

# Energy Saving Trust Report

*Safeguard Europe  
Stormdry  
Energy Saving Trust Verified*

*From: Energy Saving Trust  
June 2018  
Version: 1.3*



**ENERGY SAVING TRUST**  
**Product Performance Verification**

**Client:** Safeguard Europe

**Address:** Redkirk Close, Horsham, West Sussex, UK, RH13 5QL

**Product:** Stormdry

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## BACKGROUND

The Energy Saving Trust (EST) is the UK's leading independent and impartial organisation in the domestic energy sector. Our internationally renowned services are underpinned by the very best evidence, research and evaluation, and delivered by highly skilled and experienced specialists in the field. We have an outstanding track-record of delivery, whether leading programmes on behalf of UK-wide governments, the European Commission or working alongside businesses.

EST offers a range of services relating to the evaluation and verification of the performance of energy efficiency and renewable technology. **EST Product Verification** is a bespoke service, designed to assist businesses in communicating the energy related and performance benefits of their products. The process involves the independent verification of a product's performance characteristics followed by the development of factual, informative, consumer-facing claims for use in promotional marketing materials.

This report presents an evaluation of the evidence that was provided by Safeguard Europe and the conclusions of product performance that EST has been able to draw at the end of the process. 4

## STORMDRY EXTERNAL WATERPROOFING COATING

### Product description



Stormdry is an external wall waterproofing product manufactured by Safeguard Europe that claims to enhance water resistance and energy performance by creating a breathable water-repellent barrier on the masonry surface to maximise the thermal performance of the walls, as it is asserted that dryer masonry walls have a lower thermal transmittance than masonry walls that are more-moist.

Energy Saving Trust carried out a desk evaluation and verification of the product's waterproofing behaviour and impact on thermal performance based on evidence supplied by Safeguard Europe

Safeguard Europe would like product performance verification from EST on the basis of the evidence submitted that Stormdry:

- prevents ingress of moisture into bricks and reduces their moisture content
- improves thermal and energy performance of buildings, and reduces running costs
- offers other advantages such as a low upfront cost and preservation of the existing building aesthetic and does not have an impact on the appearance of the building

This to be combined with:

- development of consumer-facing claims, based on the verification findings, for use in marketing materials, with relevant supporting caveats
- comment on the savings provided by Stormdry in relation to solid wall insulation

## Supporting Evidence of Product Performance

Safeguard Europe has supplied a range of product performance data, including laboratory testing, field trial data and calculations of thermal performance. The documents provided and reviewed are as follows:

1. Giraffe: brief evaluation of water repellent surface protection for masonry, and potential energy requirements in space heating. Giraffe Innovation Dr Sibylle Frey and Mark Dowling, 17 October 2011
2. Estimates of Energy Saving with Stormdry: Laboratory report 9th December 2009
3. James MacMullen et al (2011) Brick and mortar treatment by cream emulsion for improved water repellence and thermal insulation, Energy and Buildings 43 (2011) 1560–1565
4. CLR Case Study 1A+B: Hydrophobic Brick Cream on Solid Wall + IWI (Internal wall insulation)
5. British Board of Agreement (BBA) test report No 53232
6. Paper for submission for “Retrofit 2012” prepared by Dr. Eric Rirsch (Safeguard) and Dr Zhongyi Zhang (University of Portsmouth) Energy Saving from Water Repellents
7. Heat Loss Savings from the Treatment of Masonry with Water Repellents - Feasibility Study: Stormdry Laboratory report April 2008

## Review and summary of evidence reports

The section below provides a short summary of the evidence submitted and their relevance to claims made about Stormdry.

### **1. Giraffe: brief evaluation of water repellent surface protection for masonry, and potential energy requirements in space heating. Giraffe Innovation Dr Sibylle Frey and Mark Dowling, 17 October 2011**

This report contains a peer review of selected literature, results of a SAP CO<sub>2</sub> model for a “typical house”, a high-level carbon assessment of Stormdry treatment product’s production and an estimate of the carbon savings arising from lower space heating requirements.

The SAP CO<sub>2</sub> emissions modelling is for one home. The model estimates that a home treated with Stormdry will have carbon emissions 23% lower than an untreated home. EST cannot comment on the validity of these claims based on the evidence submitted as only the results are provided in this report. These are based on modelling in “Safeguard laboratory report no.18”.

