Chapter 2
Hard to treat properties

This chapter focuses on those dwellings that had the worst energy performance (energy efficiency rating bands F and G) in 2012 and how the profile of these has changed over time. It then examines the feasibility of undertaking energy improvements to these homes and how this compares to more energy efficient homes. The chapter also investigates the difficulties in undertaking energy improvements in so-called ‘hard to treat’ homes, presenting some case studies to illustrate key and common issues.

Additional findings relating to energy inefficient dwellings can be found in web tables DA7101 to DA7104.

Homes with the worst energy efficiency

Types of dwellings

2.1 In 2012, around 1.4 million dwellings (6%) had the poorest energy efficiency ratings (SAP bands F and G), Annex Table 2.1. The majority of the worst energy efficient homes were owner occupied (68%). However, the private rented sector was over represented among these homes, comprising 28% of energy inefficient homes, but only 18% of the total housing stock. By contrast, only 4% of these homes were in the social sector. Around 10% of these homes were vacant at the time of the survey, Table 2.1.

2.2 Detached dwellings (28%), bungalows (13%) and converted flats (9%) were also over represented among the worst energy efficient homes whilst purpose built flats were under represented (6%), Table 2.1.

2.3 Over half of the worst energy efficient homes were built before 1919 (52%). Homes in rural areas were over represented, comprising 41% of energy inefficient homes compared with 17% of the total stock. This is largely because rural areas have a higher proportion of older homes and a lower proportion of purpose built flats, Table 2.1.

Table 2.1: Profile of homes with the worst energy efficiency compared with the profile of the rest of the housing stock, 1996 and 2012

all dwellings

	1996		2012	
	SAP bands F and G	**all dwellings**	**SAP bands F and G**	**all dwellings**
				percentage of dwellings
tenure				
owner occupied	70.1	68.5	68.0	65.1
private rented sector	13.8	9.8	28.3	18.1
social sector	16.1	21.7	3.7	16.8
type of vacancy				
occupied	94.7	96.1	89.7	95.6
vacant	5.3	3.9	10.3	4.4
dwelling type				
small terraced house	12.9	13	7.6	9.5
medium/large terraced house	12.9	15.8	13.9	18.2
semi detached	29.1	26.3	22.3	25.8
detached	20.2	15.4	28.5	17.3
bungalow	16.1	10.2	13.1	8.9
all houses	91.2	80.8	85.4	79.7
converted flat	3.9	4.3	8.7	4.1
purpose built flat	4.9	14.9	5.9	16.2
all flats	8.8	19.2	14.6	20.3
dwelling age				
pre 1919	33.9	23.4	51.9	19.7
1919 to 1944	25.2	19.2	20.8	16.6
1945 to 1964	20.1	20.9	12.1	20.1
1965 to 1980	18.5	23.3	11.5	21.0
post 1980	2.3	13.3	3.8	22.6
area				
city and other urban centres	17.3	20.9	19.7	20.6
suburban residential areas	52.5	59.5	39.0	62.3
rural areas	30.2	19.6	41.3	17.2
all dwellings	**100.0**	**100.0**	**100.0**	**100.0**
sample size	*3,533*	*13,711*	*650*	*12,763*

Note: underlying data are presented in Annex Table 2.1
Source: English Housing Survey, dwelling sample

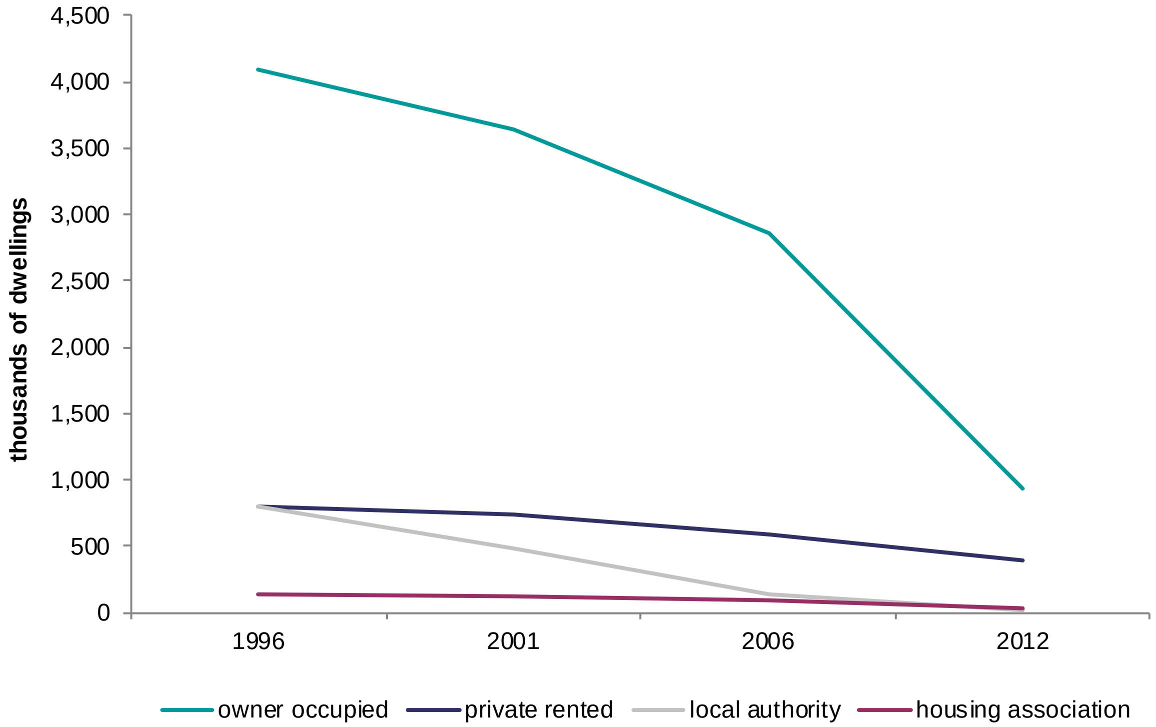
2.5 In 1996, dwellings with the worst energy efficiency comprised 29% of the total housing stock, but this proportion had decreased to 6% by 2012. The profile of these dwellings changed over this period. The proportion in the private rented sector increased from 14% to 28% in 2012, while the proportion in the social sector decreased from 16% to 4%, Table 2.1.

