

June 1st 2014

In light of the recent position statement made by the labor community concerning the use of only 5.5 mm or greater thickness thin porcelain tile panels for floor use (http://www.tileletter.com/2014/05/thin_porcelain_tile/), Crossville Inc. has decided to release some of its own third-party proprietary testing. While we can claim no participation in the creation of this statement, we do fully endorse its position. We hope that this release of our testing serves two purposes. First, this testing provides further support to the validity of the labor community statement. Second, the testing shows that, at least for Crossville's own 5.6 mm Laminam floor panels, our recommendations for area of use and installation methodology have been arrived at with thoughtful consideration and are fully supported by third party testing.

The testing provided shows results that exceed the application areas we recommend. While the Robinson Floor test results show "Extra Heavy" ratings, we do not advocate the use of the Laminam 5.6mm for the applications covered by this category. It has always been our policy to recommend usage levels lower than testing indicates is possible. In doing so, our customers can feel very comfortable in the use of our products in the application areas we recommend. Please refer to the Laminam Technical Manual/Guidelines for appropriate use of the Laminam by Crossville.

<http://crossvilleinc.com/wordpress/wp-content/uploads/2014/10/LIT-LAMII-15.pdf>

We have added this information to the technical area of our Laminam by Crossville website. Providing documentation allows both the specifier and installer of this material to use our Laminam thin porcelain tile panels with the confidence that, if our installation procedures are followed, Laminam will perform as desired when used for the applications we indicate as appropriate. We continue to test our material to find new areas of use and applications, and we will continue to publish the results to allow the end users to proceed with confidence.

Testing available at the following link: <http://crossvilleinc.com/wordpress/wp-content/uploads/2015/01/Laminam-Testing-Data.pdf>

Best regards,

Noah Chitty
Director of Technical Services
Crossville Inc.



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100 Jemson Research Blvd.

TCNA TEST REPORT NUMBER:

PRODUCT TESTING SERVICE

Anderson, SC 29625

Tel 864 646-TILE

Fax 864 646w2821

TCNA-292-13

PAGE: 10F1

TEST REQUESTED BY:

Crossville, Inc.
Attn: Noah Chitty
434 Crossroads Drive
Crossville, TN 38555

TEST SUBJECT MATERIAL:

Identified by client as: "Oxide Nero,,

TEST DATE:

6/18/2013

TEST PROCEDURE:

MOBs Scratch Hardness
-Three whole tiles were tested.
-The tiles were tested using a Deluxe Hardness Pick Set from Mineralab, LLC. The following minerals are used as standard:

- 1 - Talc
- 2 - Gypsum
- 3 - Calcite
- 4 - Fluorite
- 5 - Apatite
- 6 - Feldspar
- 7 - Quartz
- 8 - Topaz
- 9 - Corundum
- 10 - Diamond

TEST RESULTS:

The Mohs Scratch Hardness was determined to be: *1*

Katelyn Simpson
Laboratory Manager

6/24/2013



Bologna, 29/05/09

Test report Nr" 5351109

Requested by:	LAMINAM S.p.A. - Via Ghiarola Nuova, 258-41042 FIORANO MODENESE (MO)
On (date):	15/05/09
For the sample marked:	Samples 50x50 em cutted from multilayer slabs (ceramic slab, resin and fibre glass) 100x300 em marked LAM'Sn.

ASTM C 373-88 (2006): Water absorption

Water absorption(%) of each individual tile:

Test specimens	1	2	3	4	5
W.A. (%)	0,09	0,08	0,09	0,08	0,09

A- Average water absorption (%): 0,09

Prof. Eng. Giorgio Amelina
- Director



The results reported relate only to the sample tested. No responsibility is taken for the accuracy of the sampling unless it is done under our own supervision. The reproduction of this test report is only authorized in the form of a complete photographic facsimile. Our written approval is necessary for any partial reproduction. This test report consists of 1 pages, this cover included.



Centro Ricerca e Sperimentazione per l'Industria Ceramica
C.P.R. 1 - 1 m.n. 806
(G.U. 2D-12-1&78 r. S53)

Laboratorio autorizzato dal Ministero della Sanità
per il rilevamento di inquinamenti atmosferici.
Decreto MINISTERO SANITA 1D-8-1974
(G.U. 14-11-1174 n. 240)

Laboratorio Istituzionale del "Laboratori e Istituti Pubblici e Privati" - Ministero della Sanità
Decreto MINISTERO AICERCA SCIENTIFICA 6-6-1989
(G.U. & 7-1983 n. 188)

Membro ASTM
American Society for Testing and Materials

Requested by: LAMINAM S.p.A.- Via Ghiarola Nuova, 258-41042 FIORANO MODENESE (MO)
On (date): 15/05/09
For the sample marked: Samples 50x50 em cutted from multilayer slabs (ceramic slab, resin and fibre glass) 100x300 em marked "LAM'S".

ASTM C 482-02 • Bond strength of ceramic tile to portland cement

This method covers the determination of the ability of ceramic tiles to be bonded to portland cement under controlled conditions.

Specimen	Bond Strength (psi)	Location of failure (*)
1	220	100% D
2	208	70%C-30%D
3	214	70%C-30%D
4	212	80% C-20% D
5	216	100% D

Average Bond Strength (psi) 214

Note(*):

- A= failure in the tile itself;
- B = failure between tile and bond coat;
- C = failure in the bond coat itself
- D =failure between bond coat and mortar setting bed;
- E = failure in the setting bed itself.

Requirements (ANSI 137.1-1988)

Average Bond Strength: 50 psi

Prof. Eng. *Giorgio Tinelli*
Director



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Centro Ceramico Bologna
Centro di ricerca e sperimentazione per l'industria ceramica.
C.P.R. 10.4-1978 n. SOB
(G.U.20.12-1978 n.353)

La sede è in via...
Sede: Via...
Decreto MINISTERO SANITA 10-8-1974
(G.U. 14-V-1874 n. 240)

Iscritto nell'Albo dei Laboratori Esperimentali Pubblici o Privati...
C/O Centro MINISTERO RICECA SCIENTIFICA
6-6-1983
(G.U.6-7-1983 n. 183)

Membro ASTM

American Society for Testing and Materials.

Requested by:	LAMINAM S.p.A. - Via Ghiarola Nuova, 258-41042 FIORANO MODENESE (MO)
On (date):	15/05/09
For the sample marked:	Samples 50x50 em cutted from multilayer slabs (ceramic slab, resin and fibre glass) 100x300 em marked MLAM'S".

