

## Appendix B: WP3 – Wall analysis

Prepared by BRE

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## 1. Analysis of water proofing treatments

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### 1.1 Historical BRE analysis of waterproofing treatments

Over the last 30 years or so, BRE have carried out product testing for various private clients investigating the effectiveness of water proofing treatments on walls. An in-house water spray testing methodology was developed that simulated up to 3 years exposure in severe wind driven rain environments. This testing was used to supplement tests according to BS 6477, 'Specification for water repellents for masonry'. Tests have also been carried out in situ on test houses on BRE's site, using high pressure spray techniques (at 500 Pa) to simulate severe exposure conditions.

The majority of data unfortunately cannot be reported publicly due to client confidentiality. In any case, the performance characteristics of products tested such a long time ago may not be deemed representative of equivalent products manufactured today.

What the testing did unanimously confirm is that constructional faults present in untreated wall samples (i.e. ABIS conditions, such as cracking or voids) invariably acted as the starting points for any failures observed (i.e. water penetration during testing), and where proofing products were otherwise generally quite successful, they could not prevent leakage through larger cracks. Durability testing, considering the effectiveness after up to 3 years of sample weathering, typically showed that the various types of treatments were less effective after their first year of exposure. By contrast, where products identified during this study do quote a service lifespan, it is generally between 10 and 25 years. (It should however be noted that not all products offer such durability guarantees). This may reflect the fact that product durability has improved significantly since this earlier testing was carried out by BRE, although it is difficult to generalise on this when such information could not be found for all products.

### 1.2 Identification of currently available water proofing products

The purpose of this exercise was to gain a better understanding of the range and nature of wall waterproofing products available within the UK, with the aim of selecting an indicative product or products for subsequent laboratory testing. The approach has been to identify as many relevant products as possible, starting initially with internet searches, much as many potential clients may do. Certification bodies and professional product selector services were also explored to expand on those initially identified.

Product literature was then investigated and enquiries made with manufacturers to try to establish whether products fell into different groups based on their chemical composition, effective mechanism, application method, or any other parameters. Products most representative of the industry breadth (initially intended to be based on sales volumes or similar, but ultimately based on those for which the most comprehensive information was available) were then recommended for testing.

#### 1.2.1 Products identified from internet searches

An initial Google search was made with 8 search terms to identify waterproofing treatments intended for use on any wall material type. The searches were limited to UK only in the geographic options. No other limitation was put into the search aside from the search term itself. The search terms ranged from the most basic 2-word descriptor for products to increasingly more defined terms expected to generate a more limited number and specific set of products. The search terms used were:

- brick sealant
- masonry sealant
- brick water repellent
- cavity wall sealer
- sealing brick walls exterior
- masonry impregnating sealer

- breathable remedial masonry water repellent barrier
- aqueous based hydrophobic impregnating agent

Some products were discovered with the majority of the original 8 search terms used, whilst others produced only 1 “hit” with use of the most defined search terms.

In addition to the sealant/ repellents’ name and manufacturer, a record was kept of the following parameters; a brief product description, the web page link to the product found, an indicative cost where found (e.g. “5 litres = £67”), an indicative coverage where provided (e.g. “1l = 3-5m<sup>2</sup> coverage) and BBA Certificate details if available.

A secondary search exercise was carried out using more general search terms and incorporating the use of a second search engine – Bing. The search engine choice was limited to Google and Bing as they cover 95% of all search engine use within the UK, with Google by far dominating the market with 83.5% of usage whilst Bing has 11.1% of usage. The six additional search terms included:

- water sealant for brickwork
- wall water proofer
- brickwork protector
- masonry barrier
- brickwork water proofer
- exterior wall seal

Furthermore, several of the search terms had their word order reversed to gauge its effect on the search term used e.g. applying both “water-proofer brickwork” and “brickwork water-proofer”. However, the initial variations revealed no additional products compared to the original search term and therefore this was not deemed worthy of repetition across all 14 search terms and both search engines.

On multiple occasions the search revealed a branded product that in turn led to a range of similar products available from the same company/ outlet. Information was therefore also noted for these additional products where they had not separately been identified by the various search terms.

It was not necessarily apparent from the information found whether some products were manufactured by the same company but re-branded. Although direct product supplier enquiries, discussed below, suggested that a few products were supplied by other manufacturers, it has not generally been possible to identify identical products. There is therefore likely to be a considerable amount of unknown repetition of products.

### 1.2.2 Product Selector and Certifier searches

The above search terms were used on industry product selector websites, including the RIBA Product Selector and Barbour Index, as well as the BBA (British Board of Agreement) site for certification details of products. In some cases a free text search was not possible or not successful, so instead drop down menus were used to select products from defined sub-divisions of the database structure. In the case of the RIBA product selector, product results included a menu allowing the user to access trade literature, the technical literature of the product, and/ or its BBA certificate where available. However, many of the literature sources provided were general papers for generic product types rather than specific technical details of a particular product. BBA Certificate information was found for only a very limited number (3) of relevant products.

### 1.2.3 Product technical details and supplier information

In order to try to establish product similarities and groupings, further product information was sought from manufacturer websites, technical literature, safety data sheets, or BBA certificates, depending on what was available. Some information was found as a result of the above web searches’ resulting product pages. However, in many instances very limited information was found.

It was not obvious that any of the identified products were a repeated version of another, although numerous products had similar product names. The review of the technical and application information sheets revealed that 4 products were not relevant; one was merely a concentrated form of the same product, one was a further masonry

application to be used after the water repellent treatment, one was an injectable damp proof course product, and one was a dustproofing wall sealer that whilst intended for internal use was suggested for limited use on external surfaces.

