Chartered Institute of
Environmental Health

CIEH excess cold enforcement guidance

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CIEH

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Chartered Institute of Environmental Health (CIEH)

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Introduction

Excess cold continues to kill and injure very large numbers of people in England. In 2017/18, 17,000 deaths were estimated to be directly linked to living in a cold home.[1] Cold has long term effects on the health and wellbeing of both young and old. It has a major impact on our ability to provide health and social care, and on the wider economy.

This document is mainly intended for use by practitioners enforcing housing legislation, to be read in conjunction with the Operating Guidance for the Housing Health and Safety Rating System (HHSRS). It should also be seen as a manual of good practice for anyone involved in renting property or providing health and social care for people living in cold homes. However, local authorities should develop a strategy to address the issue of cold homes more widely, including tackling fuel poverty in all tenures. A number of resources are available to assist with developing these wider plans.[2,3]

The original Operating Guidance was published in 2006. It set out a methodology for assessing HHSRS Hazards and gave average likelihoods and spread of harm to be used as a baseline for assessment. It used large-scale statistical data available at that date.

Since then, much has changed. The average energy efficiency of homes has improved, building materials and techniques have evolved and medical research has identified many of the direct and indirect physical effects of cold on individuals. There have also been significant legal judgements that impact upon housing law enforcement relating to cold.

This guidance is not intended to replace the Operating Guidance, nor to provide an update of the statistics. The aim is to update and lay out the key components of dwelling energy efficiency so that they can be used for both assessing excess cold hazards and deciding on appropriate remedial action. It also contains material that may prove helpful when preparing evidence for court or tribunal.

The original assessment benchmark was the average energy performance of dwellings in 1996, and this has not been changed. Instead, the typical building components of a 1996 dwelling are listed here so that you can compare them to the properties that you are now assessing. This should enable a more accurate calculation of likelihood and spread of harm.

The objective of the HHSRS is to improve people's health. Other standards, such as Building Regulations and Minimum Energy Efficiency Standards (MEES) set out improvements linked to climate change energy efficiency. They do not override the requirements of the Housing Act 2004, and compliance with them may still mean that a property has an excess cold hazard that requires formal action to remedy it.

In June 2019, the UK became the first major economy to pass net-zero carbon emissions law, which would bring all carbon emissions to net zero by 2050. The Chancellor also made an announcement in March 2019, that all installations gas-powered boilers in new developments would be banned from 2025. Whilst these changes do not yet affect older properties, this signalling the future direction for policy relating to excess cold and the need to better align the objectives of protecting people from the cold and reducing carbon use. The improvements in energy efficiency and the replacement of older gas boilers with new ones are likely to result in carbon reductions, but when it comes to specifying renewable heating sources as part of remedial works, we will need to wait for updated guidance and worked examples for the HHSRS.

1 Press release from E3G and National Energy Action, 15 February 2019.

2 Data sources to support local services tackling health risks of cold homes, Public Health England, Jan 2019

3 Cold homes toolkit for local authorities, Citizens Advice website [Last accessed Sep 2019]

Excess cold: hazard assessment and what should be considered

Background

Paragraph 2.05 of the statutory guidance states the following:

"A healthy indoor temperature is around 21˚C, although cold is not generally perceived until temperature drops below 18˚C. A small risk of adverse health effects begins once the temperature falls below 19˚C. Serious health risks occur below 16˚C with a substantially increased risk of respiratory and cardiovascular conditions. Below 10˚C the risk of hypothermia becomes appreciable, especially for the elderly."

When the external temperature is -1˚C an appropriate target standard should be:

- Reception rooms: 21˚C
- Kitchens large enough to also accommodate dining space: 21˚C
- Bedrooms: 18˚C
- Bathrooms: 22˚C
- Hallways: 19˚C

The statutory guidance provides a hazard profile that includes a table of national average likelihood ratios, spread of likely harm percentages for each of the four levels of harm as well as hazard scores and bands. This table is based on a dwelling in a "typical condition" for age and type as seen in 1997 to 1999.

Paragraph 2.24 of the Operating Guidance sets out the "relevant matters" that should be taken into account in the assessment:

- **Thermal insulation** – adequate insulation of the external envelope of the dwelling, including the presence of cold bridges.

Excess Cold: Average likelihood and health outcomes for all persons aged 65 years and over, 1997-1999

Dwelling type & age		Average likelihood 1 in	Spread of health outcomes				Average HHSRS scores
			Class 1 %	Class II %	Class II %	Class IV %	
Non HMOs	Pre 1920	330	34.0	6.0	18.0	42.0	1,066 (C)
	1920-45	340	34.0	6.0	18.0	42.0	1,035 (C)
	1946-79	400	34.0	6.0	18.0	42.0	880 (C)
	Post 1979	530	34.0	6.0	18.0	42.0	664 (D)
HMOs	Pre 1920	340	34.0	6.0	18.0	42.0	1,035 (C)
	1920-45	290	34.0	6.0	18.0	42.0	1,213 (C)
	1946-79	370	34.0	6.0	18.0	42.0	951 (D)
	Post 1979	350	34.0	6.0	18.0	42.0	1,005 (C)
All dwellings		**380**	**34**	**6**	**18**	**42**	**926 (D)**

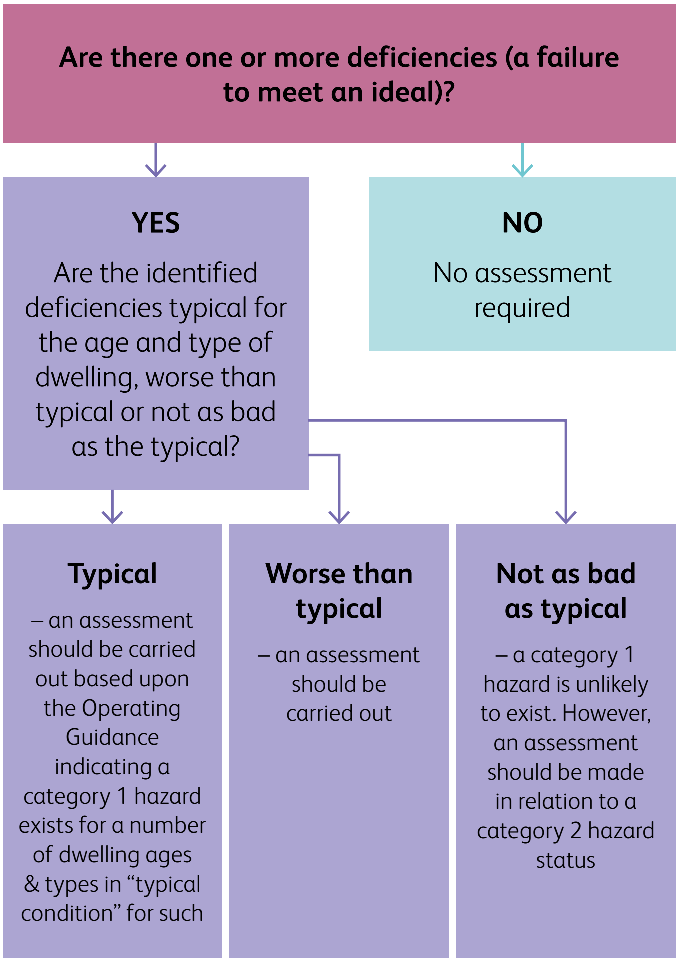
- **Dampness** – in such a position, and sufficiently extensive and persistent as to reduce the effectiveness of the thermal insulating material and/or the structure.
- **Settling of insulation** – compression of the thermal insulating material reducing its effectiveness.
- **Type of heating system** – systems and appliances inadequate for the size of the dwelling.
- **Size of heating system** – systems and appliances inadequate for the size of dwelling.
- **Installation and maintenance of heating system** – inadequately installed of maintained systems.
- **Controls of heating system** – inadequate or inappropriate controls to the system or appliance.
- **Amount of ventilation** – inadequate, excessive, or inappropriate provision for thorough ventilation.
- **Ventilation controls** – inadequate means of controlling ventilation.
- **Disrepair to ventilation** – to the system or controls.
- **Draughts** – uncontrollable draughts and those situated to cause discomfort.

These should be fully considered under these four related headings:

- The thermal resistance of the dwelling envelope
- The type, size, working condition, control over and efficiency of the heating provided
- The impact of ventilation provision and draughts
- The impact of dampness on the thermal resistance of the building elements of the dwelling

The Assessment Process

All assessments have to be carried out in accordance with the Operating Guidance, broadly summarised here:



Heat loss assessments

Assessing the ability of a dwelling to attain and retain safe internal temperatures is key. A heat loss assessment (see **Annex E**) is therefore essential. It shows:

- the likely heat losses from the dwelling and
- deficiencies of heating provision that would otherwise enable 'safe' indoor temperatures to be achieved.

Insulation

Insulation reduces heat loss from buildings and is a key remedial measure. Additional insulation may need to be specified where a deficiency in the insulation has been identified, where electric heating is installed, or where the structure or condition of the dwelling is such that it is considered necessary.

The Operating Guidance states that:

"Structural thermal insulation should be provided to minimise heat loss. The level of insulation necessary is in part dependent on geographical location and exposure, position in relation to other dwellings and buildings, and orientation." [4]

It also states that 'inadequate insulation of the external envelope of the dwelling' is a relevant matter affecting the likelihood and harm outcome.

Where other building works involve the renovation or replacement of any thermal element the Building Regulations requires insulation to also be provided.

Technical and practical considerations

It is important to bear dew points in mind. Warm air holds more water as vapour than cold air. At 21°C air holds roughly twice as much water as air at 10°C. Any moisture-laden warm air that finds its way to any cold spot may drop below the dew point and is likely to condense there.

This has three implications. First, the vapour barrier must always be on the inhabited side of the insulation, so that any vapour produced by the occupants does not find its way into the insulation or structure of the dwelling where condensation could occur in a gap inside the wall, roof or floor and may not be immediately visible. The vapour barrier may need protection to avoid accidental damage by residents.

Secondly, water carried as vapour throughout a dwelling may condense out at any point where there is cold-bridging to the outside, reduced levels of insulation, or where there are gaps in the insulation, even in a dwelling with high overall levels of heating and insulation.

Thirdly, ventilation of the property is most effective when the air inside is warmest and carrying a maximal amount of water as vapour.

Where the works to improve a property are substantial, particularly where insulation upgrades are on party walls (for example, next to unheated spaces) liaison with Building Control Officers is recommended, as works that satisfy both Part L (Conservation of fuel and power) and Part E (Sound insulation) may require more complex combinations of materials or design. Thermal insulation materials tend not to have the mass required for airborne noise attenuation.

Heat Loss from Dwellings

Heat loss through uninsulated elements impacts on the ability to retain heat and, hence, a healthy indoor temperature. The majority of heat loss is through the walls and roof of a dwelling but other areas should not be overlooked.

The Energy Performance Certificate (EPC) for the dwelling will highlight areas of low energy efficiency. Where elements of the structure offer poor thermal insulation and are likely to lead to excessive heat loss, these should form part of the recommended measures for improvement.

4 Annex D, paragraph 2.19, preventative measures and the ideal, HHSRS Operating Guidance 2006.

Areas of a dwelling may suffer from cold bridging. These may fall outside of the areas normally considered for insulation, for example where there are concrete parts of the structure such as lintels, window reveals, upper storey floor joists, balcony floors and some roof elements.

Orientation and solar gain

A building's geographical location, orientation and exposure (including position in relation to other properties) can affect the thermal efficiency of a property. Exposed glazing on south facing aspects can increase solar heat gain and save energy, but shading from this aspect will lose this benefit.

Party walls with neighbouring properties can help protect against heat loss, while exposed walls reduce the thermal efficiency of the property.

Measures of insulation values: R-values, λ-values and U-values

R-values measure the resistance to heat flow through a given thickness of material. The higher the R-value, the more thermal resistance the material has and the better its insulating properties.

There are two commonly quoted measurements of insulating capacity:

Lambda (λ) values are a measure of thermal conductivity, demonstrating how easily heat flows through a specific type of material, with the thickness of the material being irrelevant. The lower the lambda value of a material, the better the thermal performance, as heat will move more slowly across a material.

Thickness of the material becomes relevant when specifying installation. For example, the Lambda value of PIR boarding is twice as efficient as mineral wool, so only half the thickness of PIR boarding to achieve the same thermal performance. From an EPC perspective, a lambda value of 1 or less is considered sufficient to demonstrate high insulating capacity and would similarly demonstrate reduction of excess cold hazard.

U-values are given to elements of a building, measuring how much heat is lost through a given thickness of a specific material, including heat loss via conduction, convection and radiation. The lower the U-value, the better the heat insulator. Building Regulations (Part L) states maximum permitted U-values for particular building elements.

Loft insulation for pitched roofs

Up to 25% of heat is lost through the roof space.[5]

Where a deficiency in loft insulation has been identified, it would be appropriate to specify installation or upgrading to comply with the Building Regulations. It should form a part of the full dwelling inspection to inspect and assess the level of loft insulation, as failure to do so prior to enforcement action has been criticised at first tier tribunal.

Quilted insulation or mineral wool is the most common type of insulation fitted. Utilising loft space for storage is quite common, but placing items on top of insulation can compress the insulation, reducing its effectiveness.

Where access to a roof space is not available, provision of an insulated loft hatch should be included in the schedule of remedial works. Some loft hatch types with integral ladders may be unsuitable if the ladder does not permit adequate insulation of the hatch itself.

5 Roof and loft, Energy Saving Trust website, last accessed on 27 September 2019.

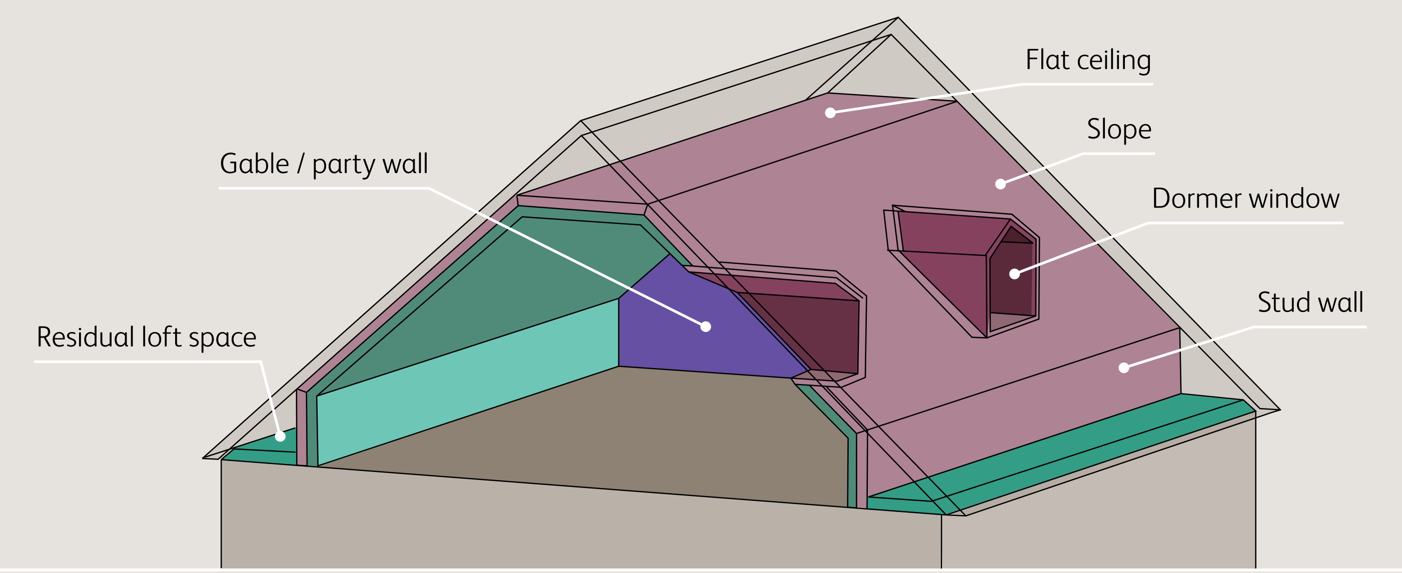


Figure 1 **A typical room in a loft**

Insulation should be specified to include around, but not beneath, water tanks and pipe work to prevent freezing, filling all holes at ceiling level to include areas penetrated by pipe work to prevent moist air condensing on cold surfaces in the loft. 'Loft legs' can be used to lift over boarding and prevent compression of insulation and fire-retardant 'loft lids' or 'hoods' can be used over down lighters to avoid cold spots caused by moving insulation away.