ASTM C 650-2004 • Resistance of ceramic tile to chemicals substances

- TEST SPECIMENS
Preparation: by cutting
Number of test specimens for each test solution:
- TEST SOLUTIONS
For the concentrations of the test solution, refer to Item 1.2 of the standard
- CONDITIONS OF THE SOLUTION APPLICATION:
Temperature (°C): 20±2
Length of exposure (h): 24

RESULTS:

Pencil test: applicable **[U]** not applicable **[D]**

Chemical:	Test solution	Visual test	Pencil test	N° of specimens affected
Common Household and Cleaning	Acetic acid 3 % (V/V)	Not affected	Not affected	0
	Acetic acid 10 % (V/V)	Not affected	Not affected	0
	Ammonium chloride 100 g/l	Not affected	Not affected	0
	Citric acid 30 g/l	Not affected	Not affected	0
	Citric acid 100 g/l	Not affected	Not affected	0
	Lactic acid 5 % (V/V)	Not affected	Not affected	0
	Phosphoric acid 3 % (V/V)	Not affected	Not affected	0
	Phosphoric acid 10 % (V/V)	Not affected	Not affected	0
	Sulfamic acid 30 g/l	Not affected	Not affected	0
	Sulfamic acid 100 g/l	Not affected	Not affected	0
Swimming Pool Acids:	Sodium hypochlorite 20 mg/l	Not affected	Not affected	0
Acids:	Hydrochloric acid 3 % (V/V)	Not affected	Not affected	0
	Hydrochloric acid 18 % (V/V)	Not affected	Not affected	0
Bases:	Potassium hydroxide 30 g/l	Not affected	Not affected	0
	Hydrochloric acid 100 g/l	Not affected	Not affected	0

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Centro di ricerca e sperimentazione per
l'industria ceramica.
C.P.R. 111-4-1978 n. 806
(G.U. 20-12-1978 n. 353)

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DacraloMINISTEAO RICERCA SCIENTIFICA 6-6-1983
(G.U. 6-7-1983 n. 183)

Membro ASTM
American Society for
Testing and Materials

Requested by:	LAMINAM S.p.A. - Via Ghiarola Nuova, 258-41042 FIORANO MODENESE (MO)
On (date):	15/05/09
For the sample marked:	Samples 50x50 em cutted from multilayer slabs (ceramic slab, resin and fibre glass) 100x300 em marked "LAM'S".

ASTM C 1378-2004- Determination of resistance to staining

- **TEST SPECIMENS:**
Preparation: by cutting
Number of test specimens for each test solution:
- **TEST SOLUTIONS:**
For the concentrations of the test solution, refer to Item 2 of the standard
- **CONDITIONS OF THE SOLUTION APPLICATION:**
Temperature (°C): 20±2
length of exposure (h): 24

STAINING AGENT	Visual test (affected/not affected)	Number of specimens affected
Contrasting grout	Not affected	0
Carbon lamp black	Not affected	0
Waterproof ink black	Not affected	0
Washable ink	Not affected	0
Potassium permanganate 1%	Not affected	0
Methylene blue 1%	Not affected	0

Prof. Eng. **Giorgio Binellini**
Director
CENTRO CERAMICO BOLOGNA
Ricerca e sperimentazione per l'industria Ceramica

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Consorzio UniCer per la gestione del Centro di ricerca e sperimentazione per l'industria Ceramica.
D.P.A. 10041/1878 n. 006
(G.U. 20-12-1978 n. 353)

Laboratorio autorizzato ad effettuare il servizio di rilevamento del inquinamento ambientale.
Decreto MINISTERO SANIT. 110.8-1174
(G.U. 144-1974 n. 200)

Laboratorio iscritto nell'elenco dei Laboratori ESISmi Pubblici e Privati Ministeriali qualificati.
Decreto MINISTERO RICERCA SCIENTIFICA 6 8 1983
(G.U. 1983 n. 183)

Membro ASTM
American Society for Testing and Materials



PRODUCT TESTING SERVICE

100 Clemson Research Blvd. Anderson, SC 29625 Tel (864) 646-TILE Fax (864) 646-2821

TCNA TEST REPORT NUMBER: TCNA-071-13#1

PAGE:1OF4

TEST REQUESTED BY: Crossville Inc.
 Attn: Tim Bolby
 301 Porcelian Tile Drive
 Crossville ,IN 38555

TEST SUBJECT MATERIAL: Identified by client as: "Laminam 5.6 mm"

TEST DATE: March 25-26,2013

TEST PROCEDURE: ASTM C627: "A Standard Test Method for Evaluating Ceramic Floor Tile Installation Systems Using the Robinson-Type Floor Tester"

TEST AND MATERIAL DESCRIPTION:

As per client's request, the following materials have been used for the preparation of the testing pads.

Material Description			
Item #	Product name and size	Product code	Provided By:
1	Concrete base with a smooth finish Nominal Size: 48" x 48" x 2" (1219 mm x 1219 mm x 51 mm)	N/A	TCNA
2	Mapei Ultraflex LFT Gray	11250000	Mapei
3	Laminam Tile non-reinforced Nominal size: 20" x 20" x 0.2" (500 mm x 500 mm x 5.6 mm) Actual tile size: 19.685" x 19.685" x 0.2" (500 mm x 500 mm x 5.6 mm) Type of reinforcement under the thin tile: No reinforcement	Crossville/Laminam Tile 5.6mm	Crossville
4	Mapei Kerapoxy epoxy grout part A	G13H212	Mapei
5	Mapei Kerapoxy epoxy grout part B	G03H225	Mapei
6	Euro-Notch Trowel	Modell Y	TCNA
7	Black and Decker Orbital polisher/sander	N/A	TCNA
8	Grout Float	N/A	TCNA

Katelyn Simpson
 Laboratory Manager

5/13/13
 Date



PRODUCT TESTING SERVICE

Anderson, SC 29625 Tel 864 646-TILE Fax 864 646-2821

TCNA TEST REPORT NUMBER: TCNA-071-13 #1

PAGE:20F4

TYPE OF INSTALLATION:

All the materials used were specified by the client and the tested assembly was built per the client's instructions. The installation was a non-reinforced thin tile over concrete substrate.

The non-reinforced thin tile, "Laminam", was installed over the concrete substrate, using "Mapei Ultraflex LFT" thin-set mortar. Further details about the installation are provided below.

Base:

A 48" x 48" x 2" concrete base was prepared and cured for a minimum of 28 days prior to testing.

