LABORATORY REPORT

R&D 13 BBA 29th June 2010

Façade Cream - Water Uptake Tests on Different Substrates

Safeguard are developing a waterproofing cream (Stormdry) for use on walls of residential and commercial buildings. This will have the ability to keep the outer wall of a house dry and thereby improve the insulation properties. Additional targets are to provide a) driving rain resistance and b) flood resilience

This report describes the testing done to check the imparted water resistance on a range of different substrates.

Substrates and Test Method

The water absorption was measured according to EN ISO 15148:2002 (E). Specimens of approximate size 100 x 100 x 25 mm were prepared by cutting blocks of material. The sides of each specimen were sealed with a water and vapour tight sealant (Blackfriars Interior Sealdamp) and allowed to dry.

The test coating was then applied to one of the 100 x 100 mm faces on each specimen. This was applied by brush and the amount applied was calculated at the coverage of 200 g/m^2. The specimens were then left for 28 days at 20 ℃ and 50% RH to allow the treatment to cure.

A metal grid was then placed in a water tight tray. This grid gave a small gap of 3 mm between the specimen and the bottom of the tray which allowed free access of water.

After the conditioning phase was complete, to start the test the specimens were weighed and placed in the water tray. Water was kept to a depth of 5mm. The weight was then recorded at intervals up to 7 days. The test method is normally run for 24 hours but this was extended to gain data that could be relevant to flood resilience.

Table 1 : Substrates used in the test

Type	Details	Composition	pH
Brick	Fired clay standard LBC Fletton – Most common type	Silicate	8.1
Brick	Fired clay West Hoathly Stock Brick	Silicate	6.4
Brick	Sand-lime type	Silicate	12.0
Mortar	New mortar made with soft sand:cement 5:1	Silicate	11.8
Mortar	“Old” mortar made to Safeguard laboratory recipe	Silicate	9.1
Sandstone	Blaxter sandstone	Silicate	7.7
Sandstone	York sandstone	Silicate	7.9
Sandstone	Sheffield sandstone. Sample from local merchant	Silicate	7.1
Limestone	Portland	Carbonate	8.4
Concrete	Paving slab (Builder Centre)	Silicate	12.9
Granite	Off-cut from a kitchen work top. Italian origin	Silicate	No data

The pH of the different substrates was measured by grinding 5 g of substrate to a powder and then dispersing this in 50 ml of deionised water.

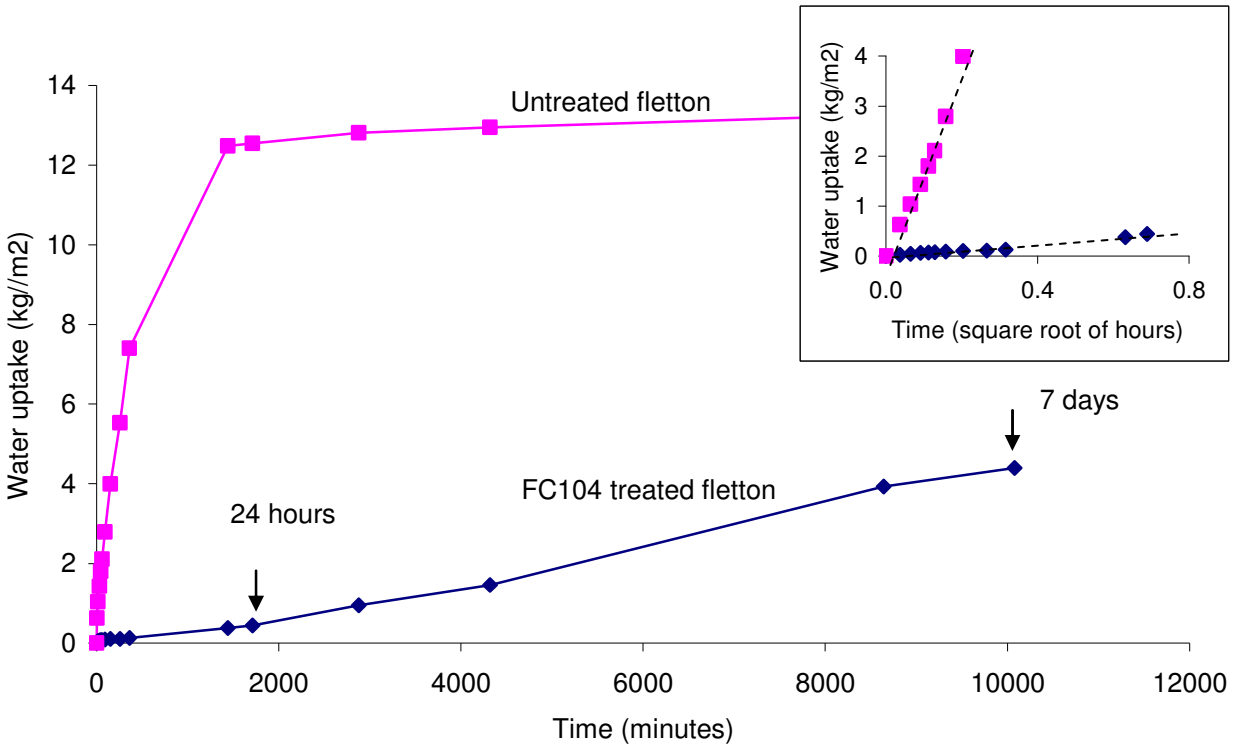
Figure 1 : Shows the appearance of the Blaxter sandstone blocks during the water absorption test.

