Historic Royal Palaces Insulation Project

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ABSTRACT

Rockwool and British Gas install insulation in Hampton Court Palace, the Tower of London and Kensington Palace.

Britain's most iconic palaces have been getting a green makeover through a rigorous insulation project installed by British Gas and Rockwool.

These three palaces after renovation will cut £130,000 from their gas-bills and reduce CO_2 emissions by 850 tonnes over the lifetime of the insulation. Protecting the environment and making savings will further ensure that these palaces and their wonderful stories will be here for future generations to enjoy.

The renovation is managed by Historic Royal Palaces and requires unique expertise for insulation installation in 500 years old buildings.

Nearly 11,500 m^2 of the three palaces will be covered by insulation. Around 7,000 rolls of insulation will be required for the project which will take around 1,900 hours to complete.

KEYWORDS

Rockwool, stone wool, insulation, fire safe insulation, thermal insulation, Historic Royal Palaces, London, renovation

ROCKWOOL AND BRITISH GAS INSTALL INSULATION IN HAMPTON COURT PALACE, THE TOWER OF LONDON AND KENSINGTON PALACE

Rockwool worked in partnership with British Gas to undertake this project to insulate the three main historic royal palaces, The Tower of London, Kensington Palace, and Hampton Court Palace. The Objective of the project was to reduce the carbon emissions from the palaces, reduce running costs and to improve the indoor climate conditions through the installation of both traditional roll and blown loft granulate insulation.

Discussions on the project began in late 2009 and were completed in November 2010; most of this time was spent in the planning and technical assessment phase. Below is some further detail of how this project was carried out.

The Historic Royal Palaces (HRP)

Historic Royal Palaces is the independent charity that looks after The Tower of London, Hampton Court Palace, the Banqueting House, Kensington Palace and Kew Palace. HRP helps everyone explore the story of how monarchs and people have shaped society, in some of the greatest palaces ever built.

HRP receives no funding from the Government or the Crown; they depend on the support of visitors, members, donors, volunteers and sponsors.

For more information about the Palace go to http://www.hrp.org.uk/

The importance of the right team from the start

At the start of this project, in late 2009, a project team was put in place made up of people from the three core delivery organisations associated with the project; Historic Royal Palace, British Gas (installation); and Rockwool Limited, the insulation provider, technical advice and inspection. At every level of the project, from logistics through technical advice, operations and relationship management, all three parties were represented.

This project management approach was vital to the successful delivery of the key objectives in the project. At every step, all three parties were able to debate, consult, develop and deliver the core requirements. It was essential during the early months of technical development of the solution for each of the palaces that this open and honest relationship was developed.

Scope of the project

The scope of this project was very ambitious. The team were looking to supply and install approximately 6,514 rolls of Rockwool insulation. This amount of insulation would cover about 11,478 square metres. It would involve about 1,900 hours of labour which would equate to a four man team working about 60 days.

The project was generally completed with two 2 man teams of technicians, allocated to specific areas of work with permanent site supervision. About 10% of attic spaces involved had quality assurance inspections while the work was in progress and 30% had quality assurance inspections post completion of the work. All inspections were carried out by the Rockwool technical team.

The project was broken down into five phases:

Phase 1; Tower of London, Queens House and Butler's Pantry – Built around 1530 and situated within the walls of the Tower on Tower Green. The insulation task - a building which is divided into two main areas; the first only accessible with scaffolding and the second made of six compartments or voids, accessed by a stone spiral staircase.

Phase 2; Hampton Court Palace, Barrack Blocks and Apartments – Hampton Court Palace was originally built for Cardinal Wolsey circa 1514. The Barrack Block provided the earliest purpose built barracks still standing in Britain dating back to 1689. The insulation task - the Barrack Block contains 15 lofts, and there were 15 apartments all covered by a single void with various access points.

Phase 3; Hampton Court Palace, Base Court – The Base Court is the first court one comes to when entering the palace, leading straight to the Anne Boleyn gate and the clock Court where on enters the palace itself. The insulation task - the Base Court comprises 16 apartments, 2 offices, an IT area, 2 plant rooms and 3 living apartments. There were also 4 apartments in a state of disrepair.

Phase 4; Hampton Court Palace, Fountain Court – Fountain Court was designed by Sir Christopher Wren for William III to replace Henry VIII's courtyard which stood on the same site. The insulation task - this comprised 11 voids (the unused space between the ceiling of the highest storey and the roof).

Phase 5: Kensington Palace, The Orangery – Kensington Palace has been a royal residence since the 17th century and today it is the official residence of the Duke and Duchess of Gloucester, The Duke and Duchess of Ken and the Prince and Princess Michael of Kent. The Orangery was built in 1761 for Queen Anne and is sent in the gardens of the Palace. The insulation task - This was single building which included a restaurant and tea room all of which had a single void.