Where the provision of roof insulation is specified, it is essential that adequate provision for ventilation is also included in schedules of remedial works.[6]

Proprietary spray foam products applied to the underside of rafters may reduce adequate ventilation to rafters and battens, leading to rot and insect infestation. During the 1980s and 1990s some properties had insulation fitted between the rafters rather than between the ceiling joists. This is not as efficient and should not be considered adequate as the roof space has to be warm before the benefits of trapping the heat from the main house will be felt. If the loft space below is ventilated or draughty to any extent, insulation at rafter level will be largely ineffective.

Habitable roof spaces

Rooms within a roof structure can vary and may be original or result from conversion. To be considered a true room in the roof there should be a fixed staircase providing access, with a wall window, dormer windows or skylights for natural lighting and ventilation. A typical room in the roof may look like in Figure 1, above.

When a loft area is boxed in to create a habitable room, several heat loss elements are formed, including the roof, walls and gable end, sloped ceilings and residual ceiling of storey below and the dormer window area.

Whether original lath and plaster or all elements having been plaster-boarded, heat loss will be considerable and should be considered as uninsulated loft spaces unless significant improvements have been made to the thermal elements.

Note that if a Prohibition of an upper floor is being considered for other reasons (such as falls on stairs), this space will still need to be insulated despite being unoccupied as it will affect the heat loss from the dwelling as a whole.[7]

6 see Building Regulations Approved Document L1B

7 This course of action was upheld by the RPT in Alsaad v London Borough of Islington

It is not easy to achieve the thermal insulation (u-values) in the Building Regulations for loft rooms.A number of methods may need to be specified to reach the standard. The package of remedial works as a whole will need to be adequate and reasonable to mitigate the excess cold hazard.

If there is a dormer window to the room, then particular attention should be paid to the cheeks and any internal ceiling of the dormer. These are frequently uninsulated or poorly insulated, as upgrading with older, thicker insulating materials would have impacted on window functionality.

If the habitable roof space incorporates stud walls, a check should be made of access to the void space behind these stud partitions. If access is not provided it will be necessary to create access panels to both elevations in order to check and upgrade insulation levels to both the residual ceiling and the stud walls in these voids. Similar checks will be necessary above any flat ceiling cutting off the apex of the roof.

Where the existing roof covering is in good condition, insulation should be specified as being provided from below by either:

- Removing the ceilings/spandrel/wall linings and fitting a rigid/semi-rigid board/slab between rafters/joists/studs and then forming a new ceiling with a 50mm air gap or;
- Over-boarding the existing ceiling and walls with thermal-board incorporating a vapour barrier or;
- Forming a suspended ceiling with insulation, as part of an overall solution for a pitched roof or a complete solution for a flat roof.

The solution specified will depend upon the depth of the rafters/joists and the overall headroom. The re-covering of a roof would usually require Building Regulation approval, so you should have regard to these requirements when a thermal element is being renovated or replaced.[8]

Particular attention should be paid to existing electrical wiring. The wiring should be carried over the top of the insulation if possible. Chemical reactions between some insulation types and PVC or rubber-coated wiring can break down insulation. In addition, wiring elements are sized to cope with their design load (current) and dissipate heat. This may not be possible if heavily insulated and can increase the risk of fire.

Insulation for flat roofs

Flat roofs also need insulating. Although not common in the main body of the dwelling, they are often found in extensions, commonly containing rear addition kitchens and bathrooms – rooms where a lack of insulation and excessive heat loss is highly likely to increase condensation.

In considering the best way to achieve an insulated finish, you should have regard to the age and condition of the existing roof covering, and the wishes of the owner and occupants.

Where there is no defect to the external roof, insulating a flat roof internally is likely to be preferable, with a vapour barrier on the inside of the insulation. Removing the ceiling and fitting insulation between the joists is likely to cause the most disturbance. Boarding over the current ceiling or forming a suspended ceiling are also options, although this will reduce the ceiling height.

Where the flat roof is defective, external insulation will be an option. This can be done in a number of ways to achieve sufficient insulating quality and comply with building regulations. In either event, adequate ventilation should be considered as part of the schedule of works.

8 See worked example 1 for mansard roof insulation and see worked example 9.

Wall insulation

It is important to check on existing airbricks running through walls. Although cavity wall insulation installers should sleeve bricks to prevent insulation blocking them, in all cases it is important to check whether there are any devices (such as open gas fires) that depend on the brick for combustion. In properties with sealed uPVC windows and no trickle vents these can cause nuisance draughts, but if blocked there is a danger of incomplete combustion and carbon monoxide formation, as well as secondary condensation effects. If alternative sources of ventilation can be found close to the combustion device, such as a vent in a suspended timber floor immediately below the device, then nuisance draughts are less likely to occur and the occupants are less likely to block the vent up.

Cavity wall insulation

The provision of cavity wall insulation can reduce heat loss through walls by up to 60%.After loft insulation it is the most cost-effective insulation measure. So it would be an appropriate measure to specify where an excess cold hazard has been identified and unfilled cavity walls are present.

It is not always appropriate to install cavity wall insulation, particularly in properties exposed to driving wind and rain, or by the coast. Some brick types can also be pervious to water penetration. Specific guidance should be sought if in any doubt. Insulation of cavity walls should be carried out by a member of the National Insulation Association and backed by suitable insurance such as the Cavity Insulation Guarantee Agency. The Building Research Establishment can also provide more information.

Solid wall insulation

A solid wall can be insulated internally or externally, but both provide practical challenges. Solid wall insulation should only be specified where there is a large external wall area or there are other remedial works to address, such as dampness. Internal dry lining is generally the preferred option, but both can be costly.

Internal insulation consists of either dry lining, in the form of laminated insulating plasterboard fixed on a studwork frame, or a flexible thermal lining. A vapour barrier is required on the room side of the insulation to prevent interstitial condensation. Skirting boards, door frames and electrical fittings will all need to be repositioned. Care must be taken to avoid piercing the vapour barrier.

Internal insulation reduces the size of the room; this can be critical in smaller rooms and should not result in a reduction of more than 5% of the floor area. Where required, the impact on the crowding and space hazard has to be considered. In a House in Multiple Occupation (HMO), minimum room sizes must also be considered, and external wall insulation should be preferred where the impact on room size is excessive. As with all works, the tenants' wishes should be considered.

External insulation systems are made up of an insulation layer fixed to the existing wall, with a protective render or cladding finish. It is costly, more complex than internal insulation and has a long payback time unless installed in conjunction with other remedial work. It has the benefits over internal insulation by causing less disruption or reducing internal space floor area and therefore tends to be more popular with tenants.
It should only be considered for inclusion in schedules of work in the following circumstances:

- In premises with considerable areas of exposed external facade, such as semi-detached or detached premises, particularly premises with existing external render, and
- Where a significant area of the facade is in poor condition, or there is a need for reconstruction of part

of the external envelope of the building, or
- Where the premises require major building works affecting external walls e.g. where there is poor structural design such as thermal bridging, and in premises with cavity wall construction in areas of high wind and rain exposure where cavity wall fill would not be appropriate.

Planning consent should be sought for any change in external appearance where the dwelling is a listed building, in a conservation area or has fine architectural detailing.

Floor insulation

Insulation measures can significantly reduce heat loss through floors. It is most effective for dwellings with large ground or basement floor areas e.g. detached premises, and for suspended floors with butt jointed boards. More heat is lost along the perimeter of the floor by external walls.

Ground floor insulation should generally only be included in a schedule of works where there are other related hazards, which require the floor surface or structure to be exposed or where access is easy to access from below via a cellar.

It can be particularly important in converted non-residential buildings. For example, a converted pub is likely to have a larger than average cellar area, which could have an impact on the temperature of the rooms above the cellar, if adequate insulation is not installed.

Where floor insulation is specified for suspended wood floors, this can be achieved by laying mineral wool insulation supported by netting between the joists. In addition to insulation, sealant can be used to fill any gaps between floorboards and skirting boards. If it is not appropriate to fully insulate the floor then sealant can be used on its own, as this will reduce heat loss.

Window insulation

For existing single glazed windows, it is appropriate to specify remedial action for minor defects such as cracked panes, draught-proofing and rotten timber that contribute to the hazard.

Where windows are beyond repair and causing serious draughts and excessive heat loss, it would be appropriate to specify their replacement. Here it would be cost effective to require double glazed windows to be installed. There are Building Regulations and planning requirements for the replacement of windows to listed buildings or buildings in conservation areas. Councils should also consider their specifications to encourage the use of products which meet their standards for sustainability and environmental strategies according to Building Regulations.

If replacements specified, care should be taken to incorporate adequate trickle ventilation that can be safely and securely used when the occupant is out, particularly where the windows are out of public sight or where there is poor lighting, such as in basement wells. If this is not done, then the occupants cannot safely ventilate the property at times when the internal humidity is at its highest.

Where there are exceptionally large areas of glazing, secondary glazing could be considered for inclusion if more cost effective than double glazing. The number of single glazed windows, their surface area, condition and size, will be relevant considerations. The gap between the existing glazing and the secondary glazing should not be so wide as to create convection currents that will reduce the insulation levels. To encourage occupants to ventilate their home, any proprietary secondary glazing system used must be both functional and easy to use or the occupants may not ventilate the property at all.

Dwellings of non-traditional and vernacular construction

The Building Research Establishment have produced a useful guide that can help identify of different types of construction.[9] Where dwellings of a non-typical or non-traditional construction have a category 1 excess cold hazard there may be justification for specifying works which 'extend beyond' removal of the category 1 hazard. When assessing these, the major issue of concern will be any poorly insulated wall structure. Whilst it may be relatively simple to specify an appropriate heating system and insulate a loft space, these may be inappropriate if the wall structure of the building still provides poor thermal insulation with little practical scope for upgrading. The practicality and cost of remedial work should be major considerations of enforcement options to determine the "most appropriate course of action". In this type of property the reduction in the hazard score following works may also not be as great as would normally be achieved.[10]

Older and vernacular dwellings are not readily assessable by simpler energy assessment tools such as RdSAP. The default construction options available tend not to effectively cover such things as earth, rendered or slate-hung studwork. Such tools are also inaccurate for properties that have had multiple changes or adaptations and do not conform to the standard built form for their date of construction – e.g. multiple heat sources, window types or additions and extensions. In these cases, basic assumptions built into the calculations - such as the surface to volume ratios, heat zone losses, basic building element performance - are flawed.

Historic buildings are often difficult to upgrade for a number of reasons. It is recommended that you seek specialist advice if any of the particular issues listed here apply, not only from manufacturers and installers, but also from organisations that can advise you about the particular requirements of these building types.

Thatched properties

The insulation properties of the roof depend greatly on the entrained air in the wheat or water reed, so insulation levels are likely to decline if the roof has reduced in thickness, has moss growth or has been 'rick-patched'. Additional internal insulation is frequently impracticable if the original, often light-weight, split sapling timberwork is still present; a false ceiling between A-frames may be possible, and an access hatch necessary. Note that insulation that is water-retentive may not be applicable, particularly in areas where the thatch is likely to fail first, such as around chimney stacks, at valley junctions and dormer cheeks built into the thatch.

Cob walls

Many thatched and other properties may have walls that are part-earth or clay. Purely cob walls are often thick enough to give high levels of insulation, but narrower walls, and those of mixed pieces of stone, brick and earth can present problems if additional insulation is required, because it is important not to seal moisture into the wall.

Often such walls have a stone plinth base, but because older properties are adjacent to road levels that will have risen over the centuries, the earth component may be close to ground level, and any rising dampness or damp entering the wall there, or at thatch level must not be trapped by impervious insulation and/or render that reaches down to the ground. Such walls are lime-washed (a permeable render) rather than sand-cement rendered for this reason.

Stud walls

Many older and vernacular style properties have stud walls, often slate or tile hung, or with render on lathes. Stripping the inside plasterwork and insulating between the studs will improve insulation, but do not forget that the timber-framing will act as a thermal

9 Identifying basic constructions (v.8.0), Building Research Establishment, last accessed on Sep 2019.

10 See HHSRS Worked Example 5 for further guidance.

bridge, especially if the studs are not deep enough for a significant amount of insulation. In this case, additional insulation may also be required on the inside.

Other solid walls

Older brick and stone walls can be thick enough to offer insulation comparable with cavity brickwork. However, blocked-up window and door openings, later back additions, coal-shed and outside toilets that have been incorporated into the main property often have half-brick or single-brick thick walls with poor thermal performance. Not only do these areas contribute significantly to excess cold, they are also likely to be the areas below the dew-point and will therefore be where condensation and mould accumulates.

Precast concrete and cross-wall construction

Many properties have concrete components that are carried from the outside to the inner skin of the wall, such as porch roofs, balconies and bay window roofs. Cross-wall construction – a pre-cast concrete framework with brick infill will have concrete components connecting the outside with the inside. In older properties, the concrete can act as a powerful thermal bridge and heat sink, particularly where the walls are made of concrete 'bricks' with individual air spaces. In some cases where it is unclear whether insulation would be more effective internally or externally, it may be worth considering whether the concrete component can be removed and replaced with a different design that does not act as a thermal bridge, or whether it would be more cost-effective to 'envelope' it, for example by creating an enclosed porch.

Heating

Heating will be included in most specifications for remedial works to deal with excess cold hazards. Clauses will relate to the type, size, controls, installation and maintenance of the existing heating.

This assessment is made easier by understanding the barriers to adequate heating from the occupiers' perspective:

Provision - what is there in terms of the built form of the dwelling, including controlled and uncontrolled ventilation as well as the heating system.

