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Ministry of Housing, Communities & Local Government

The Housing Health and Safety Rating System (HHSRS): Operating Guidance (Part 2): A Technical Guide for Assessors

March 2026

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The Housing Health and Safety Rating System (HHSRS): Operating Guidance (Part 2): A Technical Guide for Assessors

Presented to Parliament pursuant to section 9 of the Housing Act 2004

March 2026

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The Housing Health and Safety Rating System
Operating Guidance (Part 2): A Technical Guide for Assessors

This guidance (Part 2) provides technical information to support the Housing Health and Safety Rating System (HHSRS) inspection and assessment process. Part 2 must be read in conjunction with the accompanying guidance listed below:

- *"The Housing Health and Safety Rating System Operating Guidance (Part 1): An Introductory Guide" which provides introductory information and guidance on the HHSRS inspection and assessment process.*
- *"The Housing Health and Safety Rating System Operating Guidance (Part 3): A Supplementary Guide to the Hazard of Fire and Explosions" which provides additional technical information to support the HHSRS specifically in relation to the hazard of Fire and Explosions.*

Housing Act 2004 - Guidance about inspections and assessment of hazards given under Section 9

CONTENTS

Introduction

Part 2 of the Operating Guidance contains technical information to support assessors. This part should be used after referring to Part 1 of the Guidance, which deals with the overall assessment process and the principles of the HHSRS. Assessors should refer to Part 1 when required.

Part 2 of this Guidance contains a series of hazard profiles providing essential information on each of the 21 hazards. Part 3 contains additional guidance on inspection of the Fire and Explosions hazard, providing information beyond the hazard profile, to assist in property inspection and risk assessment. Both Part 2 and Part 3 of the Guidance also signpost assessors to the various other guidance documents available at the time of publication. Assessors should not rely exclusively on this list and are expected to keep abreast of the production of new and updated guidance, research, and other information as it becomes available. For example, the new worked examples produced by organisations representation local authorities and landlords such as DASH in the east Midlands[1].

Baseline indicators have been introduced. These are not a mandatory set of requirements for dwellings but instead provide a prescriptive, but non-exhaustive, list of proportionate building measures designed to protect the health, safety, and wellbeing of occupiers. While they cannot eliminate risk, they are designed to address common health related housing deficiencies found across the housing stock. The baseline indicators are designed in such a way that they can be applied to most property types and ages. There may be exceptions to this, for example, where a baseline indicator can't be met due to a lack of listed building consent, or when a non-traditional building is being assessed.

The baseline indicators are set out in a table, with accompanying guidance notes, which can be used to check elements of a dwelling which are relevant to the health and safety of the occupiers. Only the relevant baseline indicators themselves are set out for each hazard profile, and assessors should always refer to the accompanying guidance note for each baseline indicator included in the full table in Appendix A.

The 21 hazards have been grouped to reflect the basic health requirements set out in the previous version of the HHSRS. Hazard profiles have been provided for each of the hazard categories in the following format:

- Hazard title
- A description of the hazard.
    - This defines the hazard and states what is included and what is excluded for that hazard.
- A table of the vulnerable age group, national average likelihood, harm outcome and HHSRS scores for the hazard, broken down by property type (where the data permits).
    - Brief notes on the data sources used to update the national averages from those in the previous version of the HHSRS have been included below each of the average tables.
    - Note - In these tables 0% is sometimes given at the score for a particular class of harm outcome. This does not necessarily mean those harms do not occur for the hazard. It is because they represent less than 0.05% of the harm outcomes for this

[1] https://www.dashservices.org.uk/Resources

hazard, so it's shown as 0%. This threshold has been applied to all hazard tables in the HHSRS.

- A summary box providing a summary of the information about the hazard.
    - This is intended to be used as a reminder for assessors once they have become familiar with the content of the hazard profile.
- Health effects
    - A summary of how the hazard can affect occupier health and safety.
- Causes
    - Information on potential causes of the hazard, considering the dwelling, its surroundings and occupation, to assist with scoring decisions.
    - Behavioural factors
        - These have been included to respond to demand for guidance assisting officers in understanding how behaviour exposes occupiers to risk arising from relevant deficiencies in the dwelling and what elements of that behaviour are outside the scope of the HHSRS.
- Relevant matters and baseline indicators affecting the likelihood and harm outcomes.
    - Any other hazards impacting on the likelihood and harm outcomes.
    - A checklist of baseline indicators and relevant matters to consider when scoring likelihood and harm outcomes.
        - Identifying numbers for each of the baseline indicators have been provided (e.g. 1.4, 4.2.1, etc.). These correspond to the numbers in the baseline indicators checklist provided in Appendix 1.
        - The baseline indicators can be considered for any dwelling. The baseline indicators may not in themselves reduce the risk from a given hazard to an acceptable level. They give an indication of what basic requirements need to be satisfied to help reduce the risk to health from the hazard. Failure to meet a relevant baseline indicator should be regarded as a deficiency (see Part 1 of this guidance).
        - The relevant matters affecting the likelihood and harm outcomes identify other aspects which should be considered, beyond the relevant baseline indicators.
        - Assessors should review both lists when assessing a hazard and consider any other factors which may be relevant, when making their judgement of the level of risk posed by the hazard.
- Preventative measures
    - Guidance on measures to avoid the hazard or minimise the risk from the hazard.
- Notes on other considerations for assessment of the hazard
    - Additional advice for inspection of the hazard, including considerations for multi-occupied properties.
- Further reading
    - Useful sources providing information relevant to that hazard profile. These sources may not be statutory guidance but will be of assistance to assessors.

THE HAZARD PROFILES

PROTECTION AGAINST ACCIDENTS

1. Falls on the Level

Description of the hazard

This hazard covers falls on any level surfaces such as floors, yards, paths and gardens. It covers all falls associated with a bath, shower or similar facilities. It also covers any falls associated with small changes in level up to 300mm in height, such as door thresholds, single steps and small slopes. Falls associated with larger changes in height are covered by the hazards Falling on Stairs etc. and Falling Between Levels.

Falls caused by occupiers standing on steps or furniture to operate difficult to access window catches or to access high cupboards and shelving should be dealt with under the Collisions, Entrapment and Ergonomics hazard.

Vulnerable group and the national average scores

Falls on the Level – Average likelihood and harm outcomes for all persons **aged 60 years and over.**							
Dwelling type and age		Average likelihood 1 in	Spread of harm outcomes				Average HHSRS scores
			Extreme %	Severe %	Serious %	Moderate %	
Houses	Pre 1920s	50 (48)	0.5	10	30	59.5	492 (518) Moderate risk
	1920-45	50 (53)	0.2	10	30	59.8	432 (437) Moderate risk
	1946-79	50 (58)	0.2	10	30	59.8	432 (413) Moderate risk
	Post 1979	50 (48)	0.1	10	30	59.9	412 (516) Moderate risk
Flats	Pre 1920s	30 (33)	0.2	10	20	69.8	623 (666) Moderate risk
	1920-45	30 (38)	0.5	10	20	69.5	723 (703) Moderate risk
	1946-79	50 (51)	0.5	20	20	59.5	632 (517) Moderate risk
	Post 1979	50 (43)	0.1	20	20	59.9	552 (602) Moderate risk
All dwellings		**50 (52)**	**0.2**	**10**	**30**	**59.8**	**432 (469) Moderate risk**

Note – Scale point values are shown, with the national average values for likelihoods and their corresponding final scores (determined using actual harm outcome values rather than scale point values) provided in brackets. Data quality for these averages is strong due to hospital episode data distinguishing between different types of falls and specifying the age of fall victims. One limitation was that the hospital episode data did not distinguish between falls in dwellings and falls in other building types or falls in outdoor settings. A further limitation was that falls involving baths only had the involvement of baths mentioned in the cause if the victim drowned.

Summary box – Falls on the Level

Vulnerable group – Those aged 60 years and over

Groups other than vulnerable group at greater risk – Children up to 15 years, persons with disabilities or visual impairment, and those living alone.

Main issues to look for – Cold living conditions, unexpected obstacles and changes in level, inadequate friction of floor finishes including likely contaminants (e.g. water) on internal floors, pooling water which will freeze, or algae/moss/mud build up on outdoor surfaces, and problems with lighting. Consider what a person will strike as they fall.

Risk reduction measures – Warmer living environment, appropriate floor covering if necessary, greater surface friction particularly where floors etc. are likely to be subject to contamination, removal or highlighting of changes in level/unexpected obstacles, ensure there are even surfaces with effective drainage in external environments. Improve lighting levels/reduce glare from lighting.

Health effects

Those under five years of age are most likely to have a fall and those under 15 years are more likely to be admitted to hospital following a fall on the level. However, those over sixty years of age suffer more severe harm outcomes from a fall so have been designated as the vulnerable age group.