The darker colour of the control samples has resulted from water reaching the upper surface. The darker colour on the sample edges is the sealant.

2. Results

A graph showing a typical water absorption is shown below. For the untreated brick most water absorption occurs in the first 24 hours. The treatment has the effect of reducing the rate on water absorption and the final amount.

Figure 2 : Water uptake graphs of treated and untreated Fletton brick



The test method also gives a description of how to calculate the Water Absorption Coefficient (W_w).

This is the gradient of the water uptake in kg/m2 against square root of time graph in hours. The inset in the figure shows the data over the first 24 hours plotted against the square root of time. The gradient was measured to be 19.0 kg/m^2 hr $^{0.5}$ for the untreated brick and 0.59 kg/m^2 hr $^{0.5}$for the treated one.

The Water Absorption Coefficient is a term which describes how quickly water flows into the substrate. The alterative measure of this characteristic is the sorptivity as measured in the Survey of Mortar samples undertaken by Safeguard. In the example above the sorptivity of the untreated Fletton was measured as 0.25 mm min $^{-0.5}$

(b) Comparison on different substrates

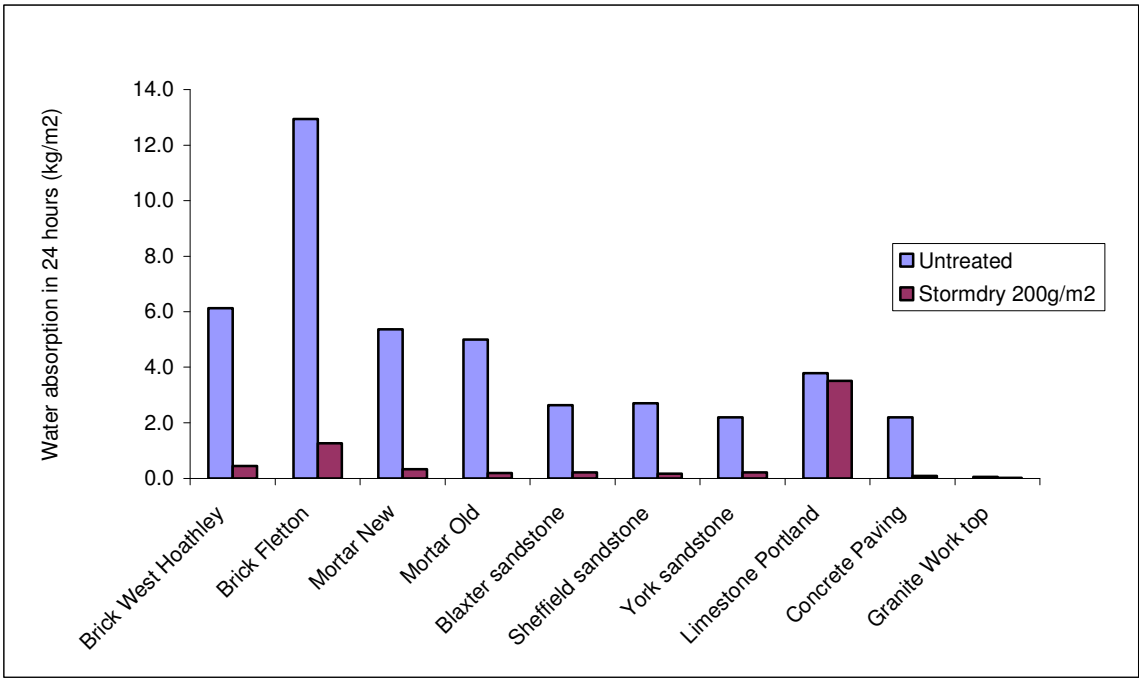
The water uptake results at 24 hours are presented in Table 2. Two samples were run on each of the untreated materials and two on Stormdry. The results have been divided up into those on bricks, mortar, sandstone and others. The comments on these results are as follows;

