



**Cost to improve the SAP rating of dwellings in Northern Ireland  
(from band F or G to band E)**





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This report is based on data from the House Condition Survey 2016. The main report for the survey is published on the Housing Executive's website:

<https://www.nihe.gov.uk/Working-With-Us/Research/House-Condition-Survey>

For further information about the 'Cost to improve the SAP rating of dwellings in Northern Ireland (from band F or G to band E)', or the House Condition Survey contact:

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## Introduction

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The Standard Assessment Procedure (SAP) is the Government's standard method of rating the energy efficiency of a dwelling. The Building Research Establishment (BRE)<sup>1</sup> has developed the current and previous models on behalf of Government.

The current model is SAP 2012 (RdSAP 9.93)<sup>2</sup> which was introduced in 2017 and was used to produce the SAP figures for the Northern Ireland House Condition Survey 2016. The model uses an A-G banding system to rate energy efficiency. Energy efficiency rating (EER) band A represents low energy costs i.e. the most efficient band, and EER band G represents high energy costs i.e. the least efficient band.

The Northern Ireland House Condition Survey (NIHCS) 2016 reported that 3% of dwellings in Northern Ireland had an EE rating in bands F-G. Following the publication of the report, and in response to users' needs, the Housing Executive commissioned BRE to estimate the costs required to improve dwellings with an EE rating in bands F-G, to band E.

The findings of this report are based on the 3% of dwellings in Northern Ireland with an EE rating in bands F-G. User should note that the NIHCS 2016 is a sample survey and that 3% represents a relatively small number of surveyed addresses (59). In general small numbers (25 or below unweighted) are not reported, however in some cases they have been included as they aid understanding of the statistics. In these instances guidance is given on how to interpret and use the figures.

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<sup>1</sup> <https://www.bregroup.com/>

<sup>2</sup> Information about SAP (including the updates to the model), is available in the NI House Condition Survey 2016 (Appendix H) <https://www.nihe.gov.uk/Working-With-Us/Research/House-Condition-Survey>



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## Cost to Improve Dwellings with SAP Rating F or G to SAP Rating E

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BRE has produced an estimate of the energy efficiency of every dwelling surveyed for the 2016 Northern Ireland House Condition Survey. This was done by calculating the SAP 2012 rating for the dwelling as surveyed. The modelling also included the assessment of performance following the installation of a range of improvement measures. Assigning costs to these measures allows an estimate to be made of the total and average cost of improving dwellings up to a given standard.

Energy efficiency policy throughout the UK currently has a focus on improving the worst performing stock. This takes the form in some areas of improving dwellings to at least a SAP rating band E (although the [Clean Growth Strategy](#) published in 2017 included the proposal that all fuel poor households should be upgraded to Band C by 2030)<sup>3</sup>. This report summarises the number of dwellings affected and the associated cost if a policy of improving dwellings to Band E were to be implemented on the Northern Ireland housing stock. It is anticipated that this report will not be produced again (to band E). In the future it will align with the Clean Growth Strategy and will produce estimates of the cost to improve dwellings to Band C<sup>4</sup>.

For each dwelling with a SAP band of F or G, improvement measures were applied cumulatively, and the SAP rating recalculated after each improvement, until the dwelling reached the threshold for SAP band E (a SAP rating of 38.5 or higher). The improvement measures, the order in which they are applied and the associated costs of each measure follow the energy performance certificate (EPC) improvement methodology set out in SAP 2012. Appendix 1 lists the measures applied and the associated eligibility criteria. For more detail see Appendix T of SAP 2012<sup>5</sup>.

Table 1 shows the improvement measures applied to eligible F and G rated dwellings from the NIHCS 2016. Numbers of improved dwellings and their associated costs were not reported due to small numbers, however, percentages are shown.

The total cost of applying all of the measures to approximately 23,200 F and G rated dwellings in Northern Ireland was close to £87m. The mean price of improving these dwellings was £3,700.