Repair - problems with provision, including dampness, gaps leading to draughts or any part of the system not functioning as it should.

Control - whether the occupiers can control the heating and ventilation of the dwelling to provide a safe level of warmth over the year. This may be about whether they understand and use the controls that exist effectively, controlling ventilation, understanding the risk that a cold dwelling represents and also being able to engage to find the best tariff, available benefits.

Cost - See the case study from Liverpool in **Annex A** for more information on how to take cost of heating into account. You should consider whether the money needed to heat the dwelling to a safe temperature over 12 months is significantly higher than it could be and whether this has an impact on excess cold.

The preventative measures and the ideal as described in the HHSRS Operating Guidance are relevant to the remedial works specified. At paragraph 2.20 of **Annex D**, it states *'heating should be controllable by the occupiers and safely and properly installed and maintained. It should be appropriate to the design and layout and construction, such that the whole of the dwelling can be adequately and efficiently heated.'* The heating system should therefore provide direct heating to every room as a matter of principle, but it is possible that some small, often 'internal', rooms with low heat losses can stay at a reasonable temperature via indirect heating from other rooms.

The Building Regulations Approved Document L1 is referred in the Operating Guidance as a source of further information and is therefore relevant to HHSRS. It should be noted that they require new boilers to be condensing boilers, unless a competent person states that an exception can be made.

The specification for heating works will be influenced by the insulation and ventilation in the dwelling on completion of works; for example more insulation may be required in an older property where there is electric heating than where there is gas heating.

The key issue for heating remains whether healthy indoor temperatures can be achieved in the dwelling, taking into account the likely heat losses through the building envelope. It is not possible to fully consider existing heating and heating requirements and improvements without carrying out a recognised heat loss assessment (see **Annex E**).

A number of heat loss tools are available, ranging from the basic to the more sophisticated. An assessment will provide an indication of the size of the heating appliance needed for each room, which can be compared with existing provision by referring to on-line manufacturer details radiators and appliances. This will identify any heating deficiency and a possible solution in terms of improving heating, with or without improvements in thermal resistance of structural components of the dwelling.

The Operating Guidance states that *'A healthy indoor temperature is around 21˚C.'* Where deficiencies relating to inappropriate, inefficient or inadequate heating systems make a major contribution to the likelihood of a hazardous occurrence, it will be appropriate to specify the installation of improved heating in most cases and, commonly, gas central heating systems, although this is not the only option available. This will usually be the most appropriate type of heating system, which is capable of heating the whole of the premises so that a temperature in all rooms of 21˚C can be maintained when the external temperature is below freezing point. This is the most typical form of heating in the national stock and the cheapest to run. However, care must be taken to assess each dwelling individually and to take the cost, fuel availability and practicality of installation into account.

All schedules of remedial works should also contain a clause that suitable alternative measures may be appropriate but should be subject to prior written consent from the council. In this sense it might be most appropriate for schedules of remedial works to be 'outcome target specific, – such as the specification of temperatures to be achieved - rather than to simply require a specific heating type.

These temperatures are a common industry standard that is used to such an extent that it is unlikely to be successfully challenged.

In general terms the current relative cost of different fuels for heating a dwelling are as follows from least expensive to most expensive:

Fuel type [11]	Price (pence per kWh)	Standing charge (£ per annum)
Gas	3.74	85.53
Coal / solid fuel	4.00	N/A
Oil	5.24	N/A
Wood pellet	6.45	N/A
LPG	6.86	N/A
Electricity (off-peak economy 7)	9.10	82.25
Electricity (standard rate)	19.00	77.02

In the context of the above, use of wood pellets as a fuel source is relatively rare in the housing stock, with the predominant heating fuel type being gas. Lack of availability of some fuel types in a locality might result in "less typical" fuel types being found. Even if they are of a type that is cheaper than the predominant fuel (gas) other factors such as lack of system controls etc. might be issues that would need to be considered in an assessment of the excess cold hazard.

In deciding whether it is cost effective to specify a gas heating system, you need to take account of the costs involved if a gas supply needs to be installed. Where it is not feasible or cost effective to provide a gas supply to property, other types of fuel such as electric heating or oil-fired central heating systems should be considered. Unlike rural areas, setting up a new gas connection in an urban area is often not prohibitively expensive. Where there is no gas meter present at a property, an EPC will only suggest electric heating solutions. This does not mean that gas would not be appropriate and the possibility of connecting a property to the gas network should explored. It must be recognised that decisions at First Tier Tribunal level are not binding in the way that decisions of the Upper Tribunal are, so whilst these will be useful for guidance, the outcomes should not limit the specifications being sought.

When considering the appropriateness of different types of heating, you may wish to consult Sutherland Tables, which provide statistics on different domestic fuels and the costs of using these fuels under similar conditions. It should also be noted that the Government announced that gas boilers would no longer be installed in new build residential properties from 2025.

11 Information in table from: Energy Saving Trust, March 2019 update.

Within the overall context of heating, the English Housing Survey Energy Report 2014 found the following:

- 85% of dwellings had gas central heating compared with 73% in 1996
- Where gas central heating was present, 99% of dwellings had a timer, 85% had at least one room thermostat and 76% had thermostatic radiator valves
- Dwellings with electric storage heating comprised 6% of the housing stock compared with 8% in 1996
- In dwellings with electric storage heating only 26% had automatic charge control. This is when a control adjusts the amount of heat stored overnight by measuring the temperature in the room and if it is milder, stores less heat. As such, running costs will be reduced.
- 9% of dwellings had gas wall heaters in 1996 but this had reduced to 1% in 2014

Information produced by the Ministry of Housing, Communities and Local Government identified the heating types in 2015 for the private rented sector and across all tenures:

Tenure [12]	**Gas Central Heating**	**Electric Storage Heating**	**Room heaters** (fixed or unfixed)
Private Rented Sector	83.6%	10.3%	6.1%
All dwellings	92.1%	5.5%	2.4%

12 Information in tables from https://www.gov.uk/government/statistical-data-sets/energy-performance, last update 13 July 2017

In terms of age of households and income status, the findings are shown in the table below:

Group [12]	% with Gas Central Heating	% with Electric Storage Heating	% with Room Heaters (fixed or un-fixed)
Age of Oldest Person			
60 years or more	91.0%	6.1%	2.9%
75 years or more	88.7%	8.1%	3.2%
Income Group			
1st quintile (lowest income)	90.3%	6.7%	3.0%
2nd quintile	90.6%	5.9%	3.5%
3rd quintile	90.2%	7.0%	2.8%
4th quintile	92.8%	4.8%	2.4%
5th quintile (highest income)	95.6%	3.0%	1.4%
Living in Poverty			
In poverty	89.8%	6.8%	3.4%
Not in poverty	92.3%	5.2%	2.5%
Workless Households			
Workless	88.3%	8.2%	3.5%
Not Workless	93.6%	4.1%	2.2%
All Households	92%	5.4%	2.6%

It is clear that the predominant form of heating dwellings is by gas central heating and should be seen as the typical or "norm". Despite this fact, care should be taken in assuming that any other form of heating provision will, by default, be deficient. Whatever the form of heating provided, the key points to consider are:

1. Can the rooms of the dwelling be heated to ensure that the healthy temperatures identified in paragraph 2.05 of the Operating Guidance are achievable?
2. Can this be done at reasonable cost?

If the heating cannot ensure that healthy temperatures can be reached then this is clearly a deficiency. If it can but only at a high running cost then the system is unlikely to be used at its optimum level of performance. This then becomes an issue of running costs and should be considered with reference to the tribunal decisions referred to in **Annex A**.

In all cases, it is good practice to make a detailed consideration of the practicality and cost of repair or improvement of existing systems versus the cost of specifying a new heating system and the alternatives that are available. These have been a major consideration in several Residential Property Tribunal cases. There should be a robust justification for the remedial works that you have included in schedules of work.

Existing central heating systems

Deficiencies in an existing heating system may arise because the system is inadequate or poorly designed, it is not functioning as intended or the controls are insufficient. Remedial works can include repair, replacement or improvement of the system. Replacement and improvement required should be guided and informed by a heat loss assessment. An EPC may also provide valuable information around what improvements a gas boiler replacement would achieve.

Where the controls need to be improved they can often be installed without incurring great cost, although the practicality of installing controls to older heating systems might be constrained by the design of the system. Consider specifying Thermostatic Radiator Valves (TRVs), a programmer and/or a room thermostat. The assessment of what is needed can be aided by comparing the existing controls of the system to the current Building Regulations requirements; these reflect the ideal for excess cold. When a boiler is being replaced or other work is being carried out on the heating system it will be even more cost effective to upgrade controls, but this may have to be a recommendation rather than a requirement in the specification.

If the central heating is inadequate or poorly designed it may need to be extended or adjusted to adequately heat the whole dwelling.

If an existing gas central heating boiler is less than ten years old, it may be appropriate to specify replacement of the boiler or the heating system where:

- There are serious or multiple component failures, where the combined cost of the remedial measures may exceed the cost of a new boiler e.g. failure of the boiler's heat exchanger or other major parts.
- There are serious design or installation failures that have caused complete malfunction of the system e.g. multiple component failure or corrosion.
- The capacity of the boiler is not adequate.

Whilst it might be more economic in the long-run to replace rather than repair a boiler having regard to its likely future life, where a repair is possible you must be careful not to dismiss this as a suitable remedial action even if it isn't the ideal one.

The required capacity of a boiler is calculated from the number and sizes of the radiators required for a dwelling in Kilowatts and including an allowance for 'reasonable demand' hot water use to provide a total minimum boiler capacity. In some cases an assessment of the capacity size of a central heating and hot water boiler may be necessary in informing an excess cold assessment as well as important in situations where additional radiators are required so as to ensure that the boiler has sufficient capacity with the additional heating load imposed on it if it is not being replaced.

As a rough guide the following are the combination boiler sizes required for different dwelling size:

- Small house (1-2 bedrooms) or flat: 24-27Kw
- Medium house (3-4 bedrooms): 28-35Kw
- Large house (more than 4 bedrooms): 35-42Kw

Assessment of the boiler size required can be approximated from the above although for a complete assessment the advice of a suitably qualified heating engineer should be obtained.

Where existing gas central heating systems are more than 15 years old some parts may be coming to the end of their useful life. It would be reasonable to specify replacement where there is poor efficiency and signs of disrepair or repeated system failure, such as leaking radiators, corroded components and inoperative parts. If, for example, half of the radiators in a system need replacement, a complete new system may be cost effective. The condition, efficiency and capacity of existing radiators and pipe work should also be considered. Indicators of older central heating systems would be panel radiators without fins, gravity fed or partly pumped systems. Such systems will also be less likely to have controls such as TRVs and may lack other temperature and timing controls. There may also not be separate controls for the heating and hot water systems.

In the specification of works, any part replacement of a gas central heating system should include the need for full cleaning of the system e.g. a power-flush and use of appropriate inhibitor in the system.

Gas central heating boiler efficiency and typical fuel costs

ErP is a labelling system using similar ratings to earlier boiler efficiency rating systems but is based on different principles, introduced in September 2015. Since April 2018, all new gas boilers have to reach 92% ErP efficiency.[13] A change from an older and much less efficient boiler should provide significant cost savings.

It is worth remembering that the ratings used are simply a measure of how efficient the boiler is in converting fuel into heat. If details of the manufacturer and model are available, it is possible to check boiler efficiencies here: http://www.ncm-pcdb.org.uk/

Electrical heating systems

In general electricity is more expensive than other heating fuels, however the cost of installation of electric heating systems with storage radiators and direct acting heaters will generally be lower than for a gas fired central heating system. The running cost of heating with electricity will be significantly higher than with other fuels, but a high proportion of off-peak electricity will reduce the cost.

Higher standards of insulation will be necessary with electric heating systems than with gas. Electric heating systems should not be specified in premises with large areas of exposed wall with low levels of insulation such as un-insulated solid walls typically found in older properties, unless high standards of insulation are also specified.

Electrical heating systems and, in particular, 'on-demand' electrical heating systems are unlikely to be considered as 'appropriate heating provision' unless the premises are small and very well insulated.

13 Boiler Plus: New standards for domestic boiler installations from April 2018, FAQs, BEIS, January 2018.

For the purposes of this guidance, electrical heating systems would commonly only be considered as suitable to mitigate an excess cold hazard where:

- It is not practical or it is prohibitively expensive to install a cheaper fuel supply such as gas or oil at the premises; or
- The dwelling has a low heat demand, because it is small and in a sheltered location and a good standard of insulation exists or can be achieved.
- There is existing electrical storage heating and it can be improved to a reasonable standard. The feasibility and cost of extending or improving the system should be compared with that of installing a gas central heating system and having regard to the availability of fuel types in the locality.

Energy Saving Trust's Electric heating systems page provides further information. All electrical heaters should be fixed rather than portable.

There are claims that electrical heating is 100% energy efficient. The claims made about 100% efficiency are correct but only in the sense that all incoming electrical energy is converted into heat. You should be aware of what 100% energy efficient actually means and bear this in mind.

On and off-peak storage heaters

A storage heater contains heat-retaining blocks that are heated up overnight usually using off-peak electricity. They are manufactured in a range of sizes with storage capacity quoted in kWh. They perform better in well-insulated draught-proofed homes, where heat loss from the building is lower and is less affected by sudden changes in the weather. They are charged with heat during off-peak periods at night and release it slowly over longer periods during the day.

Storage heaters are unable to respond rapidly to changes in demand, but more modern ones have controls to set the amount of heat that they are charged with, depending on the outdoor temperature, and have variable emission rates. A lack of controls to set overnight charging correctly leads either to insufficient storage for the next day's requirements or to an excessive amount that will be wasted if milder weather reduces heating needs. It is now the case that energy providers can install devices that will make existing heaters more responsive so this remains an option to consider for existing, older, storage heaters.

Storage heaters run on off-peak tariffs are not ideal for the following reasons:

- The heat output will always be running 24 hours behind as they are not very adaptable to daily temperature variations
- When the outdoor temperature is very low, especially during the evening, the heat may be inadequate so supplementary heating would be needed
- They have high levels of static heat loss so heating may be provided when people are out and it is not needed
- A lower tariff for night-time charging can be associated with a higher than normal tariff for all other day-time use

The greater running costs of storage heaters with the necessary supplemental on-peak electric heating should be considered, to some extent, when selecting the heating to be specified. The high running costs may lead to the appliances not being used regularly enough to maintain a healthy indoor room temperature.

Existing storage heating

Where considering the retention of existing electrical storage heaters, decide whether they are of adequate capacity. If so, consider whether the controls are adequate, whether the existing level of insulation is sufficient and whether additional insulation can be specified. It may also be an option for the landlord to consider working with an energy provider to provide a device upgrade of an older system, allowing on demand control via grid balancing schemes.