Further requests for information were sent via email directly to 33 manufacturers/ suppliers for which contact details could be found. This particularly focussed on aspects that were not readily available in the public domain, such as the type of product (chemically speaking) and market information that may help provide a picture of the most commonly used products in the UK. Manufacturers were asked the following questions of their products:

1. Please list the wall waterproofing treatment products you supply that are both:
  - a. Clear once dried (i.e. not paints or renders)
  - b. Breathable in nature (i.e. allow moisture within a wall to dry out)

For each of the above products:

2. For categorisation purposes, what is the fundamental product type (in chemical terms), e.g. siloxane, silane, aluminium stearate, etc
3. Has the product performance been independently certified by a third party, e.g. BBA? If so, please provide relevant certificate information.
4. Do you have any statistics on the market share of each product, or the typical volume of sales, e.g. litres per year?
5. Is the product suitable for use on brick/ stone/ concrete/ calcium silicate/ cement mortar/ lime mortar (please list as appropriate)?
6. If possible, please provide statistics for the effectiveness of the product(s) to the resistance of moisture ingress? (e.g. % reduction in water absorption)
7. Do you propose an expected lifespan/ effective duration for the product(s)? If so, how long?
8. Does the product need to be reapplied at a given frequency to ensure continued durability? If so, what is the typical period of recommended reapplication?

Unfortunately, the majority of manufacturers did not respond at all, or did not reply directly to the questions raised. Information was received from only 10 contacts representing 16 relevant products. In particular, no meaningful data could be established regarding market share, hence this cannot be used to help select products for laboratory testing.

### 1.3 Products considered for laboratory testing

Key information identified for the products from the above search activities is separately available including all data found for the products, including:

- Name of product
- General description
- Technology type
- Company name
- Original manufacturer (if known to be different)
- Cost (calculated per litre)
- Coverage
- Approx. market share/units sold
- Durability/ lifespan
- Means of application
- Certification (if applicable) e.g. BBA
- Resistance to rain penetration (% reduction in water absorption)

60 products have been included, some of which have more information available than others. Of these, 43 have an identifiable product 'type', which broadly fall into three categories:

- Acrylic
- Stearates
- Silane/ Siloxanes (or blends)

Only 3 products are identified as acrylics, 3 as stearates and 37 as silane/ siloxanes, of which 11 are noted as taking the form of a cream. Some products are solvent based, while some are solvent free, with examples of the latter suggesting they may be applied to damp walls, rather than insisting on dry walls for application. Although silane/ siloxane blends appear to be the most common product type of those identified, testing each of the different types at the bench testing stage at least would help to determine whether there are any fundamental differences in performance. However, unless bench testing determines otherwise, it seems most appropriate that silane/ siloxane blends are favoured in the larger scale WDR testing as being most representative of the market. In addition, testing both a cream and liquid version of the silane/ siloxane type at the bench testing stage would allow comparison of the ease and relative merits of their application method and, whether this fundamentally impacts on subsequent performance. Also, testing a product that is approved for application on both damp and dry walls respectively during the bench testing would identify whether the moisture content of the substrate during application affects the eventual product performance.

Other parameters that may be considered when selecting products for test include:

- Claimed resistance to moisture penetration. Only 17 products offer such data and they do not necessarily report on their effectiveness on all potential material substrates. There is also very little difference between the resistance levels quoted.
- Expected lifespan. Around half the products offer an estimate, or in some cases a guarantee of expected product durability. Most state at least 10 years, with some as high as 20-25 years
- Cost data could be considered, however it is not always clear whether multiple coats of the product would be required; often manufacturers state that the coverage and number of coats will depend upon the porosity of the substrate material. This may therefore not be a particularly strong metric on which to base product selection
- Products for which third party testing/ certification have been sought. This would limit the range of products substantially
- Product availability. It will be necessary for the products tested to remain anonymous, so the study is not seen to endorse or cast doubt on the effectiveness of any particular product. Some products only seem to be available by making direct contact with manufacturers, which may make them aware their product has been used for this research. It is therefore likely to be preferable if products were obtained anonymously online.

Based on the above parameters, it is recommended that products of each type are chosen using the following hierarchy, which reflects the level of information available (and hence confidence) for the products:

1. Those with declared performance data relating to moisture resistance, preferably with third party Certification
2. Whether a lifespan/ durability is declared and guaranteed (with preference to those offering longer lifespans)
3. Whether the product is readily available online, to aid with confidentiality when sourcing products
4. If the same manufacturer is put forward for more than one product, an alternative should be sought for a more balanced market spread
5. If remaining products otherwise appear to have the same criteria, the cost per m<sup>2</sup> wall coverage will be considered

**The above factors result in selection of the following products for bench testing:**

Acrylic, 10 years lifespan, no resistance performance claims. Note that product guidance recommends 2 coats if the substrate is absorbent.

Stearate, 10 years lifespan, independent performance testing with claimed resistance rates. Note that the product guidance recommends 2 coats be applied.

Silane/ siloxane blend liquid, 10 years lifespan, with claimed resistance rates. Note that product guidance requires only 1 coat to be applied. This product is solvent free and can be applied to damp walls.

Silane/ siloxane blend cream, 25 years lifespan, BBA cert with claimed resistance rates. Note that product guidance requires only 1 coat to be applied.

### 1.4 Summary of samples proposed for bench testing

Considering the wall variables identified for test and ABIS conditions from Work Package 2 (with the exception of mortar droppings on ties, since no ties will be present in the bench test samples) and products from section 1.3, the diagram in Figure 1 sets out the range of samples proposed for bench testing. Including control samples receiving no treatment, 18 test specimens will be required overall. Note that the testing structure for the subsequent WDR testing will be determined based on the findings of the bench testing.

Figure 1: Sample and product permutations for bench testing