2.6 This above finding demonstrates the greater progress made by the social sector in improving the energy efficiency of homes, for example, via the Decent Homes programme. In addition, it may reflect the on-going lack of incentives for some private landlords to install energy improvement measures. Landlords have to meet the costs of these measures, but do not directly accrue some key benefits, for example, reduced heating bills. Also, as rents may not reflect the differences in the thermal efficiency of a property, there may be little incentive for landlords to invest in these measures.

2.7 Overall, houses comprised a lower proportion of the poorest energy efficient homes in 2012 (85%) than in 1996 (91%) although the proportion of detached homes increased from 20% to 28%. Homes built after 1919 accounted for a smaller proportion of these homes in 1996 (34% compared with 52% in 2012), which reflects the difficulties (costs and feasibility) in installing energy efficiency measures in these oldest dwellings, Table 2.1.

2.8 The number of dwellings with the worst energy efficiency ratings decreased from 5.8 million to 1.4 million from 1996 to 2012, Annex Table 2.2. Those in the owner occupied sector fell from 4.1 million in 1996 to 938,000 in 2012.The smallest decrease occurred within the housing association sector, although these homes accounted for the smallest proportion and number of homes with the poorest energy efficiency in 1996. The number of homes with the poorest energy efficiency fell steadily within the local authority sector between 1996 and 2006, aligning levels to those found among housing association homes by 2012. This is likely due to planned maintenance programmes in this sector and to the improvements made under the Decent Homes programme, Figure 2.1.

Figure 2.1: Dwellings with the worst energy efficiency by tenure, 1996-2012



Base: all dwellings
Note: underlying data are presented in Annex Table 2.2
Sources:
1996-2006: English House Condition Survey, dwelling sample;
2012: English Housing Survey, dwelling sample

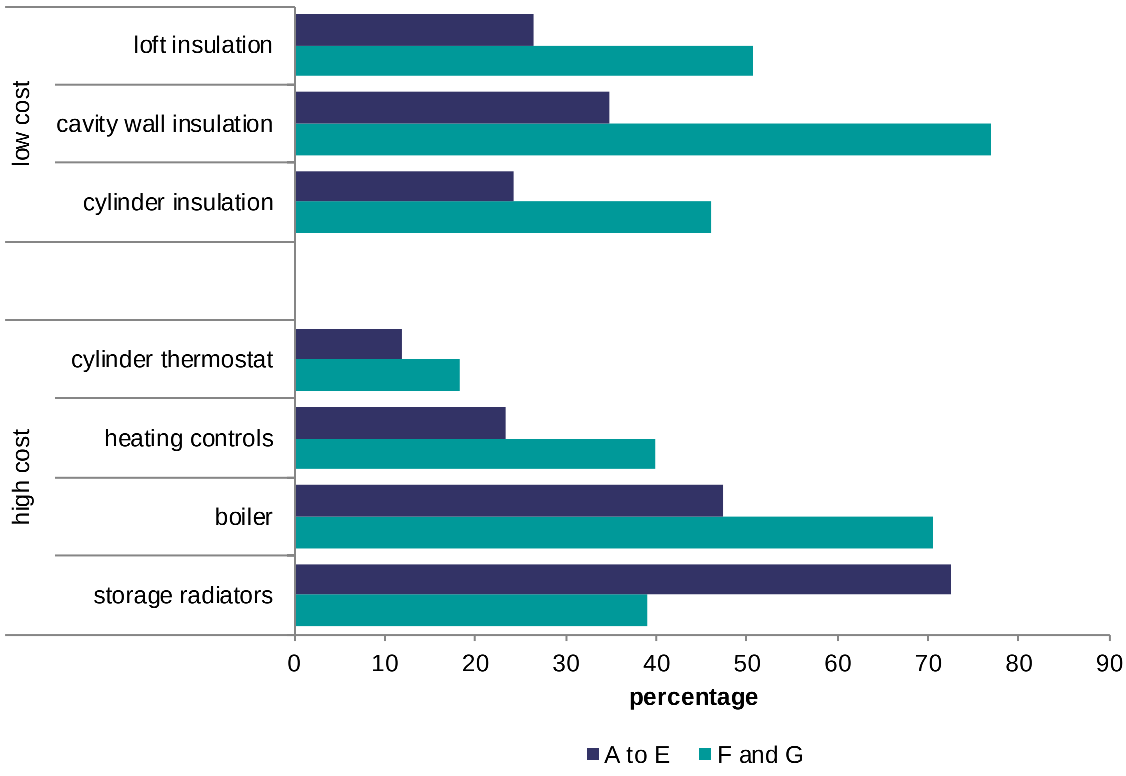
Feasibility of installing energy measures

