

# Rothesay

## Installation of insulation and secondary glazing



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## **Rothesay**

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## 1. Introduction

This case study describes thermal performance improvements undertaken at two residential properties in Rothesay, Isle of Bute, during 2011. In keeping with the preceding Refurbishment Case Studies, the aim of this work was to upgrade the property - by improving its thermal performance in a manner compatible with the existing building fabric. Three types of improvement were trialled in this Case Study; the addition of insulation to internal walls, secondary glazing to windows, and additional insulation to a door.

## 2. The Two Sites

The two properties in this case study are owned by Fyne Homes Housing Association, a Residential Social Landlord in the West of Scotland who have a large portfolio of older properties, including many Listed Buildings and those in Conservation Areas. Fyne Homes were interested in assessing the benefit of simple interventions that could assist them in providing warmer homes for the tenants and reducing fuel bills.

### ***18 Columshill Street***

This late 19<sup>th</sup> century, category C-listed two storey tenement is constructed of lime bonded whinstone with sandstone dressings. It has been repointed with a cement/sand mix in the past which is in satisfactory condition. There are four flats within the tenement block, all of which are accessed from an external stair tower to the rear of the property (Fig. 1). The property retains traditional timber glazing on the ground and first floor although most other internal features have been lost. In terms of energy efficiency improvements only the loft of the tenement had been insulated. The landlord, Fyne Homes, wished to improve the thermal comfort of the tenants with a programme of trial insulation works. As the stone stair stood proud of the building line, and was consistently cold during the winter months, it was considered that this area should be upgraded first. This was to comprise internal wall insulation and glazing upgrades to the stair windows. An additional benefit of this work was that the living spaces of the tenements would be unaffected as the work was restricted to the stairwell.



Fig 1: Rear stairwall at Columshill Street



Fig 2: Front elevation of Russell Street

### **17 Russell Street (Colbeck Place)**

The second site is a mid 19<sup>th</sup> century, category C-listed two story tenement constructed of lime bonded whinstone rubble with sandstone dressings (Fig. 2). The building had formerly been a single dwelling, and in the post war period it had been divided into two flats. The glazing on both floors was single glazed sash type, dating from the late 19<sup>th</sup> century, and possibly original to the building. The front door was a 4 section fielded panel door, also believed to be of the late 19<sup>th</sup> century. While there were some gaps in the sashes and the door frame, both these elements were in good condition, with no signs of timber decay. As such, both these elements were considered an important aspect of the character of the building and the local amenity, and a premise of the upgrade was the retention and thermal improvement of these original elements.

### **3. Pre-intervention Thermal Performance**

Prior to any intervention taking place Edinburgh Napier University measured U-values at both sites. At Columshill Street the masonry wall of the stone stair tower was measured, yielding a U-value of 1.3 W/m<sup>2</sup>K. The front door at Russell Street was measured, yielding a U-value of 3.9 W/m<sup>2</sup>K. Both measurements were taken in January 2011.

<b>Building Element</b>	<b>U-value (W/m<sup>2</sup>K)</b>
<b>Columshill Street – Stairwell Wall</b> 500mm masonry rubble wall with ‘plaster on the hard’	1.3
<b>Russell Street – Front Door</b> Hardwood timber with four panels, 19mm in thickness	3.9

These results are broadly similar to those at other test sites monitored by Historic Scotland, the results of which can be found in Historic Scotland Technical Paper 19. Technical Paper 19 also outlines the methodology for obtaining U-values on site.

### **4. Columshill Street – Stairwell Insulation Trial**

#### ***Internal Wall Insulation***

The finish to the stairwell before work started was a plaster direct onto the masonry (termed “on the hard”) and finished with gloss paint. In order to ensure that water vapour in the walls was able to disperse, and especially since the external masonry was pointed in a cement mortar, the paint was removed. A flexible aerogel blanket, 10 mm in thickness was then fastened to the wall behind an expanded steel mesh with thermally decoupled fasteners (a “mushroom type”) in order to prevent cold bridging. The aerogel was then enclosed with 2 coats of lime plaster, following the curve of the stair. The plaster was painted with a vapour open clay paint to maximise vapour dissipation. Aerogel blanket is a relatively new insulation material, which while expensive (currently approx £50.00 per square metre) it was technically suitable as it is vapour open, and so compatible with traditional structures. The addition of new insulation and plaster required the removal and relocation of several light fixtures and the stair handrail.

The aerogel blanket proved very suitable for use within the stairwell, particularly in terms of workability on site, as it was easy to install on the curved wall. Board based insulation would have been more difficult to work with on the curved form (Fig. 3).



*Fig. 3: The stairwell post intervention - aerogel blanket with lime plaster and clay paint finish. The secondary glazing is also visible on the window.*



*Fig. 4: Secondary glazing added to the interior side of the existing window in the stairwell*

### **Glazing**

The single glazed window in the stairwell was also upgraded with the addition of secondary glazing to the interior side (Fig. 4). A slim, aluminium framed secondary glazing unit with an operable lower sliding sash was selected. It can be removed for cleaning if required.

## **5. Russell Street – Door and Window Upgrades**

The walls at Russell Street had been relined in the 1990's, and although the work was carried out to today's standards the surfaces were in good condition with some mineral wool insulation behind plasterboard. The tenant was elderly and did not want any disruption to the property – this limited improvements to the timber windows and the front door. It was therefore determined that the most beneficial intervention would be the addition of secondary glazing to the interior side of three of the largest windows in the flat, two on the front elevation and one on the side elevation. The existing windows, single-glazed timber sash and case, were in good condition and needed minimal repair and painting. The secondary glazing needed to be operable for ventilation and, as with Columshill Street, a sliding sash system that allowed the raising of the lower secondary sash was selected. Fig. 5 shows the secondary glazing and the external sash open for ventilation.



*Fig 5: Windows and door upgraded, with secondary glazing and aerogel board applied to door panels*



*Fig 6: Interior side of front door prior to application of aerogel board*

The second aspect of the upgrade work at Russell Street was the thermal improvement of the front door (Fig. 6). The existing timber door was retained, and sections of 10 mm aerogel blanket were applied to the internal face of the panels. The blanket was held in place, thin plywood was then applied over it and fastened with a timber bead. This held the plywood flat against the insulation, and also maintained the fielded panel design of the inside face. The door was then repainted.

## 6. U-value Measurements

The post-intervention U-values are shown below alongside the pre-improvement figures. Considerable improvement has been achieved in the walls at Columshill Street where the U-value is less than half. The door in Russell Street also shows significant improvement. These measurements were taken in September 2011.

Building Element	Pre-Intervention U-value (W/m <sup>2</sup> K)	Post-Intervention U-value (W/m <sup>2</sup> K)
<b>Columshill Street - Stairwell Wall</b>	1.3 500 mm rubble wall, plastered on the hard	0.6 10 mm aerogel blanket, mesh & plaster
<b>Russell Street – Front Door</b>	3.9 4 panels 19 mm thick	0.8 addition of 10 mm aerogel board

## 7. Conclusion

The trials at both properties in Rothesay demonstrate relatively simple improvements which can be made to solid walls and joinery elements of traditional buildings. By retention of the existing windows and doors on both buildings there was minimal impact to the existing fabric, yet a good level of thermal improvement was measured. Disruption to occupants was minimal and both properties remained occupied during the works. These measures are equally applicable to similar homes in Scotland, which form a significant proportion of Scotland's housing stock.

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