Tile preparation:

The non-reinforced thin tiles were shipped by the client and received already cut in the nominal size of 20" x 20" x 0.2" (500 mm x 500 mm x 5.6 mm).

Tile and Grout:

All thin tile installation and grouting was performed by a TCNA representative (Laboratory Technician). The installation procedure followed by this representative is outlined below.

Mapei Ultraflex LFT thin-set mortar was mixed per manufacturer's instructions (mix ratio 27:100) and was troweled over the concrete subfloor with a Euro notched trowel. The thin-set was combed with the notched side to form parallel ridges. The non-reinforced thin tiles were back buttered and the backs were troweled with a Euro notched trowel. Special care was taken to ensure that the combed ridges on the backs of the tiles and the ridges on concrete subfloor were running parallel to one another. Special precaution was also taken by the Laboratory Technician to increase back buttering on each corner of the thin tile. After each tile was installed, the tiles were gently tapped with a rubber float and vibrated with an orbital sander/ polisher to attempt to eliminate any air pockets or voids underneath the tiles. The maximum lippage measured on the installed thin tile surface was 0.018" (0.46 mm). Once set, the tiles were allowed to cure for 24 hours before grouting.

Mapei Kerapoxy epoxy grout was mixed per manufacturer's instructions (Part A and part B) and was forced into the 3 mm (0.11") grout joints with an epoxy grout float. The grout was allowed to set up for approximately 20 minutes before the installation was cleaned with a sponge and clean water. The grouted installation was subsequently allowed to cure for 31 days.

Katelyn Simpson
Laboratory Manager

5/13/13
Date



PRODUCT TESTING SERVICE

100 Clemson Research Blvd. Anderson, SC 29625 Tel (864) 646-TILE Fax (864) 646-2821

TCNA TEST REPORT NUMBER:TCNA-071-13 #1

PAGE:3 OF4

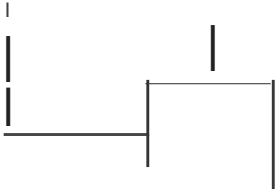


Figure 1: Tile layout -Each tile was 20¹¹ x 20¹¹ x 0.2¹¹ (500 mm x 500 mm x 5.6 mm) with a notch cut from one corner of each tile to accommodate for the ASTM C627 testing apparatus.

TEST RESULTS:

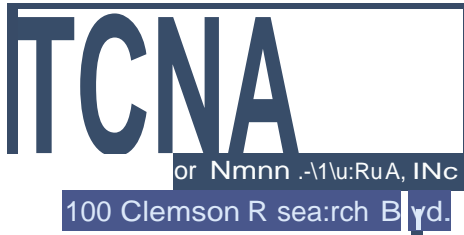
The installation completed fourteen cycles with no evidence of damage to the thin tiles or grout joints. All evaluation criteria were based on 4 tiles and 4 grout joints in the wheel path of the Robinson-Type Floor Tester.

CONCLUSION:

In accordance with the Performance-Level Requirement Guide and Selection Table of the 2013 *TCNA Handbook for Ceramic, Glass, and Stone Tile Installation* (page 40), the installation is classified "EXTRA HEAVY".

Katelyn Simpson
Laboratory Manager

5/13/13
Date



PRODUCT TESTING SERVICE

AncJ:erson, SC 29625 Tel 854 646-TILE Fax 864 646-2821

TCNA TEST REPORT NUMBER: TCNA-071-13 #2

PAGE: 1 OF 4

TEST REQUESTED BY: Crossville Inc.
 Attn: Tim Bolby
 301 Porcelian Tile Drive
 Crossville, TN 38555

TEST SUBJECT MATERIAL: Identified by client as: "Laminam 5.6 mm"

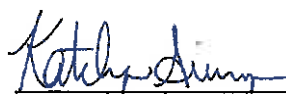
TEST DATE: March 27 -April 1, 2013

TEST PROCEDURE: ASTM C627: "A Standard Test Method for Evaluating Ceramic Floor Tile Installation Systems Using the Robinson-Type Floor Tester"

TEST AND MATERIAL DESCRIPTION:

As per client's request, the following materials have been used for the preparation of the testing pads.

Material Description			
Item #	Product name and size	Product code	Provided By:
1	Concrete base with a smooth finish Nominal Size: 48" x 48" x 2" (1219 mm x 1219 mm x 51 mm)	N/A	TCNA
2	Laticrete 254 Platinum	Item# 0254-0050-21	Laticrete
3	Laminam Tile non-reinforced Nominal size: 20" x 20" x 0.2" (500 mm x 500 mm x 5.6 mm) Actual tile size: 19.685" x 19.685" x 0.2" (500 mm x 500 mm x 5.6mm) Type of reinforcement under the thin tile: No reinforcement	Crossville/Laminam Tile 5.6mm	Crossville
4	Laticrete SpectraLOCK Pro Premium epoxy grout Part A&B	S-225P1-NS-02	Laticrete
5	Laticrete SpectraLOCK Pro Premium epoxy grout Part C	1224-0409-2	Laticrete
6	Euro-Notch Trowel	Modell Y	TCNA
7	Black and Decker Orbital polisher/sander	N/A	TCNA
8	Grout Float	N/A	TCNA


 Katelyn Simpson
 Laboratory Manager

5/13/13
 Date



PRODUCT TESTING SERVICE

100 Clemson Research Blvd.

Anderson, SC 29625

tel 864 646-TILE

Fax {864 646-2821

TCNA TEST REPORT NUMBER: TCNA-071-13 #2

PAGE:20F4

TYPE OF INSTALLATION:

All the materials used were specified by the client and the tested assembly was built per the client's instructions. The installation was a non-rein(orced thin tile over concrete substrate.

The non reinforced thin tile, "Laminam", was installed over the concrete substrate, using "Laticrete 254 Platinum" thin-set mortar. Further details about the installation are provided below.

Base:

A 48" x 48" x 2" concrete base was prepared and cured for a minimum of 28 days prior to testing.

Tile preparation:

The non-reinforced thin tiles were shipped by the client and received already cut in the nominal size of 20" x 20" x 0.2" (500 mm x 500 mm x 5.6 mm).

Tile and Grout:

All thin tile installation and grouting was performed by a TCNA representative (Laboratory Technician). The installation procedure followed by this representative is outlined below.