2.9 The current insulation and heating characteristics of homes impact on the type and feasibility of energy improvements that can be made. Not surprisingly, many of the dwellings with F and G SAP band ratings were found to lack effective insulation. A quarter of these dwellings (25%) had uninsulated cavity walls and two-thirds (66%) were non cavity walled dwellings with no additional internal or external insulation. Of those dwellings with a loft, 13% had no loft insulation. These dwellings were also more likely to have no double glazing, 19% compared with 5% in more energy efficient dwellings (with A-E SAP band ratings), Annex Table 2.3.

2.10 Dwellings with the worst energy efficiency ratings were more likely to have fixed room heaters (25%) and storage heaters (12%) than more energy efficient homes (1% and 6% respectively). Consequently, they were far less likely to have central heating than more energy efficient homes (63% compared to 92% respectively). Dwellings with poor energy efficiency were more likely to use electricity for the main heating (33%) and less likely to use mains gas (46%), Annex Table 2.3.

2.11 The overall potential to improve the energy efficiency of these homes using low and high cost EPC measures, irrespective of the ease of installation, is shown in Figure 2.2. Around half of these homes would benefit from loft insulation (51%), and hot water cylinder insulation (46%) whilst 77% would benefit from having cavity wall insulation. The most common high cost measure that could be applied was an upgrade to either a gas or oil condensing boiler (71%), Figure 2.2.

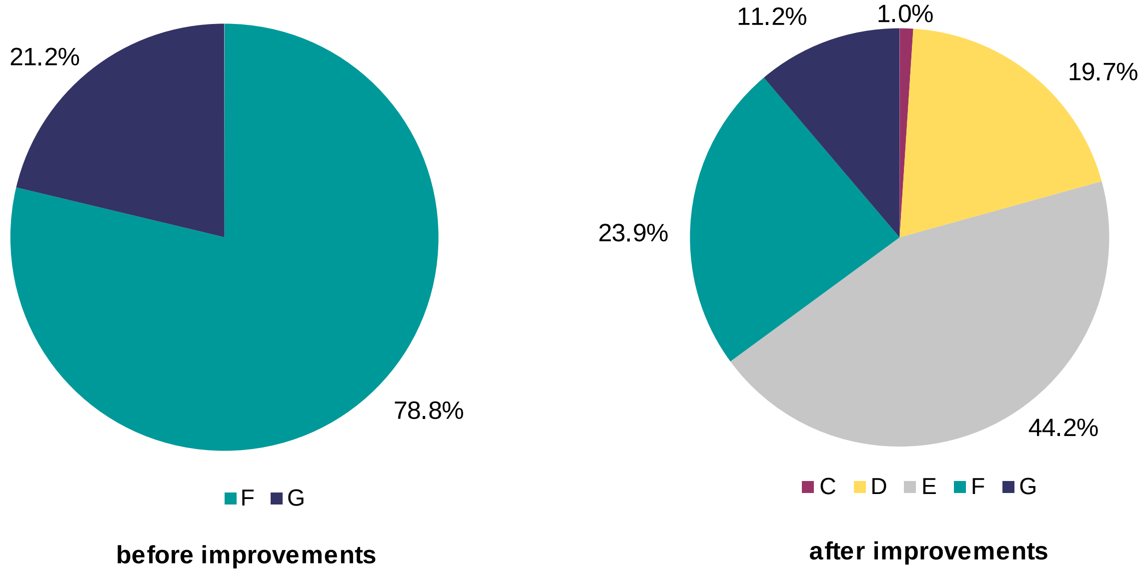
Figure 2.2: Potential energy performance upgrades by SAP rating bands for all dwellings, 2012



Base: number of dwellings where this improvement might be possible irrespective of the ease of installation, e.g. for cavity wall insulation the base is the number of dwellings with cavity walls
Note: underlying data are presented in Annex Table 2.4
Source: English Housing Survey, dwelling sample

2.12 Of the 1.4 million dwellings in SAP bands F and G, around 992,000 would improve by at least one SAP band if both low and high cost energy improvement measures were applied, Annex Table 2.5. Approximately 21% of these dwellings would move up to band C or D, 44% of these dwellings would move up to band E and 35% would remain in bands F and G (although the proportion in Band G would reduce considerably), Figure 2.3.

Figure 2.3: SAP rating before and after energy improvement measures have been applied, 2012



Base: all energy inefficient dwellings where improvements might be possible irrespective of the ease of installation, e.g. for cavity wall insulation the base is the number of dwellings with cavity walls
Note: underlying data are presented in Annex Table 2.5
Source: English Housing Survey, dwelling sample

2.13 Of those 484,000 dwellings that remained in SAP band F and G, the vast majority (79%) were non-cavity walled dwellings with no additional external or internal insulation, Annex Table 2.6. Potentially, these properties could benefit from solid wall insulation, discussed later in this chapter.

