Evaluation of a Novel Damp Proofing Method Developed by Safeguard Europe

Background to testing

Silicone based creams are used in the control of rising damp. These creams include higher potency materials (approximately 65 % actives) and lower potency creams (approximately 20 % actives). They act by spreading and permeating within the mortar course delivering the active material, which then bond to the masonry creating a hydrophobic layer for controlling the rising damp.

A new method and corresponding product has been developed by Safeguard Europe where the active material is held in an absorbent rod. The rod is then inserted into the holes in the mortar course. The technology is designed to allow the active material to spread from the rod to form a hydrophobic layer. It has the advantage of being a very clean and fast method of damp proofing with the capability of being tailored to different substrates.

The University of Portsmouth was invited to assess this new technology and to compare its effectiveness to existing cream technology.

Sample preparation

Brick assemblies – referred to as "Brick Burgers" – were prepared from a sandwich of two brick slips and wet mortar.

The brick slips were provided by Hanson PLC and were of size 214 mm x 65 mm x 20 mm. The mortar was prepared from plastering sand supplied by a local merchant. This was bound with a neutral pH binder. It is important to note that the properties which encounter rising damp are often several decades old and the original alkaline mortar used in construction becomes carbonated towards a neutral pH (See *Rirsch, E., MacMullen, J., & Zhang, Z. (2011))*

A series of test "burgers" were made as follows;

A – Dryzone Rod Recipe 1
B – Control (no treatment)
C – Dryzone Rod Recipe 2
D – Conventional Cream (Dryzone)
E – Low strength cream

"Burgers" A and C were prepared with 10 mm holes spaced 120 mm apart from centre-to-centre.
"Burgers" B, D and E were prepared with 12 mm holes spaced 120 mm apart centre-to-centre.

Water absorption testing

The water absorption of the brick burgers was measured by placing the burgers in a shallow tray of water of approximately 4 mm in depth. The weight gain was measured periodically to give the water absorption graph. In addition, photographs were taken to show the rising damp boundary advance with time.

Graphs

The graphs below show the weight gain of the test "burgers" given as a % weight increase. Figure 1 displays the weight gain profile over a period of 9 days. Figure 2 shows the final weight increase after 9 days of testing.