Injuries following a fall on the level are most likely to occur to the extremities and face. Older people are more likely to sustain long-bone fractures, pelvic fractures and intracranial injuries and are more likely to suffer a mortality from the initial fall. Other aspects of an older person's health may also deteriorate following a fall. The initial accident may lead to further falls as the person's movement becomes less relaxed due to the fear of another fall, making further slips or trips more likely. Reduced mobility during the recovery period after a serious fall can also lead to other health conditions. This may result in a decline in health, potentially resulting in a mortality from other factors. These factors are often recorded as the cause of death, but it is the fall which triggered the sequence of events that ultimately led to the mortality. Reduced mobility can also cause social isolation contributing to feelings of loneliness and depression.

All age groups are at risk from falls on the level and slips or trips are common occurrences. The ability to recover one's balance and their reaction times usually prevent a fall occurring. Familiarity with the home environment can also lessen the chance of a slip or trip occurring in the first place. Given the frequency of slips and trips, a significant minority of these occurrences will continue into a fall and harms may then occur. Injurious falls in the domestic environment are a serious threat to public health.

The severity of any injury which occurs due to the impact on landing following a fall is subject to a number of factors including the distance of the fall, the nature of the surfaces where the fall occurred, any projections which a falling person may strike and what happens in the period following the fall. Falls in baths and showers may cause more cuts and lacerations as the person is less likely to be protected by clothing. If a person is immobilised by the fall they may remain without assistance for a period of time, allowing progressive deterioration due to the initial injuries from the fall and leaving them vulnerable to other threats such as hypothermia in cold environments. Those who live alone are at greater risk from a fall.

Causes

Falls on the level are caused by both slips and trips. The potential for a slip is influenced by both the footwear of the person and the friction between the footwear and the surface it is placed upon. The surface roughness of a substrate is a term used to describe the irregularities on its surface. This may alter over time with wear (causing polishing) and as a result of weather conditions (e.g. ice and snow). Surfaces with low surface roughness will be more slippery. When it is placed on a surface the sole of the footwear or foot will engage in the microscopic features of the surface, creating friction and providing grip. If the features of the surface are coarser there will be more grip. Different types of footwear will provide different levels of grip and those with flatter, smoother soles will be more vulnerable to reductions in their grip due to contamination (e.g. mud or water).

Surface contaminants can decrease the level of friction between a foot and the surface it is placed upon. Common surface contaminants inside buildings are water, oils, foodstuffs and polishes. Common surface contaminants in external environments are mud, water, ice, snow, and organic matter such as moss, algae and leaves. Surface contaminants fill the microscopic wrinkles, ridges and undulations of a surface. In rougher materials these surface features will be larger in size so can tolerate some contamination and retain some level of friction when footwear is placed on them. However, all surfaces will lose friction as the level of surface contamination increases.

When moving on a level surface, a person's feet will follow the profile of that surface closely. Stumbles and trips on level surfaces are more likely where there are changes in the level, particularly where they go unnoticed. Small changes in level (5-20mm) and those which are poorly marked by change in colour or pattern of the surface or are difficult to see due to low lighting or glare will be less likely to be seen by someone moving over them, so are more likely to cause a trip. Distractions can also cause someone not to notice a small change in level or obstruction causing a trip.

A range of factors contribute to falls on the level. The original surface material, drainage (poorly drained outdoor surfaces may cause water to pool and this can freeze in cold weather), maintenance of the floor or surface and drying time for external surfaces following wet weather (longer drying times allow algae and moss to grow). Additionally, cleaning regimes, appropriateness of or lack of floor finishes for the contaminants they are likely to be exposed to and the types of activities undertaken in the area all contribute to falls on the level.

Hard and unforgiving surfaces, projections and sharp corners all increase the severity of injuries when a falling person strikes them. Falls in and around baths, showers, kitchens and those in external areas with hard landscaping have a lot of hard surfaces, projections and corners a person may come into contact with, the chance of which are increased by the lack of appropriate floor coverings.

Falls around baths may be caused by inappropriately sited taps and waste controls or difficulties getting into and out of the bath or shower due to navigating steps, doors or screens. Bath or shower rooms may not provide adequate space for dressing and drying following bathing which may increase the risk of a fall.

Falls on the level may be caused by other factors such as obstacles in the environment. Inadequate plug sockets may result in avoidable use of extension cables. Lack of storage space may require items to be stored on traffic routes such as hallways and landings. Floor coverings such as carpet and tiles may become loose due to age or not being properly installed and maintained, and floors may deteriorate causing unevenness and holes. Ramps may be poorly identified through changes in colour or surface materials causing them to go unnoticed, resulting in a misstep. Noisy or distracting

environments or poor lighting (low light or glare) will increase the chance of falls. Visual impairment will also increase the risk from falls.

Behavioural factors

Carrying objects and carrying out tasks can reduce attention to the environment and prevent someone from using their arms/hands for balance and to arrest a fall. This is important in kitchens.

Occupiers may wear socks/stockings which provide poor friction on smooth floor finishes or may wear low stability footwear such as open back slippers. Occupiers may rush, making a trip or slip more likely, so dwellings should have as few slip/trip hazards as possible.

Occupiers may not adopt regular maintenance of surfaces, for instance they may not clean/treat external surfaces to prevent the growth of algae and moss. Ideally, surface finishes should not depend on frequent cleaning/treatment to provide adequate friction properties.

Relevant matters and baseline indicators affecting the likelihood and harm outcomes

Other hazards impacting the likelihood and/or harm outcomes

Excess Cold – Exposure to cold living conditions will increase the risk of a fall by impairing balance, co-ordination and reaction times. Excess cold may increase the severity of the harm outcomes from a fall if a person immobilised by the accident were to remain undiscovered for a prolonged period of time. Lack of adequate space heating in bathrooms is particularly important.

Lighting – Inadequate levels of lighting or glare from lighting may make it more difficult to navigate obstacles, making falls more likely.

Relevant baseline indicators (accompanying notes are in Appendix 1)

2.3 There shall be adequate provision for surface- and foul-water drainage for the size and maximum occupancy of the dwelling. All drains and gullies shall be covered by a suitable grille or cover to prevent the build-up of debris restricting the natural operation of the system.

2.4 All rainwater pipes shall discharge properly into the drainage system or soakaway. Rodding or access points shall be available to allow the clearance of any blockage.

2.5 All access covers to drainage and other services shall be fitted with suitable flush-mounted covers adequately marked to indicate purpose.

4.5 Where a shower is fitted separate to the bath, a purposely designed shower tray must be fitted so that the step into the tray is no greater than 150mm. All waste outlets and connections shall be sealed and free from defects.

4.7 There must be a cleanable, non-absorbent water-resistant material on floor surfaces and extending on bathroom walls at least 300mm above a bath and 1800mm above the floor of a shower or shower tray. Such materials on walls and floors shall form a watertight joint with each other and with the bathtub or shower tray. Any shower shall have a shower screen, curtain or return wall that prevents water spillage to the floor.

5.9 A kitchen floor in good condition, with a sealed, water-resistant, non-absorbent and cleanable surface.

8.1 Internal doors leading between areas of a single dwelling must provide a sufficient barrier to the spread of smoke and fire (where appropriate). Any glazing in doors must respond safely to collision and must be designed for functionality to avoid strains or entrapment when in use, and must be

maintained in good repair. All bathrooms and WC room doors must be fitted with a suitable lock and must not contain clear glass.

9.1 External yards, paths, steps, accessways and surrounds within the curtilage of the dwelling shall be in good repair, even and well drained. Accessways must be suitable non-slip surfaces, have adequate lighting and should not have slopes of sufficient gradient to present a falls risk. This includes consideration to unevenness, trip risks and poor slip resistance, to any steps or surfaces within external space that is provided, to the front door, yard and garden.

Where there are drops of more than 300mm from paths, patios, steps, terraces or garden areas guarding will be necessary where there are high risks of falling.

All boundaries should be clearly defined and enclosed by well-maintained and suitable walls or fences. This also applies to structure, accessways, security doors and lifts.

11.1 Adequate external lighting shall be provided to all means of access including entrances and external refuse stores, providing good visibility when there is no daylight.

11.2 Access doors to dwellings should have adequate locks. Doors must be solid external grade and fitted with a minimum of a mortice deadlock to BS 3621, openable from the inside without a key. There must be a means for occupiers to view visitors without opening the door, either by means of a viewer within the door or by a glazed pane adjacent or close to the entrance door. All rear doors should be fitted with a mortice dead lock to BS 3621 or 2 security bolts.

12.1 Every interior and exterior stairway, ramp, deck, porch, balcony walkway, terrace, landing and hall shall be maintained structurally sound, in good repair, properly anchored and capable of supporting the imposed loads.

13.3 Any open fires or flames as a source of heat must be adequately guarded to ensure any accidental falls or trips do not result in contact with the open flames. Where there is risk of prolonged contact with hot surfaces of more than 43oC, adequate guarding must be provided to prevent contact.

14.1 Every habitable room shall have adequate natural lighting.

14.2 Every hall, stairs and landing within the house, and every room used, or intended for use, by the occupant of the house shall have a suitable and adequate means of artificial lighting that is controllable and accessible which can allow lighting to be turned on and off and bulbs/fixtures to be changed and maintained safely. Two-way or PIR-activated lighting shall be provided to any internal staircase.