2.14 Table 2.2 demonstrates how the installation of energy improvement measures would improve the average SAP rating, CO_2 emissions and energy costs for energy inefficient dwellings, and how these compare with the post-improvement performance of other dwellings. The average SAP ratings for the poorest energy inefficient dwellings would increase by 14 points whilst the average energy cost would reduce by around £400 to £1,410 per year. Nonetheless, this average fuel cost would still be considerably greater than the current average for more energy efficient dwellings.

Table 2.2: Potential improvements in energy efficiency (SAP) ratings, CO^2 emissions and fuel costs by energy efficient and inefficient dwellings, 2012

all dwellings

	mean energy efficiency (SAP09) rating		mean notional total CO_2 emissions (tonnes/yr)		mean notional total energy cost (£/yr)		
	current	post-improvement	current	post-improvement	current	post-improvement	*sample size*
current SAP band							
SAP band A to E	60.5	65.8	4.8	4.0	861.2	746.7	*12,113*
SAP band F and G	27.8	41.7	10.5	7.6	1,811.8	1,409.7	*650*
all dwellings	**58.5**	**64.4**	**5.1**	**4.2**	**919.0**	**787.0**	***12,763***

Source: English Housing Survey, dwelling sample

Homes with hard to treat walls and lofts

2.15 This analysis categorises the housing stock according to the ease with which cavity wall, solid wall and loft insulation could be fitted if necessary. The dwelling characteristics of those which were hard to treat were then assessed to identify the house types that are most difficult to improve. It should be noted, however, that this section is not intended to form any definitive guidance on how these homes should or should not be treated, as this can only be undertaken on a case by case basis.

Original wall construction

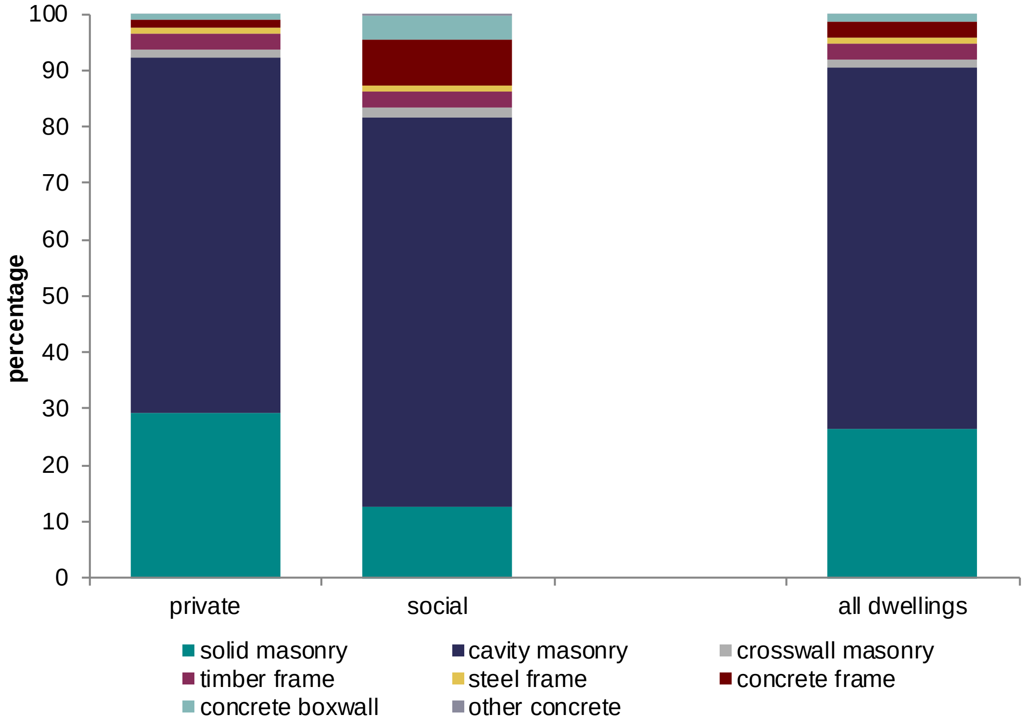
2.16 Before looking more closely at aspects of solid and cavity walled homes that could impede improvements to their energy efficiency, this section examines the types of wall construction found in the English housing stock. These are recorded for the original construction of the dwelling, before considering extensions and improvements which may change the predominant construction type. Further details regarding the different construction methods over time can be found in Chapter 1 of the 2011 EHS Stock Report.

2.17 Wall construction has always been dominated by masonry (brick, block, stone and flint), although cavity masonry has replaced solid masonry as the dominant construction type for load-bearing walls since 1945 and was used in 82% of all homes built after 1990. Around 2% of existing dwellings built before 1919 were built with a traditional timber frame. Timber frame building declined until modern factory-built systems were developed in the 1970s. This method accounted for 9% of all homes built after 1990, Annex Table 2.7.

2.18 From 1945 to 1980, concrete frame and concrete boxwall methods were used in around 7% to 8% of homes, but concrete boxwall construction was rare in homes built after this period, Annex Table 2.7.