The report gives the carbon footprint of the production and use of Stormdry as 0.73 kg CO<sub>2</sub>e per meter square treated. This claim has not been independently verified by EST. The outcomes of this report are based on figured provided by Safeguard Europe (2009).

### **2. Estimates of Energy Saving with Stormdry: Laboratory report 9th December 2009**

This report shows the inputs and results from the SAP modelling of two modelled homes, located at 1 Safe Street, Mr Mark Saich. The worksheets show that the home was modelled using SAP 2005 for a semi-detached house with a floor area of 73.6 square metres and a gas boiler with SEDBUK efficiency of 83%. These are reasonable and conservative assumptions to use when modelling the energy use of a typical semi-detached home in Great Britain.

To calculate energy saved, the paper compares the energy use of the same dwellings, but varying the U-value of the external walls from 3.16 Wm<sup>-2</sup>K<sup>-1</sup> to 1.91 Wm<sup>-2</sup>K<sup>-1</sup>. Effectively this assumes a 40% reduction in heat loss through the walls. The U value of 3.16 is taken from document 6, this is an estimate for a „worst case” scenario with a completely saturated wall. This is the maximum energy that could be saved for a house in a very exposed location, assuming the brick remains saturated at all times. The energy savings for a more typical property will be less than this, therefore EST are unable to verify the typical energy saving for a whole house from this report. 7

### 3. James MacMullen et al (2011) Brick and mortar treatment by cream emulsion for improved water repellence and thermal insulation, Energy and Buildings 43 (2011) 1560–1565

This journal article presents results from a lab test whereby a small model “house” was built from 2 courses of 4 bricks (8 bricks in total), placed inside an environmental chamber. A lightbulb acting as a heater and thermostatic control were placed inside the house. The electricity consumption of the bulb was recorded to measure the energy required to maintain the internal temperature of the house with changing external humidity and temperature, in situations when a waterproofing agent was and was not applied to the external brick work. Another lab test also measured the change in the mass of Frogged London Bricks and mortar after being submerged in a tank of water for 24 hours with and without a waterproofing agent being applied, to measure the absorbency of the material. Another test to measure the “mean contact angle” for the samples showed that contact angle increased with Stormdry treatment, demonstrating the surface had become hydrophobic.

The lab test showed that when the waterproofing agent was applied, in cases where the external relative humidity was 10%, the treatment reduced thermal conductivity of the materials. This reduced the energy used in the model house to maintain the internal temperature at 20 degrees C by 55.8%-48%.9% in wet conditions when the external temperature was -5 and 5 degrees respectively. It showed energy reduction of 2.4% at -5 degrees externally in dry conditions and 5.4% at 5 degrees.

As noted in the report, the savings from this modelled house can in no way be directly extrapolated to actual homes in-situ. For various reasons the model house does not reflect the conditions of a real home with varying heating demand throughout the year experiencing variable precipitation and humidity. A major difference is the ratio in the model home of the heated volume to the heat loss area. As estimated in the two figures below the model house has approximately 18 times the relative heat loss wall area to volume area compared to the 3 bedroom semi-detached house modelled in SAP.

#### *Model lab house*

<i>Internal width:</i>	150	mm
<i>Internal wall height</i>	204	mm
<i>Internal wall area (*4)</i>	0.12	sqm
<i>Internal volume</i>	0.005	cubic meters
<i>surface area to volume ratio:</i>	26.7	/m

#### *Model SAP scale house*

<i>External wall area:</i>	108.21	sqm
<i>Volume:</i>	73.6	cubic meters
<i>surface area to volume ratio:</i>	1.47	/m

This report indicates that brick treatments can reduce heat loss through “Frogged London Brick” walls.

#### **4. CLR Case Study 1A+B: Hydrophobic Brick Cream on Solid Wall + IWI (Internal wall insulation)**

This report shows measurements of over a four-year period of moisture levels on a solid wall that has been insulated in situ with an open cell PUR foam sprayed between timber battens.

An issue of concern with internal wall insulation, is that the insulation reduces heat flow to the external walls from inside the building, allowing more water vapour to condense within the masonry. This may lead to structural issues related to damp. The report presents analysis of moisture sensors installed in the brick work where half of a west facing wall was treated with Stormdry the other half remains untreated. It is noted in the report that a limited number of sensors were in place due to funding constraints, which means caution is required when drawing conclusions.