However, it should be noted that the total cost *includes* the cost to improve vacant dwellings to SAP Band E. Vacant dwellings represent a small number of the dwellings in SAP bands F and G (34%) in Northern Ireland but a high cost to improve (due to the poorer condition of these dwellings). To bring F and G rated vacant dwellings up to band E would cost approximately £64m<sup>6</sup> of the overall £87m with a mean cost of £8,100 per dwelling. The breakdown of occupied and vacant<sup>7</sup> dwellings is outlined in Table 3.

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<sup>3</sup> The [Clean Growth Strategy](#) published in 2017 set out the UK government's policies and proposals for decarbonising all sectors of the UK economy. It also included a number of housing related policies and proposals.

<sup>4</sup> This will improve the robustness of the results as a larger number of dwellings will be included.

<sup>5</sup> BRE 2017. Appendix T: Improvement measures for Energy Performance Certificates, RdSAP 2012 v9.93. [https://www.bre.co.uk/filelibrary/SAP/2012/RdSAP-9.93/RdSAP\\_2012\\_9.93.pdf](https://www.bre.co.uk/filelibrary/SAP/2012/RdSAP-9.93/RdSAP_2012_9.93.pdf)

<sup>6</sup> Care should be taken with this estimate as numbers were small.

<sup>7</sup> Although vacant dwellings represent a small number unweighted they are included in the table to aid understanding of the statistics, and to demonstrate how much of the overall cost to improve dwellings to Band E was accounted for by vacant dwellings.



**Table 1. Improvement measures applied in the model<sup>8</sup>**

Item	Measure	% of improved dwellings
A	Loft insulation	58
B	Cavity wall insulation	24
C	Cylinder insulation	47
D	Draught proofing	29
F	Heating controls-Cylinder stat	3
G	Heating controls-wet central heating	25
A3	Roof room insulation	10
W1	Floor insulation (suspended)	9
W2	Floor insulation (solid)	23
X	Insulated doors	4
K	Upgrade boiler, Biomass room heater	6
L2	Upgrade heating, Storage heaters	14
N	Solar water heating	3
O	Double glazed windows	3
Q	Solid wall insulation	3

Please note measures excluded from Table 1 had no dwellings which were eligible to receive the improvement measure and therefore had no associated cost.

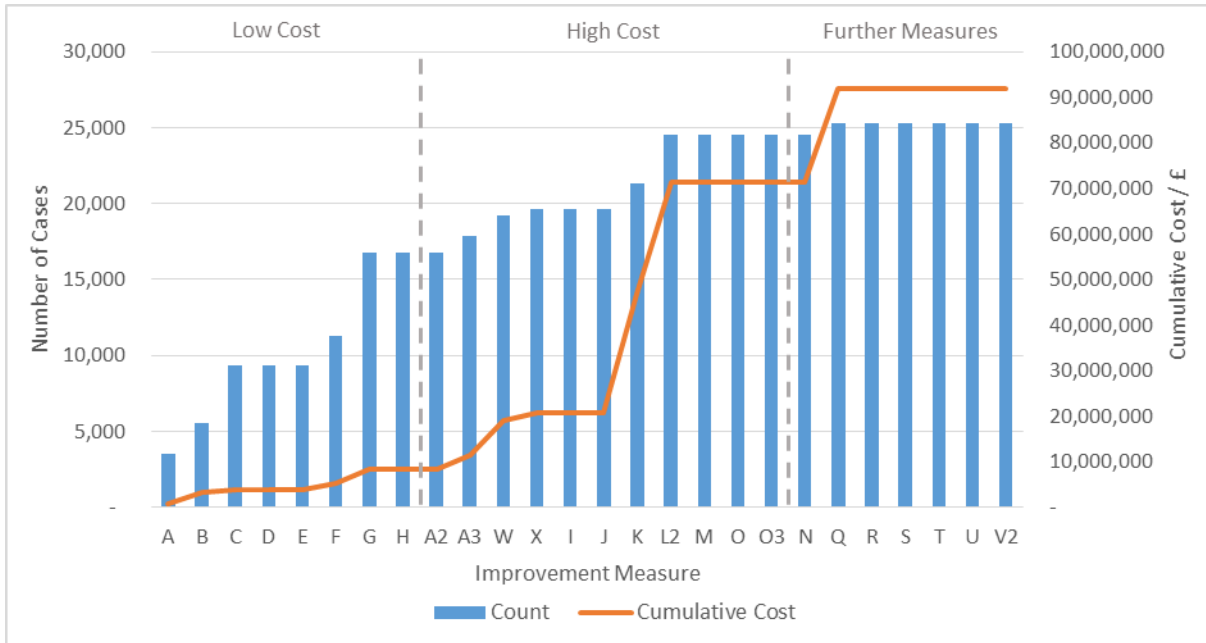
Figure 1 shows the cumulative number of dwellings, both F and G rated, that have reached the SAP band E threshold at each improvement measure stage, along with the cumulative cost of implementing all the measures necessary to improve each dwelling to SAP band E.

