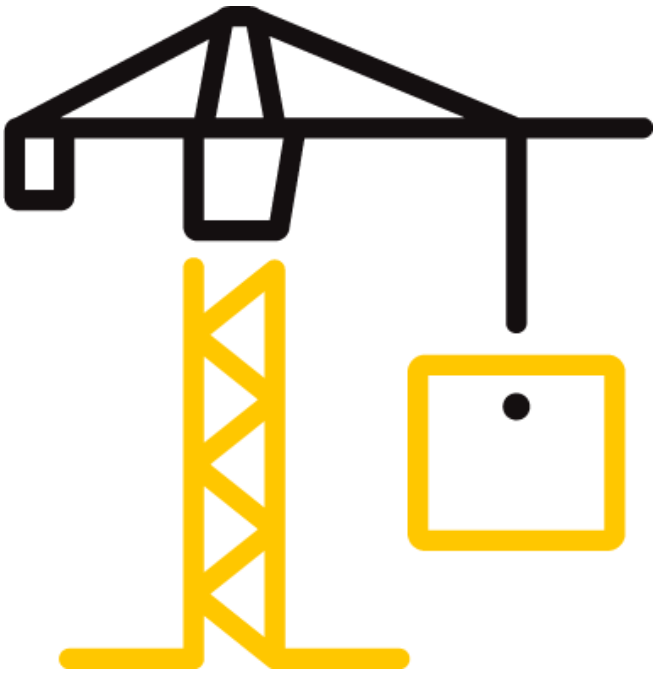

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# TEST REPORT FOR MOLD AND MOISTURE TECHNOLOGIES, INC.

Report No.: K2772.01-106-31 R0
Date: 04/14/20

## REPORT ISSUED TO

**MOLD AND MOISTURE TECHNOLOGIES, INC.**
214 Putnam Avenue
Cotuit, Massachusetts 02635

## SECTION 1

## SCOPE

**Products**: MMT-Sealer - Water Resistant Barrier

Intertek Building & Construction (B&C) was contracted by Mold and Moisture Technologies, Inc. to evaluate MMT-Sealer as a Water Resistant Barrier in accordance with ASTM E2570, *Standard Test Methods for Evaluating Water-Resistive Barrier (WRB) Coatings Used under Exterior Insulation and finish Systems (EIFS) or EIFS with Drainage* for compliance to ICC-ES AC212. Results obtained are tested values and were secured by using the designated test methods. Testing was conducted at the Intertek B&C test facility in York, Pennsylvania.

This report does not constitute certification of this product nor an opinion or endorsement by this laboratory.

For INTERTEK B&C:

| | | | |
|---|---|---|---|
| **COMPLETED BY:** | J. Rich Hammons | **REVIEWED BY:** | Joseph M. Brickner |
| **TITLE:** | Technician III<br>Materials Laboratory | **TITLE:** | Laboratory Supervisor<br>Materials Laboratory |
| **SIGNATURE:** | Digitally Signed by: James Hammons | **SIGNATURE:** | Digitally Signed by: Joseph M. Brickner |
| **DATE:** | 04/14/20 | **DATE:** | 04/14/20 |

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## SECTION 2
**SUMMARY OF TEST RESULTS**

| AC212 SECTION | TEST METHOD | REQUIREMENTS | AVERAGE TEST RESULT | PASS/ FAIL |
|---|---|---|---|---|
| 4.1 | ASTM C297 Tensile Bond | **AC212 -** 15 psi also **ASTM E2570** | 234 psi | PASS |
| 4.2 | ASTM E2485 Freeze-Thaw | **AC212 -** No delamination or surfaces changes when viewed under 5x magnification also **ASTM E2570** | None Observed | PASS |
| 4.3 | ASTM D2247 Water Resistance | **AC212** - No deleterious effects such as cracking or crazing also **ASTM E2570** | None Observed | PASS |
| 4.4 | ASTM E96 Vapor Transmission | **ASTM E2570 -** Report Results | 1.230 (perms); 9.6224 (g/(24hr·$m^2$)) 1.96 (lbs/24hr-1000 $ft^2$) | ASTM E2570 |
| 4.8 | Ultraviolet Light Exposure | **AC212** - No cracking of the coating or bond failure between the WRB and substrate also **ASTM E2570** | None Observed | PASS |
| 4.8.2 | Accelerated Aging | **AC212 -** No cracking of the coating or bond failure between the WRB and substrate also **ASTM E2570** | None Observed | PASS |
| 4.8.3 | AATCC 127 Hydrostatic Pressure | **AC212 -** No water penetration on the plane of the exterior facing of the side of the substrate also **ASTM E2570** | None Observed | PASS |
| N/A | ASTM B117 Salt Fog Exposure | Report Results | None Observed | PASS |
| N/A | ASTM C67 Efflorescence | Report Results | None Observed | PASS |

