

TEST PROGRAM
"RAIN PENETRATION RESISTANCE"
"STONETILE" CLADDING SYSTEM

Submitted To:

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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
7.0 CLOSURE	3

1.0 INTRODUCTION

AGRA Earth & Environmental Limited (AEE) was retained by Stonetile (Canada) Ltd. to conduct a test program to evaluate the "Rain Penetration Resistance" of the "Stonetile" cladding system. All testing was conducted in accordance with 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 in November 1996 and was viewed by Mr. Alan Dalglish, 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 insert 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

One 2 meter x 2 meter test specimen was constructed by Stonetile (Canada) Ltd. for testing purposes. The test sample comprised a 2x4 framed wall with four 2x4 internal studs at 16" on centre. The wall was covered with 3/8" plywood sheathing and building paper in accordance with common building practices. The exterior surface of the wall was covered with the "Stonetile" panel system (natural colour). For this test, the grout was not installed to simulate the worst case scenario. In order to observe water penetration through the system, three 200 mm x 300 mm acrylic viewing windows were installed in the sheathing at various locations. Diagrams #1 & #2 illustrate the test specimen and setup.

4.2 Test Procedure

Testing was conducted in accordance with the Canadian Construction Materials Centre document "Technical Guide for Prefabricated, Concrete Brick/Tiles, Exterior Cladding System" and ASTM E331-93 "Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Differential". For this test, the specimen was mounted onto the face of the test chamber in our Mobile Window Performance Laboratory (accredited by the Standards Council of Canada). Water was applied through a spray rack system spraying at the top of the wall and providing the required 25 L/meter of wall/hr flow rate. An air pressure difference of 500 Pa (100 km/h wind) was applied to across the wall using a variable speed blower and measured using an inclined manometer. To measure the pressure equalization of the system, an additional inclined manometer was connected to the cavity behind the cladding. The test was allowed to continue for a period of 1 hour.

5.0 TEST RESULTS

Failure was deemed to have occurred if water appeared on exposed interior surface of

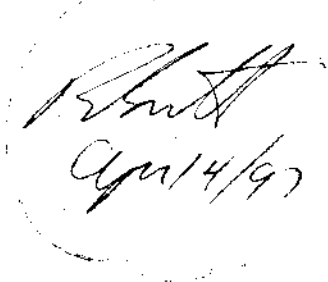
the sheathing. No water or moisture staining was observed. Viewing of the water penetration through the acrylic windows did indicate some minor water penetration behind the cladding system. Given the "rain screen" style of design of the cladding, this minor amount of moisture was never allowed to reach the interior surfaces. Further, the pressure measurements behind the cladding indicated the cavity to be pressure-equalizing effectively. This ability may change with the addition of the grout sealant as the venting area would be reduced.

6.0 DISCUSSION

The "Stonetile" system passed the Rain Penetration Resistance Test. No water penetration as evident of the interior surfaces. Since improved performance would be expected with the installation of the grout sealant, it is anticipated that weathering of the system over time would not adversely affect the systems ability to shed water.

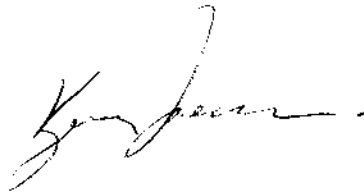
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Prepared by:

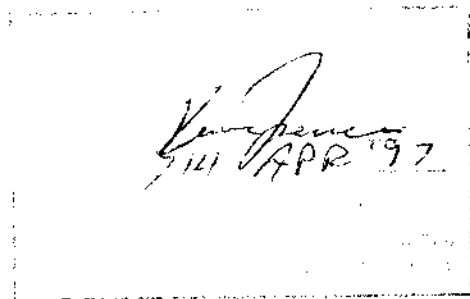


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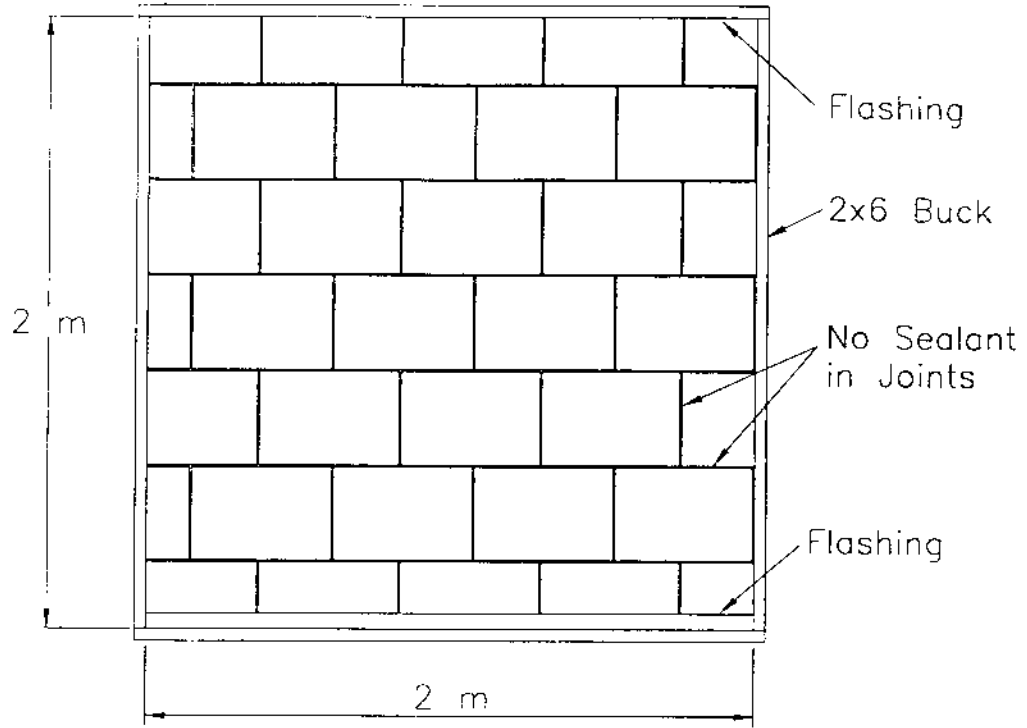
Reviewed by:



Kevin Spencer, P.Eng.



Front View



Rear View