Table 1: Water absorption results (kg/m2) in 24 hours

	Brick West Hoathley	Brick Fletton	Mortar New	Mortar Old	Blaxter sandstone	Sheffield sandstone	York sandstone	Limestone Portland	Concrete Paving	Granite Work top
Untreated	6.1	12.9	5.4	5.0	2.6	2.7	2.2	3.8	2.2	0.06
Stormdry 200g/m2	0.5	1.3	0.3	0.2	0.2	0.2	0.2	3.5	0.1	0.02

(i) The data on the untreated controls shows some big differences in water uptake rates. The Fletton bricks have the highest water value and the lowest value is seen with granite

Figure 2 : Bar chart showing the 24-hour water absorption results on different materials



(ii) A bar chart showing the performance of the Stormdry is shown. It can be seen to be effective on the silicate based materials but not on carbonate (limestone).

At the end of the 7-day test, the depth of the hydrophobic zone was measured by breaking the sample in half to give the data in Table 3. "nv" marked in the table indicates that the zone was not visible

Table 3: Depth of hydrophobic layer

	Brick West Hoathley	Brick Fletton	Mortar New	Mortar Old	Blaxter sandstone	Sheffield sandstone	York sandstone	Limestone Portland	Concrete Paving	Granite Work top
Untreated	0	0	0	0	0	0	0	0	0	0
Stormdry 200g/m2	10	12	4	8	6	_	6	nv	4	0

The Fletton brick showed the greatest penetration depth, granite the least. The results broadly reflect the differences seen from water absorption on the untreated substrates with the alkalinity of the material reducing penetration due to the faster reaction rate with the substrate.

Conclusion

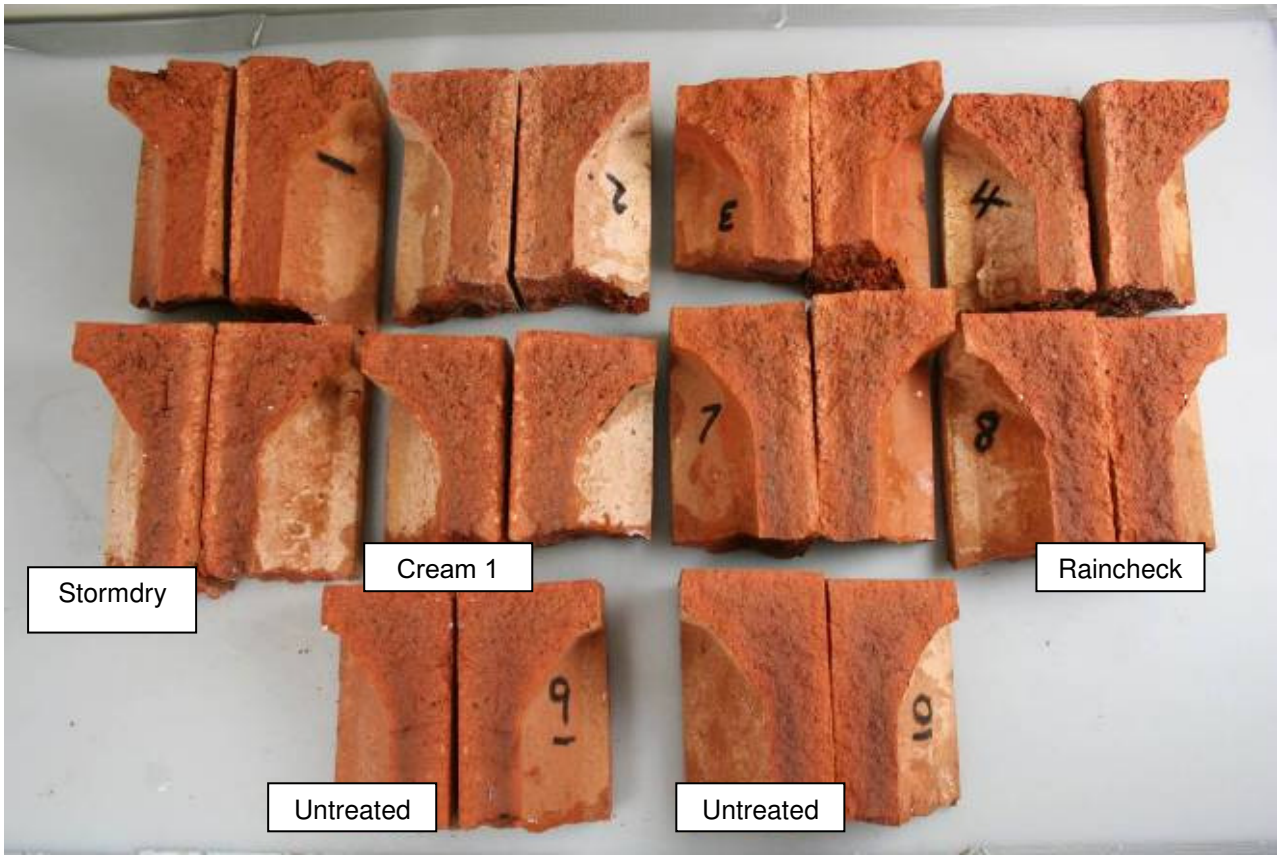
The test results show the water absorption of the substrate to be significantly reduced by Stormdry applied at 200 g/m2