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## SECTION 3
## TEST METHODS

The specimens were evaluated in accordance with the following:

**ICC-ES AC212-2015 Revised (2018)**, *Acceptance Criteria for Water-Resistive Coatings Used As Water-Resistive Barriers Over Exterior Sheathing,* approved February 2015

**ASTM E2570-07(2019)**, *Standard Test Methods for Evaluating Water-Resistive Barrier (WRB) Coatings Used under Exterior Insulation and finish Systems (EIFS) or EIFS with Drainage*

**ASTM C297/297M-16**, *Standard Test Method for Flatwise Tensile Strength of Sandwich Constructions*

**ASTM E2485 / E2485M-13 Reapproved (2018)**, *Standard Test Method for Freeze / Thaw Resistance of Exterior Insulation and Finish Systems (EIFS) and Water Resistive Barrier Coatings,* per AC212 section 4.2.

**ASTM D2247-15**, *Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity,* per AC212 section 4.3.

**ASTM E96/E96M-16**, *Standard Test methods for Water Vapor Transmission of Materials, Procedure B Water Method, per AC212 section 4.4.*

**AATCC 127-2014**, *Water Resistance: Hydrostatic Pressure Test*, per AC212 section 4.8.3

**ASTM B117-19**, *Standard Practice for Operating Salt Spray (Fog) Apparatus*

**ASTM C67/C67M-18**, *Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile, Section 11*

## SECTION 4
## MATERIAL SOURCE

The materials were provided, and test specimen fabrication was performed by Mold and Moisture Technologies, Inc. personnel. Refer to the product description photos in Section 10. The material was tested as provided with the exception of preparing the smaller test specimens from the materials. Representative materials/test specimens will be retained by Intertek B&C for a minimum of four years from the test completion date.

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## SECTION 5
**LIST OF OFFICIAL OBSERVERS**

| NAME | COMPANY |
|---|---|
| J. Rich Hammons | Intertek B&C |
| Joseph M. Brickner | Intertek B&C |

## SECTION 6
**TEST PROCEDURES**

All conditioning of test specimens and test conditions were at standard laboratory conditions unless otherwise reported. Refer to the test related photos in Section 10.

**ICC-ES AC212 Section 4.8.3 - Tensile Bond Strength**
Tensile bond strength was performed in accordance with ASTM C297, per AC212 section 4.1. T-block fixtures were epoxied to the surface of the water resistant barrier coated CMU paver and mounted into a SATEC UTM (ICN: Y002011) equipped with a 500 pound load cell (ICN: 471502A) operating at a crosshead movement rate of 0.02 in/min.

**ICC-ES AC212 Section 4.2- Freeze Thaw**
Freeze thaw evaluation was performed in accordance with ASTM E2485 Method B, per AC212 section 4.2. using the following cycle:

8 hours in an oven (ICN: Y002567) maintained at 49°C
8 hour immersion in deionized water maintained at room temperature (24°C)
16 hours in a freezer (ICN: INT000208) maintained at -28.9°C.

Ten cycles were performed with visual evaluations recorded both prior to and after each cycle. Five specimens were prepared without a joint treatment.

**ICC-ES AC212 Section 4.3 - Water Resistance**
Water resistance was performed in accordance with ASTM D2247 per AC212 section 4.3. The water resistance was determined utilizing a Humidity Chamber (ICN: 005986) with 100% relative humidity at 100°F maintained with a control box (ICN: 005158). Specimens were exposed to these conditions for 340 hours. Three specimens were prepared without a joint treatment.