Laticrete 254 Platinum thin-set mortar was mixed per manufacturer's instructions (mix ratio 23:100) and was troweled over the concrete subfloor with a Euro notched trowel. The thin-set was combed with the notched side to form parallel ridges. The non-reinforced thin tiles were back buttered and the backs were troweled with a Euro notched trowel. Special care was taken to ensure that the combed ridges on the backs of the tiles and the ridges on concrete subfloor were running parallel to one another. Special precaution was also taken by the Laboratory Technician, to increase back buttering on each corner of the thin tile. After each tile was installed, they were gently tapped with a rubber float and vibrated with an orbital sander/polisher to attempt to eliminate any air pockets or voids underneath the tiles. The maximum lippage measured on the installed thin tile surface was 0.016" (0.41 mm). Once set, the tiles were allowed to cure for 24 hours before grouting.

Laticrete SpectraLOCK Pro Premium epoxy grout was mixed per manufacturer's instructions (Parts A, B, and C) and was forced into the 3 mm (0.11") grout joints with an epoxy grout float. The grout was allowed to set up for approximately 20 minutes before the installation was cleaned with a sponge and clean water. The grouted installation was subsequently allowed to cure for 33 days.

Katelyn Simpson
Laboratory Manager

5/13/13
Date



PRODUCT TESTING SERVICE

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Anderson, SC 29625

Tel (864) 646-=-.TILE

Fax 864 646-2821

TCNA TEST REPORT NUMBER: TCNA-071-13#2

PAGE:3 OF4

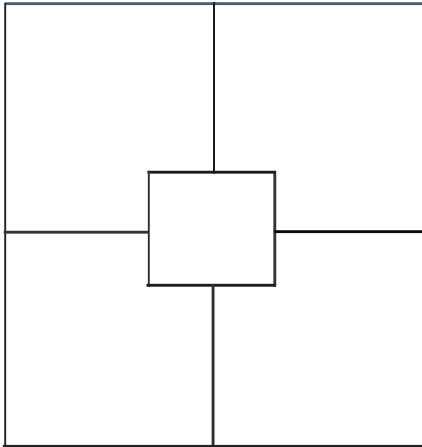


Figure 1: Tile layout -Each tile was 20" x 20" x 0.2" (500 mm x 500 mm x 5.6 mm) with a notch cut from one corner of each tile to accommodate for the ASTM C627 testing apparatus.

TEST RESULTS:

The installation completed fourteen cycles with no evidence of damage to the thin tiles or grout joints. All evaluation criteria were based on 4 tiles and 4 grout joints in the wheel path of the Robinson-Type Floor Tester.

CONCLUSION:

In accordance with the Performance-Level Requirement Guide and Selection Table of the 2013 *TCNA Handbook for Ceramic, Glass, and Stone Tile Installation* (page 40), the installation is classified "EXTRA HEAVY".

Katelyn Simpson
Laboratory Manager

5/13/13
Date



PRODUCT TESTING SERVICE

100 Clemson Research Blvd. Anderson, SC 29625 Tel 864 646 TJLE Fax 864 546 2_8 1

TCNA TEST REPORT NUMBER: TCNA-071-13 #3

PAGE: 1 OF 4

TEST REQUESTED BY: Crossville Inc.
 Attn: Tim Bolby
 301 Porcelian Tile Drive
 Crossville, TN 38555

TEST SUBJECT MATERIAL: Identified by client as: "Laminam 5.6 mm"

TEST DATE: April 4 – 5, 2013

TEST PROCEDURE: ASTM C627: "A Standard Test Method for Evaluating Ceramic Floor Tile Installation Systems Using the Robinson-Type Floor Tester"

TEST AND MATERIAL DESCRIPTION:

As per client's request, the following materials have been used for the preparation of the testing pads.

Material Description			
Item #	Product name and size	Product code	Provided By:
1	Concrete base with a smooth finish Nominal Size: 48" x 48" x 2" (1219 mm x 1219 mm x 51 mm)	N/A	TCNA
2	Custom Building Products Prolite Tile and Stone thin-set mortar	Item# PLMW30	Custom Building Products
3	Laminam Tile non-reinforced Nominal size: 20" x 20" x 0.2" (500 mm x 500 mm x 5.6 mm) Actual tile size: 19.685" x 19.685" x 0.2" (500 mm x 500 mm x 5.6mm) Type of reinforcement under the thin tile: No reinforcement	Crossville/Laminam Tile 5.6mm	Crossville
4	Custom CEG Lite commercial 100% solid epoxy grout part A	LWCEG09A-EA	Custom Building Products
5	Custom CEG Lite commercial 100% solid epoxy grout part B	LWCEGB1-EA	Custom Building Products
6	Euro-Notch Trowel	Modell Y	TCNA
7	Black and Decker orbital sander/polisher	N/A	TCNA
8	Grout Float	N/A	TCNA

Katelyn Simpson
 Laboratory Manager

5/13/13
 Date



PRODUCT TESTING SERVICE

10Q Clemson Research Blvd.

Anderson, SC 29625

Tel: 646-646-6466

Fax: 646-646-2821

TCNA TEST REPORT NUMBER: TCNA-071-13 #3

PAGE:2 OF4

TYPE OF INSTALLATION:

All the materials used were specified by the client and the tested assembly was built per the client's instructions. The installation was a non-reinforced thin tile over concrete substrate.

The non-reinforced thin tile, "Laminam", was installed over the concrete substrate, using "Prolite" thin-set mortar. Further details about the installation are provided below.

Base:

A 48" x 48" x 2" concrete base was prepared and cured for a minimum of 28 days prior to testing.

Tile preparation:

The non-reinforced thin tiles were shipped by the client and received already cut in the nominal size of 20" x 20" x 0.2" (500 mm x 500 mm x 5.6 mm).

Tile and Grout:

All thin tile installation and grouting was performed by a TCNA representative (Laboratory Technician). The installation procedure followed by this representative is outlined below.

Custom Prolite Tile and Stone thin-set mortar was mixed per manufacturer's instructions (mix ratio 38:100) and was troweled over the concrete subfloor with a Euro notched trowel. The thin-set was combed with the notched side to form parallel ridges. The non-reinforced thin tiles were back buttered and the backs were troweled with a Euro notched trowel. Special care was taken to ensure that the combed ridges on the backs of the tiles and the ridges on concrete subfloor were running parallel to one another. Special precaution was also taken by the Laboratory Technician to increase back buttering on each corner of the thin tile. After each tile was installed, they were gently tapped with a rubber float and vibrated with an orbital sander/polisher to attempt to eliminate any air pockets or voids underneath the tiles. The maximum lippage measured on the installed thin tile surface was 0.013" (0.33 mm). Once set, the tiles were allowed to cure for 24 hours before grouting.