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<sup>8</sup> Care should be taken with the smaller percentages as the numbers were small



**Figure 1. Number of Dwellings improved to SAP band E with each improvement, and the associated cumulative cost**



*Please note caution should be used when looking at the number of dwellings which had improvement measures A – E (in the low cost improvement category) applied. Each of these bars represent a small number unweighted (25 or less). They are included for illustrative purposes and to aid understanding, numbers should not be quoted.*

The improvement measures implemented are split into three categories according to the EPC methodology: low cost, high cost, and further measures. A to H are low cost, A2 to O3 are high cost and N to V2 are further measures (naming conventions are taken from SAP booklet). If only low cost measures were to be implemented, 63% of F and G rated dwellings would be improved to SAP band E, costing approximately £7,300,000 – 8% of the total cost to improve all F and G rated dwellings. Implementing both low and high cost measures would result in 97% of all F and G rated dwellings being improved to SAP band E, costing around £66,100,000 – 76% of the total cost. This means that further measures are only needed to improve the remaining 4% of F and G rated dwellings to band E, but require 24% of the total cost.

Table 2 shows that three-fifths of the F and G rated dwellings can be improved to band E with up to two improvements, while two-fifths of dwellings are improved to band E with three or more improvements. There is a steep rise in mean cost for dwellings needing over two measures. This is likely caused by the need for high cost measures to be used to increase the SAP rating to E, after implementing all the eligible low-cost measures.



**Table 2. The number of improvement measures needed for each dwelling and the average cost of that number of improvements.**

No. of Improvements	% of Dwellings	Mean Cost (£)
1-2	59	619
3 plus	41	8203

Table 3 provides the total and mean costs of improving dwellings in SAP bands F and G to SAP Band E split by occupancy; occupied or vacant. The number of vacant dwellings with a SAP Band of F or G was small (23 unweighted) so caution should be used when quoting these figures. However, it was important to include the vacant figures to demonstrate how much of the overall cost to improve dwellings to SAP Band E was accounted for by vacant dwellings (due to the poorer condition of these dwellings). The total cost to improve all vacant dwellings to SAP Band E is higher than the cost to improve all occupied dwellings, contributing 74% to the total cost for improving all F and G rated dwellings, despite only representing 34% of the F and G rated dwellings.

**Table 3. The total and mean cost of improving SAP Band F and G dwellings to SAP Band E based on occupancy.**

Occupancy	No. of Dwellings	% of Dwellings	Total Cost (£)	Mean Cost (£)
Occupied	15,200	66	22,600,000	1,500
Vacant	7,900 <sup>9</sup>	34	63,900,000	8,100

### Tenure

In terms of tenure<sup>10</sup>, 89% of the F and G rated dwellings were owner occupied (20,600) with a total cost of approximately £81m (includes vacant stock) required to bring up to Band E (mean cost per dwelling £3,900). Table 4 provides the total and mean costs of improving all F and G rated owner occupied dwellings to Band E, split by occupancy. Although the number of vacant dwellings within the owner occupied stock is much smaller than those that are occupied, they contribute to 75% of the total cost to improve the F and G rated dwellings in this tenure.