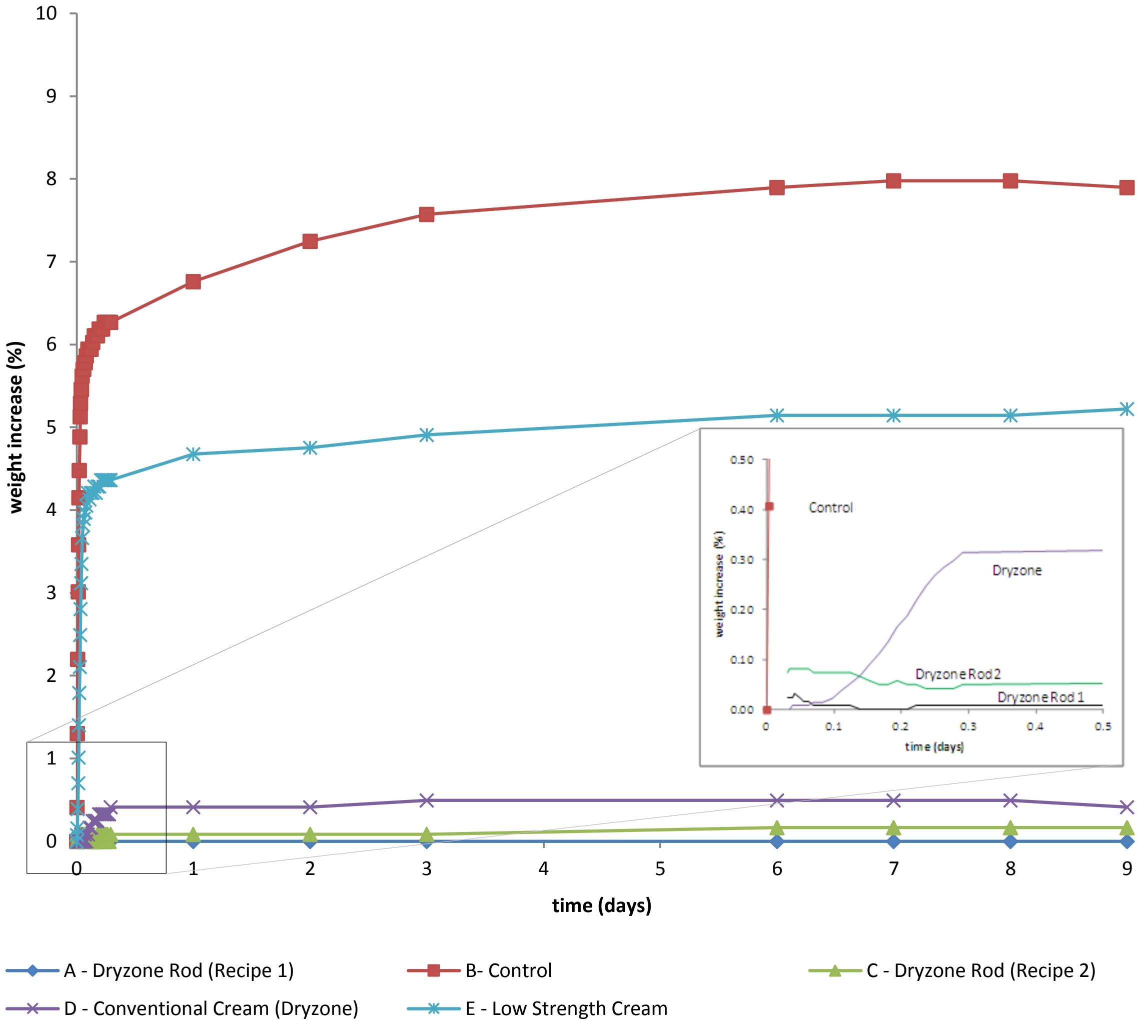

Figure 1: Weight gain on contact with water of brick assemblies treated with damp proofing creams and Dryzone Rods

The control "burger" underwent a rapid weight increase during the early stages of testing. After this point the weight gain slowed and reached a steady level. A similar profile is observed for the "burger" treated with the low strength cream. However, the weight increase did not reach the same level as the control.

The "burger" treated with the Dryzone Cream experienced a low weight increase compared to the low strength cream, and again exhibited most of this increase occurring during the early stages of

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testing. The two “burgers” treated with Dryzone Rods experienced very little weight increase during the test period.

