



Home Innovation
RESEARCH LABS™

Durability Testing for Six3Tile

Prepared on September 8, 2023 for

Six3Tile – An Aleris Company
119 Grace Avenue
Lancaster, SC 29720

Home Innovation Research Labs is accredited by A2LA in accordance with ISO 17020, 17025, and 17065. The test methods within this report are included in the scope of accreditation. Results apply only to the samples tested. This report shall not be used to claim product endorsement by Home Innovation Research Labs or A2LA. This report may be distributed in its entirety, but excerpted portions shall not be distributed without prior written approval of Home Innovation Research Labs.



Contents

Background.....	2
Test Specimens.....	2
Test Methodology	2
Results.....	6
Equipment Used.....	12

Background

Six3Tile requested durability testing on Six3Tile Backsplash Pro Kit and Six3Tile Shower Surround Pro Kit to determine its durability as compared to its respective minimum/maximum code requirements, as well as in comparison to traditional ceramic tile. An agreement to perform testing was entered into on April 6, 2023, between Six3Tile and Home Innovation Research Labs, Inc.

Test Specimens

Six3Tile Shower Surround Pro Kit and Six3Tile Backsplash Pro Kit specimens were submitted directly to Home Innovation by the client. Specimens were designated for specific tasks per the different standards. The specimens were not independently or randomly selected for testing. Specimens were received at Home Innovation on May 15, 2023 and were assessed for tampering and shipping damage prior to releasing for testing.

Figure 1. Six3Tile Shower Surround Pro Kit



Figure 2. Six3Tile Backsplash Pro Kit



Test Methodology

Testing was conducted, observed, and documented by Home Innovation staff. Testing was divided into six different tasks:

Task 1: Stain Resistance.

Testing was conducted in accordance with CSA B45.5:22 / IAPMO Z124-2022 "Plastic Plumbing Fixtures" Section 5.11 Stain Resistance Test using black crayon, black liquid shoe polish, blue washable ink, lipstick, hair dye, iodine solution, gentian violet, beet juice, grape juice, and liquid from wet tea bag. Testing was conducted on Ceramic Tile, Six3Tile Backsplash, and Six3Tile Shower Surround.

Ratings for removal of the stains listed in the referenced standard are as follows:

The maximum stain resistance rating was the sum of the individual stain ratings for each of the covered and uncovered stain areas and shall not exceed 50, except for sinks, where it shall not exceed 64. The maximum allowable thickness of material removed to eliminate a stain shall be 0.127 mm (0.005 in).

The stain resistance test was conducted as follows:

- (a) The specimen(s) were conditioned by wet rubbing them with an abrasive powder consisting of 60 g (2.1 oz) of trisodium phosphate and 2700 g (95.2 oz) of 160 mesh pottery flint or ground quartz and cheesecloth for at least 20 cycles.

(b) Two drops of each of the following liquid reagents and a similar amount of the solid reagents were applied to the test specimen(s):

- (i) black crayon;
- (ii) black liquid shoe polish;
- (iii) blue washable ink;
- (iv) lipstick of contrasting color;
- (v) hair dye of contrasting color;
- (vi) iodine solution (1% alcohol solution); and
- (vii) gentian violet solution (2% aqueous solution).
- (viii) beet juice;
- (ix) grape juice; and
- (x) liquid from a wet tea bag.

(c) Leave one of the two reagent drops specified in Items (b) uncovered and cover the other drop with a watch glass to prevent evaporation and to ensure contact with the specimen(s).

(d) Allow the specimen(s) to remain for 16 h at a temperature of 23 ± 2 °C (73 ± 4 °F) and a relative humidity of $50 \pm 5\%$.

(e) Remove the excess reagents by blotting lightly with a paper towel.

Rating System for the Stain Results:

Rating of 1: Non staining – Stains that have been washed with water and cheesecloth or a soft bristle brush for 20 scrub cycles using normal hand pressure, and dried by blotting.

Rating of 2: Removable by alcohol – Stains present after initial washing with water shall be washed with alcohol (commercial rubbing alcohol) or naphtha (lighter fluid) using cheesecloth or a soft bristle brush for 20 scrub cycles with normal hand pressure. The specimen(s) shall then be washed with water and dried by blotting.

Rating of 3: Removable by first application of household scouring powder – Stains present after the cleanings specified for Rating of 1 and 2 shall be scrubbed for 20 cycles using 160 mesh pottery flint only. The specimen(s) shall then be washed with water and dried by blotting. Reduction of gloss due to scrubbing shall not constitute staining.