Custom CEG Lite epoxy grout was mixed per manufacturer's instructions (Part A and B) and was forced into the 3 mm (0.11") grout joints with an epoxy grout float. The grout was allowed to set up for approximately 20 minutes before the installation was cleaned with a sponge and clean water. The grouted installation was subsequently allowed to cure for 41 days.

Katelyn Simpson
Laboratory Manager

5/13/13
Date

Tel: 646-646-6466

Literature Orders: literature@Meusa.com

Website: www.tcnat.com



PRODUCT TESTING SERVICE

Anderișii,5 Tel 864) 646-TILE Fax 864 646-2821

TCNA TEST REPORT NUMBER: TCNA-071-13 #3

PAGE:3 OF4

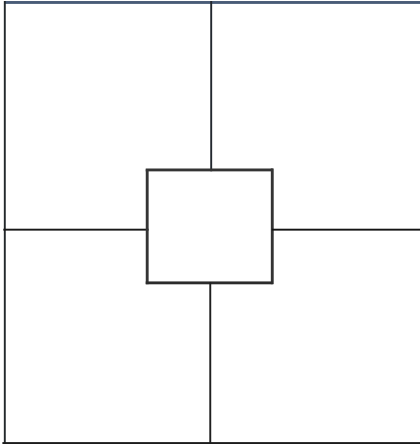


Figure 1: Tile layout -Each tile was 20" x 20" x 0.2" (500 mm x 500 mm x 5.6 mm) with a notch cut from one corner of each tile to accommodate for the ASTM C627 testing apparatus.

TEST RESULTS:

The installation completed fourteen cycles with no evidence of damage to the thin tiles or grout joints. All evaluation criteria were based on 4 tiles and 4 grout joints in the wheel path of the Robinson-Type Floor Tester.

CONCLUSION:

In accordance with the Performance-Level Requirement Guide and Selection Table of the 2013 *TCNA Handbook for Ceramic, Glass, and Stone Tile Installation* (page 40), the installation is classified "EXTRA HEAVY".

Katelyn Simpson
Laboratory Manager

5/13/13
Date



PRODUCT TESTING SERVICE

100 Clemson Research Blvd.

Anderson, SC 29625

Tel 864 646-TILE

Fax 864 646-2821

TCNA TEST REPORT NUMBER: TCNA-071-13 #5

PAGE: 1 OF 4

TEST REQUESTED BY: Crossville Inc.
 Attn: Tim Bolby
 301 Porcelian Tile Drive
 Crossville, IN 38555

TEST SUBJECT MATERIAL: Identified by client as: "Laminam 5.6 mm"

TEST DATE: April 9 - 11, 2013

TEST PROCEDURE: ASTM C627: "A Standard Test Method for Evaluating Ceramic Floor Tile Installation Systems Using the Robinson-Tyoe Floor Tester"

TEST AND MATERIAL DESCRIPTION:

As per client's request, the following materials have been used for the preparation of the testing pads.

Material Description			
Item #	Product name and size	Product code	Provided By:
1	Concrete base with a smooth finish Nominal Size: 48" x 48" x 2" (1219 mm x 1219 mm x 51 mm)	N/A	TCNA
2	TEC 3N1 Performance thin set mortar	3921213120	TEC specialty Products
3	Laminam Tile non-reinforced Nominal size: 20" x 20" x 0.2" (500 mm x 500 mm x 5.6 mm) Actual tile size: 19.685" x 19.685" x 0.2" (500 mm x 500 mm x 5.6mm) Type of reinforcement under the thin tile: No reinforcement	Crossville/Laminam Tile 5.6mm	Crossville
4	TEC AccuColor EFX epoxy grout Part A	821205158	TEC specialty Products
5	TEC AccuColor EFX epoxy grout Part B	8221210385	TEC specialty Products
6	Euro-Notch Trowel	Modell Y	TCNA
7	Black and Decker orbital sander/polisher	N/A	TCNA
8	Grout float	N/A	TCNA

Katelyn Simpson
 Laboratory Manager

5/13/13
 Date



PRODUCT TESTING SERVICE

100 Clemson Research Blvd. Anderson, SC 29625 Tel (864) 646-TILE Fax (864) 646-2821

TCNA TEST REPORT NUMBER: TCNA-071-13 #5

PAGE: 20F4

TYPE OF INSTALLATION:

All the materials used were specified by the client and the tested assembly was built per the client's instructions. The installation was a non-reinforced thin tile over concrete substrate.

The reinforced thin tile, "Laminam", was installed over the concrete substrate, using "3NI" thin-set mortar. Further details about the installation are provided below.

Base:

A 48" x 48" x 2" concrete base was prepared and cured for a minimum of 28 days prior to testing.

Tile preparation:

The non-reinforced thin tiles were shipped by the client and received already cut in the nominal size of 20" x 20" x 0.2" (500 mm x 500 mm x 5.6 mm).

Tile and Grout:

All thin tile installation and grouting was performed by a TCNA representative (Laboratory Technician). The installation procedure followed by this representative is outlined below.

TEC 3NI Performance thin-set mortar was mixed with water per manufacturer's instructions (mix ratio 45.2:100) and was troweled over the concrete subfloor with a Euro notched trowel. The thin-set was combed with the notched side to form parallel ridges. The non-reinforced thin tiles were back buttered and the backs were troweled with a Euro notched trowel. Special care was taken to ensure that the combed ridges on the backs of the tiles and the ridges on concrete subfloor were running parallel to one another. Special precaution was also taken by the Laboratory Technician, to increase back buttering on each corner of the thin tile. After each tile was installed, the tiles were gently tapped with a rubber float and vibrated with an orbital sander/polisher to attempt to eliminate any air pockets or voids underneath the tiles. The maximum lippage measured on the installed thin tile surface was 0.016" (0.41 mm). Once set, the tiles were allowed to cure for 24 hours before grouting.

TEC AccuColor EFX epoxy grout was mixed per manufacturer's instructions (Parts A and B) and was forced into the 3 mm (0.11") grout joints with a epoxy grout float. The grout was allowed to set up for approximately 20 minutes before the installation was cleaned with a sponge and clean water. The grouted installation was subsequently allowed to cure for 46 days.

