LABORATORY REPORT

R&D 75 12th December 2013

Dryzone Replastering System

The current method of refurbishment of properties suffering from rising damp is time consuming.

The first step is the removal of the damp and salt contaminated plaster typically to 1-1.5 metre height. Secondly the damp-proofing cream is then inserted by drilling and filling regularly spaced holes in the mortar course. Lastly the area of the wall with the plaster removed is re-rendered with a sand and cement mixture applied in two layers and followed by a plaster skim coat. This last step is the most time consuming and labour intensive aspect to the job. Additionally the render must incorporate a special sand grading that is becoming increasingly more difficult to obtain, and a salt blocking additive.

This report covers the work done by Safeguard to investigate a new quicker method of replastering which overcome these short comings. The work has led to the filing of a patent application on a new replastering method.

1. Concept

The general concept in the project was the following;

(i) After the salt contaminated plaster had been removed and the damp proofing cream installed, apply a salt inhibitor barrier cream (Dryshield) to the salty wall. The function of the barrier cream is to minimise the impact of crystallising salts on the surface by impairing the crystallisation process

(ii) After the salt inhibitor cream has been applied, building board (e.g. plasterboard) is bonded on to the surface using a moisture and salt resistant adhesive.

(iii) Lastly a plaster skim coat is applied

The whole process is quick and potentially saves on labour costs.

2. Testing with Plasterboard

A series of tests were conducted to identify a suitable adhesive. The first round of work focused on the ability of the adhesive to hold the board in place.

Pieces of plasterboard were adhered to upright concrete paving slabs in order to test the slip of the adhesives. The distance that the board slipped in 10 minutes was then measured.

The results from the slip test are shown in Table 1. It can be seen that the Recipe No.3 held position well, as did the cement and plaster products.

Photo 1: Slip Testing of Different Adhesives

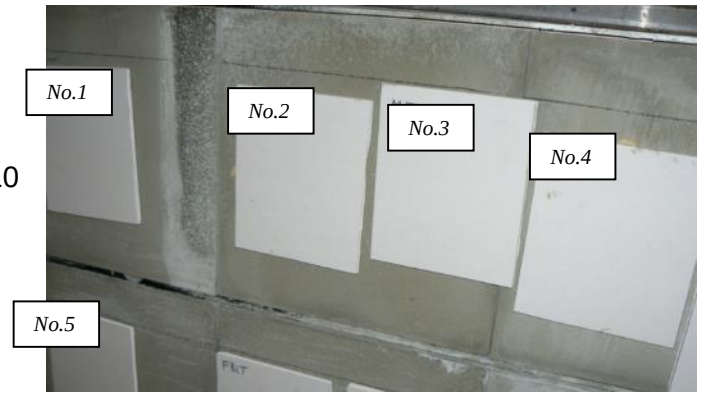


Table 1: Adhesive Testing Results

Adhesive No.	Type	Slip Test (cm)	Salt Test	Comments
1	Silane modified polyether	2.3	No salt or moisture transfer	
2	Silane modified polyether	2.4	No salt or moisture transfer	
3	Silane modified polyether	0.1	No salt or moisture transfer	
4	Silane modified polyether	3.8	No salt or moisture transfer	
5	Silane modified polyether	12	No salt or moisture transfer	Low viscosity
6	Silane modified polyether	12	No salt or moisture transfer	Low viscosity
7	Silane modified polyether	0.2	No salt or moisture transfer	
8	Bitumen emulsion	0.2	No salt or moisture transfer	
9	Polymer mod cement	0.1	No salt or moisture transfer	
10	Polymer mod cement	0.1	Partial salt transfer	
11	Plaster dab	0.1	Salt and moisture transfer	Control sample
S1	Polymer mod cement (high latex)	0.1	No salt or moisture transfer	
S2	Polymer mod cement (high latex)	0.1	No salt or moisture transfer	

Different types of adhesive were tested for slip and salt resistance as shown in the table. Photos showing the testing of the adhesive are on the next page.

The salt test devised had the objective of measuring the transfer of salt and moisture from a brick to plasterboard.