Specifying storage heating systems

Where an electrical storage heating system is to be specified in a schedule of remedial works, it should meet the following requirements:

- Adequate heating should be provided to all parts of the premises. It should be based on a combination of storage heaters and ideally fixed modern panel type electric heaters.
- A reasonable proportion of the heating should be provided at off-peak rates, a target of 90% is recommended.
- Time controls and automatic input and output charge controls should be provided, including an internal or external temperature sensor, which is used to set the amount of heat to be stored automatically. Alternatively, the heating system should be managed from one central unit with time and temperature programming, with separate zones for living and sleeping areas. This enables more precise control of individual heaters throughout the dwelling.

A clause should be included in the schedule of works to ensure that the storage heating system is correctly designed. The TEHVA Guide provides guidance on designing storage heating systems.[14]

The electrical installation may need to be upgraded to cope with the increased load. This may add considerably to the cost of the heating system.

Improved storage heaters

New storage heaters from a relatively small number of manufacturers have recently come onto the market. They are cited as being replacements for older storage heaters that reportedly offer the following benefits over and above standard storage heaters:

- Improved insulation
- Use less electricity
- Have a fan-based system to distribute heat
- Have an LCD control panel to better customise heating programmes and which 'learns' the heating habit of the domestic user
- Has an energy management system that can communicate with the energy company to optimise the periods when the charging is done

Individual room heaters

A wide range of types of fixed individual room heaters are available including electric convector, panel and radiant heaters with advanced controls, intelligent operation and lower running costs than have been available up to now. They may also be fuelled by gas, heating oil, liquid petroleum gas (LPG) or solid fuel. They are usually highly responsive to immediate heating needs and tend to be expensive to run. In general, they can only be considered suitable as supplementary heating and sometimes in bedsit type HMOs. In all cases such heaters must be fixed rather than portable. Where electric heaters are specified they should include a timer and thermostat as minimum features.

14 DOM 8: Guide to the design of electric space heating systems, The Electrical Heating & Ventilation Association, February 2008.

Warm air heating

Warm air heating can be fuelled by gas, LPG, oil or electricity. The heat is distributed around the dwelling through duct work; individual grilles usually have sliding 'dampeners' which open and close to help balance the heat distribution. For gas warm air systems, gas is burnt to warm up a heat exchanger and air is drawn over the heat exchanger. Electric warm air units work on a similar principle as storage heaters. A heat-retaining block is heated overnight using off-peak electricity. Replacement units are available, but greater savings will usually be made by specifying a new fixed gas central heating system where possible. However, it should be noted that asbestos may be present in the form of rope in older systems.

Under floor heating

Under floor heating systems provide background heat and are usually powered by electricity or a gas boiler; they tend to be difficult to maintain. In general, only the most modern under floor heating systems could be considered to provide adequate heating.

District heating systems

District heating systems are local heating systems that generate heat in a centralised location and distribute the heat across multiple dwellings. There are over 17,000 district heating networks across the UK, and nearly half a million connections to them. They are essentially a high-powered central boiler and a network of well insulated pipes beneath the streets carrying the heat via high pressured hot water. Often these systems use energy generated from waste and are usually in the control of the Local Authority or arm's-length management organisations (ALMOs). They are generally competitively cost effective if they are routinely maintained and upgraded.

You should ensure you are aware if there are any district heating systems operating in your area and ideally develop a relationship with your system provider, as the individual district heating system provider is usually the best place to start in understanding how to identify what is wrong with a district heating system.

In the field officers are likely to come across deficiencies in these systems where they have either not been upgraded, not been routinely maintained, or worked on by someone unfamiliar with the system.

In requiring works to be done, officers need to be aware not only of the operation of their own particular system, but of any clauses in the system contract – for example there may well be a clause saying that no other heating systems can be installed the property, locking users into future energy pricing.

Ground source heat pumps

Ground source heat pumps (GSHPs) are relatively uncommon in the private rented sector, but you may come across them when you visit Registered Social Landlord (RSL) properties. They have a network of underground water pipes that are warmed by solar energy stored in the ground, and the pump converts this to a higher temperature to supply a building's heat demands. The size of the ground loop of the underground pipes needs to be matched to supply the heat requirements of the building.

They are expensive to install but are recognised as a cost efficient and low carbon method of heating a dwelling. They are cheap to run and are also likely to be tied to Renewable Heat Incentive (RHI). They also require less maintenance than combustion based heating systems.

The main problems that tend to be encountered with GSHPs are when an installation is not well designed, or where the pipe loop is not matched to the heating needs of the building. In attempting to understand the nature of a problem with GSHPs, you are likely to need the assistance of an expert installer.

Air source heat pumps

Air Source Heat Pumps (ASHPs) are relatively uncommon in the private rented sector, but you may come across them when you visit RSL properties. They are similar in design to the pump of a fridge; they extract heat from the outside air in the same way a fridge pump extracts heat from inside the fridge. They are capable of getting heat from air even with a temperature of -15°C. Heat from the air is absorbed into a fluid which is converted to a higher temperature by a compressor.

ASHPs can be air to water systems, which run via a wet heating system using radiators or underfloor systems, or air to air systems which run via fans (this system will not provide hot water). They are expensive to install but are recognised as a cost efficient and low carbon method of heating a dwelling. They are relatively cheap to run but they do require electricity, which increases costs from that of a GSHP and are also likely to be tied to RHI. They also require less maintenance than combustion-based heating systems.

Any heat pumps being installed to heat via a water-based system rely not only on a suitable heat store and heat exchange unit, but also on slower, long-term heat exchange. Education of tenants will be important in explaining that such systems cannot be turned on or off in the same way as a 'heat on demand' system.

The main problems that tend to be encountered with ASHPs are weathering of parts alongside general wear and tear. You may also come across issues with unsuitable locations of the pumps and noise nuisance. In attempting to understand the nature of a problem with ASHPs you are likely to need the assistance of an expert installer.

Ventilation

Ventilation is one of the relevant matters within an assessment of an excess cold hazard. Excessive ventilation will invariably result in increased heat loss from a dwelling, making it more difficult for healthy indoor room temperatures to be attained and maintained. In addition, draughts though poor ventilation can affect thermal comfort.

There is a significant link between ventilation provision, surface condensation and the Damp & Mould Growth hazard, a hazard that shares a number of "relevant matters" with excess cold. There is a close relationship between the attributes of a dwelling and these two hazards and it is important to understand the relationship.

In addition, the presence of dampness and wetting of insulation materials results in an increase in thermal conductivity and a reduction in thermal resistance of the material. Additional heat loss will occur and this will impact on indoor room temperature.

Background

Ventilation is defined as the rate at which air within a building is replaced by outside air. The ventilation rate may be expressed as either (a) The number of times the volume of air within a space is changed in one hour (air changes per hour or (b) rate of air change in litres/second. Ventilation rates in dwellings are important because they influence internal air temperatures and internal humidity.

Four factors influence both excess cold and condensation dampness hazards:

1. Heating
2. Thermal insulation
3. Ventilation
4. Moisture vapour pressure

Condensation may be expressed as the relationship between the temperature of a surface and the vapour pressure of the air.

Surface temperature is dependent upon the following factors:

- The type(s), amount, time and rate of heating of the building
- The ventilation rate
- The thermal properties and surface finish of the building fabric
- The external temperature

Vapour pressure of the air is determined by:

- The water vapour production within the building
- The ventilation rate
- The moisture content of the 'replacement' outdoor air

The ability of the building fabric and contents to absorb or desorb water vapour (the sponge effect).This will reduce or increase the vapour pressure depending on whether the building is cooling or heating.[15]

An adjustment to any of the factors influencing surface temperature or any of the factors influencing vapour pressure will influence the performance of a building in terms of both potential excess cold and condensation dampness so all must be taken into consideration when specifying remedial measures to ensure successful management of the excess cold hazard.

15 BS 5250: 2002 Code of practice for control of condensation in buildings (AMD 16119) (No longer current but cited in Building Regulations guidance)

Occupant activity, heating and ventilation regime

- Occupants and their activities generate moisture. More occupants means that there is more moisture released inside the dwelling creating a higher risk of damp and mould problems
- Fuel costs can make occupants reluctant to provide adequate heating for buildings or to alter the type and pattern of heating
- Patterns of use of buildings have changed. There has been an increase in intermittent heating of dwellings because of alterations in working patterns
- Households, particularly those on low incomes, may be reluctant to use uncontrolled forms of ventilation such as windows, during periods of colder weather because of the excessive heat losses associated with such forms of ventilation and the cost penalty incurred
- The following tables provide an indication of the levels of moisture generated by people, different household activities and the typical ventilation rates for different buildings.

Typical moisture generation rates for household activities

Household activity	Moisture generation rate
People:	
asleep	40 g/h per person
active	55 g/h per person
Cooking:	
electricity	2000 g/day
gas	3000 g/day
Dishwashing	400 g/day
Bathing/washing	200 g/person per day
Washing clothes	500 g/day
Drying clothes indoor (e.g. using unvented tumble drier)	1500 g/person per day

Typical ventilation rates

Description of dwelling	Ventilation rate ac/h
Well-sealed dwelling in sheltered position	0.5
Average dwelling in sheltered position	1.0
"Leaky" dwelling in sheltered position	1.5
Well-sealed dwelling in exposed position	1.0
Average dwelling in exposed position	1.5
"Leaky" dwelling in exposed position	2.0

Heating will normally be tailored to personal comfort in the dwelling, taking cost into consideration. However, in addition, for condensation control, it should match the combined effects of occupancy pattern, building mass and insulation, the period it is intended to heat the building, and any ventilation system, natural or induced. The principles are explained by reference to extreme conditions.

If the heating maintains comfort levels in the whole building at all times, condensation problems will be minimised, but costs will be high. If only one room is heated infrequently, that room could suffer condensation because the structure will remain cold; other rooms will remain cold and moisture migrating to them will cause severe condensation problems. These intermittent heating effects will be exacerbated if the structure has a high thermal mass and if the heating is purely convective. A whole range of conditions exists between these two extremes.

Building Regulations contain requirements for ventilation of specific rooms in domestic buildings, expressed in terms of openable areas, background or trickle vents and the provision of extract fans or passive stack ventilators.

The ideal ventilation system would extract air from the moisture producing areas to outside and replace it with outdoor air flowing in via the other rooms. This would reduce the amount of moisture at source, prevent its spread and ventilate the whole building with outdoor air.

Adequate ventilation for condensation control exceeds the minimum rate of outdoor air change necessary for health and comfort and should normally be between 0.5 and 1.5 air changes per hour for the whole building.

There are a number of ventilation mechanisms that can be employed, including:

- passive devices such as trickle ventilators;
- passive stack ventilators which extract moist air from kitchens and bathrooms via a duct to the roof ridge;
- supply ventilation systems, installed in a loft which supply air to the dwelling space.

Mechanical ventilation systems can provide a reliable energy efficient solution at reasonable operating costs.

The ideal ventilation system is controllable, quiet, responds to occupancy and extracts air from moisture production areas to outside during periods of high moisture generation and replaces it with a controllable amount of outdoor air flowing in via the other rooms. This would regulate the amount of air required to remove moisture at source, prevent its spread and ventilate the whole building with outdoor air in a controlled manner.

Heating and ventilation costs

Condensation control has associated costs that can be minimized by good design. Once a balance of heating, insulation and ventilation requirements has been established, ongoing ventilation running costs can be determined. If these are unacceptable, a different permutation may be successful, but to avoid condensation risks *all* factors have to be reconsidered.

Specification of remedial measures for excess cold

Where the most appropriate enforcement action is to serve a notice to remove category 1 or reduce unacceptable category 2 excess cold hazards, under the Housing Act 2004, a specification for remedial work will need to be drafted. The measures specified will depend on the individual circumstances of a particular case and should relate directly to the deficiencies that have been identified during the HHSRS inspection.

On completion of works, there must not be a category 1 hazard on the premises. You should therefore consider the full range of possible remedial works to address each deficiency to mitigate the hazard.

The statutory guidance says that remedial measures should:

- be sufficient to remove a category 1 hazard, but may extend beyond this
- prevent a recurrence
- prevent building elements deteriorating
- ensure measures can be justified to benefit the health of the occupiers
- be reasonable in relation to the hazard
- be cost effective in terms of the health risk reduction.

Whatever remedial actions are specified, the key outcome should be to ensure that within the dwelling it is possible to ensure that healthy temperatures can be achieved.[16] The HHSRS Enforcement Guidance warns against a 'patch and mend' approach, stating that, *"Any works required to mitigate a hazard should be carried out to a standard that prevents building elements deteriorating. It would be false economy to allow work which only temporarily reduces a category 1 hazard to, say a band D category 2 hazard."*

The works specified must be "reasonable" in relation to the hazard. This will depend on the deficiencies, the cost of works, and the type, size, and age of construction of the dwelling. Remedial works appropriate for a Victorian detached dwelling may not be applicable to or justifiable for a small, more modern flat.

It would be reasonable to aim for category 1 hazards to be mitigated to the level of a HHSRS (band E), category 2 hazard, where the hazard is rescored after the works have been carried out. The practicality of achieving such an aim would depend on the particular type of construction of the premises and the extent of the remedial works.

Key elements of remedial works

The key elements of heating, insulation and ventilation are interrelated and must be assessed on the basis of how they interact with each other, the overall impact and the contribution each of them make to achieving and maintaining a healthy indoor temperature.

The choice of mitigation works will vary, depending on the deficiencies, their severity and the type of property and its occupiers in the particular case.They can be prioritised on the basis of their cost effectiveness in removing the excess cold hazard. They are:

- Provision of a central heating or equivalent whole dwelling heating system and/or provision of additional or larger heating appliances to an existing installation
- Provision of effective insulation to the structure of the building (roofs, lofts and where practicable, walls) having regard had to the type of heating system to be installed or already present
- Draught-proofing to seal disused chimneys and flues

16 See paragraph 2.05 of the Operating Guidance 2006.

(ensuring adequate, but more controlled ventilation)
- Minor repairs to windows/external doors
- Secondary glazing
- Replacement of windows with double glazed units
- The provision of adequate heating controls. In order to be thermostatically controlled and programmable all controls must be readily accessible by the occupant

These will not be appropriate in every case and must be reasonable considering the dwelling age, construction type, size and design. A key outcome is ensuring that healthy indoor temperatures can be achieved.

If the dwelling also has dampness and other hazards related to excess cold a decision will need to be made about whether or not these should form a part of the remedial measures to address excess cold within the context of the level of assessed hazard and the reduction in hazard level that it is sought to achieve.

Wherever possible, alternative options for remedial works should be specified, without being overly restrictive or prohibitive. For example, an option could be full central heating, with the alternative of less costly heating improvements along with upgrading of insulation.

Where a notice specifies works for other related hazards, it may be worth considering inclusion of items that would not normally be specified because they would be too expensive in isolation. For example, if a window requires replacement, the additional cost of double glazing may be minimal.

It is important that the works specified are sufficiently detailed that the recipient of the notice is aware of what is required, but also allow options to achieve the desired outcome. They should relate directly to the identified deficiencies and preventative measures in the Operating Guidance and should take into account the findings of the heat loss assessment (discussed in the Heating section).