**Table 4. The total and mean cost of improving SAP Band F and G dwellings to SAP Band E based on occupancy of the owner occupied stock.**

Owner Occupied				
Occupancy	No. of Dwellings	% of Dwellings	Total Cost (£)	Mean Cost (£)
Occupied	13,400	65	19,500,000	1,500
Vacant	7,200 <sup>11</sup>	35	61,000,000	8,400

<sup>9</sup> The number of vacant properties surveyed was small so caution should be used with this estimate.

<sup>10</sup> The numbers of private rented and social dwellings were too small to report.

<sup>11</sup> The number of vacant properties surveyed was small so caution should be used with this estimate.



## Appendix 1: Improvement measures for EPCs

Table 1 shows the improvement measures considered for EPCs, the order in which they are implemented and the eligibility criteria.

**Table 1. EPC improvement measures**

Item	Measure	Considered when:	Recommended if:	Improve to:
A	Loft insulation	Pitched roof	$\leq 150\text{mm}$	270mm
B	Cavity wall insulation	Unfilled cavity	U-value $> 0.6$	Filled cavity
C	Cylinder insulation	Cylinder present	$\leq 25$ foam, $< 80$ jacket	80mm Jacket
D	Draught proofing	Always	$< 100\%$ draught proof	100%
E	Low energy lights	Always	$< 100\%$	100%
F	Heating controls- Cylinder stat	Cylinder present	No cylinderstat	Cylinderstat
G	Heating controls-wet central heating	Wet central heating	$<$ roomstat, programmer + TRVs	Roomstat, programmer + TRVs
H	Heating controls- warm air	Warm air	$<$ roomstat + prog.	Roomstat + prog.
A2	Flat roof insulation	Flat roof	$< 100\text{mm}$	U-value = 0.18
A3	Roof room insulation	Roof rooms	U-value $> 0.5$	U-value = 0.18
W1	Floor insulation (suspended)	Suspended	As-built age band $\leq J$ Retrofit $\leq 50\text{mm} / U$ $> 0.5$	U= 0.25
W2	Floor insulation (solid)	Solid and ground below	As-built age band $\leq J$ Retrofit $\leq 50\text{mm} / U$ $> 0.5$	U= 0.25
X	Insulated doors	Door to outside	Uninsulated	U=1.5
I	Upgrade boiler, same fuel	Gas boiler LPG/oil boiler where gas not available	Non condensing, Range boiler	Condensing
J	Upgrade boiler, Biomass boiler	Solid fuel boiler	No mains gas	Manual feed biomass boiler
K	Upgrade boiler, Biomass room heater	Solid room heater / fire	No mains gas	Wood pellet stove with radiators
L2	Upgrade heating, Storage heaters	Old storage rads	No mains gas	High retention storage rads
M	Upgrade heating , Warm air unit	Warm air gas / lpg	Pre 1998	Non-condensing warm air unit
O3	Glazing replacement	Pre 2006 double glazed	$< 80\%$ post 2006	U = 1.6
N	Solar water heating	All	No SHW	SHW
O	Double glazed windows	Single glazing	$< 80\%$ multiple glazed	U = 1.6
Q	Solid wall insulation	Solid brick	U $> 0.6$	Insulated solid
R	Upgrade boiler – Oil	Oil warm air	No mains gas	Condensing Oil





				Central Heating
S	Upgrade heating – gas fires	Gas fires	All	Condensing CH
T	Upgrade heating – fuel switch	Non mains gas room heaters / non-condensing boilers)	Mains gas available	Condensing gas boiler
U	Photovoltaics	Not thatched roof	No PV	PV
V2	Wind turbine	Rural	No turbine	Turbine



## Appendix 2: User guide

### Method

The 2016 NIHCS collects information on building characteristics for each dwelling sampled. The building characteristics are used as inputs for BRE's energy model which calculates a numeric SAP rating (1-100) for each dwelling, from which a SAP band (A-G) is assigned, see Table 2.