2.19 Owing to the higher proportion of older homes, it is not surprising that a greater proportion of homes of solid wall construction were found in the private sector (29%) compared with social sector homes (13%). Whilst the proportion of timber framed dwellings was similar between the two sectors (3%), the social sector contained a higher proportion of homes of concrete construction (13% compared with 3%) due to the greater proportion of purpose built flats, Figure 2.4.

Figure 2.4: Construction type by tenure, 2012



Base: all dwellings
Note: underlying data are presented in Annex Table 2.7
Source: English Housing Survey, dwelling sample

2.20 City and urban areas and rural areas also contained a higher proportion of older homes, so solid wall construction was more prevalent here (49% and 29% respectively) compared with homes located in suburban and residential areas (19%). Owing to the greater proportion of purpose built flats in city and urban locations, homes of concrete construction were more prevalent (10%), Annex Table 2.7.

Cavity wall insulation

2.21 In this section homes with predominantly cavity walls are classified as standard or hard to treat according to the criteria in Box 1. This classification and analysis differs from the approach used in the 2010 and 2011 EHS Stock Profile Reports. The 2012 methodology aims, as far as possible, to provide a count of hard to treat cavity walls consistent with the energy company obligation definition, although the EHS is unable to fully replicate this[1].

Box 1: Hard to treat cavity walls

The categories for the ease of filling uninsulated cavity walls are:

Standard fillable: no compelling physical barrier to installation exists. These are typically bungalows or 2 storey houses with standard masonry cavity walls and masonry pointing or rendered finishes.

Hard to treat cavity walls: These are homes with cavity walls that could in theory be filled, but which exhibit one of the following difficulties:

1. They are in a building with 3 or more storeys, where each storey has cavity walls. The need for scaffolding to install insulation in these higher buildings would contribute to the complication and cost of improving these homes.
2. The gap found in the cavity wall is found to be narrower than in standard walls. Although an attempt could be made to insulate these homes by injecting foam, the limited cavity space may lead to an uneven spread of the insulating material, resulting in substandard thermal properties.
3. The dwelling is of predominantly prefabricated concrete, metal or timber frame construction. Although more recent examples of these homes will have had insulation applied during construction, these are generally unsuitable for retrospective treatment. In the case of timber frame construction, the industry recommendation is not to inject insulation as this can hamper ventilation between the frame and the external wall that may lead to rot in the timber frame.
4. The cavity wall has an outer leaf finished predominantly with tiles or cladding.

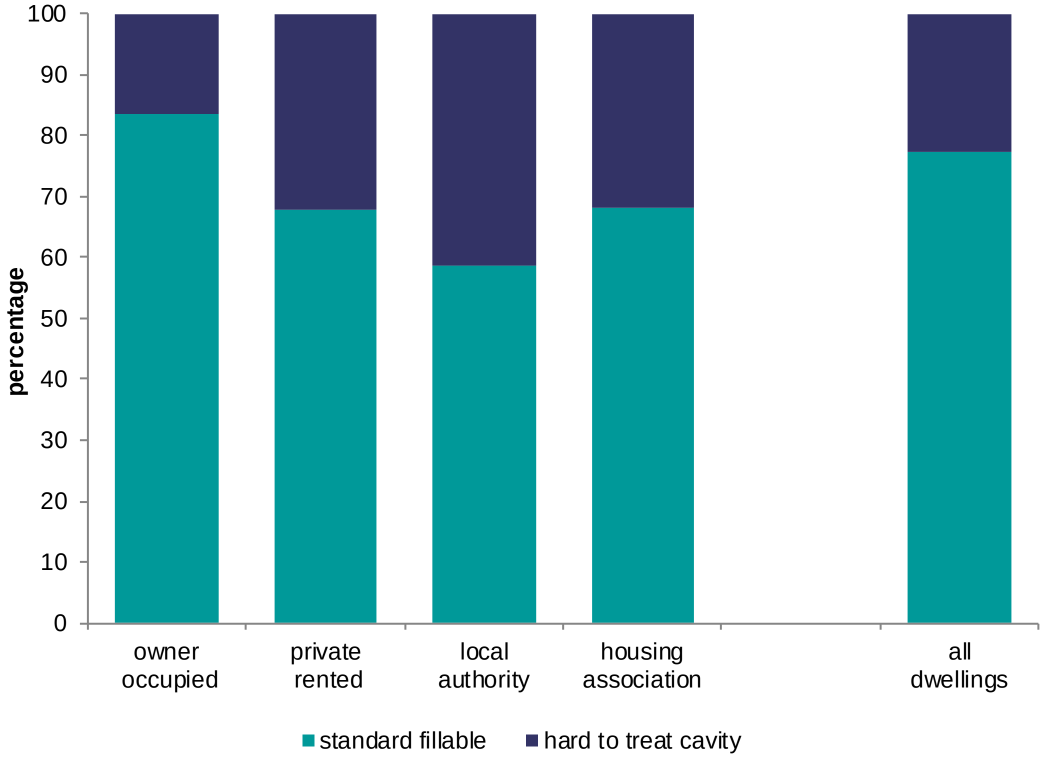
2.22 Of the 5.3 million dwellings[2] that could potentially benefit from the installation of cavity wall insulation, 77% were assessed to fall into the standard fillable category whilst the remaining 23% (1.2 million) of homes were classified as hard to treat. Amongst the tenures, owner occupied homes were the least