The report concludes that the Stormdry Masonry Protection Cream appears to reduce rain load. It also states that the interface between the brick and the insulation is about 12% WME in the treated area compared to 18% in the untreated area, but again notes that the microwave survey shows a fair amount of variation so may not be completely representative.

#### **5. British Board of Agreement (BBA) test report No 53232**

This report presents the results of tests undertaken by the British Board of Agrément (BBA) on Stormdry Masonry Protection Cream. The test assesses water vapour transmission; Water absorption coefficients by partial immersion for various substrates treated and untreated by Stormdry. The tests also assessed the depth of penetration of Stormdry into the materials and the drying time of the bricks after saturation. The masonry substrates tested were: Beestone blocks (red sand stone), concrete, mortar, mortar with repointing additive and Milton Buff brick. The test also assessed the performance of Stormdry to inhibit absorption of water after prolonged exposure to UV. With each substrate a significant reduction in water absorption was observed and even after exposure to UV, the increase in water absorption was small. Across all of the substrates the mean penetration of Stormdry was between 2.5 and 10mm. The test showed that Milton Buff Bricks treated with Stormdry take longer to dry than untreated bricks, however the bricks were able to fully dry.

This report shows that Stormdry can inhibit the absorption of water into red sand stone, concrete, mortar and Milton Buff bricks. "Tests on a brick substrate indicate the product does not significantly affect the resistance to water vapour diffusion of the substrate and therefore will not increase the risk of condensation." (BBA certificate No 15/5198).

#### **6. Paper for submission for "Retrofit 2012" prepared by Dr. Eric Rirsch (Safeguard) and Dr Zhongyi Zhang (University of Portsmouth) Energy Saving from Water Repellents**

This paper contains a compilation of results from various reports. It shows evidence that the moisture content of masonry affects its thermal conductivity. It shows absorptivity test results of Stormdry across various substrates: Fletton brick, West Hoathley brick, mortar (new and old), Blaxter sandstone, York sandstone, Sheffield sandstone, Portland limestone, concrete paving and granite. In all cases Stormdry shows some reduction in absorption, and this is considerable in all cases apart from Portland Limestone where the reduction is only marginal and granite, which is practically non-absorbent to begin with. It also shows the estimated energy savings modelled in SAP for homes with varying wall U-values.

The modelling shows that the heating requirement for a semi-detached home with U-values of 3.16 Wm<sup>-2</sup>K<sup>-1</sup> to 1.91 Wm<sup>-2</sup>K<sup>-1</sup>. This refers to the modelling shown in "Estimates of Energy Saving with Stormdry: Laboratory report 9th December 2009". The conductivity value used



for an exposed wall and a non-exposed wall, though the u-value of 3.16 Wm<sup>-2</sup>K<sup>-1</sup>, should also account for the thermal performance of the plaster on the internal wall and the mortar between the bricks, but as the paper states in reference to space heating requirements “it is difficult to model accurately”. The paper also provides results from the paper: “Brick and mortar treatment by cream emulsion for improved water repellence and thermal insulation” discussed above.

## **7. Heat Loss Savings from the Treatment of Masonry with Water Repellents - Feasibility Study: Stormdry Laboratory report April 2008**

This paper was put together by Safeguard in 2008 bringing together information from 4 reports, including ones produced by Fraunhofer and BRE Scotland, in order to model the energy savings achievable by having a waterproofing agent on the walls. The report explains the different ways that heat loss is affected by moisture, including graphing the relationship between conductivity and moisture content from a Portsmouth university report and the influence of latent heat of vaporisation. Savings estimates are provided, but these are crude as noted in the paper and could not be used for the purpose of consumer savings.

### **Conclusions from evidence review**

- The evidence provided about Stormdry show from independent testing that:
- Dry masonry has a lower thermal transmittance than wet masonry (secondary sources)
- Stormdry Masonry Protection Cream can reduce heat loss through Masonry (frogged London bricks) when applied (James MacMullen et al (2011))
- Stormdry can inhibit the absorption of water into red sand stone, concrete, mortar and Milton Buff bricks. (BBA test report No.53232)
- Testing has shown that Stormdry can slow the drying time of bricks due to a 10% decrease in vapour permeability. However, this does not prevent the complete drying of the brick with time. (BBA test report No.53232).