14.3 Light switches that control ceiling- or wall-type electric light fixtures shall be located conveniently in each room for safe use.

14.6 Every habitable room shall have at least 2 separate and remote double electric sockets that are suitably located for use. Kitchens shall have at least 4 suitably located double sockets.

15.4 Every dwelling shall have a properly installed heating system in good and safe working condition that is capable of safely and adequately heating all habitable rooms, bathrooms and WC rooms. The system must be capable of heating the main living area to 21°C and the remaining habitable rooms to a temperature of 18°C when the external temperature is minus 1°C, and the system should not allow the temperature to exceed 25°C in any room during the heating season.

Other matters affecting the likelihood of a harmful occurrence include:

- Inadequate drainage – of surface water from the path or yard.
- Inadequate space – for the carrying out of appropriate tasks and manoeuvres.
- Poor lighting or glare – both artificial and natural.
- Raised thresholds – raised thresholds or small changes in level at external doors.
- Poor friction – of the internal surface of a bath or shower.
- Siting of taps, wastes, light switches and other controls– inappropriate siting increasing the risk of falls.
- Handles and grab rails – lack of, or insecurely fitted.
- Unstable appliance – unstable fitting of bath, shower, WC basin, or wash hand basin.

Other matters affecting the severity of the harm outcome include:

- Hard surfaces – unforgiving or abrasive surface to the floor, path or yard.
- Projections etc. – the presence of sharp edges, heat producing appliances, or glass, in the area where a fall might occur or where a person may lie following a fall.
- Nature of area – type of the activities which will be undertaken in the area where a fall might occur.
- Inadequate space – functional space and space between appliances.

Preventative measures

Effective drainage and rapid drying of outdoor surface water are important to reduce moss and algae growth and avoid ice formation. Some surfaces (e.g. decking) may require periodic cleaning and treatment to prevent them becoming slippery. Where surfaces are prone to moist conditions and moss/algal growth causing slippery conditions, a more permanent solution would be to replace/cover them (partially or totally) in a material with high surface roughness, which can retain high friction qualities under such conditions.

Improving the visibility of obstructions, changes in level, slopes, raised thresholds and projections through adequate lighting provision and contrasting colour or pattern choice will reduce the risk of these factors going unnoticed. Artificial lighting and windows should be sited to avoid glare, shadows and dark corners which make it difficult for users to see where they are going. Lighting controls should be easily accessible, easy to locate and provided in a location where they can be operated before the user has to negotiate any unlit space.

Internal floor finishes should have well-anchored carpet finishes; old or poorly installed or maintained floor coverings can present a risk of falls. Where tiles or vinyl are to be used these should have a surface roughness appropriate for the type of contamination likely to be encountered in those areas (e.g. water from bathing). Finishes of baths and showers should retain adequate friction when contaminated with water. Varnished/polished internal wooden floors have poor slip resistance particularly for those in socks/stockinged feet and should be avoided where they present a significant risk of falls.

Each room should have adequate space and internal layout for the activities carried out in that room. In bathing facilities space should be adequate for an adult drying and changing, or an adult assisting a child.

Baths and showers should have adequate grab rails or other measures to assist balance and ease access/egress. Baths and showers should have easily accessible controls which do not require excessive reaching and do not put the user off-balance.

Other considerations for assessment of this hazard

Assessments must determine the overall risk to health considering the cumulative risk posed by all internal and external corridors, landings, rooms, enclosures, small changes in level involving steps or slopes, passageways, gardens and yards occupiers have access to as part of their expected use of the dwelling. This includes shared access routes. Assessments must consider the frequency of use of different areas of the dwelling. Problems in those areas used more frequently by dwelling occupiers will give greater exposure to the hazard.

This hazard is an amalgamation of two hazards from the last version of HHSRS. Assessors should conduct a whole dwelling assessment covering all aspects of this hazard, but if there are issues affecting just one element of the hazard it is useful to understand what proportion of the national average likelihood is attributable to each of these areas. Approximately 2% of harms come from falls involving baths and bathroom facilities, the rest are due to falls in other areas.

Further reading

British Standard BS6465 Sanitary installations. Code of practice for the design of sanitary facilities and scales of provision of sanitary and associated appliances. Available at: www.bsigroup.com

HM Government (2013) The Building Regulations 2010 Protection from Falling, Collision and Impact – Approved Document K. Available at: www.gov.uk

HM Government (2010) The Building Regulations 2010 Drainage and Waste Disposal – Approved Document H. Available at: www.gov.uk

The Health and Safety Executive web site contains some guidance on slips and trips and assessing the slip resistance of flooring which may be relevant in a domestic situation. Available at: www.hse.gov.uk

2. Falling on Stairs etc.

Description of the hazard

This hazard covers any fall associated with stairs, steps and sloping surfaces/ramps where the change in level is greater than 300mm. It includes both internal and external stairs, steps and ramps, including shared access routes and fire escapes. It includes sloping sections of gardens. It also includes falls over guarding (balustrading) associated with stairs, steps and ramps.

The hazard does not include falls associated with trip steps, thresholds or ramps where the change in level is less than 300mm. These are covered by the hazard Falls on the Level. It does not include falls over guarding from balconies or landings. These are covered by the hazard Falling Between Levels.

Vulnerable group and the national average scores

Falling on Stairs etc. – Average likelihood and harm outcomes for all persons **aged 60 years and over.**							
Dwelling type and age		Average likelihood 1 in	Spread of harm outcomes				Average HHSRS scores
			Extreme %	Severe %	Serious %	Moderate %	
Houses	Pre 1920s	200 (166)	2	10	20	68	183 (223) Moderate risk
	1920-45	200 (172)	2	5	20	73	159 (205) Moderate risk
	1946-79	200 (195)	2	5	20	73	159 (153) Moderate risk
	Post 1979	200 (195)	1	5	20	74	109 (146) Moderate risk
Flats	Pre 1920s	200 (163)	5	10	20	65	333 (328) Moderate risk
	1920-45	200 (200)	2	2	20	76	144 (128) Moderate risk
	1946-79	300 (312)	2	5	20	73	106 (126) Moderate risk
	Post 1979	300 (312)	2	5	20	73	106 (121) Moderate risk
All dwellings		**200 (187)**	**2**	**5**	**20**	**73**	**159 (176) Moderate risk**

Note – Scale point values are shown, with the national average values for likelihoods and their corresponding final scores (determined using actual harm outcome values rather than scale point values) provided in brackets. Data quality for these averages is strong due to hospital episode data distinguishing between different types of falls and specifying the age of fall victims.

Summary box – Falling on Stairs etc.

Vulnerable group – Those aged 60 years and over

Groups other than vulnerable group at greater risk – Young children, persons with disabilities or visual impairment and those living alone.

Main issues to look for – Cold living conditions, changes in tread/riser size, lack of stair carpet indoors, steep stairs/steps/slopes, disrepair to stairs/steps, poor friction especially on nosings, pooling water which will freeze, or algae/moss/mud build up outdoors, inadequate guarding, missing handrails, very high/low pitch, open risers, inadequate lighting/glare from lighting. Consider what a person will strike as they fall.

Risk reduction measures – Warmer living environment, improve friction particularly on the top/edge of nosings, provide handrails and guarding, even surface and effective drainage of external steps, closed risers, improve lighting levels/reduce glare from lighting.

Health effects

Falls on stairs are common in domestic situations. In 2015 there were 787 fatalities recorded as a direct result of falling on stairs and steps, representing 60% of deaths from falls in the home. In the UK in 2016 someone fell on stairs or steps every 90 seconds. Stair-related falls account for between a third and a fifth of falls by older people in the home environment. Falling on Stairs etc. are also common in other age groups and may have serious consequences for those outside the vulnerable age group. Falls associated with stairs and steps are more likely to cause Extreme and Severe harms due to the number of unyielding and projecting edges (e.g. stair nosings, banister rails) and the momentum the person builds up when they fall. They can lead to multiple injuries.

The immediate health impact from the fall are physical injuries which vary in severity based on a range of factors including the length of the fall, mechanism of injury, objects struck during the fall and the time it takes for the individual to receive assistance. When falls occur outside a person immobilised by a fall may remain undiscovered for a significant period of time. This allows progressive deterioration due to the initial injuries from the fall and leaving them vulnerable to other threats such as hypothermia in cold conditions. Those living alone are at greater risk following a fall.

Threat to health from Falling on Stairs etc. is greater in older age groups. Existing musculoskeletal disorders and visual impairments may make falls more likely. Poor vision can double the risk of a fall in older people and injuries tend to be more severe than in other age groups. Very young children are also at greater risk from falls on stairs and steps, particularly when using walkers, as are children from lower socio-economic groups.