Rating of 4: Removable by two abrasive powder scrubbing – Stains present after the cleanings specified for Rating of 1, 2 and 3 shall be scrubbed for 40 cycles using 160 mesh pottery flint only. The specimen(s) shall then be washed with water and dried by blotting. Reduction of gloss due to scrubbing shall not constitute staining.

Rating of 5: Removable by 400 grit sandpaper – Stains present after the cleanings specified for Rating of 1, 2 and 3 shall be scrubbed lightly with 400 grit sandpaper until the stain is removed and depth of the stained area shall be measured to the nearest 0.001 in.

Task 2: Accelerated Weathering / Colorfastness Test.

Testing was conducted in accordance with ASTM G155-21 “Standard Practice for Operating Xenon Arc Lamp Apparatus for Exposure of Materials,” exposure cycle 1 from Table X3.1 for 1,000 hours. Test specimens were visually examined at intervals of 336 hours. Testing was conducted on Ceramic Tile, Six3Tile Backsplash, and Six3Tile Shower Surround.

The conditions for the colourfastness test are as follows:

- (a) The black panel temperature shall be maintained at 63 ± 5 °C (145 ± 9 °F).
- (b) Humidity need not be controlled.
- (c) The irradiance of the xenon arc lightbulb shall be maintained at 0.35 ± 0.02 W/m² at 340 nm for the duration of the test.
- (d) The light filters surrounding the xenon arc lightbulb shall be borosilicate glass.

Color readings are taken on the test sample before and after accelerated aging with the reading instrument set to read at an illumination of D65, a CIE 10° observer with the specular component excluded, and using the CIELAB colour scale. The location

on the sample where the readings are taken, as well as the orientation of the sample in relation to the reading instrument, is noted. A minimum of three delta E readings shall be taken and averaged.

Samples were examined for cracking, crazing, blistering or spalling, or delamination. The average color difference of the test sample before and after exposure shall not exceed 2 ΔE units, to meet the requirements of the standard.

Task 3: Hot and Cold Cycling.

Testing was conducted in accordance with modified ANSI/KCMA A161.1-2022 “Performance and Construction Standard for Kitchen and Vanity Cabinets” Section 9.3 Hot and Cold Check Resistance for a total of ten cycle. The exposure setpoints and number of cycles were beyond the standard procedure. The exposure cycle is as follows: One cycle follows: 150°F ± 5°F and 70% ± 5% humidity for 1 hour. Remove for 0.5 hour and allow test specimen to reach ambient temperature and humidity. - 5°F ± 5°F for 1 hour. Remove and allow test specimen to reach ambient temperature and humidity. Repeat for ten cycles. Samples were examined for cracking, crazing, blistering or spalling, or delamination.

Testing was conducted on Ceramic Tile, Six3Tile Backsplash, and Six3Tile Shower Surround. The test specimens were installed on drywall with Loctite Power Grab Heavy Duty Construction. The specimen has adhesive applied and grouted as a finished application. The ceramic tiles were installed by a professional tiling company – Antonio Flooring LLC. Home Innovation staff installed the Six3Tile products.

NOTE TO READER: These samples DID NOT have PVC cement installed on the tongue of the tongue and groove of the Six3Tile Shower and Tub Pro Kits. This testing was conducted to verify Six3Tile could accomplish the watertight seal without this additional installation step. The results are documented in the results portion of this report.

Task 4: Water Resistance.

Testing was conducted in accordance with ASTM D2247-15(2020) “Standard Practice for Testing Water Resistance of Coatings in 100 % Relative Humidity.” Test specimens were exposed to 100°F ± 5°F at 100% relative humidity (RH) for 1,344 hours, or until effects from exposure to water were observed. Specimens were visually examined at intervals of 336 hours for deleterious effects such as any discoloration, cracking, checking, crazing, erosion, delamination or other distress that might affect performance.

Testing was conducted on Ceramic Tile, Six3Tile Backsplash, and Six3Tile Shower Surround. The test specimens were installed on drywall with Loctite Power Grab Heavy Duty Construction. The specimen has adhesive applied and grouted as a finished application. The ceramic tiles were installed by a professional tiling company – Antonio Flooring LLC. Home Innovation staff installed the Six3Tile products.

NOTE TO READER: These samples DID NOT have PVC cement installed on the tongue of the tongue and groove of the Six3Tile Shower and Tub Pro Kits. This testing was conducted to verify Six3Tile could accomplish the watertight seal without this additional installation step. The results are documented in the results portion of this report.

Task 5: Continuous Water Spray.

Conduct testing in accordance with CSA B45.5:22 / IAPMO Z124-2022 “Plastic Plumbing Fixtures” Section 5.18 Field-Installed Tiling-Flange Seal Test. Test setup was modified to accommodate the Client’s objectives.