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**ICC-ES AC212 Section 4.4 - Water Vapor Transmission**
Water Vapor Transmission was performed in accordance with ASTM E96 per AC212 section 4.4. Specimens were secured with two rubber seals to a water-filled test dish for wet cup testing. This resulted in a higher water vapor pressure on the inside of the test specimen assembly.

The resulting open area of each specimen for testing was 7.1 in2. The side designated as A of each specimen remained in direct contact with the laboratory conditions. The weights of the specimen assemblies were recorded twice a day during normal business days utilizing a Mettler Toledo AX504 Balance (ICN: 003449). Specimens were kept in an Espec environmental chamber (ICN: 64509) maintained at 70˚F and 50% relative humidity for the duration of the test. The average relative humidity did not fall within 50 ±2% as stated in the method and was taken into account in the calculations. The water vapor permeance and transmission were calculated in accordance with the test method.

**ICC-ES AC212 Section 4.8.1 - Ultraviolet Light Exposure**
UV Light Exposure was performed in accordance with AC212 section 4.8.1. The specimens were exposed to ultraviolet sun lamps for a period of 210 hours (10 hours a day for 21 days). Equivalent bulbs to General Electric Type H275 RUV (275W) were used that provided UV characteristics of 5.0 $W/m^2/nm$ irradiance at a wavelength of 315 to 400 nm at 1 meter. The enclosure was adjusted so the temperature at the specimens was maintained between 135°F and 140°F (57°C and 60°C). After exposure, samples were visually inspected for any deleterious effects such as cracking or bond failure.

**ICC-ES AC212 Section 4.8.2 - Accelerated Aging**
The same specimens that were used for ICC-ES AC212 Section 4.8.1 - Ultraviolet Light Exposure were used for this evaluation. The specimens were subjected to 25 cycles of accelerated aging as follows:

- Three hours of oven drying at 120°F (49°C)
- Three hours of immersion in room temperature water
- 18 hours of air-drying at 75 ±5°F (23.8 ±2.8°C) after blotting dry

After exposure samples were visually inspected for any deleterious effects such as cracking or bond failure.

**ICC-ES AC212 Section 4.8.3 / AATCC 127 - Hydrostatic Pressure**
The same specimens that were used for ICC-ES AC212 Section 4.8.1 - Ultraviolet Light Exposure and Section 4.8.2 - Accelerated Aging were used for this evaluation. Specimens were attached to a 6 in. diameter section of PVC pipe using a silicone sealant. After curing for 1 day the pipe was filled to a height of 55 cm with water. After 5 hours the samples were observed for any signs of water leakage through the water-resistant barrier.

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**ASTM B117 - Salt Fog Exposure**
Test specimens were subjected to a 500 hour exposure in an QFOG salt fog cabinet (ICN: Y001671) utilizing a 5% (by weight) solution of reagent grade Sodium Chloride and laboratory grade water. The cabinet operated with a continuous fog at 35 ±3°C and an atomized solution pH between 6.5-7.2. Specimens were supported at an angle between 15° and 30° from vertical. Specimens were removed at test completion for observations and to be photographed.

**ASTM C67 - Efflorescence, Section 11**
The efflorescence evaluation exposure was conducted on all provided coated specimens in accordance with the procedures detailed in ASTM C67, Section 11. Prior to evaluation, all specimens were surface brushed to remove dust and easily disengaged residual mortar. The specimens were then dried and cooled as per ASTM C67, Section 5 prior to placement, on-edge in distilled water to a depth of 1 in. for a period of 7 days at standard laboratory conditions (23 ±2°C, 50 ±5% RH). Upon completion of the specified exposure period, the specimens were removed from their exposure baths and oven-dried at 110°C for 24 hours. The specimens were then visually evaluated against matching controls for evidence of efflorescence on any facing. In accordance with section 11.5, a result of "Effloresced" or "Not Effloresced" was reported for each specimen.

