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SAP 2009 Appraisal of Thermal Element Improvements to three proposed mid terraced flats at 6 Belvedere Terrace, West Road, Buxton, Derbyshire, SK17 6HQ for Part L1b Compliance

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1. Introduction

Following the planning application to convert the property from the current use of a House of Multiple Occupancy to the planned change of use three self contained flats a material change of use will occur under The Building Regulations 2000. In order to comply with Part L1b of The Building Regulations an assessment has been made into the feasibility of improving the thermal performance of the following elements which currently do not comply with the threshold limits under section 5 of Approved Document L1b;

- The existing 470mm (approx) thick non insulated stone external walls – u-value 2.41 w/m2 k, threshold value 0.70 w/m2 k.
- The existing 160mm (approx) thick internal partition walls – u-value 2.29 w/m2 k, threshold value 0.70 w/m2 k.
- The existing solid floor – u-value 0.87 w/m2 k, threshold value 0.70 w/m2 k.
- The existing suspended timber floor – u-value 0.71 w/m2 k, threshold value 0.70 w/m2 k.
- The existing timber framed single glazed windows – u-value 4.80 w/m2 k, controlled fitting value 1.6 w/m2 k.
- The existing uPVC framed windows – u-value 2.10 w/m2 k, controlled fitting value 1.6 w/m2 k.

The external thermal elements to the top floor and roof of the proposed second floor flat were upgraded in 1996. The u-values for these elements are assumed to be in line with SAP 2009 appendix S which reflect the building regulations in force at that time. The assumed u-values are below the threshold values and therefore have not been assessed as upgrading is not required. The assumed values are;

- Flat ceiling area – 0.26 w.m2 k
- Slope ceiling area – 0.35 w/m2 k
- Stud walls & dormer cheeks – 0.40 w/m2 k

2. Procedure

The assessment has been carried out using SAP 2009 which is The Government's Standard Assessment Procedure for the assessment of energy efficiency and CO2 emissions of dwellings in England & Wales. The assessment process involves conducting a survey of the property to establish the existing construction specification and the use of scale drawings produced by the architect.

Once accurate data regarding the construction, specification and dimensions of the thermal elements has been collected, it is entered into SAP 2009 design software to assess the performance of the existing dwelling. The outputs from the software give accurate figures for both the cost and CO2 emissions for the heating, hot water and lighting provision based on standard occupancy assumptions. The advantage of using this method is that an accurate assessment can be made of the likely reduction of CO2 emissions together with cost savings for each improvement measure considered.

3. Requirements

When considering improvement to the thermal efficiency of an existing dwelling subject to a material change of use, Part L1b requires that retained thermal elements should be upgraded if the current thermal performance exceeds a certain threshold. If above this threshold then the element should be improved to a lower u-value as shown in the table 1 below.

Table 1 Upgrading retained thermal elements		
Element	**Threshold u-value w/m2 k**	**Improved u-value w/m2 k**
Solid Wall	0.70	0.30
Floor	0.70	0.25

In addition to improving retained thermal elements Part L1b also requires that certain controlled fittings should achieve a particular standard. In this case the fittings and the standards required are shown in table 2 below.

Table 2 Standards for controlled fittings	
Fitting	**Standard**
Window	u-value of 1.6 w/m2 k or lower
Door	u-value of 1.8 w/m2 k or lower

4. Current u-values

Following the survey of the property the u-values for the various elements have been calculated using a u-value calculator that follows the methodology of BR443 "Conventions for U-value Calculations" and is in accordance with BS 6946 and BS 5250. For windows and doors the u-values have been taken from SAP 2009 version 9.90 March 2010. The u-values of the existing dwelling are shown in table 3 below.

Table 3 Existing & Threshold U-Values		
Element	**U-Value w/m2 k**	**Threshold Value**
Existing External walls – 470mm (approx) stone, no insulation	2.41	0.70
Existing Partition Walls – 160mm Solid Brick	2.29	0.70
Solid Ground floor – concrete, no insulation	0.87	0.70
Suspended Timber Ground Floor – no insulation	0.71	0.70
Single Glazed, Timber Framed Windows	4.80	1.60
Double Glazed, uPVC Windows	2.10	1.60

From table 3 it can be seen that all of the u-values of the existing construction assessed are above the threshold limits in table 1 and the standards for controlled fittings in table 2. These elements are therefore required to be upgraded or replaced to comply with the provisions of Part L1b. However, paragraph 5.12 allows a test to be applied to ascertain whether the improvement is economically feasible. The test of being economically feasible is whether it is possible to achieve a simple payback of 15 years in savings from running costs against the cost of the upgraded element.

5. Assessment

SAP 2009 calculations have been undertaken to assess the cost savings achieved by improvements to each of the retained elements and replacement of the controlled fittings. The cost savings for each flat are shown in tables 4a, 4b & 4c below.