Katelyn Simpson
Laboratory Manager

5/13/13
Date



TCNA TEST REPORT NUMBER:TCNA-071-13#5

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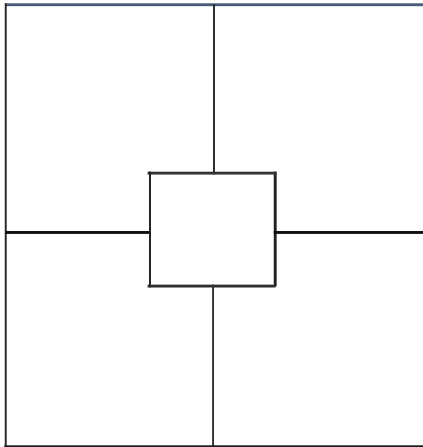


Figure 1: Tile layout -Each tile was 20" x 20" x 0.2" (500 mm x 500 mm x 5.6 mm) with a notch cut from one corner of each tile to accommodate for the ASTM C627 testing apparatus.

TEST RESULTS:

The installation completed fourteen cycles with no evidence of damage to the thin tiles or grout joints. All evaluation criteria were based on 4 tiles and 4 grout joints in the wheel path of the Robinson-Type Floor Tester.

CONCLUSION:

In accordance with the Performance-Level Requirement Guide and Selection Table of the 2013 *TCNA Handbook for Ceramic, Glass, and Stone Tile Installation* (page 40), the installation is classified "EXTRA HEAVY".

Katelyn Simpson
Laboratory Manager

5/13/13
Date



PRODUCT TESTING SERVICE

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Anderson, SC 29625

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TCNA TEST REPORT NUMBER: TCNA-378-13 Test 2

PAGE: 1 OF 4

TEST REQUESTED BY: Bostik Inc.
 Attn: Brian Day
 11320 Watertown Plank Road
 Wauwatosa, WI 53226-3434

TEST SUBJECT MATERIAL: Identified by client as: "Crossville Laminam 5.6 mm"

TEST DATE: July 31- August 1, 2013

TEST PROCEDURE: ASTM C627: "A Standard Test Method for Evaluating Ceramic Floor Tile Installation Systems Using the Robinson-Type Floor Tester"

TEST AND MATERIAL DESCRIPTION:

As per client's request, the following materials have been used for the preparation of the testing pads.

Material Description			
Item #	Product name and size	Product code	Provided By:
1	Concrete base with a smooth finish Nominal Size: 48" x 48" x 2" (1219 mm x 1219 mm x 51 mm)	N/A	TCNA
2	Bostik Reflex Ultra Premium Latex Modified thin-set Mortar	G90918-31A 1305100046-5	Bostik
3	Laminam 5.6 mm Tile Nominal size: 20" x 20" x 0.22" (500 mm x 500 mm x 5.6 mm) Actual tile size: 19.685" x 19.685" x 0.21" (500 mm x 500 mm x 5.6 mm) Type of reinforcement under the thin tile: No reinforcement		Crossville
4	Bostik EZ Poxy 100 % solids epoxy mortar and grout	012313	Bostik
5	Euro-Notch Trowel	Modell Y	TCNA
6	Black and Decker Orbital polisher/sander	N/A	TCNA
7	Grout Float	N/A	TCNA


 Katelyn Simpson

Laboratory Manager

8/5/13
 Date



PRODUCT TESTING SERVICE

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TCNA TEST REPORT NUMBER: TCNA-378-13 Test 2

PAGE:20F4

TYPE OF INSTALLATION:

All the materials used were soecified by the client and the tested assembly was built per the client's instructions. The installation was a non-reinfOrced thin tile over concrete substrate.

The non-reinforced thin tile, "Crossville Laminam 5.6 mm", was installed over the concrete substrate, using "Reflex Ultra Premium Latex Modified thin-set mortar". Further details about the installation are provided below.

Base:

A 48" x 48" x 2" concrete base was prepared and cured for a minimum of 28 days prior to testing.

Tile preparation:

The non-reinforced thin tiles were cut to the nominal size of 20" x 20" x 0.22" (500 mm x 500 mm x 5.6 mm) using a rail cutter and wet saw.

Tile and Grout:

All thin tile installation and grouting was performed by a TCNA representative. The installation procedure followed by this representative is outlined below.

Bostik Reflex Ultra Premium Latex Modified thin-set mortar, mixed per manufacturer's instructions (mix ratio 25:100), was troweled over the concrete subfloor with a Euro notched trowel. The thin-set was combed with the notched side to form parallel ridges. The non-reinforced thin tiles were back buttered and the backs were troweled with a Euro notched trowel. Special care was taken to ensure that the combed ridges on the backs of the tiles and the ridges on concrete subfloor were running parallel to one another. Special precaution was also taken by the Laboratory Technician to increase back buttering on each corner of the thin tile. After each tile was installed, the tiles were gently tapped with a rubber float and vibrated with an orbital sander/ polisher to attempt to eliminate any air pockets or voids underneath the tiles. Once set, the tiles were allowed to cure for 24 hours before grouting.

Bostik EZ Poxy 100% Solids Epoxy mortar and grout was mixed per manufacturer's instructions (Part A and part B) and forced into the 3 mm (0.12") grout joints with an epoxy grout float. The grout was allowed to set up for approximately 20 minutes before the installation was cleaned with a sponge and clean water. The grouted installation was subsequently allowed to cure for 33 days.

Katelyn Simpson

Laboratory Manager

8/5/13

Date

Testing Service: testing@tleusa.com Literature Orders: literature@weusa.com Web Site: www.tleusa.com

This report is confidential and has been prepared for the exclusive use of the client. It is not an endorsement, approval, certification, or criticism of any product by TCNA. This report shall not be published in any form without prior written consent from TCNA.



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TCNA TEST REPORT NUMBER: TCNA-378-13 Test 2

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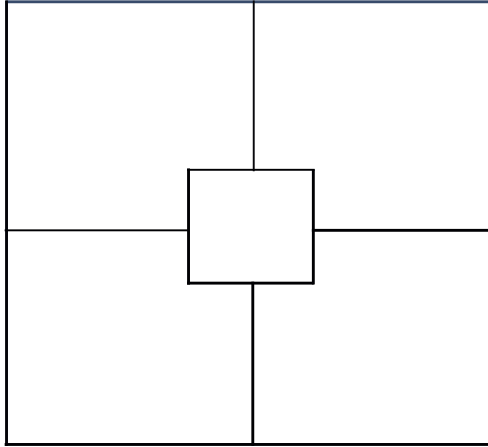


Figure 1: Tile layout -Each tile was 20" x 20" x 0.21" (500 mm x 500 mm x 5.6 mm) with a notch cut from one corner of each tile to accommodate for the ASTM C627 testing apparatus.