Older people are more likely to suffer more severe fractures and head injuries from the initial fall and are more likely to die from injuries following the initial fall. Other aspects of the older person's health not directly associated with the fall injuries may also deteriorate following a fall incident. An initial accident may lead to further falls as the person's movement becomes less relaxed due to the fear of a further accident, making missteps more likely. Reduced mobility during the recovery period after a serious fall can lead to other health conditions manifesting themselves. This may lead to a decline in health potentially resulting in a mortality from other factors. These factors are recorded as

the cause of death, but it is the fall which triggered the sequence of events which led to the mortality. Reduced mobility can also cause social isolation contributing to feelings of loneliness and depression.

Causes

Climbing or descending a flight of stairs or steps involves a rhythm to the movement of the body. Unexpected variations in the dimensions of the risers and treads will increase the possibility of missteps. Failure to anticipate such changes due to poor lighting (lack of lighting or sharp changes in levels of lighting) or distractions (e.g. from navigating low ceilings, items left on the stairs, or doors opening onto the stairs) is also likely to lead to a misstep.

Expected changes in direction on a flight of stairs or steps actually reduce the risk of a misstep as persons using the stairs increase their level of caution and attention to the stairs or steps when such obstacles are encountered. Accidents are more likely to occur on straight sections of staircases, particularly where these have a pitch greater than 42 degrees. Steeper flights of steps/slopes and longer flights/slopes can also increase the severity of the outcomes from a fall.

Poor friction quality on treads and particularly nosings will make falls more likely. When descending a flight of stairs or steps feet are mostly placed near/over the edges of the steps, so friction on this part of the steps is particularly important. Low levels of friction may occur due to the use of a varnished finish on wooden stairs (accidents are three times more likely on stairs without a carpet covering) and the use of more rounded nosings on internal steps. On external steps rounded edges on nosings and the growth of moss/algae or presence of ice will reduce levels of friction.

When climbing a flight of stairs or steps the friction of the treads is important. Open risers or excessively projecting noses (over 25mm) can also mean that the toes of the person climbing the steps catch on the nosing causing a trip.

Lack of a wall or guarding to one side of the stair or lack of any handrails will double the likelihood of a fall. Handrails may be difficult to grasp or have a finish which provides limited friction, reducing their effectiveness.

When climbing or descending stairs foot movement is variable and tends to be very close to the step which can lead to scuffing. It can also make falls more likely where steps are uneven or move due to disrepair. People tend to use the balls and toes of their foot to initiate a step (as opposed to the heel when walking on level surfaces). This creates a weight transfer that requires more effort. During the swing phase of the movement, up or downstairs, is when a fall is most likely to happen. The force on the stair through the sole of the foot is greater when climbing the flight than when descending, suggesting a slip is more likely to occur when descending a flight of stairs or steps. When ascending a flight of stairs a trip is more likely, for instance when the toes catch on a projecting nosing.

Exposure to cold conditions reduces co-ordination and balance making a trip or slip more likely. It also decreases reaction times, so when a trip or slip occurs the person is less likely to regain their balance or arrest the progress of their fall.

Behavioural factors

Artificial lighting on a flight of stairs/steps may not be used if the switches are difficult to locate, particularly for guests who are unfamiliar with a premises. Assessors should consider the lighting and lighting controls around flights of stairs/steps.

Occupiers may wear socks/stockings inside the dwelling, which reduce friction with the tread (particularly where there is no carpet) or may wear poor stability footwear such as open back slippers. Occupiers may also rush when using stairs, making a trip or slip more likely. Stairs/steps should be designed and maintained to make them as safe as possible.

Relevant matters and baseline indicators affecting the likelihood and harm outcomes

Other hazards impacting the likelihood and/or harm outcomes

Excess Cold – Exposure to cold living conditions will increase the risk of a fall by impairing balance, co-ordination and reaction times. Excess cold may increase the severity of the harm outcomes from a fall if a person immobilised by an accident were to remain undiscovered for a prolonged period of time.

Collisions, Entrapment and Ergonomics – Aspects of this hazard may make a fall on stairs, steps or slopes more likely. Doors may open onto stairwells, light fittings, cupboards or shelves may be sited over stairs and windows over stairwells may have controls which require awkward bending and reaching from the stairs. There may be low ceilings which cause a risk of head injuries. These can increase the likelihood of a fall.

Lighting – Inadequate levels of lighting may make it more difficult to navigate obstacles, making falls more likely.

Relevant baseline indicators (accompanying notes are in Appendix 1)

1.1 Externally, every foundation, roof, ridge line, flashing, fascia, soffit and bargeboard, exterior staircase, exterior wall/fence shall be safe to use and capable of supporting the intended design loads and load effects and shall be in a proper state of structural repair.

Internally, every wall, floor, ceiling, inside stair, porch, accessory structure, door, window and window glass shall be safe to use and capable of supporting the intended design loads and load effects, and shall be in a proper state of structural repair.

9.1 External yards, paths, steps, accessways and surrounds within the curtilage of the dwelling shall be in good repair, even and well drained. Accessways must be suitable non-slip surfaces, have adequate lighting and should not have slopes of sufficient gradient to present a falls risk. This includes consideration to unevenness, trip risks and poor slip resistance, to any steps or surfaces within external space that is provided, to the front door, yard and garden.

Where there are drops of more than 300mm from paths, patios, steps, terraces or garden areas guarding will be necessary where there are high risks of falling.

All boundaries should be clearly defined and enclosed by well-maintained and suitable walls or fences. This also applies to structure, accessways, security doors and lifts.

11.1 Adequate external lighting shall be provided to all means of access including entrances and external refuse stores, providing good visibility when there is no daylight.

12.1 Every interior and exterior stairway, ramp, deck, porch, balcony walkway, terrace, landing and hall shall be maintained structurally sound, in good repair, properly anchored and capable of supporting the imposed loads.

12.2 Internal and external stairs must be safe, secure, in sound condition, free from defects and projections and well maintained. External stairs must be designed to allow water to drain away from the steps.

12.3 Stair coverings must be securely and safely fastened. Treads on exterior stairways shall have non-slip surfaces, be firmly fixed and cover at least 75% of each tread.

12.4 Every interior and exterior stairway with four or more risers shall have at least one structurally sound continuous handrail installed, between 900mm and 1000mm high, measured from the pitch line to the top of the handrail. The handrail shall be firmly fastened, capable of supporting a load of 140kg and in good condition.

12.5 Minimum headroom on a staircase shall be 1900mm.

12.6 There shall be landings at the top and bottom of all internal and external flights of stairs, with a minimum width of 750mm and length of 500mm.

13.1 Every stairway, porch, patio, landing, balcony walkway, terrace and hall located more than 600mm above an adjacent area shall have a structurally sound guard, between 900mm and 1100mm high, measured vertically from the floor. The guard shall be firmly fastened, capable of supporting normally imposed loads and in good condition. Balusters with a minimum thickness of 10mm shall be placed at intervals that do not allow passage of a sphere greater than 100mm in diameter. There shall be no climbable cross-pieces.

14.2 Every hall, stairs and landing within the house, and every room used, or intended for use, by the occupant of the house shall have a suitable and adequate means of artificial lighting that is controllable and accessible which can allow lighting to be turned on and off and bulbs/fixtures to be changed and maintained safely. Two-way or PIR-activated lighting shall be provided to any internal staircase.

15.4 Every dwelling shall have a properly installed heating system in good and safe working condition that is capable of safely and adequately heating all habitable rooms, bathrooms and WC rooms. The system must be capable of heating the main living area to 21°C and the remaining habitable rooms to a temperature of 18°C when the external temperature is minus 1°C, and the system should not allow the temperature to exceed 25°C in any room during the heating season.

Other matters affecting the likelihood of a harmful occurrence include:

- Tread lengths (going) – outside of the dimensions specified in the Building Regulations Approved Document K.
- Riser heights – outside of the dimensions specified in the Building Regulations Approved Document K.
- Variation in treads or risers – dimensional variation producing an uneven pitch.
- Nosing length – projecting more than 25mm
- Lack of handrails – the absence to both sides of the staircase.
- Grip on handrails – difficulty grasping handrails due to shape, position or surface finish.
- Lack of guarding – the absence of guarding where there is no wall to both sides of the staircase or deficiencies with guarding.
- Length of flight – long flights may increase the likelihood of a fall.
- Glare from lighting – whether natural or artificial.
- Poor differentiation of nosings due to low light and/or the colour/pattern of the stair coverings.
- Door(s) onto stairs – doors opening directly onto the stairs.
- Handrail(s) on slopes – lack of adequate handrail(s) to aid safe movement on sloping ground.

Other matters affecting the severity of the harm outcome include:

- Length of flight – long flights increase the severity of the outcome.

- Pitch of stairs – stairs which are of above average steepness or shallowness.
- Projections, etc. – the presence of sharp edges, heating installations, glass, etc. around the stairs or at the foot of the flight which may be struck when falling.
- Hard surfaces – unforgiving surfaces around the flight.

Preventative measures

Excessively steep or shallow pitches should be avoided. Approved Document K for the Building Regulations sets out maximum and minimum dimensions for elements of stairs/steps. Stairs/steps adhering to these requirements will present a reduced risk of falls. Treads and riser sizes should be consistent on any flight of stairs or steps.