The results generally fit the pattern that the depth of penetration is influenced by the sorptivity and pH of the substrate.

The pictures in the Appendix show some examples of the hydrophobic zone. These pictures are from a wide range of recipes that were tested in the process of finalising the Stormdry recipe.

E.Rirsch
29 June 2010

Appendix : Pictures showing the Depth of Hydrophobic Zone



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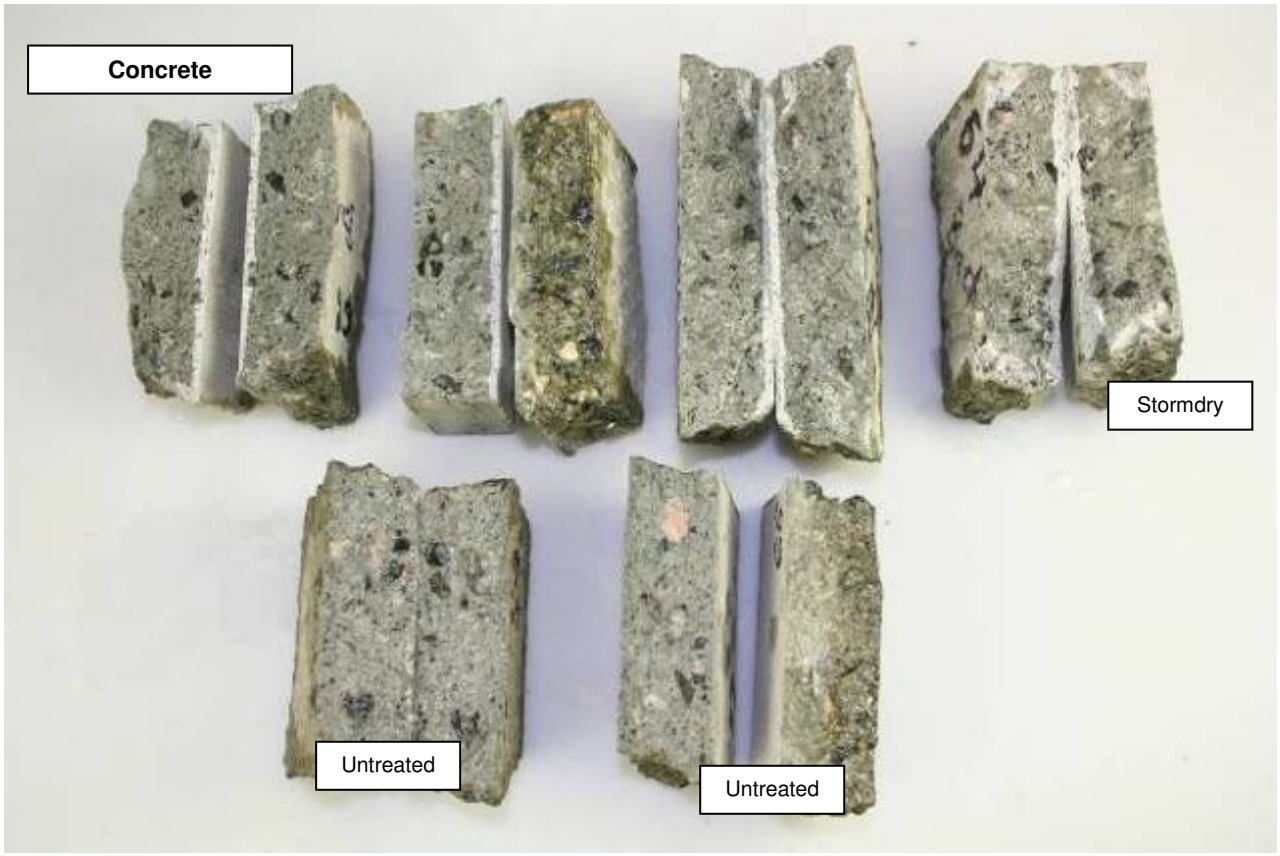

Photo : Water Spray on Stormdry Treated Wall