TEST RESULTS:

The installation completed all fourteen cycles with no evidence of damage to the thin tiles or grout joints. All evaluation criteria were based on 4 tiles and 4 grout joints in the wheel path of the Robinson-Type Floor Tester.

CONCLUSION:

In accordance with the Performance-Level Requirement Guide and Selection Table of the 2013 *TCNA Handbook for Ceramic, Glass, and Stone Tile Installation* (page 40), the installation is classified "EXTRA HEAVY".

Katelyn Simpson
Laboratory Manager

8/5/13
Date



PRODUCT TESTING SERVICE

100 Clemson Rd. Blvd. Anderson, SC 29625 Tel 864 646-TILE Fax (864) 646-2821

TCNA TEST REPORT NUMBER: TCNA-150-14 Test #3

PAGE: 1 OF 6

TEST REQUESTED BY: Bonsai American

TEST SUBJECT MATERIAL: System identified by client: "Floor tile assembly with Laminam 5.6 mm over Concrete bonded with ProSpec Quick PermaFlex® 570"

TEST DATE: June 2-June 4, 2014

TEST PROCEDURE: ASTM C627: "A Standard Test Method for Evaluating Ceramic Floor Tile Installation Systems Using the Robinson-Type Floor Tester"

TEST AND MATERIAL DESCRIPTION:

As per client's request, the following materials have been used for the preparation of the test pad.

Material Description			
Item #	Product name and size	Product code	Provided By:
1	Concrete base with a smooth finish Nominal Size: 48" x 48" x 2" (1219 mm x 1219 mm x 51 mm)	N/A	TCNA
2	ProSpec Quick PermaFlex® 570 Mortar, White	65467546	Bonsai
3	Laminam 5.6 mm Tortora Custom Nominal size (cut by client prior to submittal): 20" x 20" x 0.22" (508 mm x 508 mm x 5.6 mm) Actual tile size: 19.625" x 19.625" x 0.23" (498 mm x 498 mm x 5.72 mm)	13795. custom.6 2264542	Crossville
4	ProSpec B-7000 Epoxy grout	65464541	Bonsai
5	Euro notch trowel (11")	N/A	TCNA
6	Margin trowel	N/A	TCNA
7	Orbital sander	N/A	TCNA

TYPE OF INSTALLATION:

All the materials used were specified by the client and the tested assembly was built per the client's instructions.

The "Laminam 5.6 mm" was installed over the concrete substrate using "ProSpec Quick PermaFlex® 570" mortar. Further details about the installation are provided below.

Katelyn Simpson
Laboratory Manager

6/10/14
Date



PRODUCT TESTING SERVICE

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TCNA TEST REPORT NUMBER: TCNA-150-14 Test #3

PAGE:2 OF6

Base:

A 48" x 48" x 2" concrete base was prepared and cured for a minimum of 28 days prior to testing.

Tile preparation:

The tiles were cut to nominal 20"x20" by the client prior to submitting for testing. One corner of each tile was cut by a TCNA Representative in order to accommodate for the drive shaft of the Robinson Floor tester. The tiles were cut with an angle grinder and inked with Methylene Blue dye to ensure there were no cracks prior to installation.

Tile and Grout:

All tile installation and grouting was performed by a TCNA representative. The installation procedure is outlined below.

ProSpec Quick PermaFlex® 570 thin-set mortar was mixed with water per manufacturer's instructions (mix ratio 24.8:100 by weight) and was troweled over the substrate with a Euro notched trowel. The Laminam 5.6 mm tiles were back buttered with a scratch coat then the backs were troweled with a Euro notched trowel. Special care was taken to ensure that the combed ridges on the backs of the tiles and the ridges on the test pad were running parallel to one another. Special precaution was also taken to increase back buttering on each corner of the tile as requested by the client. After each tile was installed, they were vibrated with an orbital sander to attempt to eliminate any air pockets or voids underneath the tiles. The maximum lippage in the wheel path of the tester measured at the time of installation was 0.008" (0.20 nun). Once set, the tiles were allowed to cure for 24 hours before grouting. Figures 1 and 2 represent the layout of the lippage and the mortar depth while the test pad was curing and prior to running.

ProSpec B-7000 epoxy grout was mixed per manufacturer's instructions (Part A, B, and C), and was forced into the 1/8" grout joints. The grout was allowed to set up for approximately 5 minutes before the installation was cleaned with a sponge and water. The grouted installation was subsequently allowed to cure for 49 days.

Katelyn Simpson
Laboratory Manager

6/10/14
Date



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TCNA TEST REPORT NUMBER: TCNA-150-14 Test #3

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Figure 1: Each tile submitted was 20" x 20" x 0.2" (508 mm x 508 mm x 5.6 mm). A notch was cut from one corner of each tile to accommodate for the ASTM C627 testing apparatus. Each grout joint is labeled below with a number which is the same grout joint number referenced throughout the rest of the report.

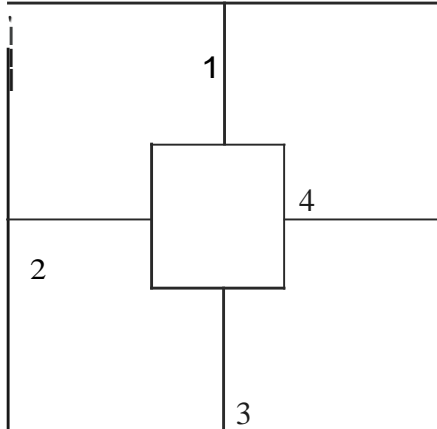


Table 1: Lippage Measurements (measured using feeler gauges)

	Initial Lippage	Lippage after 1st Week	Lippage after 2nd Week	Lippage after 3rd Week	Final Lippage
Date Measured	4/17/14	4/24/14	5/1/14	5/8/14	6/2/14
Grout Joint 1	0.008" (0.20 mm)	0.008" (0.20 mm)	0.008" (0.20 mm)	0.008" (0.20 mm)	0.012" (0.30 mm)
Grout Joint 2	0.003" (0.08 mm)	0.003" (0.08 mm)	0.003" (0.08 mm)	0.003" (0.08 mm)	0.005" (0.13 mm)
Grout Joint 3	0.002" (0.05 mm)	0.002" (0.05 mm)	0.002" (0.05 mm)	0.002" (0.05 mm)	0.002" (0.05 mm)
Grout Joint 4	0.003" (0.08 mm)	0.003" (0.08 mm)	0.003" (0.08 mm)	0.003" (0.08 mm)	0.004" (0.10 mm)