Firmly anchored carpets increase friction and partially cushion nosings, reducing the likelihood and severity of harm outcomes of a fall.

Providing adequate guarding (balustrade) to stairs/steps will help prevent vertical falls from the side of the flight. Avoid gaps in guarding (the balustrade) and constructing guarding to prevent children from squeezing through it or climbing the guarding will help to reduce the likelihood of them falling off a flight of stairs.

Handrails 900-1000mm from the pitch line improve balance and can be used to arrest falls once they start. Ideally these should be well anchored, easily grasped, with good friction properties and on both sides of the stairs, even when there is a wall on both sides. The baseline indicator suggests a handrail for all flights of at least four steps, but risk of falls will be reduced by handrails on any flight of steps. Where there is only one wall adjacent to a flight of steps a balustrade should be used to provide a handrail and guarding to prevent falls from the flight of steps.

Low ceilings and ceiling projections less than 1900mm from the treads can cause a head injury or force someone using a flight of stairs to bend over, spoiling their balance, distracting them from their foot placements and interrupting their rhythm when moving up or down the stairs.

Good lighting with controls which are easy to locate and lighting which is controllable from the top and bottom of the stairs will improve perception of the outline of the steps. Sharp changes in lighting levels such as areas of shadow or glare should be avoided. Colour schemes and patterns can make identification of the nosings difficult. Using a contrasting colour for nosings makes them more visible, reducing the likelihood of a fall.

Doors, furniture, fixtures, fittings and appliances either at the top, bottom or part way down a flight of stairs can prevent users appraising the flight, making a fall more likely. Doors opening directly onto a flight of stairs or immediately above or below the flight may collide with someone using the stairs causing a fall.

Water may pool on poorly drained external steps and freeze in cold weather, so steps should be well drained. Some types of stone and particularly wooden steps in sheltered locations will suffer from moss and algal growth creating a slippery surface. Strips of high friction material should be attached to treads and/or nosings to improve traction. Treating and cleaning away moss/algal growth will only alleviate the problem temporarily. In snowy conditions all external steps and slopes will become very slippery, making the presence of a handrail particularly important.

Other considerations for assessment of this hazard

Assessments must determine the overall risk to health considering the cumulative risk posed by all internal and external stairs, steps and slopes occupiers have access to as part of their expected use

of the dwelling. This includes shared access routes and fire escape routes. Assessments must consider the frequency of use of different stairs, steps and slopes. Those used more frequently will give greater exposure to the hazard.

Further reading

British Standard BS 5395-1: 2010 – Stairs. Code of practice for the design of stairs with straight flights and winders. Available at: www.bsigroup.com

British Standard BS 5395-4: 2011 – Code of practice for the design of stairs for limited access. Available at: www.bsigroup.com

British Standard BS 585-1: 1989 – Wood stairs. Specification for stairs with closed risers for domestic use including straight and winder flights and quarter or half landings. Available at: www.bsigroup.com

British Standard BS 585-2: 1985 – Wood stairs. Specification for performance requirements for domestic stairs constructed of wood-based materials. Available at: www.bsigroup.com

HM Government (2013) The Building Regulations 2010 Protection from Falling, Collision and Impact – Approved Document K. Available at: www.gov.uk

3. Falling Between Levels

Description of the hazard

This hazard covers falls from one level to another where the change in height is more than 300mm. This may be inside or outside the dwelling (e.g. falls from landings, windows, balconies, basement wells and garden retaining walls).

This hazard does not include falls associated with stairs, steps and slopes (these are covered by the Falling on Stairs etc. hazard), nor does it cover falls from furniture when reaching for window or light fittings. Falling Between Levels where the change in height is less than 300mm are dealt with under the Falls on the Level hazard.

Vulnerable group and the national average scores

Falling Between Levels – Average likelihood and harm outcomes for all persons **aged 5 years and under.**							
Dwelling type and age		Average likelihood 1 in	Spread of harm outcomes				Average HHSRS scores
			Extreme %	Severe %	Serious %	Moderate %	
Houses	Pre 1920s	3,000 (2,521)	0.1	0	10	89.9	2 (2) Low risk
	1920-45	2,000 (1,862)	0.2	2	10	87.8	4 (4) Low risk
	1946-79	1,000 (1,499)	0.2	2	10	87.8	8 (6) Low risk
	Post 1979	3,000 (2,539)	0	0	20	80	2 (2) Low risk
Flats	Pre 1920s	3,000 (3,265)	0.5	2	5	92.5	3 (3) Low risk
	1920-45	3,000 (2,919)	0.5	2	5	92.5	3 (3) Low risk
	1946-79	2,000 (2,133)	0.5	2	5	92.5	5 (5) Low risk
	Post 1979	1,000 (1,471)	0.5	2	5	92.5	9 (7) Low risk
All dwellings		**2,000 (2,016)**	**0.2**	**2**	**10**	**87.8**	**4 (4) Low risk**

Note – Scale point values are shown, with the national average values for likelihoods and their corresponding final scores (determined using actual harm outcome values rather than scale point values) provided in brackets. Data quality for these averages is strong due to hospital episode data used distinguishing between different types of falls and specifying the age of fall victims.

Summary box – Falling Between Levels

Vulnerable group – Those aged 5 years and under

Groups other than vulnerable group at greater risk – Young adults, those misusing drugs or alcohol and those with learning difficulties or mental ill-health. Older people are less likely to fall between levels than other age groups but suffer more severe outcomes.

Main issues to look for – Unguarded changes in level, windows with large opening areas which can be easily accessed and opened by children, low windows of insubstantial construction, easily climbed guarding, windows where outer surfaces are hard to clean from the inside.

Risk reduction measures – Opening restrictors on windows (which can be disabled by adults in the case of a fire), safety rails or toughened glass on low windows, guarding which hard for children to climb through/over, window designs which can be easily cleaned from inside the building.

Health effects

The severity of injury from Falling Between Levels depends on the mechanism of injury. The height of the fall and the surface/projections a falling person strikes will dictate the spread of harm outcomes.

Falling Between Levels cause bruising, puncture wounds, fractures, injury to internal organs, head, and spinal injuries. Other impact exposures from falls from heights of 7.5m include death, shock, bleeding, pelvic fractures, skull fractures and intracranial haemorrhage.

Almost any fall over six metres is classed as high energy trauma and will require specialist care. Falls from four storeys (approx. 15m) will result in a fatality in half of all cases and those over 18m almost all end in fatalities. Falls in under-fives can lead to long-term disabilities as well as mortality. Children under five years of age are more likely to be hospitalised by a fall. Children have a different centre of gravity to adults so are more likely to suffer head injuries when they fall.

Approximately 4,000 children under 15 years of age fall from height each year, causing around 10 deaths (some of this figure may be counted as Falling on Stairs etc.). Approximately 2,000 of these falls are in children under five years of age.

Falls from balconies, landings and windows are a common cause of Falling Between Levels. Despite low figures, Falling Between Levels are a leading cause of mortality in young people, who otherwise have a very low mortality rate. Falls are more likely to affect young adults up to the age of 30 years, those with learning disabilities and those intoxicated due to drug or alcohol misuse.

Older adults are least likely to fall between levels but suffer the greatest health effects, often due to pre-existing health issues and reduced bone strength. Other aspects of an older person's health may deteriorate following a fall. Reduced mobility during the recovery period after a serious fall can lead to other health conditions manifesting themselves and can contribute to a fear of further falls, affecting the movement and balance and potentially making secondary falls more likely, or decreasing the desire to move around. This may lead to a decline in health, potentially resulting in a mortality from other factors. These factors are recorded as the cause of death, but the fall triggered the sequence of events which ultimately led to the mortality. Reduced mobility can also cause social isolation contributing to feelings of loneliness and depression.

Causes

Accidental falls include falls by people who are in a diminished mental state due to dementia, drug or alcohol use, or being in a heightened mental state resulting in them falling accidentally. Young children are more at risk from a fall as they have more natural curiosity and a poorly developed sense of danger. Boys are more likely to fall than girls.

Placement of furniture can provide a route for young children to reach windows and overcome guarding, or they may climb the guarding itself. Dustbins and bicycles are sometimes placed on balconies, providing a means of climbing the guarding.

Approximately 80% of falls from windows were due to either a missing or malfunctioning window catch. Large opening areas for windows and low internal sill heights will increase the risk of falls. Where windows are above the ground floor, the ease of cleaning from the inside will affect likelihood of a fall. Windows which are easy to open may increase the likelihood of a fall by a child. Windows with particularly stiff or harder to reach opening mechanisms may also increase the risk of a fall (although this may be more properly assessed in relation to ergonomics).

Windows are opened to address environmental factors such as indoor living temperatures and air pollutants. Excessive heat, damp or inadequate ventilation of indoor air pollutants may impact on how often windows are left open.

Longer falling distances and the nature of the surfaces and objects/projections a falling person will strike all affect the mechanism of injury and severity of harm outcomes. Paved areas or railings will increase the harm outcomes from a fall, whereas grass and shrubbery will provide a softer impact.