Building Regulations

The Operating Guidance says that the Building Regulations *Approved Document L1: Conservation of fuel and power in dwellings* and *Part F: Ventilation* are sources of further information for remedial measures. Compliance with the regulations will be necessary where remedial action is specified on an improvement notice.

It is therefore important to include a statement in the schedule of remedial works that works will need to comply with Building Regulations and any other consent(s) that may be required, such as requirements for listed buildings or consents required in conservation areas. It is also important to allow time for obtaining consents and to factor in likely delays from listed building or conservation area requirements.

Are the works cost effective?

The cost of remedial works compared with relative heath risk reduction is a material consideration in determining a reasonable level of work and can be used to justify the decision to specify it in the schedule. However, you should make the link between specified measures and their role in improving health outcomes and not just on the payback period based on energy efficiency grounds.

When considering the cost benefit of the remedial works, the payback period is a useful concept. It compares the cost of a measure to the time taken to recoup the outlay through annual fuel savings. Payback periods can be used to compare the options for remedial works. Measures with a payback period of less than 5 years are considered low cost energy efficiency improvements and could be considered justifiable priorities for remedial works specified in schedules of works for excess cold. Although the Building Regulations specify a 15 year payback period for thermal elements, this reflects the ‘ideal’ under HHSRS, and may not be justifiable as works needed to remove the hazard.

Payback periods may also allow further opportunities for remedial action to be identified. For example, the installation of insulation to a ground floor solid floor will not normally be appropriate in isolation due to the long payback period, but if dampness remediation is also being considered, exposing the floor structure to deal with the damp might enable insulation to be incorporated within in it, and it will become much more cost effective.

The Energy Savings Trust website contains information about economic payback periods. These relate to good or best practice for energy efficiency rather than for dealing with excess cold hazard but are nevertheless useful sources of further reading.

Funding for remedial works

It is always useful and appropriate to consider whether a landlord can be signposted to any funding to assist in financing works. Working with landlords in this way can prove beneficial, particularly where they may have multiple properties of a similar age and construction. It is also likely to reflect well on the local authority in the event of a First Tier Tribunal hearing.

Simple Energy Advice website is a useful source of information, but funding may also be available for various types of insulation and boiler replacements from local charities and providers. However, funding that has a financial impact on the tenant, such as increased bills or energy supplier tie-in, is not likely to be appropriate.

Heating in Houses in Multiple Occupation

For the average dwelling type and age, the Operating Guidance distinguishes between HMOs and non-HMOs. The term 'HMO' refers to several different types of dwelling in multi-occupation, which it defines as:

a) self-contained;

b) non-self-contained, where not all rooms are behind one entrance door to the dwelling, but where no facilities or rooms are shared;

c) non-self-contained, where some rooms are shared (for example dining or living rooms), but where no facilities are shared; and/or

d) non-self-contained, and where one or more of the following facilities are shared in common with other units within the building, including sanitary and personal washing facilities as well as food storage, preparation and cooking facilities.

In terms of the HHSRS average scores for excess cold, the average HMO is very similar to the average non-HMO. Furthermore, in the majority of HMOs the assessment of the hazard would involve an investigation of the same issues of heating, insulation, ventilation and draughts. However, there are obvious differences in heating requirements between different types of HMOs and the assessment of adequate heating will depend on the type of heating in relation to the type, use and occupation of the property.

Where each bedsit has an existing fixed heating appliance, any deficiencies should be identified and a decision made on whether the provision of a central heating system can be justified. In practice, where no central heating exists in a bedsit-type HMO, it is more likely that a full gas central heating system will need to be specified.

Occupation

HMOs present considerable variety in property types, styles of occupation, as well as vulnerability of occupants. High tenancy turnover is common. In deciding whether the heating is adequate consider whether the lifestyles of the occupiers are varied with respect to the hours they are at home and sleeping.

Principles for heating systems in HMOs

1. The heating system should be working properly and capable of heating all parts of the property and water supply to recommended levels.

2. Tenants should be able to control both heating levels and the time periods when their heating is on. If they cannot directly control the time periods, the heating must be available at all times so that they can control it via temperature controls.

3. Heating to common parts should not be the responsibility of individual tenants and should be both available at all times and capable of heating the common parts to recommended levels.

4. Heating should be controllable by thermostatic controls that can be locally and accurately set in each of the living units.

5. The functionality of any form of remote/smart heating controls supplied to the tenant should not be dependent upon separate payment being made by the tenant and should be the sole responsibility of the landlord.

Central heating

The Operating Guidance states at **Annex D**, paragraph 2.22, *'In multi-occupied buildings, provision for space heating may be centrally controlled. Such systems should be operated to ensure that occupants are not exposed to cold indoor temperatures and should be provided with controls to allow the occupants to regulate temperature within their dwelling.'*

The heating system should provide direct heating to every room, including the common parts and shared bathrooms. The boiler and all system controls should be located in a common part, not in an occupier's room. The controls should be accessible to all occupiers, or, in line with the principles above, temperature controlled using thermostatic radiator valves.

Fixed individual room heaters

There is the potential for high quality fixed room heaters to be adequate, if there is consistent heating throughout the property and adequate insulation, and so specifying them in bedsit HMOs to remedy excess cold should not be dismissed. Room heaters may be more typical for bedsit type accommodation but would be considerably 'worse than average' for other types of HMOs.

In deciding whether fixed heating using gas, on-peak electricity or off-peak electricity is, or would be adequate, consider the following factors for each bedsit:

- The exposure and insulation of the external walls and windows and whether this can be improved.
- The capacity of the fixed heating appliance.
- Whether the heating is controllable and whether it would be able to warm the room up speedily from cold in winter.
- Whether there is adequate heating to the common parts.

Heating controls

Adequate heating controls must be available to all occupiers. This should include the ability to operate the system, regulate the temperature in communal rooms and spaces, determine the times and duration of the heating pattern as well as the temperature and pattern in individual units or rooms.

Each individual area should have TRVs to allow the temperature to be fully regulated to individual need. Where there are room heaters, these should be fully controllable and offer the ability to set the temperature.

Fuel payment arrangements

Bill paying varies greatly between HMO types and is typically imposed by management, rather than being led by suitability for the occupation style.

Where bills are all-inclusive, the landlord should not impose any limitations around continuity, availability or controllability of heating in all seasons.

Shared pre-payment card meters in communally supplied HMOs may be unsuitable because of the difficulty of arranging an effective 'payment rota' between occupiers. In student properties, the cost can be split as per other bills, but where tenants do not know each other and have different backgrounds they may have differing preferences, financial circumstances or heating needs. This can lead to no-one topping up the meter, or pressure on individuals to top it up to allow heating to operate for non-contributors.

The same principles apply to any other forms of indirect payment via landlord, agent or another tenant. Tenants should be readily able to maintain an uninterrupted heating supply in their unit of accommodation. This may not be possible, for example, where a landlord has to empty coin meters by accessing individual accommodation, or where top-ups involve smartphone apps in a property without internet or data access.

The preferred arrangement in shared accommodation, where tenants do not live as a socially cohesive unit, should therefore be that the landlord supplies the heating. Where a credit meter is deemed suitable, this should be communally accessible, and not within an individual let.

Heating of communal areas

In a HMO with circulation spaces outside the front doors of individual dwelling units, including in bedsit-style accommodation, heating for these communal areas should be provided independently and paid for by landlord (as with the lighting in these spaces). Heating in these areas should allow the space to maintain a reasonable temperature.

Energy supply

A landlord can only dictate the energy supplier where they are directly responsible for paying the bill. Where the tenants are paying they are free to choose their own supplier. Tenants commonly struggle to change supplier or top up their meter due to debt on the meter that pre-dates their tenancy. This should not be their responsibility to pay, and they may need directing to local energy advice champions to assist them in resolving complex energy debt tenancy issues that will affect their ability to heat the property.

Where an energy company proposes to install a pre-payment meter to pay off accrued debt at a property, if the HMO type is not suitable for a pre-payment meter, then the supplier should not be pursuing this; there are other arrangements that they can put into place for debt repayment. Under their Ofgem licence conditions energy companies should only offer pre-payment meters as a method of debt repayment where it is safe and reasonably practicable (of particular relevance for those suppliers who have signed up to the ‘Energy UK principles for prepayment meters’.

The table below shows that the running cost of an on-demand electric wall heater is similar to that of a gas wall heater and that an electric night storage heater is likely to be significantly cheaper than both.[17]

Heating appliance Type	Appliance Average Efficiency (%)	Expected Approximate Annual Appliance Running Costs (£)
Natural gas balanced flue wall heater	73	320
Natural gas radiant or convector fire	60	385
Natural gas decorative effect open fire	28	785
Electric off-peak storage heater	90	195
Electric on-peak fire	100	365

17 Derived from Sutherland Tables 2010.

Secondary hazards

Dwelling deficiencies contributing to excess cold can also significantly increase risk posed by other hazards by increasing the likelihood of an incident.

As a single deficiency can contribute to multiple hazards, the practitioner may need to assess and score each hazard to decide which represents the greatest risk and is thus the most appropriate heading to take enforcement action under.

It must not be forgotten that a multiplicity of Category 2 hazards could be considered unacceptable (especially when considering vulnerable tenants) so local enforcement policies must be borne in mind even at the assessment stage.

Some deficiencies may not contribute to a Category 1 excess cold rating, but can still disproportionately impact on other hazards. An unheated bathroom in an otherwise adequately heated dwelling could contribute to a Falls associated with baths hazard. Deficiencies contributing to excess cold often have a significant impact on the following related hazards.

Damp and mould

Wherever a combination of inadequate heating and/or insulation and ventilation occurs, dewpoint can be reached (see Ventilation section) particularly where there is cold-bridging, or lower levels of insulation or heating in conjunction with poor air ventilation or circulation. Water vapour will circulate to all parts of a dwelling, condensing locally, particularly in little used or heated areas.

Damp is strongly associated with mould growth and house dust mites. These have strong causal links with childhood asthma and respiratory problems that persist into adulthood, with serious educational, social and economic impacts upon individuals and families. Studies show that physical and chemical control measures for dust mites are ineffective,[18] so the problem has to be tackled at source.

The Operating Guidance gives low average HHSRS scores because lower proportions of victims' harm outcomes are in Classes 1 and 2, but if excess cold is present the close causal link must be taken into consideration. Where a high excess cold rating exists, there will also be a very high and continuing likelihood of damp and mould being present.

This requires an integrated approach. Remedying excess cold may not solve condensation and mould problems – these can still occur in a warm, humid dwelling, occurring at a higher temperature when the air becomes saturated. Key to this is achieving adequate heat and insulation in conjunction with safe and secure ventilation systems to expel air when it contains the highest amount of water in vapour form.

Falls on level surfaces, falls associated with baths and falls on stairs

Indoor excess cold impacts on older people, reducing muscular strength, balance and grip, increasing the likelihood and spread of harm from falls. This is recognised in the Operating Guidance (Paras. 19.14(h), 20.19(j), 21.30(u) and 21.31(f) which lists inadequate space heating and insulation as relevant matters impacting on likelihood, and possibly severity of harm outcomes from Falling on Stairs. There are considerable risks of falls amongst older people when heating is only

18 Dust-mite control measures of no use, The Lancet, V371, 26 April 2008.

used in one room or after getting up in the morning. The use of portable heating appliances can also increase the risk of trips and falls from trailing leads and from flames and hot surfaces.

Fire

Portable heating appliances used because of excess cold can increase the risk of fire via overloaded electrical sockets and wiring. The Operating Guidance (Paras. 24.31(b) and (c)) refers to inadequate space heating and defects to heating as relevant matters to consider.

A lack of clothes-drying facilities in the absence of fixed heating systems increases the likelihood of clothes being dried on portable appliances, increasing the risk of fire (and perhaps Carbon Monoxide production, if the appliances use gas).

Excess heat

Properties constructed of lightweight materials (including traditional designs, such as slate or tile-hung stud-walling) often lack thermal mass, and are prone to rapid heat loss and gain. Excess cold itself would not be a secondary hazard that exacerbated excess heat but both hazards may reflect the same constructional and design deficiencies. When considering inadequate insulation and poor ventilation control combined with low thermal mass, you should bear in mind that these may also represent a serious health hazard in hot weather to the same vulnerable group.

Carbon monoxide

Landlords and tenants of properties with inadequate fixed heating or insulation may block permanent ventilation (e.g. air bricks) to reduce draughts. This can result in inadequate combustion air being available for any non-room-sealed combustion heating appliance such as wall-hung gas fires or portable LPG heaters, increasing the chances of carbon monoxide production and poisoning.

Electrical hazards

Landlords of properties with poor insulation, inadequate fixed heating or excessive ventilation may supplement the heating, often with portable electric heaters. These can involve potentially dangerous trailing lead and adaptor combinations, particularly so in the absence of Residual Current Device (RCD) protection.

Appraisal of enforcement options

Once an excess cold hazard has been identified through an assessment, a decision will need to be made on what, if any, enforcement action would be appropriate, having regard to the statutory duty that exists for a category 1 hazard and the power available to take enforcement action for a category 2 hazard.

You should also consider the impact and presence of secondary hazards and decide whether in certain circumstances, a secondary hazard may score higher, or formal enforcement action would be more justified on the basis of a that hazard rather than excess cold. However, you will need to consider whether the resolution of the secondary hazard will achieve the same improvements needed to tackle the excess hold hazard.

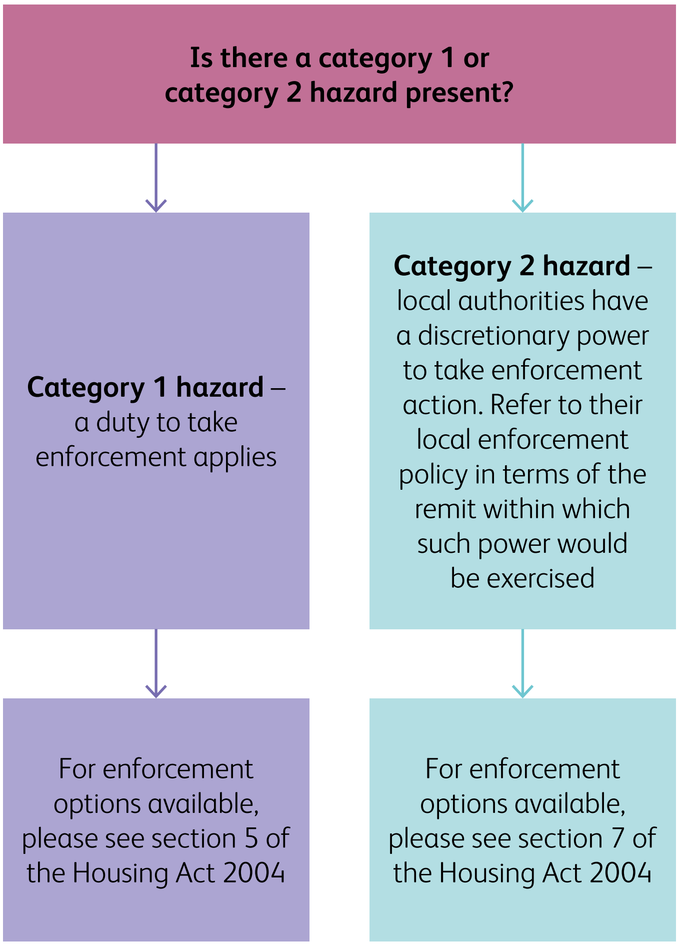
A list of actions to be considered to tackle a category 1 hazard are listed in Section 5 of the Housing Act 2004.

