

TEST PROGRAM
"FREEZE/THAW DURABILITY"
"STONETILE" CLADDING SYSTEM

Submitted To:

Stonetile (Canada) Ltd.
Bay #2, 5316 - 36 Street SE
Calgary, AB T2C 2H2

Submitted By:

AGRA Earth & Environmental Limited
219 - 18 Street SE
Calgary, AB T2E 6J5

CA-12207

May, 1997

TABLE OF CONTENTS

	<u>Page</u>
1.0 INTRODUCTION	1
2.0 DESCRIPTION OF "STONETILE" SYSTEM	1
3.0 MATERIALS	1
3.1 CONCRETE	1
3.2 GROUT	2
3.3 STEEL INSERTS	2
3.4 MOUNTING SCREWS	2
4.0 TESTING	2
4.1 TEST SAMPLE	2
4.2 TEST PROCEDURE	2
5.0 TEST RESULTS	3
6.0 DISCUSSION	3
APPENDIX A: "STONETILE" SYSTEM DRAWINGS	
APPENDIX B: TEST PHOTOGRAPHS	

1.0 INTRODUCTION

AGRA Earth & Environmental Limited (AEE) was retained by Stonetile (Canada) Ltd. to conduct a test program to evaluate the "Freeze/Thaw Durability" of the "Stonetile" cladding system. All testing was conducted in accordance with ASTM C67-94, "Sampling and Testing Brick and Structural Clay Tile" and evaluation requirements specified by the Canadian Construction Materials Centre (CCMC). The "Stonetile" system is an innovative cladding system designed by Stonetile (Canada) Ltd. to compete with the existing cladding systems on the basis of performance and cost. Testing was conducted from November 1996 to April 1997 and was viewed randomly by Mr. Alan Dalgleish, P.Eng..

2.0 DESCRIPTION OF "STONETILE" SYSTEM

The "Stonetile" system consists of concrete tiles with embedded steel inserts on the back side which are fastened to the substrate. The tile is produced in two sizes of 450x300x16 mm and 450x450x16 mm, and in various finishes and colours. Various other architectural shapes (i.e. corbels, cornices, etc.) are also available.

The fasteners are made of 0.5 mm thick, 25 mm wide galvanized steel strips. These strips are punched out to have a spine 6 mm wide and 3 mm deep and gang nails protruding into the concrete. The gang nails are embedded in concrete during casting. The top of the fasteners protrude about 10 mm above the tile with a hole for a screw that will fasten the tile to the substrate. The bottom part of the inserts protrude about 5 mm below the tile so that it will slide into the fastener of the tile below it. Steel channels made out of 30 gauge galvanized metal are provided at the base and top. These channels are perforated to ensure adequate ventilation between the tiles and the substrate.

Detailed drawings of the "Stonetile" wall system attached as Appendix 'A', were submitted by Stonetile (Canada) Ltd. and reviewed by (AEE).

3.0 MATERIALS

3.1 CONCRETE

The concrete used to cast the Stonetile was designed to meet the following specifications:

Compressive Strength	20 MPa
Slump	100 mm

The following mix proportion was used to achieve the above specification:

	<u>kg/m²</u>
Cement	335
Water	185
Aggregate - Coarse	878
Aggregate - Fine	799

Superplasticizer was used to achieve the design slump and air content. All the material used in producing this concrete conformed to CSA-A23.1 - "Concrete Materials and Methods of Concrete Construction".

Tiles of different colours were obtained by adding colouring pigments supplied by IMASCO - International Marble and Stone Company Ltd. These pigments are widely used in stucco and have been acceptable for external application.

3.2 GROUT

Grout used in this system was Tremco "Dymonic" urethane caulking. Acceptable durability of Dymonic Urethane caulking was proven by others in independent test programs.

3.3 STEEL INSERTS

The steel inserts were made from 0.5 mm thick and 25 mm wide galvanized steel. The length of the inserts was determined by the size of the tile and the length of extensions of the fasteners above and below the tile.

3.4 MOUNTING SCREWS

The screws used in this system were 12 mm #8 galvanized steel.

4.0 TESTING

4.1 TEST SAMPLE

Three 450 mm x 300 mm "Antique Grey" specimens were submitted for testing.

4.2 TEST PROCEDURE

Testing was conducted in accordance with ASTM C67-94, "Sampling and Testing Brick and Structural Clay Tile" (modified) and with the Canadian Construction Materials Centre document "Technical Guide for Prefabricated, Concrete Brick/Tiles.

For this test, the three specimens were mounted vertically in an aluminum rack and subjected to 100 - 24 hour cycles of the following test regime.

- 20 hrs in a large chest freezer at -18°C with specimens sitting in 25 mm of water
- 4 hrs in submersed in a 22°C water bath

During weekend or holiday periods, the tiles were left in the freezer. Please note that, for each freezing cycle, one same edge of the tile was always submerged in the 25 mm of water. Further

After every 10 cycles, the tiles were visually inspected and photographed. Photographs of the tile specimens are contained in Appendix 'B'.

5.0 TEST RESULTS

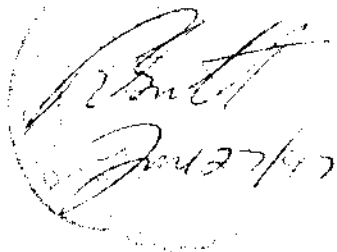
At the completion of the test, no significant physical damage to the tiles was observed. The panels did however develop a "whitish, blotchy finish" during the early stages of the test. Microscopic examination of the blotchy surface indicated microscopic spots where the surface cement paste had spalled away. Given that the blotchy appearance occurred at the early stages of the test program and that no further deterioration was observed over the duration of the test, this slight surface deterioration did not appear to be significant. It should be noted, however, that the surface blotching did tend provide the specimen tiles with a more weathered stone appearance.

6.0 DISCUSSION

The "Antique Grey" Stonetile tiles were unaffected by the freeze/thaw activity conducted in this test. Given the severity of the test regime, acceptable overall field performance of this system would be expected.

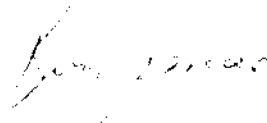
AGRA Earth & Environmental Limited

Prepared by:



Randy Smith, P. Eng.
Building Sciences Engineer
Materials Engineering Division

Reviewed by:



Kevin Spencer, P.Eng.