Table 4a – Flat 1 Cost savings achievable by improving / replacing element / fittings	
Improvement / replacement	**Cost saving per annum £ from SAP Calculation**
Flat 1 – Baseline calculation to establish the heating, hot water & lighting costs for the dwelling as proposed without any improvements to the external thermal elements	(Baseline Cost) 1166.42
Floors – Improve the insulation to both the solid and suspended timber ground floors to a u-value of 0.25 w/m2 k	111.38
Glazing – Replace existing single glazed windows with double or triple glazed windows to achieve a u-value of 1.6 w/m2 k	114.79
Walls – Improve the insulation to the solid stone walls a u-value of 0.30 w/m2 k	245.68

Table 4b – Flat 2 Cost savings achievable by improving / replacing element / fittings	
Improvement / replacement	**Cost saving per annum £ from SAP Calculation**
Flat 2 – Baseline calculation to establish the heating, hot water & lighting costs for the dwelling as proposed without any improvements to the external thermal elements	(Baseline Cost) 1162.05
Glazing – Replace existing single glazed windows with double or triple glazed windows to achieve a u-value of 1.6 w/m2 k	150.54
Walls – Improve the insulation to the solid stone walls a u-value of 0.30 w/m2 k	418.71

Table 4c – Flat 3 Cost savings achievable by improving / replacing element / fittings	
Improvement / replacement	**Cost saving per annum £ from SAP Calculation**
Flat 3 – Baseline calculation to establish the heating, hot water & lighting costs for the dwelling as proposed without any improvements to the external thermal elements	(Baseline Cost) 1577.76
Walls – Improve the insulation to the solid stone walls a u-value of 0.30 w/m2 k	448.79
Glazing – Replace existing single / double glazed windows with double or triple glazed windows to achieve a u-value of 1.6 w/m2 k	51.56

6. Costs

Costs for the improvements to the retained elements and replacement of the controlled fittings have been taken from a quotation provided by M T Ashton & Sons and the BCIS Housing Repair Cost Guide. A quotation for the floor and wall improvements was sought as the BCIS cost guide does not specifically list estimates for floor or wall insulation improvements for flats. The BCIS Housing Repair Cost Guide is produced by The Royal Institution of Chartered Surveyors and is recognised by surveyors in both the public and private sectors as being an independent guide to the repair of housing stock in the UK. The improvement costs taken from the guide are in tables 5a, 5b & 5c below.

Table 5a – Flat 1 Cost to improve element	
Improvement / replacement	**Cost £**
Floors – Improve the insulation to both the solid and suspended timber ground floors to a u-value of 0.25 w/m2 k	(M T Ashton) 4050.00
Glazing – Replace existing single glazed windows with double or triple glazed windows to achieve a u-value of 1.6 w/m2 k	(BCIS) 2285.00
Walls – Improve the insulation to the solid stone walls a u-value of 0.30 w/m2 k	(M T Ashton) 7089.00

Table 5b – Flat 2 Cost to improve element	
Improvement / replacement	**Cost £**
Glazing – Replace existing single glazed windows with double or triple glazed windows to achieve a u-value of 1.6 w/m2 k	(BCIS) 2930.00
Walls – Improve the insulation to the solid stone walls a u-value of 0.30 w/m2 k	(M T Ashton) 7245.00

Table 5c – Flat 3 Cost to improve element	
Improvement / replacement	**Cost £**
Walls – Improve the insulation to the solid stone walls a u-value of 0.30 w/m2 k	(M T Ashton) 8534.00
Glazing – Replace existing single / double glazed windows with double or triple glazed windows to achieve a u-value of 1.6 w/m2 k	(BCIS) 4470.00

7. Cost Effectiveness

The cost effectiveness of the improvements to the retained elements or the replacement of the controlled fittings are shown in tables 6a, 6b & 6c below.

Table 6a Flat 1 Cost effectiveness of improvement / replacement			
Measure	**Cumulative 15 year saving £**	**Improvement Cost £**	**Economically Feasible?**
Improve Floor U-value to 0.25 w/m2 k	1670.70	4050.00	No
Replace Windows to 1.6 w/m2 k	1721.85	2285.00	No
Improve wall u-value to 0.30 w/m2 k	3685.20	7089.00	No

Table 6b Flat 2 Cost effectiveness of improvement / replacement			
Measure	**Cumulative 15 year saving £**	**Improvement Cost £**	**Economically Feasible?**
Replace Windows to 1.6 w/m2 k	2258.10	2930.00	No
Improve wall u-value to 0.30 w/m2 k	6280.65	7245.00	No

Table 6c Flat 3 Cost effectiveness of improvement / replacement			
Measure	**Cumulative 15 year saving £**	**Improvement Cost £**	**Economically Feasible?**
Improve wall u-value to 0.30 w/m2 k	6731.85	8534.00	No
Replace Windows to 1.6 w/m2 k	773.40	4470.00	No

8. Summary

From the results in Tables 6a, 6b & 6c, no elements have been identified as being economically feasible to upgrade using the simple 15 year payback method.

9. Appendices

Quotation from M T Ashton & Sons

SAP Calculations for;
(only the SAP summary for each SAP calculation has been included for clarity)

Flat 1 – As proposed (baseline calculation)
Flat 1 – Floor improved to 0.25 w/m2 k
Flat 1 – Windows improved to 1.6 w/m2 k
Flat 1 – Walls improved to 0.30 w/m2 k
Flat 1 – U-value calculations

Flat 2 – As proposed (baseline calculation)
Flat 2 – Windows improved to 1.6 w/m2 k
Flat 2 – Walls improved to 0.30 w/m2 k
Flat 2 – U-value calculations

Flat 3 – As proposed (baseline calculation)
Flat 3 – Walls improved to 0.30 w/m2 k
Flat 3 – Windows improved to 1.6 w/m2 k
Flat 3 – U-value calculations