Behavioural factors

Occupiers may remove window restrictors to achieve better levels of ventilation. They can also use deeper internal window boards (sills) as seats.

Relevant matters and baseline indicators affecting the likelihood and harm outcomes

Other hazards impacting the likelihood and/or harm outcomes

Collisions, Entrapment and Ergonomics – Aspects of this hazard may make Falling Between Levels more likely. Light fittings, cupboards or shelves may be sited over stairs and widows over stairwells may have controls which require awkward bending and reaching from a landing. These can increase the likelihood of a fall.

Excessive heat, damp and indoor air pollutants may increase the time which windows are left open.

Relevant baseline indicators (accompanying notes are in Appendix 1)

1.1 Externally, every foundation, roof, ridge line, flashing, fascia, soffit and bargeboard, exterior staircase, exterior wall/fence shall be safe to use and capable of supporting the intended design loads and load effects and shall be in a proper state of structural repair.

Internally, every wall, floor, ceiling, inside stair, porch, accessory structure, door, window and window glass shall be safe to use and capable of supporting the intended design loads and load effects, and shall be in a proper state of structural repair.

9.1 External yards, paths, steps, accessways and surrounds within the curtilage of the dwelling shall be in good repair, even and well drained. Accessways must be suitable non-slip surfaces, have adequate lighting and should not have slopes of sufficient gradient to present a falls risk. This

includes consideration to unevenness, trip risks and poor slip resistance, to any steps or surfaces within external space that is provided, to the front door, yard and garden.

Where there are drops of more than 300mm from paths, patios, steps, terraces or garden areas guarding will be necessary where there are high risks of falling.

All boundaries should be clearly defined and enclosed by well-maintained and suitable walls or fences. This also applies to structure, accessways, security doors and lifts.

11.5 All door and window frames and furniture shall operate properly and be in a good state of repair, with no open joints or compromised seals between the windows/doors and adjacent walls.

12.1 Every interior and exterior stairway, ramp, deck, porch, balcony walkway, terrace, landing and hall shall be maintained structurally sound, in good repair, properly anchored and capable of supporting the imposed loads.

13.1 Every stairway, porch, patio, landing, balcony walkway, terrace and hall located more than 600mm above an adjacent area shall have a structurally sound guard, between 900mm and 1100mm high, measured vertically from the floor. The guard shall be firmly fastened, capable of supporting normally imposed loads and in good condition. Balusters with a minimum thickness of 10mm shall be placed at intervals that do not allow passage of a sphere greater than 100mm in diameter. There shall be no climbable cross-pieces.

13.2 All windows with an opening section greater than 100mm, through which a person may fall a single storey or more, shall have a fall-prevention device that restricts opening to less than 100mm. It must be possible to overcome this restriction easily when the windows in question are required to be escape windows, under the building regulations.

14.2 Every hall, stairs and landing within the house, and every room used, or intended for use, by the occupant of the house shall have a suitable and adequate means of artificial lighting that is controllable and accessible which can allow lighting to be turned on and off and bulbs/fixtures to be changed and maintained safely. Two-way or PIR-activated lighting shall be provided to any internal staircase.

Other matters affecting the likelihood of a harmful occurrence include:

- Ease of window operation – degree of difficulty to use window catches and opening lights missing/defective catches.
- Sill heights – less than 1,100mm above floor level and/or lack of safety glass or guarding.
- Ease of cleaning – outer surfaces that are difficult to clean.
- Guarding on windows – lack of guarding to protect low windows or guarding which can be easily scaled by children

Other matters affecting the severity of the harm outcome include:

- Height above ground – the distance of a fall to the ground or next level.
- Nature of ground – the nature of the surface and any features which may be collided with.
- Non-safety glass - the lack of safety glass where appropriate in the window or guarding.

Preventative measures

Safety catches which reduce the likelihood of children opening a window or balcony door and opening restrictors to limit the openable area of a window (typically to 100mm) will reduce the likelihood of a fall. These should be fitted on all windows above the ground floor, or above a basement well, which have openable areas a child could climb through, particularly where the

internal sill is less than 1,100mm from floor level such as fire escape windows. It should be relatively easy for an adult to use these controls where they are required for escape in the case of a fire.

Glazing less than 800mm from the floor should be toughened or protected by a safety rail. Balconies, landings, and any drop over 300mm should be protected by guarding constructed such that a 100mm sphere cannot be passed through any part of the guarding below 1,100mm from ground/floor level. Guarding should be constructed to discourage children from climbing on it and be strong enough to support the weight of multiple people leaning on it. External guarding should be constructed of weatherproof and durable materials.

Window design should facilitate safe cleaning of the outer surface, without necessitating the use of a stepladder to be able to reach all parts of the window. It should be possible to clean upper opening lights with lower opening lights closed.

Other considerations for assessment of this hazard

All deficiencies which may contribute to the hazard must be considered, from any windows, balconies, landings, basement wells, roof terraces, raised walkways, changes in levels in gardens and yards, etc. both internally and externally, as part of a whole dwelling assessment for this hazard.

Further reading

British Standard BS6180 Barriers in and about buildings. Available at: www.bsigroup.com

British Standard BS8213-1 Windows, doors and rooflights. Code of practice for safety in use and during cleaning of windows and doors. Available at: www.bsigroup.com

British Standard BS6262-1, 3 & 4 Glazing for buildings. Available at: www.bsigroup.com

HM Government (2020) The Building Regulations 2010 Fire Safety – Approved Document B. Available at: www.gov.uk

HM Government (2013) The Building Regulations 2010 Protection from Falling, Collision and Impact – Approved Document K. Available at: www.gov.uk

4. Fire and Explosions

This hazard profile should be read in conjunction with "The Housing Health and Safety Rating System Operating Guidance (Part 3): A Supplementary Guide to the Hazard of Fire and Explosions." The Part 3 Guidance expands upon the areas covered by this hazard profile and provides further information on relevant matters affecting the likelihood and harm outcomes within tall/complex buildings. A list of the relevant baseline indicators for this hazard are included in Appendix A of this part of the Guidance and Appendix B of Part 3 of the Guidance.

Description of the hazard

This hazard covers threat to health from exposure to uncontrolled fire and associated smoke and fumes at a dwelling. It also covers the threat from the blast of an explosion and flying debris generated by an explosion. The hazard covers the partial or total collapse of a structure as a result of a fire or explosion. The hazard covers exposure to heat and hot gases from uncontrolled combustion.

The hazard does not cover harms relating to controlled combustion such as that used for cooking and space heating. These are addressed by the hazards Flames, Hot Surfaces, Etc. and Indoor Air Pollutants.

Explosions include those caused by combustion and those caused by failure of vessels containing heated water and steam.

Vulnerable group and the national average scores

Fire and Explosions – Average likelihood and harm outcomes for all persons **aged 60 years and over.**							
Dwelling type and age		Average likelihood 1 in	Spread of harm outcomes				Average HHSRS scores
			Extreme %	Severe %	Serious %	Moderate %	
Houses	Pre 1920s	5,000 (5,980)	10	2	10	78	21 (25) Low risk
	1920-45	5,000 (8,400)	20	2	5	73	41 (21) Low risk
	1946-79	5,000 (8,280)	10	2	10	78	21 (12) Low risk
	Post 1979	5,000 (7,508)	10	0	10	80	21 (13) Low risk
Flats	Pre 1920s	2,000 (2,275)	10	0	5	85	51 (43) Low risk
	1920-45	5,000 (4,602)	10	5	5	80	21 (23) Low risk
	1946-79	3,000 (3,693)	10	0	5	85	34 (28) Low risk
	Post 1979	3,000 (2,947)	5	0	5	90	17 (19) Low risk
All dwellings		**5,000 (6,342)**	**10**	**2**	**5**	**83**	**21 (19) Low risk**

Note – Scale point values are shown, with the national average values for likelihoods and their corresponding final scores (determined using actual harm outcome values rather than scale point values) provided in brackets. Data quality for these averages is strong. There is good data on fires and their consequences covering England. The data includes ages of victims, the nature and severity

of injury and clear identification of the setting. The infrequent occurrence of explosions means that explosions data may be weaker. The data have been combined to provide the above averages table.

Summary box – Fire and Explosions

Vulnerable group – Those aged 60 years and over

Groups other than vulnerable group at greater risk – Single parent households, children, those who drink and/or smoke, 16-25 year olds including students, those living alone and persons with disabilities or sensory impairments.

Main issues to look for – Missing or inadequate smoke/heat detection, multiple cooking facilities, inadequate separation, problems with the route of escape, lack of regular inspection of electrical wiring/appliances and gas appliances, unsafe gas storage, reliance on portable heaters, building height and length of escape to a place of safety.

