

9 July 2012



Dry-Treat Pty Ltd
65 Nicholson Street
St Leonards NSW 2065

Attention: Mr. Gabriel Chapman

Dry-Treat 40SK Sealer Evaluation

- Determination of impact on durability when applied to limestone

Client reference: Request G. Chapman

Our reference: DRT0512-1 Part 4

Investigating officers: James P Mann, Kate Tonkin & Graham Baggs

Report prepared by: James P Mann

James P Mann
Laboratory Manager



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1. INTRODUCTION

Stone Initiatives received a request from the client to carry out a test to evaluate the effectiveness of the Dry-Treat impregnating sealer product 40SK in improving the durability of Valanges limestone proposed for use as a curtain wall cladding in China.

2. PROCEDURE

Two sets of three specimens¹ were prepared according to the client's instructions² from samples of Valanges limestone supplied by Rocamat (the stone processor and quarry owner). The sample sets (three per set) were identified as follows.

- Set N – Not sealed
- Set S – treated with 40SK

Following treatment samples were allowed to air-dry under ambient conditions. Samples treated with 40SK were tested after twenty eight days curing time. Samples were weighed immediately prior to commencement of testing.

3. TEST PROGRAM

Durability was evaluated by the resistance to salt attack test procedure AS/NZS4456.10 Method A "Masonry Units and Segmental Pavers- Methods of Test - Method 10: Determining Resistance to Salt Attack". This involved subjecting the specimens to 15 cycles of soaking in a 6.2% sodium sulphate solution for a period of 2 hours followed by overnight drying at 65°C.

The salt attack test is considered a good indicator of durability as it evaluates the stability of the stone by exposing it to repeated wetting and drying cycles. The test also exposes the stone to the mechanical pressure of expanding salt crystals which can be considered analogous to the pressure imposed by freezing of water within the pores.

On completion of the test the specimens were inspected and both the specimens and residue were weighed to determine the amount of material lost through decay.

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¹ 50 x 50 x 40mm

² Sealing details are shown in Appendix B.

4. RESULTS

Results are summarized in the table below. Full test data are detailed in Appendix A of this report.

Resistance to Salt Attack	Weight loss (%) Mean (Range)	Mode of Decay
Not treated	9.8 (8.1 – 11.1)	Moderate surface pitting and crumbling of edges.
40 SK	0.07 (0.04 – 0.08)	Very slight surface pitting.

5. DISCUSSION

The testing carried out shows a marked reduction in decay on the specimens treated with 40SK with only a very slight surface pitting present. The application of 40SK has reduced the weight loss by 99% indicating a dramatic increase in durability against salt crystallization and similar mechanisms such as freeze-thaw.

The appearance of the specimens treated with 40SK after the salt attack test compared to the original treated surface is shown in Plate 1 below with no significant change in tonality (after washing to remove salt deposits).



Plate 1: Appearance of Valanges limestone specimens treated with 40SK after the resistance to salt attack test. Specimens are compared with original finish of Valanges treated with 40SK.

Appendix A

Test Certificates



RESISTANCE TO SALT ATTACK Test Certificate

TEST METHOD	AS/NZS4456.10-2003 Method A
TEST DATE	16-Jun-12 to 09-Jul-12
CLIENT	Dry-Treat Pty Ltd
OUR REFERENCE	DRT0512-1
SAMPLE	Valanges Limestone
SURFACE FINISH	Honed & Sawn
SAMPLE ORIGIN	France
SAMPLING DATE	1/05/2012
NOMINAL SIZE	50x50x40 mm
WORK SIZE	N/A - Raw material evaluation
SOLUTION USED	6.2% Sodium Sulphate

Conditioning: Dried for minimum 48 hours @ 65 deg C

Test Number	Specimen Identification	Initial Mass (g)	Mass Loss (g)	Loss after 15 Cycles (%)	Mode of Decay
X1352	L119/13S	237.20	0.17	0.07%	VSL SP
X1353	L119/14S	268.10	0.12	0.04%	VSL SP
X1354	L119/15S	248.11	0.21	0.08%	VSL SP

MEAN MASS LOSS **0.07% ± 0.04** (*U₉₅*)
Standard Deviation: **0.02**

Key to Mode of Decay

Degree	Type
VSL= Very Slight	SP= Surface pitting
SL= Slight	CE= Crumbling of edges
MD= Moderate	CR= Cracking
SV= Severe	DL= Delamination
	EX= Exfoliation

NOTE: The expanded measurement uncertainty values (u₉₅) quoted in this report are at a confidence level of 95 % with a nominal coverage factor of 2. These values do not include any estimate of the effects associated with sampling.

COMMENTS/VARIATIONS Sealed with 40SK. Modified specimen size & quantity.

TESTED BY: J Mann & G Baggs

APPROVED SIGNATORY:

NAME: James P Mann



ISSUE DATE: 09-Jul-12

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RESISTANCE TO SALT ATTACK Test Certificate

TEST METHOD	AS/NZS4456.10-2003 Method A
TEST DATE	02-Jun-12 to 28-Jun-12
CLIENT	Dry-Treat Pty Ltd
OUR REFERENCE	DRT0512-1
SAMPLE	Valanges Limestone
SURFACE FINISH	Honed & Sawn
SAMPLE ORIGIN	France
SAMPLING DATE	1/05/2012
NOMINAL SIZE	50x50x50 mm
WORK SIZE	N/A - Raw material evaluation
SOLUTION USED	6.2% Sodium Sulphate

Conditioning: Dried for minimum 48 hours @ 65 deg C

Test Number	Specimen Identification	Initial Mass (g)	Mass Loss (g)	Loss after 15 Cycles (%)	Mode of Decay
X1340	L119/1N	260.57	28.81	11.06%	MD SP, SL CE
X1341	L119/2N	247.66	24.97	10.08%	MD SP, SL CE
X1342	L119/3N	256.67	20.90	8.14%	MD SP, SL CE

MEAN MASS LOSS **9.76% ± 0.04** (*U₉₅*)
Standard Deviation: **1.5**

Key to Mode of Decay

Degree	Type
VSL= Very Slight	SP= Surface pitting
SL= Slight	CE= Crumbling of edges
MD= Moderate	CR= Cracking
SV= Severe	DL= Delamination
	EX= Exfoliation

NOTE: The expanded measurement uncertainty values (u95) quoted in this report are at a confidence level of 95 % with a nominal coverage factor of 2. These values do not include any estimate of the effects associated with sampling.

COMMENTS/VARIATIONS

TESTED BY: J Mann & G Baggs

APPROVED SIGNATORY:

NAME: James P Mann



ISSUE DATE: 02-Jul-12

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Appendix B

Application Method for 40SK Sealer

Manufacturers Application Instructions

DRY-TREAT 40SK

- 1) Dip the tile into the sealer for approx 15 seconds
- 2) Once it is removed from the dipping container, leave to absorb sealer for 20 minutes and buff any residue (unlikely to be any residue) off with dry cloths.
- 3) This sealer must cure for at least 4 full weeks prior to testing – to give the silane opportunity to migrate and find all the suitable bonding sites in the material.