



January 10, 1996

Reference: BPSU/150

Technical Data:

Subject: Water Absorption and Chloride Ion Diffusion of Concrete Samples
Treated With "Solid Silane"

Water absorption data for: Standard Untreated Concrete
Standard Concrete Treated with "Solid Silane"

Chloride ion diffusion data for: Standard Untreated Concrete
Standard Concrete Treated with "Solid Silane"

Depth of penetration data for: Standard Concrete Treated with "Solid Silane"

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1. PREPARATION OF SUBSTRATES

a) Materials

Cement: General Purpose "Blue Circle" cement

Sand: Washed concrete sand

Aggregate I: 20 mm basalt

Aggregate II: 14/10 mm basalt

Aggregate III: 7 mm basalt

Gauging Liquid: Water

b) Preparation Method:

Standard 50 mPa concrete was prepared in a pan mixer. The ratio of ingredients was: Aggregate I 650: Aggregate II 520: Aggregate III 145: sand 630; cement 350: water 175. The concrete was poured into oiled moulds of dimensions 30cm x 30cm x 5cm deep. Each slab was placed onto a vibrating table for 10 seconds and allowed to harden overnight. The slabs were demoulded and placed in a fog chamber at 23 °C curing for 28 days. The cured concrete slabs were cleaned by water washing with neutral detergent, dried for 24 hours at 50 °C. The slabs were let stand at 25 °C and 50% relative humidity for 1 week before application of the product to be tested. A total of 9 slabs were cast for the tests.

2. APPLICATION

One coat of "Solid Silane" was evenly applied to the slabs using a paint brush to achieve a coverage of about 200 g/m² (about 0.230 mm wet film thickness) and two coats to achieve about 400g/ m². (about 0.46mm wet film thickness). One coat was applied to three slabs and two coats were applied to three slabs. The samples were dried for 24 hours between coats. Three untreated slabs were kept as controls. Table 1 lists samples tested. Once the product had been applied the slabs were kept for 14 days at 25 °C and 50% relative humidity before any tests were carried out.

Table 1

Samples	Application rate (kg/m ²)	Wet film thickness (mm)
SS1	0.20	About 0.23
SS2	0.20	About 0.23
SS3	0.20	About 0.23
SS4	0.40	About 0.46
SS5	0.40	About 0.46
SS6	0.40	About 0.46
REF1	Untreated	Untreated
REF2	Untreated	Untreated
REF3	Untreated	Untreated

3. TEST METHODS

a) Capillary Water Absorption

i) Sample Preparation

A single prism of dimensions 100x 100x 50 mm was cut from each of the slabs in Table 1. The prisms were dried at 50 °C overnight and allowed to stand at 25 °C and 50% humidity for 24 hours before testing.

ii) Measurement of Capillary Water Absorption

The capillary water absorption of the prisms was measured by the wet sponge method and presented as % weight increase over time against control.

b) Chloride Ion Diffusion

i) Sample Preparation

A single prism of dimensions 100x 100x 50cm was cut from each of the slabs in Table 1. The prisms were dried at 50 °C overnight. All surfaces except for the silane treated surface were coated with two coats of solvent-free epoxy paint to form a watertight film.

ii) Immersion in Chloride-Laden Water

The cured specimens were immersed in 3% sodium chloride solution kept at 20 °C . The immersion was with the exposed concrete facing upward 25mm below the surface of the solution. The specimens were kept in the bath for 35 days.

iii) Measurement of Chloride Ion Content

The samples were sliced into 10 mm depth increments from the treated face and each slice was pulverised. The chloride ion concentration was measured at depth increments of 0-10, 10-20, 20-30, 30-40, and 40-50 mm from the surface. The chloride ion content was determined by the method set out in British Standard BS1881 Part 6.

c) Depth of Penetration

The depth of penetration of the product was determined by splitting the remainder of each slab and applying methylene blue dye water solution to the freshly broken face. The broken face was perpendicular to the treated face. The depth of penetration was taken to be the distance from the dye interface to the applied face.

4. RESULTS

a) Capillary Water Absorption

The capillary water absorption versus time was measured. The average reduction in water absorption of the treated samples relative to reference is presented in Table 2.

Table 2

Samples	Reduction in capillary water uptake after 24 hours
SS1-3	93.2%
SS4-6	94.9%

b) Chloride Ion Diffusion

The reduction in chloride uptake relative to the untreated sample at the various depth increments is presented in Table 3.

Table 3

Samples	Reduction in chloride ion at the depth increments (%)					Overall
	0-10 mm	10-20 mm	20-30 mm	30-40 mm	40-50 mm	
SS1-3	92.1	95.4	94.3	96.7	96.1	>92%
SS4-6	93.5	95.9	94.3	97.8	96.1	>93%

c) Depth of Penetration

The depths of penetration for all samples SS1-6 are presented in table 4.

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Samples	Penetration depth (mm)	Average depth (mm)
SS1	3-5	4
SS2	2-7	4
SS3	3-5	4
SS4	5-7	6
SS5	4-7	5.5
SS6	4-8	6

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