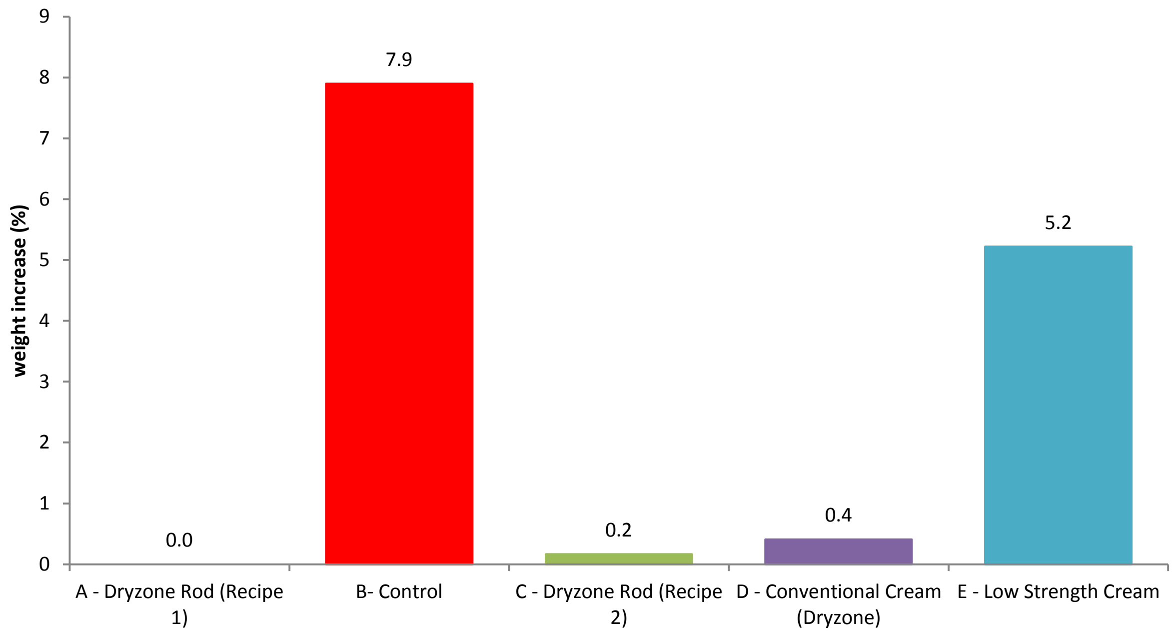

Figure 2: Weight gain after 9 days in contact with water of brick assemblies treated with damp proofing creams and Dristicks

Figure 2 demonstrates the effectiveness of the Rod technology in the control of rising damp providing a significantly better performance than that of current cream technology.

Figure 3 displays the weight increase against root time divided by thickness.

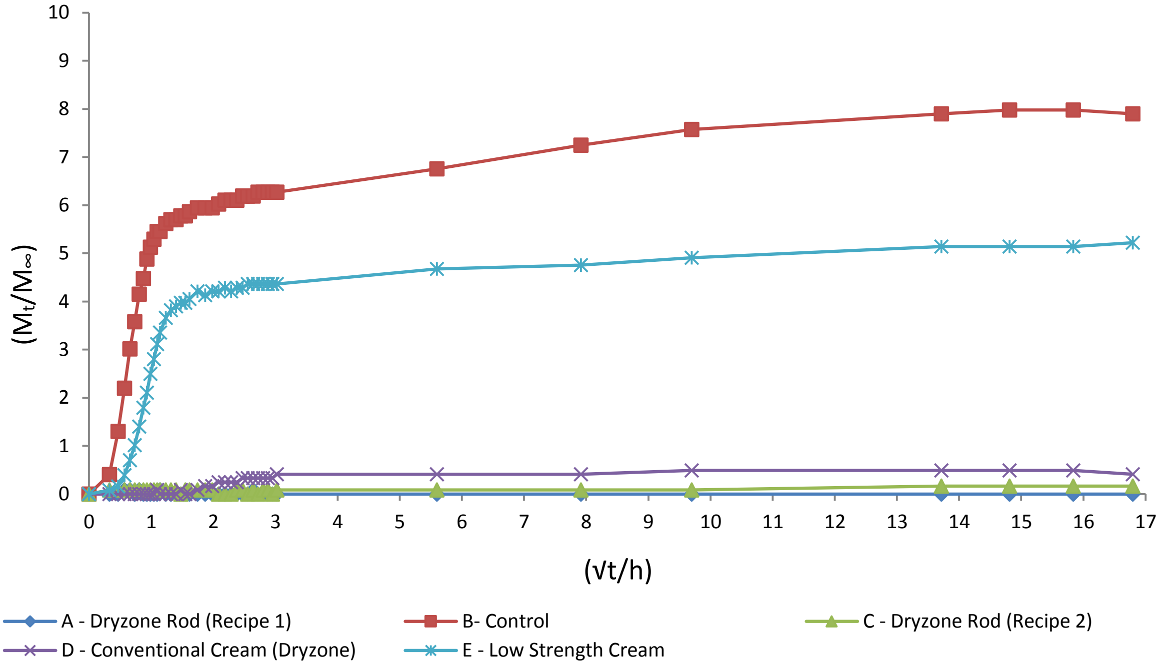

Figure 3: Weight increase data plotted verses root time divided by thickness

<u>Photographs</u>

D – Conventional cream (Dryzone; A- Dryzone Rod Recipe 1; B Control (no treatment); C- Dryzone Rod Recipe 2; E- Low strength cream