The bricks were partially immersed in a saturated salt solution and were then left until they had become fully saturated. The bricks were then allowed to dry, after which the surface salts were wiped off. The Dryshield salt inhibitor cream was then applied and after 2 hours a piece of cut plasterboard was adhered using the test adhesive.

The assembly was then placed back into the salt solution for 3 days followed by 7 days of water. After this time it was allowed to dry for 10 days to allow the salts to crystallise further on the surface. Following this drying phase, water was then re-introduced for a further 7 days. At the end of this period the bond strength and moisture content of the plasterboard was tested.

The pictures show the tests on the application adhesive along with pictures then showing the appearance of the plasterboard pieces. In this set a darker surface to the plasterboard generally coincided with more moisture being transferred through the glue to the plasterboard.

Some comments on the results are as follows;

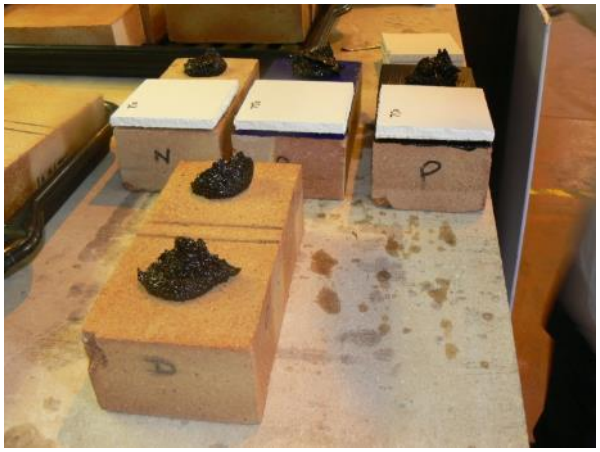
(i) The silane modified polyether adhesives have good resistance to moisture and performed well although there was some movement with several of the recipes in the slip test. This type of adhesive cures from moisture in the atmosphere.

(ii) The bitumen emulsion adhesive also gave promising results. However the limitation with this approach is that moisture is required to be removed from the adhesive to facilitate hardening. In a damp wall situation removal of moisture cannot always easily be achieved.

(iii) The polymer modified cement recipe generally gave satisfactory results though this was not always the case and there was an instance of salt transfer. The adhesive would require the mixing of water into the powder on site.

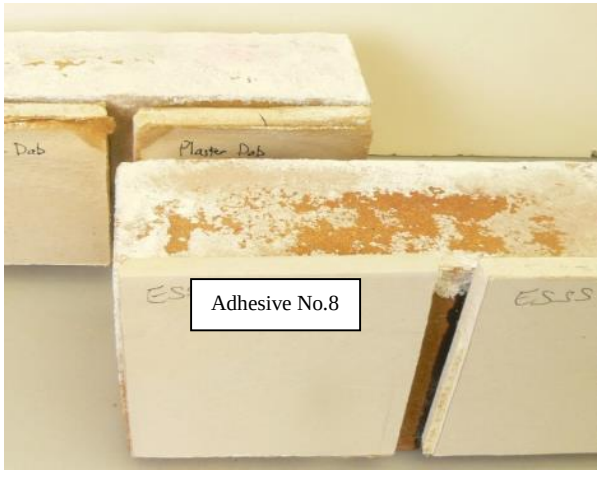
(iv) Gypsum plaster was used as a control. This showed good grab and slip resistance but moisture and salt transfer performance was poor.