The tiling flange seal test shall be conducted as follows – apply a continuous water spray to the flange seal at the joint with the fixture as follows:

- (i) using a 30° full jet spray nozzle; (ii) for 30 min;
- (ii) from a distance of 1.2 m (4 ft) from the face of the spray nozzle;
- (iii) at an angle of 45°;
- (iv) at a flow rate of 11.4 L/min (3.0 gpm); and
- (v) at a temperature of 40 ± 5 °C (104 ± 9 °F).

The criteria for passing the test was determined on if there was water leakage through the joints.

Testing was conducted on Ceramic Tile and Six3Tile Shower Surround. The test specimens were installed on drywall with Home Innovation Research Labs

Loctite Power Grab Heavy Duty Construction. The specimen has adhesive applied and grouted as a finished application. The ceramic tiles were installed by a professional tiling company – Antonio Flooring LLC. Home Innovation staff installed the Six3Tile products.

NOTE TO READER: These samples DID NOT have PVC cement installed on the tongue of the tongue and groove of the Six3Tile Shower and Tub Pro Kits. This testing was conducted to verify Six3Tile could accomplish the watertight seal without this additional installation step. The results are documented in the results portion of this report.

Results

Task 1: Stain Resistance Test

The maximum stain resistance rating was the sum of the individual stain ratings for each of the covered and uncovered stain areas was less than 50 for all three materials – Ceramic Tile, Six3Tile Backsplash and Six3Tile Shower Surround. Table 2 – Table 4 shows the individual stain rating for each of the materials.

Table 2. Ceramic Tile – Stain Rating

Ceramic Tile – Stain Rating		
REAGENT	COVERED	UN-COVERED
1. Black Crayon	1	1
2. Black Liquid Shoe Polish	1	1
3. Blue Washable Ink	1	1
4. Lipstick	1	1
5. Hair Dye	1	1
6. Iodine Solution	1	1
7. Gentian Violet Solution	3	3
8. Beet (sinks only)	1	1
9. Grape (sinks only)	1	1
10. Tea Bags (sinks only)	1	1
TOTALS	12	12
Thickness of material lost = 0	Stain resistance rating = 24	
PASS		

Table 3. Six3Tile Backsplash– Stain Rating

Six3Tile Backsplash– Stain Rating		
REAGENT	COVERED	UN-COVERED
1. Black Crayon	1	1
2. Black Liquid Shoe Polish	1	1
3. Blue Washable Ink	1	1
4. Lipstick	1	1
5. Hair Dye	5	5
6. Iodine Solution	3	3
7. Gentian Violet Solution	2	2
8. Beet (sinks only)	1	1
9. Grape (sinks only)	1	1
10. Tea Bags (sinks only)	1	1
TOTALS	17	17
Thickness of material lost = 0.003	Stain resistance rating = 34	
PASS		

Table 4. Six3Tile Shower Surround – Stain Rating

Six3Tile Shower Surround – Stain Rating		
REAGENT	COVERED	UN-COVERED
1. Black Crayon	1	1
2. Black Liquid Shoe Polish	1	1
3. Blue Washable Ink	3	3
4. Lipstick	1	1
5. Hair Dye	5	5
6. Iodine Solution	3	4
7. Gentian Violet Solution	3	3
8. Beet (sinks only)	N/A	N/A
9. Grape (sinks only)	N/A	N/A
10. Tea Bags (sinks only)	N/A	N/A
TOTALS	17	18
Thickness of material lost = 0.0005	Stain resistance rating = 35	
PASS		

Task 2: Accelerated Weathering / Colorfastness Test

The test sample showed no significant change in color or surface texture after every 336 hours of exposure to a xenon arc-type light-exposure apparatus in accordance with CSA B45.5-17 / IAPMO Z124 - 5.10.2 and 5.10.3. Measured color difference was not more than 2 ΔE units of the test sample before and after exposure. Samples for all three materials (Ceramic Tile, Six3Tile Backsplash and Six3Tile Shower Surround) showed none of the following defects: cracking, crazing, blistering or spalling, or delamination.

Table 5 summarizes the color difference before and after exposure for each of the materials.

Table 5. Summary of Accelerated Weathering / Colorfastness Test Results

Hours	Ceramic Tile	Six3Tile Backsplash	Six3Tile Shower Surround
336 hours	0.25	0.19	0.79
772 hours	0.35	0.45	0.45
1000 hours	0.45	0.12	0.39
RESULTS	PASS	PASS	PASS

Task 3: Hot and Cold Cycling

Ceramic Tile, Six3Tile Backsplash and Six3Tile Shower Surround test samples showed none of the following defects as shown in Table 6.