Authorities have similar enforcement options for category 2 hazards although the most likely options that would be considered would be to serve an Improvement Notice or a Hazard Awareness Notice with, perhaps, a smaller probability of choosing to make a Prohibition Order.

Whichever enforcement option is chosen, authorities are required to justify that decision through the "statement of reasons" that must be issued under section 8 of the Housing Act 2004. In determining the most appropriate enforcement action to take, regard should be given to the following.

- It is important to recognise that enforcement must be based solely upon health risk and not improving energy performance.[19]
- Is the dwelling occupied by a member of the hazard vulnerable group or is it reasonably likely to be?
- If not occupied by a member of the vulnerable group can you robustly demonstrate a significant risk of harm to health to those in occupation or those likely to be in occupation into the future?
- What remedial action is to be specified? Is it proportionate to the risk and circumstances of the current occupation and likely future occupation? Is the cost of remedial work proportionate to the risk identified and reasonable in relation to the benefit likely to result?

The flowchart provided below is a suggested way of approaching the decision to be made in determining the most appropriate enforcement action.



19 Unless you are enforcing the Minimum Energy Efficiency Standard in the private rented sector.

Having regard to occupation by persons not in the vulnerable group and how to take occupants into account

The current occupier of a dwelling should never be considered when carrying out an HHSRS assessment for Excess Cold, the assessment is always to be made on the basis of the assumed occupation by a person aged 65 years or over.

However, the Enforcement Guidance recommends that the current occupant is taken into account when making an enforcement decision. This does not mean that action should always be based on the vulnerability of the current occupant. Action can be taken whether or not a person most at risk is living or is a regular visitor to the dwelling. Considering the turnover of tenancies and the wide range of occupants who might potentially occupy the premises in the future may mean that enforcement action is justified.[20]

The Operating Guidance makes it clear that although there are some excess winter deaths in all age groups it becomes significant in the 45+ age group with the risk increasing roughly linearly up to age 85+, after which there is a marked increase in risk. Whilst there is a well-defined vulnerable group, **Annex D** provides further evidence of the impact of cold homes on different groups including those with chronic or severe illnesses. Children are also susceptible to the effects of excess cold[21] and are likely to spend longer periods of time in the home. It is relevant and appropriate for account to be taken of this as part of the determination of the most appropriate enforcement action.

The following approach can be used to take occupants into account:

- Is occupation by a member of the vulnerable age group likely in the short or medium term?
- Is there any significant risk of serious harm even if occupiers are not of the vulnerable group?
- Does common sense suggest that it is likely that someone is going to be significantly harmed,[22] regardless of their age?

Who occupies the private rented sector?

The English Housing Survey[23] identified that the mean average age of a private-renter was 40 years old compared with 52 years for the social rented sector and 57 years for owner occupiers. Figure 1.1 from that survey and reproduced below identifies that less than 10% of private renters are aged 65+ years old compared with slightly above that in 1996/97. Figure 2 from that report is also reproduced and provides a breakdown of household types in the private rented sector.

The report states that between 1996/97 and 2016/17 the proportion of families with dependent children in the private rented sector increased, from 15% to 24% for couples with children and from 8% to 13% for lone parents with dependent children. The English Housing Survey Headline Report, 2016/17 identified that the number of households with dependent children living in the private rented sector increased by around 966,000 households between 2006/07 and 2016/17.

In their report,[24] David Rhodes and Julie Rugg report that the growth in households with dependent children in

20 Paragraph 4.9, HHSRS Enforcement Guidance 2006.

21 Section 2.11 HHSRS Operating Guidance 2006.

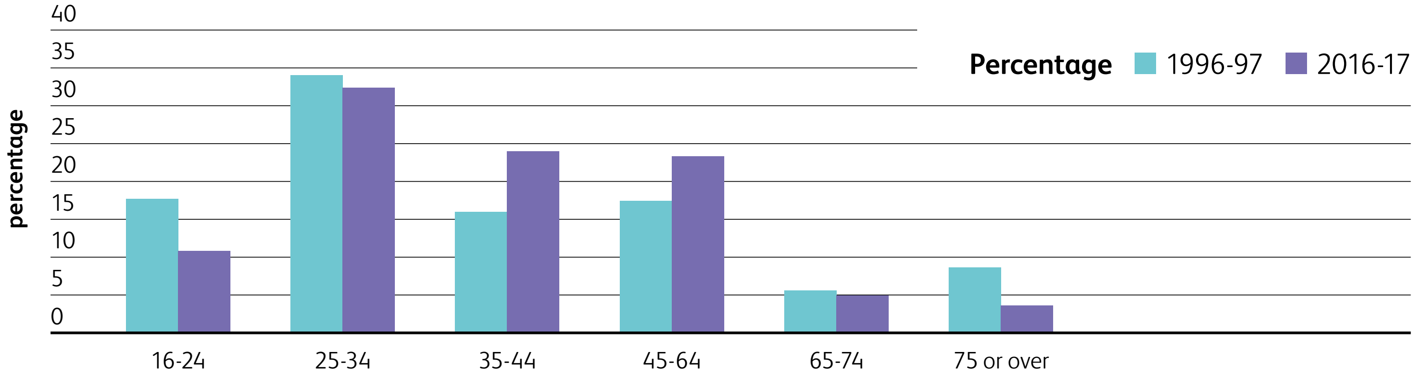
22 Class 1 or 2 harms according to the HHSRS.

23 Private rented sector report, 2016-17, ONS.

24 *Vulnerability amongst Low-Income Households in the Private Rented Sector in England,* University of York, 2018.

the private rented sector has primarily been in younger families, with the proportion of households containing a child aged under five increasing from 12% in 2000/01 to 20% in 2015/16.

Fig 2.1 **Proportion and number of private rented sector households, by age of HRP, 1996-97 and 2016-17**



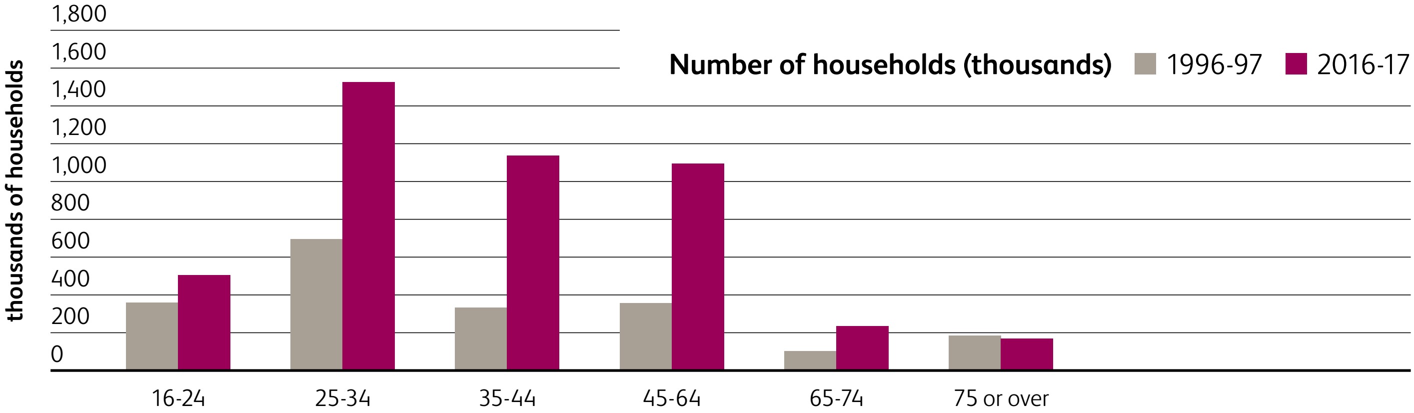
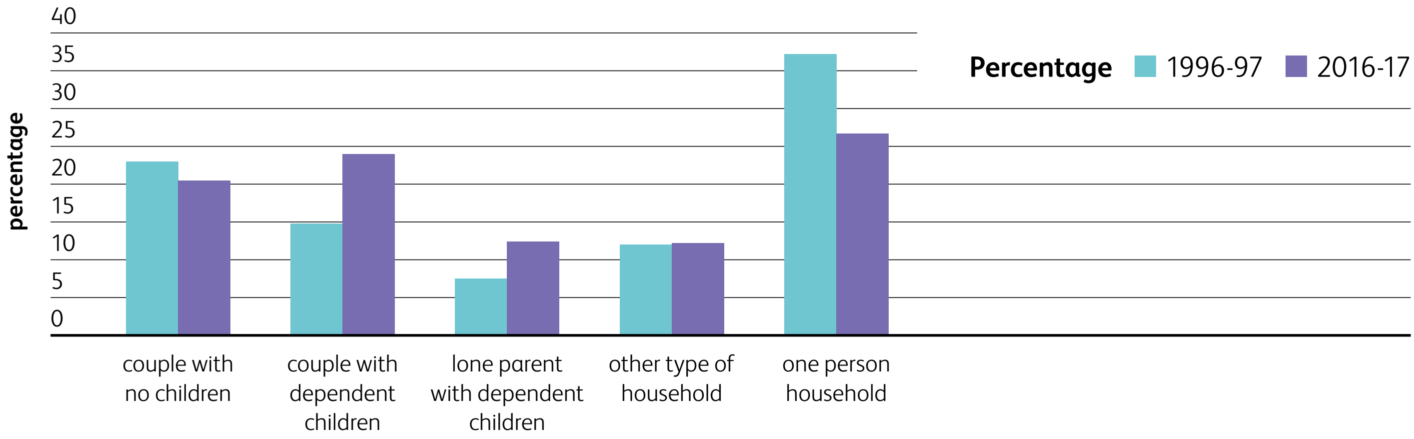
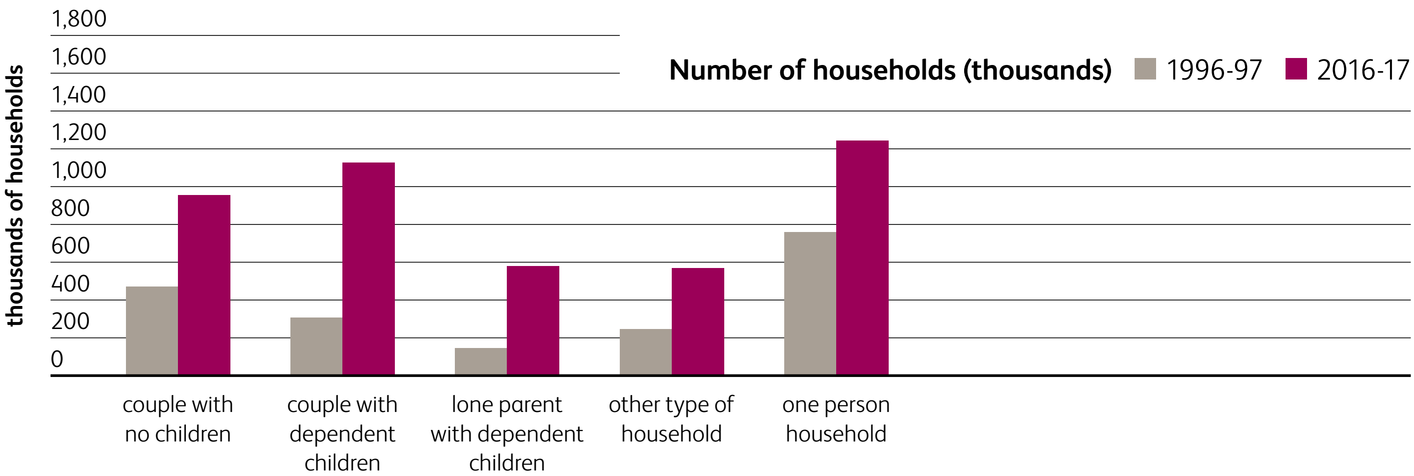


Fig 2.2 **Proportion and number of private rented sector households, by household type, 1996-97 and 2016-17**





In terms of household type, the survey identifies that the most prevalent type is single person households followed by couples with dependent children and then couples with no children.

In a more recent study[25] it was identified that the proportion of households in the private rented sector in England with a household reference person (HRP) aged 65 and over decreased between 2000/1 and 2015/16 from 14% to 8%.

The English Housing Survey 2017/18 identified that the percentage of private renters with a household reference person between the ages of 55 and 64 was 9.3% with only 5.6% of private renters having such a person aged 65 years or over.

In light of the above findings, you must be mindful of the overall relatively small chance of a privately-rented dwelling being occupied by someone of the vulnerable group for the excess cold hazard and take account of that in the decision-making for the most appropriate enforcement action. This does not mean that enforcement action requiring an improvement in dwelling conditions should not be taken but a clear justification on health grounds is also likely to be

25 *The Evolving Private Rented Sector: Its Contribution and Potential;* Julie Rugg and David Rhodes; University of York Centre for Housing Policy; 2018

necessary. Further information on health impacts of cold homes can be found in **Annex D**.

In terms of a general approach to actual and potential occupants in deciding the most appropriate enforcement action the Upper Tribunal (Lands Chamber) has stated the following:

"As for determining the appropriate course of action to take in respect of the hazard, the views of the occupiers are manifestly material, in my judgement… The evidence was that the maisonette was by its nature likely to be occupied by a working couple and that the system of convector heaters, so far from creating a hazard for them, was effective and convenient. The needs and preferences of the actual occupiers, as well as those of the vulnerable group considered for the purpose of this judgement, are in my judgement material to the choice of enforcement action to be taken."[26]

Social Exclusion and Discrimination

The HHSRS enforcement guidance identifies a concern that taking enforcement action based on actual occupation could lead to social exclusion or discrimination by owners not renting to members of a vulnerable group. You need to remain mindful of this, but there is little if any evidence to date to suggest that this has been an issue.

Use of other enforcement tools

Some deficiencies contributing to an excess cold hazard could in theory also be addressed using other provisions of the Housing Act 2004 or other legislation. Examples include the following:

- Breach of a licence condition under mandatory HMO licensing, additional licensing or selective licensing
- Breach of management duties under The Management of Houses in Multiple Occupation (England) Regulations 2006

It will seldom be most appropriate to address an excess cold hazard, using the legislation listed above in isolation. In the above examples the legal recourse is that of prosecution of offences or alternatively issuing financial penalties under section 249A of the Act, neither of which actually require remedial action to be taken. However, it could be entirely appropriate for enforcement action to be taken in relation to an excess cold hazard in addition to enforcement action under a different part of the Housing Act 2004 for an offence.

If a category 1 hazard is identified, then there is an explicit legal duty to take the most appropriate enforcement action from those specified in section 5 of the Housing Act 2004 as well as the general obligation to use the most appropriate legislation, such that following an alternative route of action is not an option.