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## SECTION 7

**TEST SPECIMEN DESCRIPTIONS**

| AC212 SECTION | TEST PROCEDURE | NUMBER OF SPECIMENS | NOMINAL SPECIMEN DIMENSIONS | VISUAL CHARACTERISTICS |
|---|---|---|---|---|
| 4.1 | ASTM C297-Tensile Bond | 5 | 2" x 2" | CMU Block Coated with MMT-Sealer Water Resistant Barrier |
| 4.2 | ASTM E2485-Freeze-Thaw | 5 | 12" x 8" x 2" | |
| 4.3 | ASTM D2247-Water Resistance | 5 | 8" x 6" x 2" | |
| 4.4 | ASTM E96-Vapor Transmission | 4 | 4" diameter x 50 mil | Membrane of MMT-Sealer Water Resistant Barrier |
| 4.8 | Ultraviolet Light Exposure | 5 | 12" x 8" x 2" | CMU Block Coated with MMT-Sealer Water Resistant Barrier |
| 4.8.2 | Accelerated Aging | 5 | 4.8 specimens | |
| 4.8.3 | AATC-127-Hydrostatic Pressure | 5 | 4.8 specimens | |
| N/A | ASTM B117-Salt Fog Exposure | 3 matched pairs | 8" x 6" x 2" | CMU Block Coated with MMT-Sealer Water Resistant Barrier and Matching Uncoated Controls |
| N/A | ASTM C67 Efflorescence | 5 matched pairs | 4" x 4" x2" | Bricks Coated with MMT-Sealer Water Resistant Barrier and Matching Uncoated Controls |

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## SECTION 8
**TEST RESULTS**

**ICC-ES AC212 Section 4.8.3 - Tensile Bond Strength**

| SPECIMEN | AREA ($in^2$) | PEAK LOAD ($lb_f$) | TENSILE BOND STRENGTH (psi) | CORE FAILURE MODE (%) |
|---|---|---|---|---|
| 1 | 4.16 | 1,030 | 248 | 100% Cohesive Failure of Water Resistant Barrier and CMU Substrate |
| 2 | 4.28 | 949 | 222 | |
| 3 | 4.33 | 994 | 230 | |
| 4 | 4.20 | 1,080 | 255 | |
| 5 | 4.24 | 903 | 213 | |
| **Average** | **4.24** | **991** | **234** | |
| Std. Dev. | | 68.2 | 17.4 | |
| COV | | 6.88 | 7.44 | |

**ICC-ES AC212 Section 4.2- Freeze Thaw**

| SPECIMEN | DURATION (cycles) | OBSERVATIONS |
|---|---|---|
| **1** | 10 | No delamination or surfaces changes when viewed under 5x magnification |
| **2** | | |
| **3** | | |
| **4** | | |
| **5** | | |

**ICC-ES AC212 Section 4.3 - Water Resistance**

| SPECIMEN | DURATION (days) | OBSERVATIONS |
|---|---|---|
| **1** | 14 | No deleterious effects such as cracking or crazing |
| **2** | | |
| **3** | | |

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**ICC-ES AC212 Section 4.4 - Water Vapor Transmission**

| SPECIMEN | AVERAGE TEMP. °C (°F) | AVERAGE RELATIVE HUMIDITY (%) | PERMEANCE | | WATER VAPOR TRANSMISSION | |
|---|---|---|---|---|---|---|
| | | | ng/(Pa·s·m²) | perms | g/(h·m²) | g/(24hr·m²) |
| 1 | 23.0 (73.4) | 50.0 | 60.0 | 1.049 | 0.3488 | 8.3712 |
| 2 | 23.0 (73.4) | 50.0 | 54.6 | 0.955 | 0.3215 | 7.7160 |
| 3 | 23.0 (73.4) | 50.0 | 96.4 | 1.686 | 0.5325 | 12.7800 |
| **Average** | | | **70.3** | **1.230** | **0.4009** | **9.6224** |

**ICC-ES AC212 Section 4.8.1 - Ultraviolet Light Exposure**

| SPECIMEN | DURATION (days) | OBSERVATIONS |
|---|---|---|
| **1** | 21 | No cracking of the coating or bond failure between the WRB and substrate |
| **2** | | |
| **3** | | |
| **4** | | |
| **5** | | |

**ICC-ES AC212 Section 4.8.2 - Accelerated Aging**

| SPECIMEN | DURATION (cycles) | OBSERVATIONS |
|---|---|---|
| **1** | 25 | No cracking of the coating or bond failure between the WRB and substrate |
| **2** | | |
| **3** | | |
| **4** | | |
| **5** | | |