Photos 2-7: Adhesive testing in salt transfer test

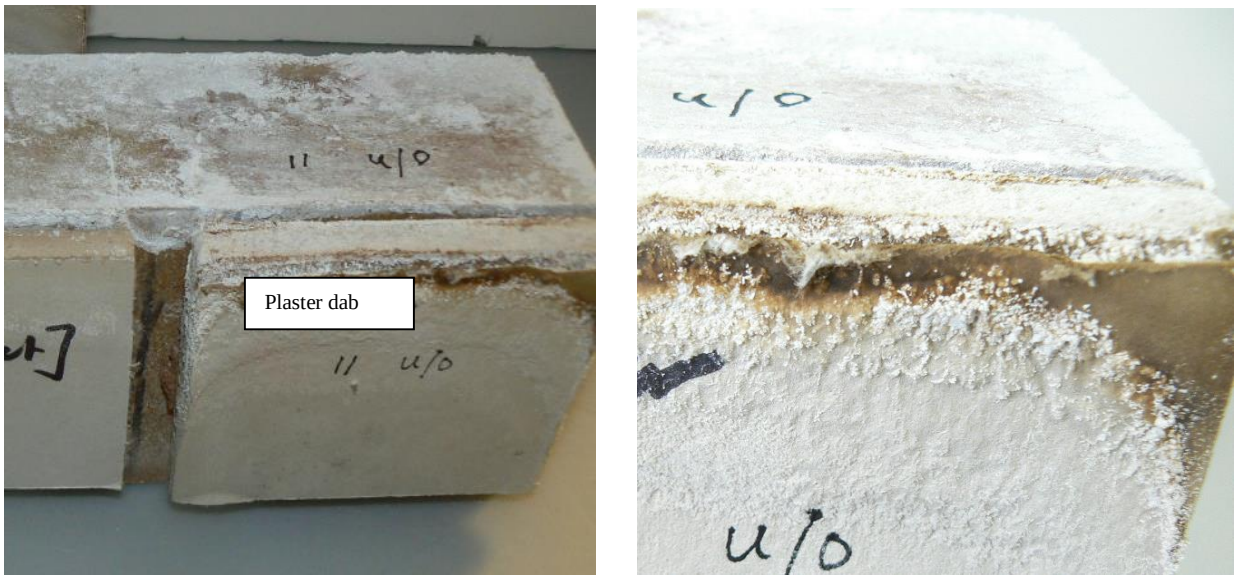


Application of adhesive No.8

Application of adhesive No.7



Visible salts crystallising on the brick do not transfer to the plasterboard surface



With the gypsum plaster dab, salt can be seen to transfer through to the plasterboard surface

Some measurements were made to establish the effectiveness of the salt barrier cream which is used as a primer prior to applying the adhesive.

Different salt inhibitor cream (Dryshield) recipes were tested as shown in Table 2. At the end of the above salt test, the moisture content was measured in the plasterboard.

Table 2: Influence of Barrier Cream on Plasterboard Moisture Content

	Moisture content of board at the end of the test (weight %)			
	No Barrier Cream	Dryshield A	Dryshield B	Dryshield C
Adhesive S2	1.2%	0.5%	0.5%	0.4%
Gypsum dab	14.5%	3.5%	6.9%	3.4%
Silane modified polyether	2.2%	0.6%	0.6%	1.3%

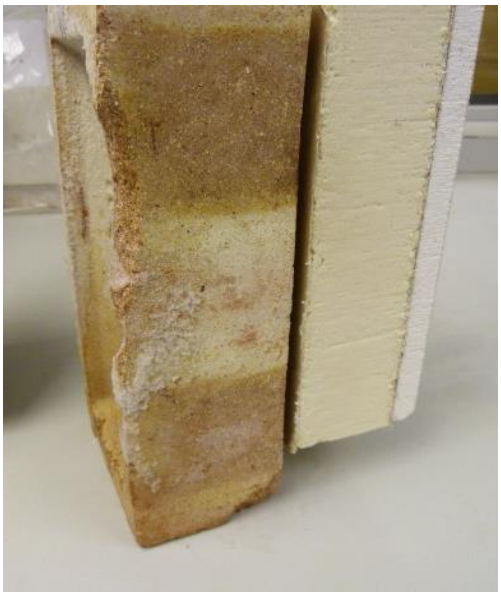
It can be seen from the results that the Recipe A has a beneficial effect at reducing the moisture content of the board. Recipe A was adopted as Dryshield.

3. Dryzone System with Ecotherm Ecoliner board

Ecotherm board is a rigid insulation board comprising insulation (PIR) and plasterboard. There is a paper and foil backing on the board which is positioned towards the wall surface; the plasterboard faces the interior of the room. The combined board thickness is 62.5 mm and capable of achieving a U-value of 0.3 W/m2. http://www.ecotherm.co.uk/

A sample of the board was received in the laboratory for testing. Adhesive No.3 (subsequently named "Drygrip") was used in the test and the standard method described was used to test bond strength and salt transfer. The results showed that there was no evidence of salt transfer from the brick to the board.