Energy performance and fuel poverty

Although the energy performance of a dwelling could be improved and fuel poverty of the occupier reduced by reducing an excess cold hazard, the focus of the enforcement action must be on reducing the risk of ill health. Failure to base enforcement action on this and straying into improving energy performance or fuel poverty could result in a successful appeal against such action. In this regard, the HHSRS enforcement guidance is clear where it states the following:

"Authorities should bear in mind that any action taken under the HHSRS must be in relation to a hazard. It will not be in relation, directly, to alleviating fuel

26 Bristol City Council V Alford Two LLP (2011) UKUT 130 (LC), case number: HA/5/2010

poverty or imposing energy efficiency, though this may be the outcome."

Minimum Energy Efficiency Standards (MEES) for the private rented sector

Energy efficiency and excess cold powers are separate, therefore, it is still possible to take enforcement action in relation to an excess cold hazard, even if the property has reached the minimum energy efficiency standard or has a valid exemption. Each case will need to be assessed carefully. However, it is highly likely that properties that are in EPC Bands F or G will have a category 1 hazard for excess cold present, and an EPC can therefore be useful in supporting remedial works that would improve the property. Government guidance to landlords provides further detail on how minimum energy efficiency standards should be enforced.[27]

All landlords should provide a valid EPC to tenants at the beginning of their tenancy. A landlord will not be able to evict tenants using a Section 21 notice if this has not been provided. EPCs that seem to be inaccurate can be reported to the authorised accreditation scheme of the Domestic Energy Assessor (DEA) who completed the EPC, such as Elmhurst, Quidos, Stroma and others. Local authorities may, alternatively, want to consider the benefits that can be gained from having their own in-house DEA who could provide guidance on incorrect EPCs and challenge them effectively to ensure relevant properties are bought under the scrutiny and enforcement powers of MEES.

Further checks by the enforcing team, or referral to Trading Standards for enforcement action for a breach of the Energy Efficiency (Private Rented Property) (England and Wales) Regulations 2015 should be considered by local authorities in the following scenarios:

- Where the tenancy began after 1st April 2018, any properties in Bands F or G being let or advertised that are not registered for an exemption on the Government register,
- From April 2020, any existing rented properties in EPC Bands F or G without a valid exemption.

27 The domestic private rented property minimum standard: guidance for landlords and local authorities, BEIS, March 2019.

Annex A: Affordability and practical lessons from Liverpool City Council vs Kassim

This section aims to address the extent to which the comparative running costs of heating systems, or 'affordability', can be taken into account when taking enforcement action under Part 1 of the Housing Act 2004, with reference to the Liverpool City Council vs Kassim case "the Liverpool Case".

The Liverpool Case – a recap

March 2011 – First appearance at the Residential Property Tribunal (RPT) MAN/00BY/HPO/2010/004

- An appeal made by landlord Anwar Kassim is heard at the RPT. The appeal concerned a prohibition order made by Liverpool City Council on Flat 1, 31 Botanic Road, Picton, Liverpool, L7 5PY.
- The prohibition order prohibited the occupation of the flat by any person other than Anwar Kassim.
- At the time the prohibition order was made, there was no form of heating to the ground floor, a pre-1920 mid terraced flat. The windows were rotten timber framed single glazed.
- By the date of the hearing, the flat was fully double glazed. The heating provision comprised of panel convector heaters and electric towel rail in the bathroom. All heaters were switched on at the tribunal members' visit and the flat was notably warm.
- The tribunal quashed the prohibition order on the basis that heating by electric is a 100% efficient and that the system in place was clearly capable of heating the space, as witnessed by the tribunal members.
- The tribunal did not accept the Council's argument that efficiency also encompassed the running cost of the heating system i.e. the energy/heat generated per penny spent. The tribunal did not accept that a system producing 12500kWh a year for £748 was more efficient than one costing £1826.

May 2012 – Upper Tribunal gives its decision on the case[28]

- Following an appeal by the Council, the Upper Tribunal (UT) finds that the comparative running costs of heating is capable of being relevant, as persons in the vulnerable age group are less well off than the general population.
- The UT remits the case back to the RPT for reconsideration, specifying three key questions that must be considered.

March 2013 – Second appearance at the RPT[29]

- The RPT does not permit the Council to admit any new evidence, which would have responded to the three key questions specified by the Upper Tribunal.
- Prohibition Order remained quashed upon there being no finding of fact.

In May 2014 an Improvement Notice was served

- It was identified that the flat was let to a couple expecting a child.
- Improvement Notice was served requiring the installation of either gas central heating or modern fan assisted storage heating with a dry lining system.

28 Liverpool City Council vs Anwar Hadi Kassim [2012] UKUT 169 (LC), HA/3/2011

29 MAN/00BY/HPO/2010/004 (the same reference number as original decision was used)

June 2015 – third RPT/First-tier Tribunal hearing[30]

- The tribunal hears the evidence that was not previously allowed at the 2013 hearing, plus additional evidence including reports generated by the Building Research Establishment's Excess Cold Calculator (BRE ECC).
- The tribunal finds in the Council's favour and confirms the improvement notice.

The Liverpool Case – the details

As mentioned above, the UT decided that the comparative running costs of heating systems was capable of being relevant, as persons in the vulnerable age group are generally less well off than the general population. It is important to remember that UT decisions set a precedent. Consequently, other authorities may be required to have regard to these questions and provide the necessary evidence in cases where the type of heating and its comparative running cost is in issue.

The three questions

Question 1 - Whether the generality of the occupiers in the vulnerable age group would be likely to use the panel system less than a night time storage system (or other system) in cold weather.

Question 2 - If the answer to the first question is yes, the second question is whether it is probable that as a result there would be such a risk to the occupier's health that a Category 1 hazard would remain.

Question 3 - The third question is in respect of appropriate enforcement action. It would be material to consider the likely occupiers of the premises, including their probable means if this was thought to be a factor.

The evidence

In preparing evidence that is appropriate and relevant to any case, it is important to have the points you are seeking to prove at the forefront of your mind.

It must also be remembered that statistical data and research papers are continually updated. Some of the data and figures discussed in this section date back to 2013 and may therefore not be representative of today's landscape. It is therefore important that you obtain the latest available data in order to ensure that your evidence is current. Use data from reputable sources that are properly referenced. Avoid using anecdotal evidence or assume any prior knowledge of the tribunal members. Officers should bear in mind the note on page 7 of the HHSRS Operating Guidance which states:

"Research on the relationship between housing and health is a continuing process, and it is the responsibility of professionals using the HHSRS to keep up-to-date on current evidence."

Question 1

The UT had already stated that persons in the vulnerable age group are generally less well off than the general population. The fact that they are less well-off could lead to a situation where they could not afford to run a heating system and therefore suffer the effects of excess cold.

The first thing to establish was how less well-off are persons aged 65 years and over were, in comparison to the general population. In 2013, the average household income for the vulnerable age group in the UK is £17,700 (a couple), with the lowest 20 percentile receiving as little as £11,492 a year. 45% of single persons aged over 65 in

30 MAN/00BY/HIN/2014/0011

the UK have an income below £10,000. As such, persons in the vulnerable age group were (on average), in income poverty. A household is defined as being in income poverty if their household income is below 60% of the median household income. 60% of £36,400 is £21,480.

Having established the average income of a person in the vulnerable age group and confirming that they are significantly less well off than the general population, it is necessary to convey what this means in terms of being able to afford running a heating system to a healthy indoor temperature.

At the time, reference was made to two reports that were published in 2008 and 2011.[31],[32] These reports investigated the relationship between income poverty, fuel poverty, heating need and actual heating use. Each of these reports concluded that heating usage of persons in income poverty (whether a person in the vulnerable age group for HHSRS purposes or not), was below their need and not able to achieve and maintain a healthy indoor temperature.

If heating usage is below heating need and a healthy indoor temperature is not achieved or maintained, a person in the vulnerable age group will endure suboptimal temperatures and suffer the effects of the excess cold hazard.

The next step is to establish the comparative running cost of heating systems. The Sutherland Tables will provide indicative running cost for the average property on a regional basis. Heat loss assessment (see **Annex E**) tools, such as the BRE ECC, will provide property specific comparisons.

From both reports, it was established that heating with on peak panel convector heaters was over twice as expensive as a storage heating system and three times expensive as a gas central heating system.

At the conclusion of the above steps, it was the Council's contention to the tribunal that occupiers in the vulnerable age group would be likely use the panel system less than the other systems in cold weather, due to their low income and this type of heating being prohibitively expensive. A healthy indoor temperature would therefore not be achieved and maintained.

Question 2

The next step was to establish whether it was probable that as a result of the answer to question 1, there would be such a risk to the occupier's health that a Category 1 hazard would remain. Again, reference was made to the two aforementioned reports to illustrate the extent of the under usage of heating.

A full HHSRS assessment was provided to the tribunal, confirming the presence of a Category 1 hazard, which followed the template used in the Worked Examples. The following documents were provided in support of the assessment:

- Copies of HHSRS Worked Examples that made reference to running cost and/or which identified a Category 1 hazard where panel heaters were in place.
- The Upper Tribunal case of *Bristol City Council v Aldford Two LLP [2011] UKUT 130 (LC), HA/5/2010* (the "Bristol Case"), where it was found that a Category 1 hazard for excess cold did in fact exist on the premises, mainly by virtue of the existence of electric panel convector heaters as opposed to other more economical heating systems.
- RPT decisions where a Category 1 hazard had been identified where panel heaters had been installed and where improvement notices had subsequently

31 "COLD AND POOR: An analysis of the link between fuel poverty and low income" published by the New Policy Institute to the Eaga partnership charitable trust

32 "Understanding fuel expenditure: Fuel poverty and spending on fuel" published by the Centre of Sustainable Energy.

- been confirmed, requiring the installation of either a gas central heating systems or modern fan assisted storage radiators (albeit that these decisions are not legally binding decisions).
- Box 9, page 27 of HHSRS Operating Guidance in regards to Thermal Efficiency.
- The findings of the Housing Stock Condition Survey 1996, which was the basis of the average property for the HHSRS Operating Guidance. For excess cold, the average property is a Category 1 hazard. So, if a property has the same or inferior heating system, insulation and/or energy efficiency as a 1996 property; it has to follow that there is a Category 1 hazard for Excess Cold.

In order to underline that there would be "such a risk to occupier's health", the serious health effects of heating under usage and income poverty experienced by the vulnerable age group was outlined to the tribunal:

- The Council highlighted the health effects outlined on page 60 of the Operating Guidance under the hazard profile for excess cold.
- The Health Impacts of Cold Homes and Fuel Poverty report by Sir Michael Marmot
- Excess Winter Death data for Liverpool obtained from the Office of National Statistics and The Liverpool Excess Winter Mortality Report 2012.
- The North West Public Health Observatory analysis and forecasting of winter emergency admissions from cold temperatures. This report also referenced the relationship between those admitted in previous years, their cold homes and fuel poverty.
- Data on Picton Ward showed that *"Male health is particularly poor in the ward. Picton's rate for male mortalities from strokes is six times the national average, male coronary heart disease is three times the England rate, while male mortality from circulatory diseases are two and a half times the national rate. Amongst females, mortality rates for bronchitis, emphysema and other COPD and lung cancer are particularly high."*

Equivalent and up to date local data should be available in all local authorities. As local authorities are now responsible for public health, in the development and prioritisation of local public health policies, much of the health etc data of the local population is likely to be gathered 'in house'. Officers should contact their colleagues in public health for this information, or their surveillance/data team.

Question 3

Having satisfied question 1 and question 2 and confirmed the existence of a Category 1 hazard, it is then necessary to consider the appropriate course of enforcement action. In this regard, the UT had directed the Council at question 3 to consider the likely occupier and also their probable means, if that was thought to be a relevant factor.

Question 3 was broken down into two parts, part a) likely occupier and part b) their probable means.

Part a) Likely occupier

During the course of tribunal proceedings, the occupancy and intended occupancy of the flat according to the landlord, changed. At some stages, the flat was student accommodation and the rent was inclusive of the heating cost, albeit the meter was a prepayment meter. For some of the time, it was for the landlord's own use. However, in 2014, the Council found that it was occupied by a young couple who were expecting a baby. The father went to work and the mother was at home.

It was necessary to discredit the landlord's assertions and to provide to the tribunal impartial data. To do this, the Council referred to data obtained from the Office of National Statistics that was based on the 2011 census.

It was identified that of the 7,563 households living in Picton:

- 43% were single person households.
- Of those single person households, 26.7% were aged over 65.
- 25.7% of households in Picton are two person

households and 8% of those are couples aged over 65.
- The remaining 31.3% have three persons or more in their households.
- 22.86% of persons living in Picton were full time students, which is 6.82% of the student population of Liverpool.
- With regards to age distribution, 74% were of working age (aged 16-64), 16.2% were children (aged 0-15) and 9.4% were aged 65 and over.

Having regard to the above statistics and given that the property was a one bedroom flat, the Council asserted that it was more likely than not that the flat would be occupied by a single person or a couple of working age.

The Council utilised section 237 of the Housing Act 2004 to obtain the number of student council tax exemption certificates to the road. The number was very low, which gave weight to the Council's argument that this is not a 'student road'.

The Council also made the point that even if occupied by students, they are also "less well off than the general population" and if rent is inclusive of heating bills, the cost is likely to be met by the tenant in an increased rent.

With regards to the flat being used by the landlord or his family members, the Council referred the tribunal to decision number LON/OOAF/HPO/2014/0001. That decision concerned a property owner and his nephew who stated that they accepted the risks associated with a flat and as it was not to be let out commercially, the prohibition order should be suspended. The tribunal found in favour of the Council and the prohibition order stood, reinforcing the fact that the HHSRS is tenure neutral.

Part b) Probable means

To illustrate the probable means of the likely occupier, the tribunal was directed to data obtained from national and local indices of multiple deprivation. The data revealed that:

- The flat is located in a Lower Super Output Area (LSOA) that was categorised as the most deprived 1% of neighbourhoods nationally.
- The average gross household income in the LSOA is between £17,200 and £21,000. This is lower than the Liverpool average and significantly lower than the National average which was £36,400 at the time.
- Worklessness in the LSOA is greater than four times the National average.
- % rate of out of work benefit is nearly twice that of the National average.
- The number of children living poverty in the LSOA is three times the National average.

In combining the findings for part a) and part b), the Council concluded that the likely occupier of the flat would be a single person or a couple of working age that were out of work and claiming benefits. If working, their income would be such that they would be living in income poverty.

So, what does this mean in terms of choosing the most appropriate enforcement action? The Council asserted that the probable means of the likely occupier corresponded to the means of a person in the vulnerable age group. Both persons live in income poverty, both would under use their heating and therefore both would experience suboptimal temperatures.

The only difference is that persons of working age are less vulnerable to the effects of suboptimal temperatures than persons in the vulnerable age group. The Council argued that even if the likely occupiers are persons of working age, it does not mean that they do not suffer any ill effects. The Operating Guidance identifies the *most* vulnerable age group, not the *only* vulnerable age group. In this regard, the Council referred again to the Marmot Review and other local statistics that showed that the health of persons under the age of 65 is indeed impacted by the effects of suboptimal temperatures.