**ICC-ES AC212 Section 4.8.3 / AATCC 127 - Hydrostatic Pressure**

| SPECIMEN | HYDROSTATIC PRESSURE (cm) | DURATION (hours) | OBSERVATIONS |
|---|---|---|---|
| **1** | 55 | 5 | No leakage through the coating or bond failure between the WRB and substrate |
| **2** | | | |
| **3** | | | |
| **4** | | | |
| **5** | | | |

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**ASTM B117 - Salt Fog Exposure**

| SPECIMEN | OBSERVATIONS |
|---|---|
| MMT Sealer Coated Specimens | No deleterious effects, cracking or crazing |
| Uncoated Specimens | No deleterious effects, cracking or crazing |

**ASTM C67 - Efflorescence, Section 11**

| SPECIMEN | OBSERVATIONS |
|---|---|
| Coated Specimens | Not Effloresced |
| Coated Controls | Not Effloresced |
| Uncoated Specimens | Efflorescence was observed at the 1-inch line of immersion and along the side of specimen 2 that had a void in Brick Formation aiding the progression of efflorescence |
| Uncoated Controls | Not Effloresced |

## SECTION 9
## CONCLUSION

The MMT Sealer Water Resistant Barrier met the specified performance requirements found in ASTM E2570.

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## SECTION 10
## PHOTOGRAPHS

**Photo No. 1**
**ASTM C297-Tensile Bond Test Setup (Typical)**

**Photo No. 2**
**ASTM C297-Tensile Bond Test Failure Detail (Typical)**

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**Photo No. 3**
**ASTM E2485-Freeze-Thaw Specimen Control (Left);**
**Post Test Specimen Detail (Right)**


**Photo No. 4**
**ASTM D2247-Water Resistance Specimen Control (Left);**
**Post Test Specimen Detail (Right)**

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**Photo No. 5**
**ASTM E96-Vapor Transmission Test Specimens**

**Photo No. 6**
**ASTM E96-Vapor Transmission Test Specimens Daily Weighing**

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**Photo No. 7**
**AATC-127-Hydrostatic Pressure Test Setup Detail (Typical)**

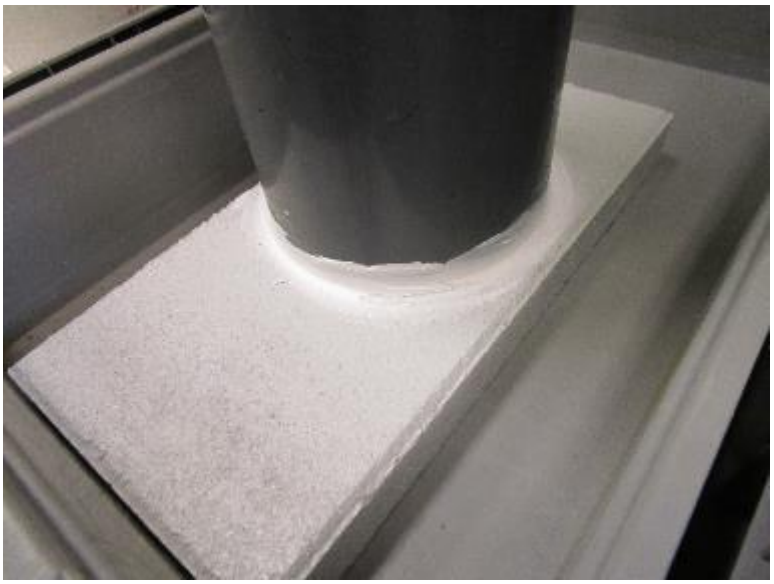

**Photo No. 8**
**AATC-127-Hydrostatic Pressure Post Test 5-Hour No Leakage Detail (Typical)**

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**Photo No. 9**
**ASTM B117-300-Hours of Salt Fog Exposure;**
**Specimen Control (Left); Post Test Specimen Detail (Right)**

**Photo No. 10**
**ASTM C67 Efflorescence Test Setup Detail (Typical)**

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**Photo No. 11**
**ASTM C67 Efflorescence Test Specimens Detail (Typical)**

**Photo No. 12**
**ASTM C67 Efflorescence Test Specimen Controls Detail (Typical)**

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## SECTION 11
## REVISION LOG

| REVISION # | DATE | PAGES | REVISION |
|---|---|---|---|
| 0 | 04/14/20 | N/A | Original Report Issue |