**Table 2. SAP Rating Bands**

Rating	Band
<b>G</b>	1 to less than 20.5
<b>F</b>	Greater than or equal to 20.5 and less than 38.5
<b>E</b>	Greater than or equal to 38.5 and less than 54.5
<b>D</b>	Greater than or equal to 54.5 and less than 68.5
<b>C</b>	Greater than or equal to 68.5 and less than 80.5
<b>B</b>	Greater than or equal to 80.5 and less than 91.5
<b>A</b>	Greater than or equal to 91.5 or more

The work presented in this report concerns improving dwellings in the F and G band, identified as those that have a SAP rating of less than 38.5, to a band E. After the F and G rated dwellings had been identified, improvement measures were applied to these dwellings cumulatively, following the order outlined in Appendix T of SAP 2012. A SAP value was recalculated at each improvement stage and checked against the threshold for SAP band E (38.5). If the SAP value had reached the threshold, no more improvement measures were applied, if the threshold had not been reached, the next improvement measure was applied and the SAP value recalculated. This process was repeated until each dwelling reached the threshold for band E.

Once all the necessary improvements needed for each dwelling to reach SAP band E have been established, a cost for improvement is calculated for each dwelling. Mean indicative costs are applied for each improvement measure that a dwelling has received, as is consistent with the methodology used for calculating the cost of improvements in EPCs. These are summed for all improvement measures a dwelling received, giving the final cost for improvement.

### Quality information

The quality assurance of this modelling work focused on ensuring that the translation of data inputs to simulate energy improvement measures was carried out robustly and appropriately. The process of development, quality assurance and creation of results followed an internal procedure so the work undertaken could be reviewed and assessed by project managers.

Examples of the quality assurance undertaken to validate the cost to improve the SAP rating of dwellings in Northern Ireland processes and results included:

- Updating and revising the methodology using the latest assumptions for this area of work.
- Checking of transformations undertaken and mathematical formulae.
- Internal checks of data inputs to assure translation was completed correctly.



- Checks of correct units for calculations.
- Check correct and latest external data sources were used.
- Sense check of results.
- Internal review of results and reporting.

Surveyors working on the 2016 NIHCS received training and support to help ensure their collection of energy related data were consistent and robust. A re-fresher training session in 2016 explained the principles, how the form should be completed as well as conducting practical exercises with feedback sessions. While these measures ensure a good level of consistency in judgements, some surveyor variability is to be expected.

## Strengths and weaknesses

### Strengths

- The 'Cost to improve the SAP rating of dwellings in Northern Ireland (from band F or G to band E)' uses data from the Northern Ireland House Condition Survey which has a number of processes in place to ensure the quality of the data.
- The model used SAP 2012 (RdSAP 9.93) which is the most up to date model available. This version updated the U-values for solid brick, stone and cavity walls to more accurately reflect their thermal performance. It also included an improvement to the way concrete walls were modelled.
- The work performed here utilises well established and robust models for applying the improvement scenarios outlined in Appendix T of SAP 2012, ensuring that the identification of eligible dwellings and the subsequent application of eligible improvements has been done accurately.

### Weaknesses

- The size of the sample for the NI House Condition Survey 2016 was 3000 addresses. A weighting and grossing process translated the information gathered into figures that reflected the real world.<sup>12</sup> This provided robust data at Northern Ireland level. A small proportion (3%) of dwellings had an EE rating in bands F-G and when analysed by improvement measure (Table 1) which led to some very small sample sizes.
- For the purposes of calculating a post improvement SAP, W1 (suspended floor insulation) and W2 (solid ground floor insulation) were combined during the SAP modelling to be consistent with the BRE energy modelling process.

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<sup>12</sup> Further information on the sampling, and weighting and grossing processes for the Northern Ireland House Condition Survey 2016 is available in the report <https://www.nihe.gov.uk/Working-With-Us/Research/House-Condition-Survey>