The evidence is indicative that Stormdry as a water repellent for masonry has the potential to save energy. However, it is noted that only one of the test reports is an entirely independent source (BBA test report No 53232).

No in-situ testing of the product has been explicitly carried out to determine the extent to which heat loss is reduced within an actual dwelling when applied to a home in the UK.

## EST Review of Quality Assurance Documentation

The scope of the EST Verification project for Safeguard Europe's Stormdry product included a document review to establish that a suitable Quality Management System (QMS) is in place, covering the manufacture of the product.

Various documents have been submitted to EST for review, summarised as follows:

- BBA Assessment of Production, document reference 97/3363 AQP 18-09-2017
- Internal procedure "Stormdry colour check", document reference QC 20 dated 23.4.13
- Internal procedure "Stormdry Re-Pointing Additive No.1 Solids Test", document reference QC 32, dated 2.11.15
- Internal procedure "Stormdry Viscosity Test", document reference QC 10, dated 24.8.16
- BSI ISO9001 Certification, certificate number FM 01937, expiry date 14.9.18
- BSI ISO14001 Certification, certificate number EMS 539224, expiry date 16.11.17

Having reviewed this documentation EST have concluded that an appropriate QMS is maintained by Safeguard Europe and is subjected to ongoing audit by both BSI and the BBA.

## Verification of Performance Claims

Safeguard Europe have provided evidence relating to performance of Stormdry, comprising of independent test data and academic reports. One of the key objectives of this project was to determine a number of statements that EST can verify, on the basis of the evidence submitted the three following claims can be verified by the Energy saving trust these are listed below.

All statements are correct as of July 2018 and valid for 12 months subject to the terms and conditions of the Energy Saving Trust Verification Licence Agreement.

### Water resistance

#### Claim

***Stormdry can inhibit the absorption of water into red sand stone, concrete, mortar and Milton Buff bricks.***

#### Caveat

BRITISH BOARD OF AGRÉMENT TEST REPORT No 53232. Please follow application guidelines. Statement correct as of July 2018 and valid for 12 months.

#### Explanation

BRITISH BOARD OF AGRÉMENT TEST REPORT No 53232: This report presents the results of tests undertaken by the British Board of Agrément (BBA) on Stormdry Masonry Protection Cream. The test assesses water vapour transmission; Water absorption coefficients by partial immersion for various substrates treated and untreated by Stormdry. The tests also assessed the depth of penetration of Stormdry into the materials and the drying time of the bricks after saturation. The masonry substrates tested were: Beestone blocks (red sand stone), concrete, mortar, mortar with repointing additive and Milton Buff brick.

### Longevity/durability

#### Claim

***Stormdry will continue to inhibit water ingress even after exposure to severe weather, including sunlight exposure and freezing temperatures***

#### Caveat

BRITISH BOARD OF AGRÉMENT TEST REPORT No 53232. Statement correct as July 2018 and valid for 12 months

#### Explanation

BRITISH BOARD OF AGRÉMENT TEST REPORT No 53232: The test also assessed the performance of Stormdry to inhibit absorption of water after prolonged exposure to UV. With each substrate a significant reduction in water absorption was observed and even after exposure to UV, the increase in water absorption was small.

## Heat loss

### Claim

***External walls with high levels of moisture in the masonry, such as those in exposed locations, will lose heat faster than dry walls. Treating walls with a water-repellent can protect them from absorbing moisture.***

### Caveat

Conclusions drawn from James MacMullen et al (2011) Brick and mortar treatment by cream emulsion for improved water repellence and thermal insulation, Energy and Buildings 43 (2011) 1560–1565. Statement correct as of July 2018 and valid for 12 months.

### Explanation

This journal article presents results from a lab test whereby a small model “house” was built from 2 courses of 4 bricks (8 bricks in total), placed inside an environmental chamber. A lightbulb acting as a heater and thermostatic control were placed inside the house. The electricity consumption of the bulb was recorded to measure the energy required to maintain the internal temperature of the house with changing external humidity and temperature, in situations when a waterproofing agent was and was not applied to the external brick work.

Another lab test also measured the change in the mass of Frogged London Bricks and mortar after being submerged in a tank of water for 24 hours with and without a waterproofing agent being applied, to measure the absorbency of the material.