



**PRODUCT PERFORMANCE TESTING LABORATORY**

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June 5, 2017

MS International, Inc.  
Attn: Morgan Huang  
2095 N. Batavia St.,  
Orange, CA 92865

Dear Mr. Huang,

Tile Council of North America has tested the samples you submitted. Test report TCNA-0490-17 is enclosed. If you have any questions or concerns, please contact us.

Best Regards,

TILE COUNCIL OF NORTH AMERICA, INC.

Nicole Spandley  
Laboratory Engineer  
Enclosures

**TCNA TEST REPORT NUMBER:** TCNA-0490-17 **PAGE:** 1 OF 4

**TEST REQUESTED BY:** MS International, Inc.

**TEST METHOD:** ASTM C373-16: “Standard Test Methods for Determination of Water Absorption and Associated Properties by Vacuum Method for Pressed Ceramic Tiles and Glass Tiles and Boil Method for Extruded Ceramic tiles and Non-tile Fired Ceramic Whiteware Products”

Informal Test Method Description: This test method covers procedures for determining water absorption, bulk density, apparent porosity, and apparent specific gravity of non-tile fired unglazed whiteware products, glazed or unglazed ceramic tiles, and glass tiles. The water absorption, reported here, is expressed as a percent, the relationship of the mass of water absorbed to the mass of the dry specimen.

This summary is provided for the reader’s convenience and is not a complete description of the method. See ASTM C373 for all method details and information.

**TEST SUBJECT MATERIAL:** Identified by client as: “**Kenzzi Collection (EQC)**”  
 Approximate Size as Received: 8" x 8"

**TEST DATE:** 6/1/2017

**TEST PROCEDURE NOTES:**

- Sample prep: Five (5) tiles were cut according to section 4.2 of ASTM C373-16.
- Samples were dried to a constant mass at a temperature of 150°C and cooled to room temperature in a desiccating unit.
- Samples were subjected to vacuum of 91 ± 5 kPa for 30 minutes. While maintaining the vacuum, water was added to the tank to fully submerge the specimens. The vacuum was then released and the pressure vessel was allowed to return to atmospheric pressure. Once at atmospheric pressure the test specimens were allowed to soak for 15 minutes.
- Saturated mass of the samples was measured after the 15 minute soak period.
- Water absorption is calculated by using the following formula:  $(M - D)/D \times 100$  Where;  $D$  is the constant dry mass;  $M$  is the saturated mass

**TEST RESULTS:**

	Water Absorption (%)
Sample 1	2.8 %
Sample 2	2.7 %
Sample 3	2.8 %
Sample 4	2.8 %
Sample 5	2.6 %
<b>Average</b>	<b>2.7 %</b>

**COMMENTS:** None





**TCNA TEST REPORT NUMBER:** TCNA-0490-17 **PAGE:** 2 OF 4

**TEST REQUESTED BY:** MS International, Inc.

**TEST SUBJECT MATERIAL:** Identified by client as: “Kenzzi Collection (EQC)”

**TEST METHOD:** ASTM C373-14a: “Standard Test Method for Water Absorption, Bulk Density, Apparent Porosity, and Apparent Specific Gravity of Fired Whiteware Products”

**TILE CLASSIFICATION\*:**

Class	Requirement
Impervious	Water absorption less than or equal to 0.5%
Vitreous	Water absorption more than 0.5 % and less than or equal to 3.0%
Semi-vitreous	Water absorption more than 3.0 % and less than or equal to 7.0%
Non-vitreous	Water absorption more than 7.0 % and less than or equal to 20.0%

**ANSI SPECIFICATIONS\*:**

ANSI standard	Tile Type	Specification
ANSI A 137.1 (Ceramic Tile)	Mosaic Tile	Shall be impervious (porcelain), vitreous, semi-vitreous, or non-vitreous depending on the class.
ANSI A 137.1 (Ceramic Tile)	Quarry Tile	Shall be classified as impervious (porcelain), vitreous, or semi-vitreous with the water absorption not exceeding 5.0 percent
ANSI A 137.1 (Ceramic Tile)	Pressed Floor Tile	Shall be classified as vitreous, semi-vitreous, or non-vitreous
ANSI A 137.1 (Ceramic Tile)	Porcelain Tile	Shall be impervious
ANSI A 137.1 (Ceramic Tile)	Glazed Wall Tile	Shall be classified as non-vitreous
ANSI A 137.2 (Glass Tile)	All Glass Tile	Shall be impervious

*\*For more detailed information, refer to ANSI A137.1 Specifications for Ceramic Tile and ANSI A137.2 Specifications for Glass Tile*



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**IMAGE OF PRODUCT TESTED:**



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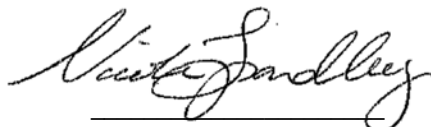


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A handwritten signature in black ink, appearing to read 'Nicole Spandley', followed by the date '6/5/2017'.

Nicole Spandley  
Laboratory Engineer



**TCNA TEST REPORT NUMBER:** TCNA-0490-17 **PAGE:** 1 OF 3

**TEST REQUESTED BY:** MS International, Inc.

**TEST METHOD:** ANSI A137.1-2012 Section 9.6.2: “Dry Dynamic Coefficient of Friction (DCOF)”

Informal Test Method Description: This test method covers the measurement of dynamic coefficient of friction of ceramic tile or other surfaces under the dry condition using the BOT 3000 device.

This summary is provided for the reader’s convenience and is not a complete description of the method. See ANSI A137.1 Section 9.6.2 for all method details and information.

**TEST SUBJECT MATERIAL:** Identified by client as: “**Kenzzi Collection (EQC)**”  
 Approximate Size as Received: 8" x 8"

**TEST DATE:** 6/1/2017

**TEST PROCEDURE NOTES:**

- Sample Prep: None
- The tiles were cleaned with Renovator #120 prior to testing.
- Three (3) pieces of tile were tested in all four directions with 8" long measurements.
- The SBR sensor was verified using a standard tile prior to testing. The DCOF measurement on the standard tile was 0.31, within the required range.
- Testing was performed under dry conditions
- Testing was conducted under laboratory conditions at approximately 70°F and 50% relative humidity using a calibrated BOT 3000 device (calibration due: 10/3/2017).
- After testing the SBR sensor was verified again according to the procedure. The DCOF measurement on the standard tile after testing was 0.32, within the required range.

**TEST RESULTS:**

The individual and average DCOF data for each tile were as follows:

Direction	Tile 1	Tile 2	Tile 3
Direction 1	0.54	0.61	0.54
Direction 2	0.58	0.64	0.60
Direction 3	0.60	0.64	0.62
Direction 4	0.63	0.65	0.61
<b>Average</b>	0.59	0.64	0.59

**COMMENTS:** None



TCNA TEST REPORT NUMBER: TCNA-0490-17 PAGE: 2 OF 3

TEST REQUESTED BY: MS International, Inc.

TEST SUBJECT MATERIAL: Identified by client as: “Kenzzi Collection (EQC)”

TEST METHOD: ANSI A137.1-2012 Section 9.6.2: “Dry Dynamic Coefficient of Friction (DCOF)”

APPENDIX: Image of product tested



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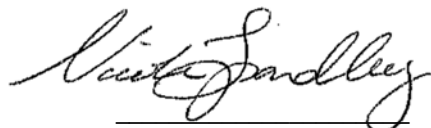
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 6/5/2017

Nicole Spandley  
Laboratory Engineer