Photos 8 and 9 show the test set-up and result.



Left hand side shows the appearance during the test and the right side afterwards with crystallising salts

4. Conclusion

Photographs from two site trials are shown in the Appendix. The Harthill test site work was done in March 2011 and is the first example of the application. There have been no problems with the installation over the current two years of installation.

The table below shows a cost breakdown of the different replastering methods.

Table 4: Cost breakdown of different methods

Cream with Glue and Plasterboard		**Current Practice**	
	£/m2		£/m2
Salt Inhibitor Cream	£3.80	Cement (at £3 per 25kg)	£1.20
Adhesive	£5.17	Sand (at £1.5 per 25kg)	£1.80
Plasterboard (9.5 mm square edge)	£2.47	Render Additive	£1.33
Positioning Plugs	£0.50		
Skim	£0.50	Skim	£0.50
Total Materials	**£12.44**	Total Materials	**£4.83**
Labour Cost	**£10.00**	Labour Cost	**£29.40**
Total cost	**£22.44**	Total cost	**£34.23**

It can be seen that the new method has a lower installation cost resulting from the faster speed of installation.

The Dryzone System is a fast way of replastering compared to sand/cement render and plaster finish coat.

Different boards may be used depending on thermal efficiency requirements.

E.Rirsch
12/12/2013

Dryzone System Information - http://www.dryzonesystem.com/

Appendix - Harthill Site Trial

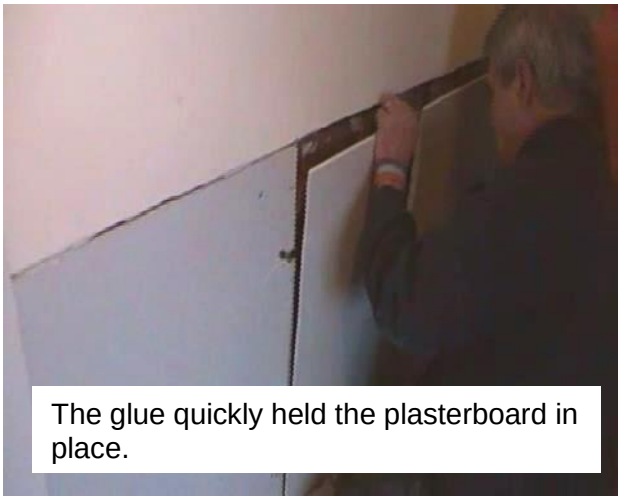
Work Done – March 2011

The cream waterproofs the surface and is a barrier to salts penetrating into the plasterboard. The board is bonded on to the wall with a waterproof adhesive.

Applying Salt Inhibitor Cream

Drygrip glue dabs applied to the plasterboard

Positioning of plasterboard



The glue quickly held the plasterboard in place.

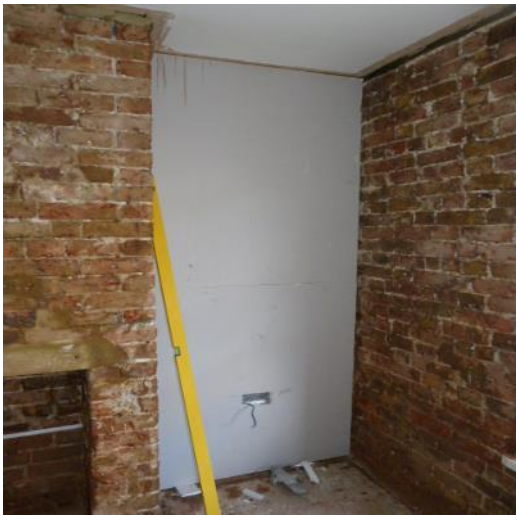
Whitstable Site Trial

Work Done – October 2012

Dryshield applied to left hand wall and half-way down right hand wall.

Drygrip dabs applied to plasterboard.

Dryshield applied behind the electrical socket backplate.



Area of wall completed in two sections.

Dryshield applied to fireplace outer walls.

Plasterboard in one section around fireplace.