The constraints of working with an historical palace

Due to the nature of the buildings involved in this project and the scope of works, there were some fundamental constraints which had to be considered such as some of the ornate ceilings below the lofts were priceless so other factors had to be included in the decision making process in order to minimise the risk and to enable sensible decisions to be made on how to proceed. Below are just some of the steps taken:

- The Palaces were declared as Scheduled which means that they are protected from any interference and as the programme of insulation required that the fabric of the building would need to be interfered with, a Scheduled Monument Consent had to be applied for before any work could begin on the Palaces.
- English Heritage, (a non-profit, government funded organisation, who champion the UK's historic palaces and advise the government on how to get the best from their cultural heritage), had to be consulted to ensure that all elements of the installation and the products used would comply with building regulations and those that are applicable to historic buildings.
- The Trustee and curators for each Palace has to authorise every programme of works at each step; without their buy-in and authority works could not progress

- Detailed health and safety risk assessment had to be undertaken of each element of the programme to take account of:
    - Voids in the attic areas of the palaces
    - Manual lifting and carrying of the rolls of insulation to the area of installation – historic buildings don't always have elevators

- Very detailed thermal (U value) calculations and dew-point calculations were undertaken. In conjunction with these reports, condensation risk analysis was carried out and reported upon. Both reports influenced the approach to take with depth of insulation and what products to use.

Picture of stairwell at Queen's House, The Tower of London

With all the above carried out, a detailed method statement was produced which described the programme of works in detail, covering:

- Resources required
- Significant hazards identified
- Safe system of work details
- Procedures for emergencies on site and accident reporting/recording
- Monitoring of the work
- Environmental arrangements for such things as dust and waste, for example.

Technical assessments of the Palaces

Each phase of the work had to undergo very detailed technical assessment, breaking each building into compartments and each compartment having its own technical assessment. The historic plans for each building were provided by HRP and were used to assess and quantify man hours and material usage. The assessment included:

- Size of the compartment – dimensions, total area, height
- Ceiling construction
- Details of existing insulation
- Condition of existing timbers
- Condition of roof tiles, lead, waterproof felt
- Details or how to access the void
- Details of existing lighting
- Was there a fixed walkway
- Was there cables housed in the compartment

Picture of void in apartment at Hampton Court

Detailed photographic records were taken, especially of any areas where there was an existing problem such as dampness.

All the technical assessments were carried out by Rockwool's technical services team. Rockwool worked closely with the installer, British Gas, and the team from HRP to ensure that all issues were considered to enable the team to draw together the final scope of works for the project.

This was broken down by building, loft and area. The scope described the proposed work to be undertaken, any special requirements to consider in that area, any remedial work that would need to be undertaken, for example, cracked roof tiles that needed to be replaced post installation. The scope also identified in each area the condensation risk by noting if there was any existing ventilation in the area and what could be done to improve this.

CONCLUSION

Rockwool spent many months working in collaboration with the team at HRP and the installers, British Gas, to reduce the carbon emissions, reduce running costs and improve the indoor comfort conditions of three of the world's most iconic Palaces.

After these historic buildings, Hampton Court Palace, Kensington Palace's Orangery and the Tower of London's Queen's House, have been properly insulated they will cut a combined £130,000 from their gas bills and reduce their CO_2 emissions by 850 tones over the lifetime of the insulation.

In total, nearly 4,500 square meters of the three palaces were covered by insulation – the equivalent of 100 average semi-detached houses. Altogether 11,000 rolls of insulation were required for the project which took around 1,000 hours to complete. [Table1]

TABLE 1

	HCP	TOL	KP	Total
Areas to be covered by insulation (m^2)	3624	241.9	614	4479.9
Total size of Palace (m^2)	16902	8304	2926	28132
3 b/room semi-detached house equivalent	81	5	14	100
Hrs to Insulate (hrs)	782	52	149	983
CO_2 Savings per year (tonne CO_2)	29.9	1.82	2.61	34.33
CO_2 Savings lifetime (tonne CO_2)	747.5	45.5	65.25	858.25
Savings on Fuel Bills per year - gas (£)	4494	297	458	5249
Savings on Fuel Bills lifetime – gas (£)	112350	7425	11450	131225
Packs of Insulation (roll)	851	72	214	1137
Packs of Insulation (blown)	238	-	-	238
No of Technicians for work	4	4	4	4
No of days work	104	8	20	132

Rockwool believes that every building, no matter when it was built or what it contains, should be insulated to protect it from the climate, protect those living and working in them from fire and from noise. Rockwool's stone wool insulation offers a 4 in 1 proposition, an insulation material that provides great thermal protection, great acoustic protection and great fire protection, plus it is truly sustainable.

Rockwool would be delighted to be given the opportunity to explain further details of this challenging, but worthwhile project to the delegates at the UNDP International conference in April 2011.

The video clip by BBC London is attached to this manuscript.