Risk reduction measures – Mains wired, interlinked smoke/heat detection appropriately designed for the dwelling, adequate separation, particularly for cooking rooms and protection of the route of escape, regular inspection of electrical wiring/appliances and gas appliances/storage. A full central heating system will avoid the use of portable heaters. When considering risk reduction measures, consider occupier behaviour as this is the main cause of fires. The type of occupancy expected at the property, potential for ignition, expected mobility and behaviour following a fire starting/false alarms will all influence the level and type of remedial measures required.

Health effects

The most common cause of death from fire is being overcome by gas or smoke, which caused death in a 30% of fire-related fatalities in 2019-20, closely followed by burns (29%). A combination of burns and being overcome by gas and smoke accounted for 20% of fire-related fatalities (from all types of fire). Of the non-fatal casualty figures, 48% were overcome by gas or smoke, 20% suffered burns and 16% suffered ‘other breathing difficulties.’

Fires are usually contained to the location in which they started. In 2019-20 only 2% of serious fires affected the whole building and less than 10% of purpose-built high-rise flat fires spread beyond the room of origin. Occupier mortality was most commonly associated with fires in living rooms and bedrooms.

Older people (particularly males) are the age group most at risk from fire. Other groups more at risk from fire and explosions include disabled persons (physical or mental health related disabilities), single parent households, children, those who drink alcohol and smoke and 16-24 year olds, including students. Those living in single occupancy dwellings without a rescuer accounted for 70% of non-fatal casualties from fire in 2018-19 and 72% of fatalities from dwelling fires.

Explosions are rare, but when they do occur health effects can be extreme. There are around ten mortalities from dwelling explosions per year and several hundred non-fatal injuries from those struck by debris. Injuries are typically crushing injuries, bruising, puncture wounds, fractures and head and spine injuries. Burns or scalds may also occur.

Causes

Fires and fire related injuries have been reducing reasonably consistently since the millennium. Total fires attended by the Fire and Rescue Services have fallen from approximately 474,000 in 1999-2000 to 154,000 in 2019-20. In 2019-20 there were 6,910 non-fatal casualties from all types of fire. Where mortalities occurred, they were most likely to occur in dwelling fires. The likelihood of suffering some form of harm or a death as a result of a dwelling fire in England is relatively low.

A range of factors have caused this reduction including improved fire prevention measures, for example, the improved use of smoke detection and separation in existing and new residential structures. Behaviours have changed including a reduction in the use of chip pans and an overall reduction in the levels of smoking and drinking/using drugs amongst adults. There have also been improvements in fire safety in items found within dwellings such as furnishings and electrical appliances.

In 2019-20 cooking appliances were the primary cause of fires making up almost half of domestic fires. Fires associated with smokers' materials caused less than 10% of fires but were the main source of fatalities, causing around a quarter of fire related deaths (with cooking appliance fires causing 14% of deaths). Malfunction of electrical and space heating appliances and leads caused 15% of accidental dwelling fires. Textiles, upholstery and furnishings were the main materials responsible for development of dwelling fires, followed by food.

Just under a quarter of fires occurred where there was no smoke alarm present, and a similar proportion of fatal fires had no smoke alarm present. Mains-powered alarms have a lower failure rate than battery powered alarms, but both can fail to operate during a fire for various reasons including:

- missing battery
- defective system
- system not set up correctly
- system damaged by fire
- fire not close enough to detectors
- system turned off, and
- detector(s) being removed.

Failures of detection systems or lack of a detection system will increase the likelihood of harm and the risk of more serious harm outcomes as fires are able to develop further before they are discovered. Smoke alarms fail in just under a third of dwelling fires.

Building height increases the risk to health from fire. Structures more than two floors in height are too high for occupiers to jump from the windows, so they must rely on the internal escape route(s). Tall multiple-occupancy properties and flatted developments present longer internal escape routes to exit the building, increasing the need for compartmentation, protection of the escape route and early warning of the need to evacuate. More modern purpose-built self-contained flats are likely to be constructed with each flat being surrounded by materials which are designed to resist the spread of fire for at least an hour. Refurbishment, energy efficiency and maintenance works may breach these barriers allowing fire to spread through or around flats, allowing it to move around the building.

Explosions are most likely to be caused by mains or stored gas. Water vapour explosions account for less than 5% of all explosions.

Behavioural factors

Human behaviour is a major factor in the occurrence of domestic fires. Cooking causes most fires and is the dominant cause of all dwelling fires, followed by smoking. Incense and candle use, the overloading of electrical wiring, outlets and extension cables and misuse of equipment (including placing items too close to space heaters) are also relatively common sources of ignition in dwelling fires.

Occupier behaviour following the discovery of a fire can affect the harm outcomes. Closing doors to prevent the spread of the fire and related smoke and fumes will improve health outcomes. Timely evacuation of the dwelling also reduces the severity of harm outcomes. This may be influenced by a variety of factors such as remaining asleep, being sensorially impaired and failing to respond to warning of a fire, lack of familiarity with the premises, and failure of other residents to warn all occupiers of a fire and ensure evacuation or rescue.

Assessors must restrict their considerations to deficiencies at the dwelling being assessed and how expected occupier behaviour will expose the occupiers to harm arising from those deficiencies. Exceptional behaviour such as hoarding may lead to accumulations of combustible items and these may block escape routes, but this cannot be considered as part of the HHSRS assessment for this hazard. Assessors may have to seek resolution of such issues through other means.

Relevant matters and baseline indicators affecting the likelihood and harm outcomes

Other hazards impacting the likelihood and/or harm outcomes

Crowding and Space – Where a dwelling is overcrowded there will be an increased likelihood of a fire starting and more residents will be exposed to the fire, smoke and fumes.

The baseline indicators and relevant matters lists below should be read in conjunction with the more complete summary in "The Housing Health and Safety Rating System Operating Guidance (Part 3): A Supplementary Guide to the Hazard of Fire and Explosions."

Relevant baseline indicators (accompanying notes are in Appendix 1)

8.1 Internal doors leading between areas of a single dwelling must provide a sufficient barrier to the spread of smoke and fire (where appropriate). Any glazing in doors must respond safely to collision and must be designed for functionality to avoid strains or entrapment when in use, and must be maintained in good repair. All bathrooms and WC room doors must be fitted with a suitable lock and must not contain clear glass.

9.1 External yards, paths, steps, accessways and surrounds within the curtilage of the dwelling shall be in good repair, even and well drained. Accessways must be suitable non-slip surfaces, have adequate lighting and should not have slopes of sufficient gradient to present a falls risk. This includes consideration to unevenness, trip risks and poor slip resistance, to any steps or surfaces within external space that is provided, to the front door, yard and garden.

Where there are drops of more than 300mm from paths, patios, steps, terraces or garden areas guarding will be necessary where there are high risks of falling.

All boundaries should be clearly defined and enclosed by well-maintained and suitable walls or fences. This also applies to structure, accessways, security doors and lifts.

11.1 Adequate external lighting shall be provided to all means of access including entrances and external refuse stores, providing good visibility when there is no daylight.

11.2 Access doors to dwellings should have adequate locks. Doors must be solid external grade and fitted with a minimum of a mortice deadlock to BS 3621, openable from the inside without a key. There must be a means for occupiers to view visitors without opening the door, either by means of a viewer within the door or by a glazed pane adjacent or close to the entrance door. All rear doors should be fitted with a mortice dead lock to BS 3621 or 2 security bolts.

12.1 Every interior and exterior stairway, ramp, deck, porch, balcony walkway, terrace, landing and hall shall be maintained structurally sound, in good repair, properly anchored and capable of supporting the imposed loads.

12.2 Internal and external stairs must be safe, secure, in sound condition, free from defects and projections and well maintained. External stairs must be designed to allow water to drain away from the steps.

13.2 All windows with an opening section greater than 100mm, through which a person may fall a single storey or more, shall have a fall-prevention device that restricts opening to less than 100mm. It must be possible to overcome this restriction easily when the windows in question are required to be escape windows, under the building regulations.

14.2 Every hall, stairs and landing within the house, and every room used, or intended for use, by the occupant of the house shall have a suitable and adequate means of artificial lighting that is controllable and accessible which can allow lighting to be turned on and off and bulbs/fixtures to be changed and maintained safely. Two-way or PIR-activated lighting shall be provided to any internal staircase.

14.3 Light switches that control ceiling- or wall-type electric light fixtures shall be located conveniently in each room for safe use.

14.4 All electrical installations, including fixtures and fittings, must be maintained in good repair.

14.5 Gas appliances and flues provided for occupants are safe for continued use.

14.6 Every habitable room shall have at least 2 separate and remote double electric sockets that are suitably located for use. Kitchens shall have at least 4 suitably located double sockets.

15.4 Every dwelling shall have a properly installed heating system in good and safe working condition that is capable of safely and adequately heating all habitable rooms, bathrooms and WC rooms. The system must be capable of heating the main living area to 21°C and the remaining habitable rooms to a temperature of 18°C when the external temperature is minus 1°C, and the system should not allow the temperature to exceed 25°C in any room during the heating season.

19.1 Any furniture or soft furnishings that are provided by the landlord should comply with the Furniture and Furnishings (Fire) (Safety) Regulations 1988, inclusive of being correctly labelled for fire resistance.