[1] For the ECO definition see
https://www.ofgem.gov.uk/ofgem- publications/84197/ecosupplementaryguidanceonhard-treatcavitywallinsulation.pdf

[2] For this analysis, the number of dwellings that could potentially benefit from cavity wall insulation will not match the number identified for the EPC improvements identified in chapter 1 of this report. This analysis excludes those post 1990 cavity walled dwellings where there is no evidence of insulation (as it assumes homes of this age are likely to have this installed).

likely to be hard to treat with only 16% of uninsulated cavity wall homes being problematic, compared with 41% of local authority homes and 32% of private rented and housing association dwellings, Figure 2.5.

Table 2.5: Barriers to installing cavity wall insulation by tenure, 2012



Base: all dwellings with theoretical potential to install cavity wall insulation
Note: underlying data are presented in Annex Table 2.8
Source: English Housing Survey, dwelling sample

2.23 Some explanation of the higher proportion of hard to treat cavity walls in the rented tenures comes from the types of dwelling that typically fall into this category. Due to the height of blocks of flats, it is not surprising that 59% of purpose built and 42% of converted flats, with uninsulated cavity walls, were classified as hard to treat, compared with 11% of semi-detached and only 6% of detached homes. The latter houses were considerably more likely to be owner occupied, whilst flats were most frequently found in the rented sector (see EHS 2012 Profile of English Housing report, chapter 1), Annex Table 2.8.

2.24 Dwellings built before 1919 and from 1965-1980 had a higher proportion of hard to treat cavity walls (31% and 30% respectively). The older age band includes a high proportion of houses with 3 or more storeys, whilst homes built between 1965 and 1980 were both more likely to be flats and to be of concrete frame construction than those in other age bands. The high percentage of flats classed as hard to treat largely explains the high proportion of urban dwellings with hard to treat cavity walls, 46% compared with 19% in suburban and 14% in rural areas, Annex Table 2.8.

Solid wall insulation

2.25 This section examines the ease with which solid walls may have external insulation applied. In a similar way to cavity walls, the applicable group has been split into non-problematic and hard to treat, with applicable dwellings here including those classed as having hard to treat cavities so that the whole stock can be assessed for some form of wall insulation. The hard to treat category is further categorised by specific issues that may increase the cost and difficulty of applying solid wall insulation, Box 2. Further details on how solid wall insulation is undertaken and associated cost estimates are provided in Box 3[3]

Box 2: Hard to treat solid walls

Non-problematic: homes with non-cavity walls or those with cavity walls previously identified as hard to treat which do not include the barriers listed below.

Hard to treat by increasing level of difficulty:

Masonry-walled dwellings with attached conservatories or other features: fixing the insulation round any projections like conservatories, porches or bays requires additional work and therefore additional expense.

Dwellings with a predominant rendered finish: this may add to the costs of the work as the render may need to be removed, repaired or treated before the insulation can be installed.

Dwellings with a predominant non-masonry wall finish: improving dwellings with wall finishes such as stone cladding, tile, timber or metal panels would either add to the cost of the work or even preclude external solid wall insulation where the wall structure itself is stone or timber.

Flats: These can be problematic for 2 reasons. Firstly, there are likely to be issues related to dealing with multiple leaseholders (getting their agreement and financial contribution to the work). Also, the height of the module for high-rise flats would present significant complications in applying external solid wall insulation.

There are other barriers such as planning restrictions that apply in conservation areas or listed building status that will affect the real potential for installing solid wall insulation but EHS does not collect data on these.

[3] See http://www.energysavingtrust.org.uk/Insulation/Solid-wall-insulation

2.26 Some 8.0 million homes, including those with hard to treat cavity walls, could potentially benefit from the installation of some form of solid wall insulation, but 6.8 million (85%) of these are categorised as hard to treat. For 24% of homes additional work would be needed to apply insulation around external features, whilst 32% had rendered rather than plain masonry wall finishes. An additional 3% would be difficult to treat due to cladding or stone finishes, Annex Table 2.9.

2.27 The proportion of hard to treat homes for solid wall insulation was relatively close for all tenures (82-92%), in contrast to the degree of variation seen between tenure for hard to treat cavity walls, Annex Table 2.9.

2.28 However, there was a great deal more divergence regarding the nature of barriers to potential insulation improvements. Flats comprised the main barrier to insulation among rented dwellings (44-65%), but only 12% for owner occupied homes. Owner occupied homes had the highest proportions of dwellings with external features (31%) and those with rendered walls (40%), suggesting that a large number of these homes could benefit from solid wall insulation, albeit at a higher average cost, Annex Table 2.9.

2.29 Terraced houses with solid or hard to treat cavity walls were more likely to be non-problematic than other house types, 25-27% compared with 15% of detached houses and 12% of semi-detached houses. This is mainly due to the lower proportion of terraced homes with predominantly rendered walls. Pre-1919 and post-1990 homes had higher proportions of both non-problematic homes (21% and 25% respectively) and homes with external features (31% and 33% respectively) than other age bands. Hard to treat solid walls due to existing rendered finishes were far more likely to be found in the 1919-44 dwelling age group (57%), Annex Table 2.9.