Figure 4: Photography of experimental set-up

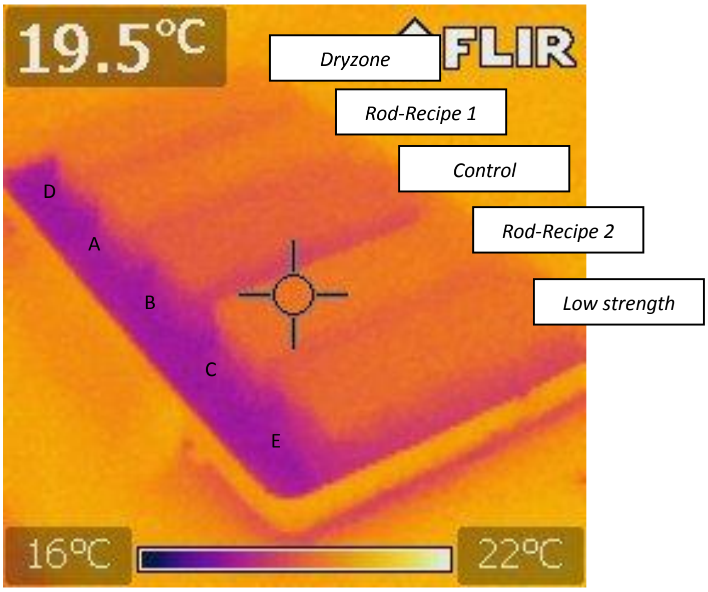

Figure 5: Thermal image of five test samples

As can be seen with “burgers” B and E, the evaporative cooling effect lowers the temperature of wet “burgers” due to the fact that water has higher thermal capacity and large evaporative latent heat. This has been explored and reported by collaborative research by the University of Portsmouth and Safeguard Europe Ltd.

Conclusions

A novel moisture and water repellent rod product developed by Safeguard Europe Ltd, which is complimentary to the existing product range was tested and evaluated. The following conclusions can be drawn;

1. Water absorption occurred in all cases, but was reduced in those brick burgers treated with either damp proofing creams or Dryzone Rods.

2. The high strength damp proofing cream was more effective than the low strength damp creams at reducing water absorption.

3. Dryzone Rod is particularly effective at reducing water absorption.

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References

Rirsch, E., MacMullen, J., & Zhang, Z. (2011). Evaluation of Mortar Samples Obtained from UK Houses Treated for Rising Damp. *12th Conference on Durability of Building Materials and Components (p. T31). Porto: Portugal.*

MacMullen, James, Zhang, Zhongyi, Radulovic, Jovana, Dhakal, Hom and Bennett, Nick (2012) *An investigation of hydroxyl end-terminated polydimethylsiloxane (PDMS) in exterior oil-in-water (O/W) emulsion treatments.* Construction and Building Materials, 37. pp. 283-290. ISSN 0950-0618 10.1016/j.conbuildmat.2012.07.056

Zhang, Zhongyi, MacMullen, James, Dhakal, Hom, Radulovic, Jovana, Herodotou, C., Totomis, M. and Bennett, Nick (2012) *Enhanced water repellence and thermal insulation of masonry by zinc oxide treatment.* Energy and Buildings, 54. pp. 40-46. ISSN 0378-7788 10.1016/j.enbuild.2012.07.030

MacMullen, James, Zhang, Zhongyi, Radulovic, Jovana, Herodotou, C., Totomis, M., Dhakal, Hom and Bennett, Nick (2012) *Titanium dioxide and zinc oxide nano-particulate enhanced oil-in-water (O/W) facade emulsions for improved masonry thermal insulation and protection.* Energy and Buildings, 52. pp. 86-92. ISSN 0378-7788

MacMullen, James, Zhang, Zhongyi, Rirsch, E., Dhakal, Hom and Bennett, Nick (2011) *Brick and mortar treatment by cream emulsion for improved water repellence and thermal insulation.* Energy and Buildings, 43 (7). pp. 1560-1565. ISSN 0378-7788 10.1016/j.enbuild.2011.02.014

Rirsch, E., MacMullen, James and Zhang, Zhongyi (2011) *Evaluation of mortar samples obtained from UK houses treated for rising damp.* Construction and Building Materials, 25 (6). pp. 2845-2850. ISSN 0950-0618 10.1016/j.conbuildmat.2010.12.050

Rirsch, Eric. Zhang, Zhongyi, Jin, M. and See, S. (2009) *Investigation into nanoclay enhanced coatings for brick moisture reduction and salt formation prevention.* In: Protection of historical buildings, PROHITECH 09. Vol. 2. Taylor & Francis, London, pp. 1717-1720.