The Council also drew the attention of the tribunal to paragraph 1.12 on page 8 of the Operating Guidance. *"The underlying principle of the HHSRS is that… any residential premises should provide a safe and healthy environment for any potential occupier or visitor."*

Apart from the means of the likely occupier corresponding to the vulnerable age group, the Council also argued that their heating need/pattern would also correspond. As the likely occupier would be a single person or couple out of work, they would likely be at home all day most days, as in the case of a person in the vulnerable age group.

To establish what the heating usage is for a person in the vulnerable age group, the Council referred to the Building Research Establishment's Domestic Energy Model (BREDEM). BREDEM classifies 'all day heating' as being from 7am to 11pm. A person out of work/ pensionable age requires 'all day heating' seven days a week. Accordingly, it was this heating usage that was inputted into the BRE's Excess Cold Calculator by the Council in order to provide as accurate a representation of the running cost at the property.

This is far superior to relying on EPCs and the Sutherland Tables. This is because EPCs and the Sutherland Tables make assumptions on the wider population and average usage patterns for working persons.

Drawing all of the above together, the Council successfully argued that an Improvement Notice was the correct enforcement action and that the remedial work necessary was either installation of a gas central heating system or the installation of modern fan assisted storage heaters, together with a dry lining system.

Implications of the Liverpool Case

There is a wide variation of demographics - occupancy age, employment status, ill health, life expectancy, household income – within a local housing authority's boundary, let alone between local authorities nationally. You should therefore take these characteristics into account when choosing the most appropriate enforcement action.

You should also bear in mind the findings of the Bristol Case.[33] That property had panel convector heaters and it was confirmed that there was a Category 1 hazard for excess cold. The property was a maisonette accessible via steps meaning that it would unlikely to be marketed or let by a person in the vulnerable age group. Indeed, the maisonette was occupied by a couple of working age that were in work and who were satisfied with the heating provision. In that instance a hazard awareness notice was deemed the most appropriate course of enforcement action.

Further points to remember

1. The Council did not make any reference to 'fuel poverty' in any of its arguments to the tribunal and did not include the fuel poverty data from BRE ECC.
2. This was purposeful on the basis of Paragraph 2.12 on page 8 of the HHSRS Enforcement Guidance, which states: *"Authorities should bear in mind that any action taken under the HHSRS must …* ***not be in relation, directly, to alleviating fuel poverty or improving energy efficiency,*** *though this may be the outcome".*
3. It is also worth remembering that HHSRS assessment and enforcement action should not be tailored to an individual occupier's circumstances. The HHSRS concerns averages in the general population and this is why comparative heating costs in relation to the generality of a likely occupier is considered. As the precedent of the UT advised during the hearing, 'affordability' is a subjective term dependent on an individual's circumstances. Even if the most economical heating is installed, an individual may still find unaffordable given their circumstances.

33 Bristol City Council v Aldford Two LLP [2011] UKUT 130 (LC), HA/5/2010

Annex B: Glossary

Cavity wall construction – A wall constructed from two skins of masonry, the outer skin of which can be brickwork or blockwork and the inner skin of which is generally of blockwork, separated by a cavity to prevent the penetration of moisture.

Cavity wall insulation – Insulation that can be added to the gap between the internal block wall and an external brick wall.

Cold or thermal bridging – A thermal bridge describes a situation in a building where there is a direct connection between the inside and outside through one or more elements that are more thermally conductive than the rest of the building envelope. The result is a cold spot where condensation, mould growth and/or staining can occur.

Domestic Energy Assessor (DEA) – Someone qualified to carry out RdSAP assessments and produce EPCs.

Dew point – The 'dew point' temperature, or the 'saturation temperature' is the maximum amount of water vapour that air can hold at a particular temperature. If air cools, it is able to hold less water vapour and water begins to condense.

Draught proofing – Draught proofing, also known as draught exclusion, is a technique for controlling draughts. It can be an inexpensive and effective way of improving thermal comfort and energy efficiency.

EPC – Energy performance certificates are a rating scheme to summarise the energy efficiency of buildings. The building is given a rating between A (Very efficient) and G (Inefficient). An EPC will also include tips for the most cost effective ways to improve the energy rating.

EPR – Energy Performance Report. This is the same rating scheme as an EPC, and will give identical results, but it is not formally registered and not publicly available.

ErP – The Energy-related Products Directive requires certain products like water heaters and storage tanks to be supplied with an energy efficiency label. It is an energy efficiency rating system introduced by the European Union (EU) in September 2015. ErP replaced the UK's SEDBUK (Seasonal Efficiency of Domestic Boilers UK) rating system.

Excess winter deaths – This is a measure of the number of deaths in the four winter months (December to March) minus the average number of deaths during the preceding four months (August to December) and the subsequent four months (April to July).

Fuel poverty – Fuel poverty in England is measured using the Low Income High Costs indicator. Under this indicator, a household is considered to be fuel poor if they have required fuel costs that are above average (the national median level) and, were they to spend that amount, they would be left with a residual income below the official poverty line. Previously a household was deemed to be in fuel poverty if it needed to spend more than 10% of household income on fuel.

Interstitial condensation – Interstitial condensation occurs when moist air penetrates inside the space within an enclosed wall, roof or floor cavity structure. When that moisture laden air reaches a layer inside the interstitial structure that is at dew point temperature, it will condense to form water.

Lambda (λ) value – See p.8 in the Insulation section.

Listed building – Listing marks and celebrates a building's special architectural and historic interest, and also brings it under the consideration of the planning system. A listed building may not be demolished, extended, or altered without special permission from the local planning authority.

MEES – Minimum Energy Efficiency Standards – a reference to the EPC bnading requirements bought in by the Energy Efficiency (Private Rented Property) (England and Wales) Regulations 2015, as amended.

Non-traditional construction – This term historically generally referred to properties built with concrete or steel frames with small or large panel walls. More recently this has also come to include modern methods of construction that include timber and composite panels or even complete "pods" prefabricated off-site.

Off peak storage heaters – This is an electrical heater which stores thermal energy during the evening, or at night when base load electricity is available at lower cost and releases the heat during the day as required.

Polystyrene Insulation – This is a kind of foam insulation that is very rigid and often comes in boards rather than rolls. As an insulator, it can usually withstand extremes in temperature and is also a noise reducer.

R-values – See p.8 in the Insulation section.

Quilted mineral insulation – This is insulation made from glass or rock, which is woven into thin strands.

RdSAP – Reduced Data Standard Assessment Procedure (RdSAP) has been developed by government for use in existing dwellings based on a site survey of the property, when the complete data set for a SAP calculation is not available. This is used in all Energy Performance Certificates since 2005.

Renewable Heat Incentive (RHI) is a government inome scheme tied to certain renewable heating technologies to encourage uptake. It provides financial support to owners of these systems, and is targeted at off gas properties.

SAP – The Standard Assessment Procedure (SAP) is the methodology used by the Government to assess and compare the energy and environmental performance of dwellings. Its purpose is to provide accurate and reliable assessments of dwelling energy performances that are needed to underpin energy and environmental policy initiatives. SAP was developed by the Building Research Establishment (BRE) for the former Department of the Environment in 1992, as a tool to help deliver its energy efficiency policies. The SAP methodology is based on the BRE Domestic Energy Model (BREDEM), which provides a framework for calculating the energy consumption of dwellings.

Sheep wool insulation – Insulation made from sheep's wool. This comes in a roll, similar to quilted mineral wool.

Solar gain – Solar gain is short wave radiation from the sun that heats a building, either directly through an opening such as a window, or indirectly through the fabric of the building. Solar design (or passive solar design) is an aspect of passive building design that focusses on maximising the use of heat energy from solar radiation.

Solid wall construction – A wall constructed of one skin of masonry which can consist of brick or blockwork.

Solid wall insulation – This is added to walls where there is no gap or cavity and is often in the form of insulation panels, which are attached to either the inside or outside of a wall.

Sutherland Tables – This is a paid for service providing comparative domestic heating costs. http://www.sutherlandtables.co.uk/

Thermal resistance – The thermal resistance of a material is a measure of how resistant it is to the transfer of heat across it. The thermal resistance of a material is measured by its R-value. The higher the R-value of a material, the more effective it is as an insulator.

Thermostatic Radiator Valves – Known as TRVs, a thermostatic radiator valve is a self-regulating valve, which works by sensing the room temperature, adjusting accordingly and shutting off the when the desired temperature is reached. TRVs allow more control over the temperature in each room.

U-value – See p.8 in the Insulation section.

Vernacular construction – a house built with what was available in terms of local materials and manpower. Such buildings are usually simple, practical and often quite old.

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Annex C: Toolkits, useful resources and tribunal decisions

Decisions from First Tier Tribunals and Residential Property Tribunals

Decisions from FTTs and RPTs are not case law and therefore do not set a precedent. However, these may still be useful in informing your work on a particular case. A resource of all recent Tribunal decisions can be found at:

https://www.gov.uk/residential-property-tribunal-decisions

This guidance has focussed on key decisions from Upper Tribunal, which are case law. All Upper Tribunal decisions can be found on the database below. Option of 'housing' and 'enforcement action' should be selected.

http://landschamber.decisions.tribunals.gov.uk

Toolkits and useful resources:

Product Characteristics Database – Part of the Building Energy Assessment support website run by Building Research Establishment. The database is a resource to check the efficiency of different boilers, heating and ventilation appliances.

Identifying basic constructions – BRE publication v8.0 covering traditional, non-traditional and modern methods of construction. Short guide includes illustrations.

Non-traditional houses: identifying non-traditional houses in the UK 1918-75 – Digital publication sample from BRE. A full copy can be purchased.

Using the Housing Health and Safety Rating System to tackle fuel poverty – a toolkit for local authorities, National Energy Action, 2011.

Annex D: Further evidence on health and cold homes

WHO Housing and Health Guidelines, World Health Organisation, 2018.

Health risks of cold homes: data sources, Public Health England, 2019.

Local action on health inequalities: fuel poverty and cold home-related health problems, UCL and PHE, 2014.

Preventing excess winter deaths and illness associated with cold homes – Quality Standard, NICE 2016.

Excess winter deaths and illness and the health risks associated with cold homes, NICE guidance, 2015.

Housing and public health: reviews of interventions for improving health – evidence briefing, NICE 2005.

Annual report, Committee on Fuel Poverty, 2018.

Effect of cold indoor environment on physical performance of older women living in the community, Ulrich Lindemann et al, Age and Ageing, Volume 43, Issue 4, 2014.

Cold Comfort: Thermal sensation in people over 65 and the consequences for an ageing population, Rachel Bills, Network for Comfort and Energy Use in Buildings, 2016.

Lower Physical Performance in Colder Seasons and Colder Houses: Evidence from a Field Study on Older People Living in the Community, Yukie Hayashi et al, Int. J. Environ. Res. Public Health, 2017.

Housing conditions and limitations in physical function among older adults, Esther García-Esquinas, et al, J Epidemiol Community Health, 2016.

Cold Comfort: The social and Environmental determinants of Excess winter deaths in England, 1986-1996, Wilkinson P et al, The Policy Press, 2001.

Home warmth and health status of COPD patients, Liesl M. Osman et al, European Journal of Public Health, Volume 18, Issue 4, Pages 399–405, 2008.

Chance of a lifetime: the impact of bad housing on children's lives, Shelter, 2006.

Mold and dampness exposure and allergic outcomes from birth to adolescence: data from the BAMSE cohort, J. D. Thacher et al, Allergy, 2017.

Fair society, healthy lives, Marmot Review Team, 2010.

The health impacts of cold and fuel poverty, BMJ, 2011.

Fuel poverty and human health: A review of recent evidence, C Liddell and C Morris, Energy Policy, 2010.

The effect of improving the thermal quality of cold housing on blood pressure and general health: a research note, E.L. Lloyd et al, Journal of Epidemiology and Community Health, 2008.

Measuring the health impact of temperatures in dwellings: Investigating excess winter morbidity and cold homes in the London Borough of Newham, J Rudge et al, Energy and Buildings, 2007.

Minimum home temperature thresholds for health in winter: a systematic literature review, Public Health England, 2014.

Annex E: Tools for the assessment of excess cold

BRE Excess Cold Calculator

Investigation of excess cold hazards is complex due to the number of technical items that need considering. BRE have produced an online tool known as the Excess Cold Calculator (ECC) to help with such investigations.

The ECC is a subscription tool specifically designed to assist Environmental Health Practitioners and Technical Officers in the assessment of excess cold hazards in UK dwellings. When provided with details about a house, flat or bedsit and its occupants the ECC provides an estimate of the likely gas and electricity costs and an assessment of the adequacy of the heating system. The tool can then be re-run with modifications to test the impact of possible improvement measures, such as packages of insulation and heating system improvements, to help consider suitable remedial action and assist in the calculation of the cost-effectiveness of such action. This provides valuable supporting evidence for Officers' decisions on the presence of excess cold hazards and in justifying any requirements for mitigation measures. Also included within the calculator is a room assessment tool to help determine the likely size of radiator needed in any one room in a dwelling.

The tool can be accessed at https://www.excesscold.com

Sutherland Tables

The Sutherland Tables provide comparative costs for space heating and hot water for the most common fuels across a range of standard house types throughout the UK and Ireland. They are based on BREDEM, the BRE Domestic Energy Model.

The Tables also provide figures for heating an individual room using a variety of appliances including open and closed solid fuel appliances, gas and electric heaters, and fixed and portable LPG heaters.

Tables are compiled quarterly in January, April, July and October of each year and each set of figures is based on average fuel costs for the preceding 3 months. These are available to subscribers for download. Archive copies are also available for purchase.

Sutherland Comparative Domestic Heating Costs Tables have been published regularly since 1976. These tables can be very useful for comparing the likely heating costs for different fuel types within set dwelling sizes. As such it is a good reference point for those investigating excess cold hazards. It is limited in that the figures can't be replicated for the individual dwelling being assessed.

For further subscription information visit http://www.sutherlandtables.co.uk

Mears Domestic Heating Calculator

The domestic heating calculator is a physical disc that determines the heating requirements of domestic properties and from this, radiator outputs, and sizes of pipework and boiler.

It is relatively quick and simple to use and gives answers close to those obtained by detailed calculation.
It is useful when considering rooms in a dwelling that

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may be underheated and, as it is a physical tool, it can be taken out on site.

For more information, visit https://mhmear.co.uk/product/domestic-central-heating-calculator

Online heat loss calculators

Other tools are available online that provide heat loss calculations for individual rooms in a dwelling. This should mirror the output from tools such as the Mears Domestic Heating Calculator. One such example of this is available from PlumbNation.

https://www.plumbnation.co.uk/heating-calculator

Energy Performance Certificates

An EPC provides some information on heating costs likely to be incurred by an average household over a three year period. It also indicates the potential costs over the same period if improvements as specified in the EPC were to be made.

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