2.30 In addition to these barriers, there are further restrictions for which the EHS does not collect data. These include planning restrictions that apply in conservation areas and listed building status. Overall, there are around 374,000 listed buildings in England[4], some of which are dwellings. An additional estimated 1.1 million dwellings are located in conservation areas[5].

[4] See http://www.english-heritage.org.uk/caring/listing/listed-buildings/
[5] See http://www.eci.ox.ac.uk/research/energy/downloads/40house/background_doc_K.pdf

Box 3: Installing solid wall insulation
The energy improvements delivered by solid wall insulation vary considerably depending on the precise construction and thickness of the original wall (e.g. single leaf brick, 9-inch brick, stone or concrete).

External solid wall insulation is applied by fixing insulating boards to the outside of the building and covering them with a weatherproof render and sometimes false stone or brick cladding. Internal insulation can be added in a similar way using insulated plasterboard and a standard plaster finish or by constructing a timber frame inside the existing wall and filling this with mineral wool insulation, with a plasterboard and plaster finish. This work involves the added cost associated with moving power points, radiators, kitchen and bathroom fittings etc. as well as making good or adjusting floor coverings and decorations. Also, the affected rooms will be slightly smaller than before – a key consideration in some small terraced houses and converted flats.

Estimates for the cost of insulating a typical solid walled dwelling range from £9,000 to £25,000 for external insulation, and from £4,500 to £15,000 for internal insulation. These costs can be mitigated by combining the work with other necessary improvements such as renewing damaged plaster or render.

Loft insulation

2.31 The presence and type of loft will affect the ease of fitting insulation in the roof space, with hard to treat categories described in Box 4. The figures and analysis in this section cover 8.5 million dwellings: the 5.6 million identified in chapter 1 of this report where there was potential to upgrade the insulation under the EPC methodology, plus an additional 2.9 million homes where the existence of a flat roof or a fully converted loft space could preclude further work on improving the energy efficiency of the roof. The analysis does not include those dwellings that have no roof above i.e. flats that do not have any rooms on the top floor of a building.

Box 4: Ease of installing or topping up loft insulation

Non problematic: installation would be straightforward with no barriers.

Hard to treat by increasing level of difficulty/feasibility:

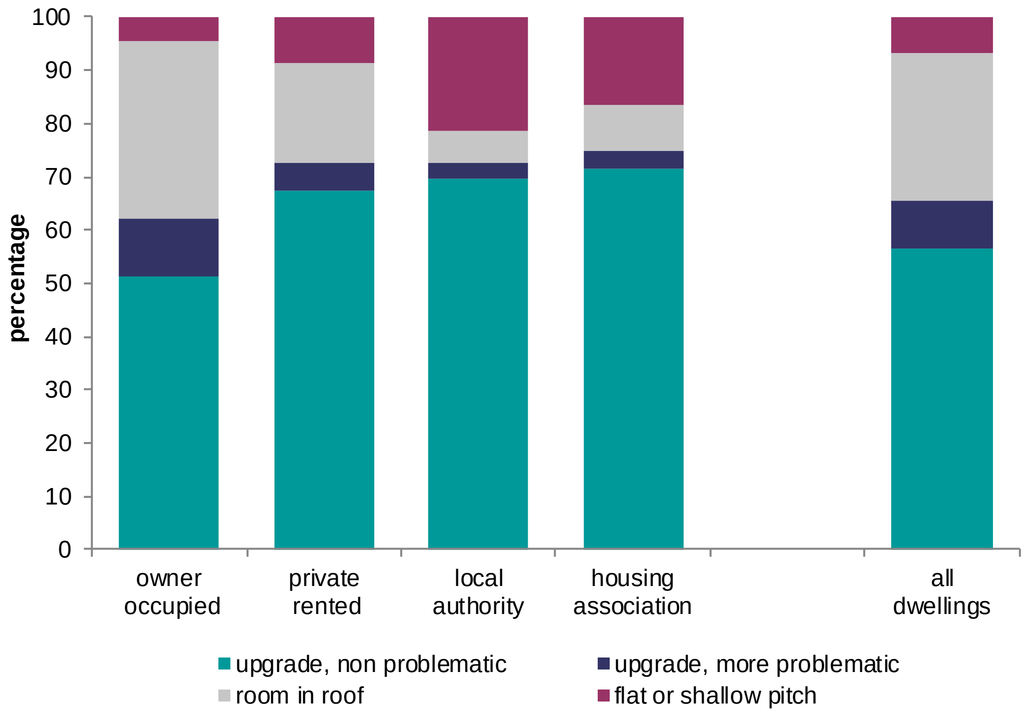
More problematic: loft is fully boarded across the joists which would lead to extra work and expense.

Room in roof: insulation would need to be added between the rafters which would involve very extensive work and considerable expense.

Flat or shallow pitched roof: not feasible to install loft insulation as there is no access into the loft or no loft space.