Table 6. Summary for modified ANSI/KCMA A161.1-2022 Section 9.3 Hot and Cold Check Resistance Test

Observations	Ceramic Tile	Six3Tile Backsplash	Six3Tile Shower Surround
Discoloration	None	None	None
Blistering	None	None	None
Cracking	None	None	None
Delamination	None	None	None
Crazing	None	None	None
Other Defects	None	None	None
RESULTS	PASS	PASS	PASS

Figure 4. Ceramic Tile, Six3Tile Backsplash and Six3Tile Shower Surround Samples in Environmental Chamber



Task 4: Water Resistance

Testing was conducted in accordance with ASTM D2247-15(2020) “Standard Practice for Testing Water Resistance of Coatings in 100 % Relative Humidity.” Test specimens were exposed to 100°F ± 5°F at 100% relative humidity (RH) for 1,344 hours. Specimens were visually examined at intervals every 336 hours for deleterious effects such as any discoloration, cracking, checking, crazing, erosion, delamination or other distress that might affect performance. The only damage noted was on the drywall due to water absorption. The drywall damage was evident on drywall installed with all three types of material.

Table 7. Water Resistance Observation Summary

Defects every X hours	Ceramic Tile	Six3Tile Backsplash	Six3Tile Shower Surround
336 hours	No Defects	No Defects	No Defects
772 hours	No Defects	No Defects	No Defects
1000 hours	No Defects	No Defects	No Defects
1344 hours	No Defects	No Defects	No Defects
FINAL RESULT	PASS	PASS	PASS

Figure 4. Ceramic Tile, Six3Tile Backsplash and Six3Tile Shower Surround Samples in Salt Fog Machine



Figure 5. Six3Tile Shower Surround samples - Post 1,344-hour Water Resistance exposure



Figure 6. Six3Tile Backsplash Samples - Post 1,344-hour Water Resistance exposure



Figure 7. Ceramic Tile Samples - Post 1,344-hour Water Resistance exposure



Task 5: Continuous Water Spray

No water leakage through the flanges and fixture joint for either Ceramic Tile assembly or the Six 3Tile Shower Surround.

Table 8. Continuous Water Spray Result Summary

	Ceramic Tile	Six3Tile Shower Surround
Observation	No water leakage	No water leakage

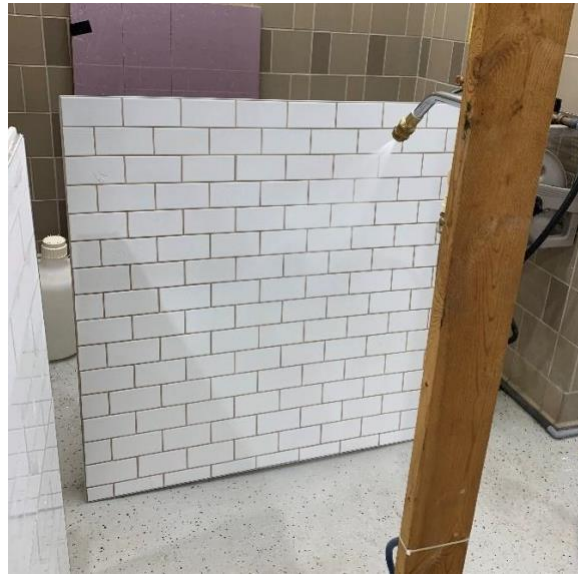
Figure 8. Water Spray Apparatus



Figure 9. Six3Tile Shower Surround sample undergoing Water Spray Testing



Figure 10. Ceramic Tile sample undergoing Water Spray Testing



Equipment Used

Description	Manuf / Model	Serial #	Calibration Due
Tape Measure	Milwaukee 25 ft	FL-TapeMeasure_25ft-1	Jul-2032
Tape Measure	Milwaukee 25 ft	TM-10	Sept-2028
Salt Fog	Ascott S1000ip	3279	Sept-2023
Dial Indicator, 0-1 in.	Fowler	HIRL45104	Mar-2024
Environmental Chamber	TH-27-3	000124	Sept-2023
Xenon Chamber	2000-Ci-3000+	000261	Jan-2024
Scale, 0-75 lb	Avery Weight-Tronix	265	May-2024
Abrasion Tester	TQC Sheen – AB6000	AB0001	Feb-2027
Volume meter	T-10	3026	Nov-2023

Prepared By

Nay Shah, P.E.
Laboratory Test Engineers

Revision No.	Date	Summary
0	8/16/23	Original Report Issued
1	9/8/23	Corrected product names