Table 2: Mortar Thickness (measured using a caliper)

	At the time of application	After curing
Date Measured	4/15/14	6/2/14
Thickness	0.16" (4.0 mm)	0.16" (4.0 mm)

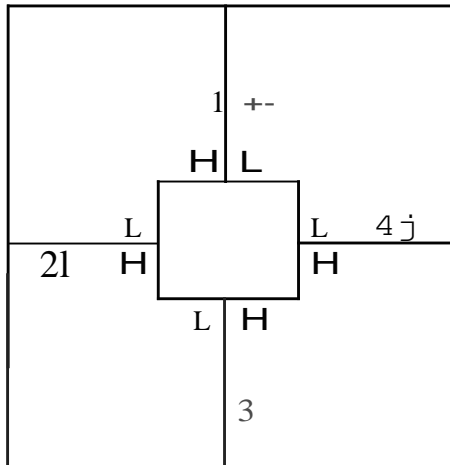
Katelyn Simpson
Laboratory Manager

6/10/14
Date

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Figure 2: The figure below shows which tiles were higher or lower when the lippage in the wheel path was measured (as shown in table 1). The lower tile is identified with the letter "L" and the higher tile is identified with the letter "H". The arrows represent the direction that the sled was traveling during testing.



TEST RESULTS:

The installation completed all fourteen cycles with no evidence of damage to the tiles or grout joints. All evaluation criteria were based on 4 tiles and 4 grout joints in the wheel path of the Robinson-Type Floor Tester. The maximum lippage in the wheel path of the tester measured just prior to testing was 0.012" (0.30 mm).

CONCLUSION:

In accordance with the Performance-Level Requirement Guide and Selection Table of the 2014 *TCNA Handbook for Ceramic, Glass, and Stone Tile Installation* (page 40), the test pad is classified "EXTRA HEAVY".



Katelyn Simpson
Laboratory Manager

6/10/14
Date

TCNA TEST REPORT NUMBER: TCNA-150-14 Test #3

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Appendix: Photos



Image 1: Laminam 5.6 mm prior to testing.

A handwritten signature in black ink, which appears to read 'Katelyn Simpson'.

Katelyn Simpson
Laboratory Manager

6/10/14
Date

TCNA TEST REPORT NUMBER: TCNA-150-14 Test #3

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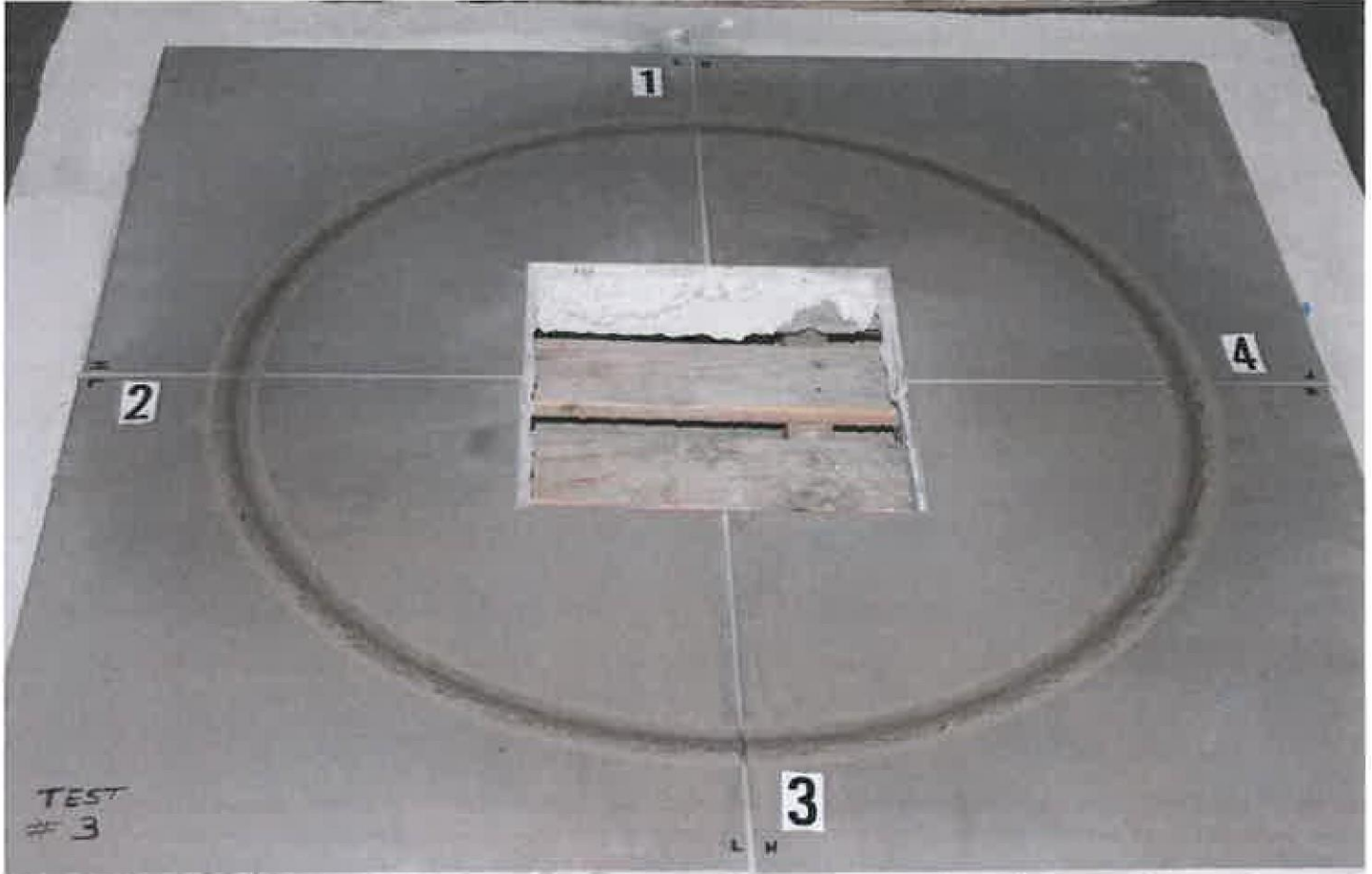


Image 2: Full assembly showing the installed Laminam 5.6 mm tile after testing. The numbers shown coincide with the numbers in Figure 1 and 2 and Table 1.

Katelyn Simpson

Katelyn Simpson
Laboratory Manager

6/10/14
Date