2.32 Some 56% of these 8.5 million homes should be non problematic to upgrade, leaving 44% harder to treat. The loft was fully boarded in 9% of homes, a permanent room in a loft was present in 28% of homes and a flat or shallow pitched roof was evident in 7% of homes, Figure 2.6. The latter two categories may not be considered potentially upgradeable because the level of insulation is usually unknown. These homes may already have had sufficient insulation installed during construction, but this analysis highlights the numbers of such dwellings that would be difficult to improve to a high level of thermal insulation.

Figure 2.6: Barriers to installing loft insulation by tenure, 2012



Base: all dwellings with theoretical potential to improve loft insulation and those that may have insufficient loft insulation
Note: underlying data are presented in Annex Table 2.10
Source: English Housing Survey, dwelling sample

2.33 Unlike the installation of cavity wall insulation, owner occupied homes were the most likely to have had hard to treat (49%) lofts, compared with rented homes (29% and 33%). Whilst only 5% of owner occupied homes were not feasible to insulate due to the presence of a flat roof (compared with 9-21% of rented homes), a larger proportion of these homes had a room or rooms in the loft 33%) compared with rented homes.

2.34 Rooms in the roof, normally resulting from loft conversions, were a much more common barrier in private rented homes (19%) compared with just 6-8% of the social sector, Annex Table 2.10.

Case studies – energy inefficient homes

2.35 This chapter has examined the characteristics of dwellings in bands F and G and considered some of the barriers that may prevent their improvement. Below are three case studies which take stereotypes of dwellings with poor energy efficiency ratings and summarise potential improvements, barriers to further improvement, and the estimated effect these would have on the SAP rating, CO_2 emissions and fuel costs.

Case study 1, Semi–detached in need of energy improvements – non problematic to treat

Source: BRE photo library

2.36 This 1930s semi-detached home has benefitted from the installation of double glazing but currently has uninsulated cavity walls and only 50mm of loft insulation. The property has mains gas and is centrally heated by a standard non-condensing boiler. Hot water is provided by the central heating, but the storage cylinder is also uninsulated. It currently has a SAP rating of 45, in SAP band E and annual CO_2 emissions of 5.8 tonnes, whilst the annual fuel costs are £1,034.

2.37 A number of low cost energy improvement measures could be applied to this dwelling, including an upgrade to the loft insulation to 270mm, applying an 80mm insulating jacket to the hot water cylinder, and the installation of cavity wall insulation, although the bay windows and tile-hung wall finish at the front of the dwelling would increase the costs of this measure. In addition, the higher cost measure of an upgrade to a condensing boiler would increase the dwelling's SAP rating to 67 putting it near the top of SAP band D. The annual CO_2 emissions would fall to 3.1 tonnes and the annual fuel costs to £625. With the work costing approximately £1,700 the payback period would be around 4 years.

Case study 2, Bungalow in need of energy improvements – problematic to treat

Source: BRE photo library

2.38 This rural detached bungalow built between 1944 and 1965 does not have a mains gas supply and the main heating is through electric heaters, supplemented by a solid fuel fire, whilst hot water is provided by an immersion heater in an uninsulated cylinder. It has double glazing but has uninsulated cavity walls. To extend the living and bedroom space at the dwelling, the owner has undertaken a large loft conversion which had 150mm of insulation installed between the rafters, but would be difficult and costly to further improve. It currently has a band F energy efficiency rating of 29, with annual CO_2 emissions of 10.3 tonnes and fuel costs of £1,097.

2.39 As the insulation in the loft space is now difficult to access, improvements to insulation are limited. Cavity wall insulation can be applied, though the large windows at the front of the dwelling will limit its effectiveness, whilst the hot water cylinder can also be insulated. The lack of a mains gas supply means that there are fewer options for a cost effective improvement to the heating, although the electric heaters can be replaced with relatively efficient modern storage heaters. Making these changes would cost around £1,500 and would improve the SAP rating to 53, in band D, with the CO_2 emissions decreasing to 5.8 tonnes per year. The annual fuel costs would fall to £820 giving a payback period of between 5 and 6 years.

Case study 3, 19^{th} century purpose built flat – problematic to treat

Source: BRE photo library

2.40 This 3^{rd} floor period flat is situated in a 6 storey city centre block built in the later 19^{th} century. The walls are solid masonry with decorative brickwork to the front, and the windows are single glazed. It is heated using old storage heaters with an immersion heater supplying hot water to an insulated storage cylinder. The SAP rating is currently 54, which is high for a dwelling of this age, but fairly typical for a mid-floor flat with low heat losses through exposed surfaces. The flat has annual CO_2 emissions of 3.8 tonnes and fuel costs of £522 per year.

2.41 Some energy efficiency improvements can be undertaken, but not to the same extent as the previous examples. The storage heaters can be upgraded and a thick jacket fitted to the hot water cylinder. These upgrades would bring about a modest rise in the SAP rating to 63, taking it from band E to band D. The annual CO_2 emissions would be reduced to 3.1 tonnes and the fuel costs to £453, giving a 7 year payback period on upgrade costs of almost £500. Although further improvements would in theory be possible they would be expensive, and the lack of mains gas in the block prevents the installation of a more efficient boiler system. External solid wall insulation may be an option but would be more complicated and expensive due to the bay windows and brickwork detail, whilst planning permission would also be difficult to obtain for a dwelling of this age and type. Insulated plasterboard could possibly be applied internally but would negatively impact on the already small space available and period decoration.