19.2 All electrical equipment supplied by landlords in rented residential premises is safe and compliant with current UK requirements for safety of domestic electrical products; all electrical appliances supplied by the landlord are subject to testing in line with the IET Code of Practice for In-service Inspection and Testing of Electrical Equipment (Fifth Edition) unless they are under one year old and display a UKCA/CE marking.

19.3 An annual gas safety check should have been undertaken within the last 12 months with a satisfactory result. Any heating provided by LPG shall be inspected annually by a suitably qualified engineer.

19.4 The electrical installation should have been inspected and tested within the last 5 years.

19.5 There should be sufficient, properly designed and appropriately sited smoke and heat detectors with alarms in every dwelling. These should be properly maintained and regularly tested (additional guidance provided in appendix 1).

19.6 The escape route from bedrooms through habitable rooms should either be avoided, or mitigated, by other provisions.

19.7 Egress through doors/windows that are required for means of escape should not require the use of a key or a code.

Many other aspects of the building design and layout, its structural elements, its fixtures, fittings and fixed appliances and its maintenance that do not readily transfer into a simple baseline indicator are likely to be relevant to the assessment of the fire and explosion hazard using the HHSRS, either in individual dwellings or within the common parts of multi-occupied buildings. A simple list of these factors, given to aid a structured consideration of the relevant matters, is provided below. However, it will often be necessary to consider the guidance in Part 3, and more specific guidance for specific building types.

> Note:
> In the case of smaller standalone dwellings, the fire safety measures required to achieve an adequate level may be very few and simple whereas, in a larger multi-occupied building, the requirements are likely to be extensive and will include separation between dwellings and the common parts.

Other matters affecting the likelihood of a harmful occurrence include:

Adequate control/elimination of sources of ignition

- Electrical sources of ignition, in addition to the requirements set out in baseline indicators, and any apparent defect, should be considered.
- Arson: consider physical security measures and presence and proximity of static fire loads to the building.
- Fixed heating: in addition to the provisions detailed in baseline indicators, any apparent defect should be considered.
- Cooking: consider proximity of cooking appliances to fixed combustible materials (e.g. curtains).
- Clothes drying facilities – lack of indoor facilities.

Other matters affecting the likelihood and severity of harm outcomes include:

Adequate means of escape

- Inadequate means of escape - dwelling layout, travel distance, operation of exits, obstructions
- Non-fire resisting fabric – allowing fire to spread.
- Smoke permeable fabric – allowing smoke to spread.
- Fire stops to cavities – lack of, allowing fire to spread.

- Disrepair to fabric – walls, ceilings and/or floors may allow smoke, fumes and/or fire to spread.
- Internal doors – insufficient doors or doors of inappropriate materials or ill-fitting doors.
- Self-closers – lack of effective self-closers where appropriate.
- Artificial lighting – including emergency escape lighting

Measures to limit fire spread

- Fire-fighting equipment – lack of adequate and appropriate means of primary firefighting (in most domestic settings, a fire blanket is sufficient)

Adequate control/elimination of explosion hazards

- Unauthorised gas supply – the supply of gas from a non-authorised supplier.
- Siting of gas tanks – inappropriate siting of LPG containers or tanks.
- Lack of a flame arrest feature (thermocouple) on gas cookers.
- Ventilation – lack of appropriate means of ventilation, taking account of the type of gas used.
- Hot water storage tank – tank of greater than 3 gallons (15 litres) connected directly to the mains water supply.
- Vented hot water system – inadequately sized and/or blocked vent to system.
- Unvented hot water system – lack of or defective non self-resetting thermal cut-out and/or temperature relief valve to unvented system.

Preventative measures

The dwelling design, construction and condition should limit the chances of a fire starting, limit the spread of a fire and related smoke and fumes, provide detection and warning of a fire starting and provide a safe means of escape.

Prevention of ignition can be achieved through precautions such as safe installation and where necessary, regular testing of electrical installations, fuel combustion appliances and electrical equipment through the appropriate certification and testing regimes. Mains or bottled gas should be supplied by an appropriately authorised organisation and stored in compliance with relevant guidelines. Gas pipework and appliances must be installed by a Gas Safe registered contractor, regularly serviced and inspected annually, or with any changes to the installations. Where liquified petroleum gas is used it is heavier than air so there should be adequate low-level ventilation or other means of allowing escaping gas to drain away safely. Storage containers should be sited away from any possible sources of ignition.

Cookers are the most common source of ignition in a domestic fire. They should be sited away from curtains and other flammable items. Rooms with cookers in should be treated as high-risk rooms for fire. These rooms should have a close-fitting door of appropriate materials and a heat detector sited away from the cooking appliance. Smoke detectors may also be used in bedsits containing cooking facilities to warn the occupier of a fire, but heat detectors should be used in an interlinked fire detection system to reduce the impact of false alarms from burning food.

Providing adequate numbers of electrical sockets will reduce the use of extension leads and overloading of sockets. Provision of an adequate, preferably wet central heating system under the control of the occupiers will reduce the use of portable heating appliances which may cause combustion when placed too close to flammable items.

Where internal doors are required to limit the spread of fire they should be constructed of appropriate materials and be properly fitted. Internal partitions which are required to limit the spread of fire should be appropriately constructed, with measures in place to address weaknesses in the separation caused by services (pipework, cables, etc.).

Assessors should consider the route of escape from the dwelling for all occupiers. The design of the building may use ventilation of smoke and gases to keep the route of escape clear for as long as possible (e.g. in stairwells of some blocks of flats). Protection of the route of escape from fire, smoke and gases for a suitable time period should be a primary focus when determining fire safety measures.

Adequate, appropriate and safe means of escape from fire should be available from all parts of a building and be kept free from obstruction. Emergency lighting will help those navigating the escape route(s). Escape routes requiring movement through other rooms before entering landings/corridors leading out of the dwelling should be avoided and these are particularly dangerous where the occupier must exit the dwelling through a high-risk room such as a kitchen or living room. In such situations escape windows are a poor option as they are difficult to navigate for those with mobility impairments and jumping from escape windows is an inherently dangerous action.

Functional smoke/heat detection and alarms provide early warning to occupiers allowing them to escape before they suffer harm from the fire. These should be mains wired, with a battery backup. Long-life battery powered systems are a temporary solution. Systems should be interlinked where appropriate and be designed in accordance with the structure(s) and situation the dwelling is located within and the anticipated occupation of the dwelling. Fire detection systems should be properly maintained and regularly tested.

Fire blankets should be provided in kitchens and be sited in a practical location for ease of use when they are needed. Fire extinguishers can be provided, but their use encourages occupiers to remain in the building when they should be evacuating, increasing the risk of being overcome by smoke/fumes and heat.

To prevent explosions caused by heated water, hot water systems should be installed in accordance with the relevant regulations and be well maintained. Vented systems should have an adequately sized vent pipe sufficient to allow steam to escape upon failure of a thermostat. Unvented systems should be provided with a non-self-resetting thermal cut-out and one or more temperature relief valves. Safety devices should be regularly tested.

Other considerations for assessment of this hazard

Hazard assessment should consider first the likelihood of a fire starting and once started, how likely it is the fire will go unnoticed, and the likelihood of it spreading. If a fire spreads the severity of harm outcomes will be worse. Most fires are detected and extinguished before injury occurs.

Assessors should consider the causes of ignition in the dwelling, means of detection and warning, level of separation and ability of the structure to control the spread of fire and smoke/fumes, and the length and ease of navigating the means of escape. Emergency lighting will improve escape times, as will information for occupiers and visitors, particularly where they may be unfamiliar with the premises. Obstacles on the route of escape, potentially confusing escape routes and key or code operated doors will all impede escape. Firefighting equipment (e.g. fire blankets) can be of assistance in controlling small fires but escape to a place of safety is paramount.

Assessors should be aware that the focus in the HHSRS on the likelihood of initial ignition of an uncontrolled fire, as well as the risk to occupiers once a fire has started, is slightly different to the approach taken by some other types of fire risk assessment, which may have their focus on managing the risk to occupiers once a fire has occurred.

When assessing Fire and Explosion hazards and determining measures to reduce the risk to health, input from a suitably qualified person and/or the Fire and Rescue Service may also be required. More typical building types and layouts may be subject to pre-agreed protocols with the Fire and Rescue Service. When dealing with HMOs or in any situation involving the common parts of a building containing one or more flats, assessors should liaise with their local Fire and Rescue Service.

If the release of uncombusted fuel gas is being considered as part of a Fire and Explosions hazard, then an assessment under Indoor Air Pollutants should also be considered.

Risk reduction measures for the Intruders and Falling Between Levels hazards should be considered alongside those for Fire and Explosions, as measures to reduce risk to health from these hazards may conflict with those required to ease escape from a dwelling in the case of a fire.

This hazard is an amalgamation of two hazards from the last version of HHSRS. Assessors should conduct a whole dwelling assessment covering all aspects of this hazard, but if there are issues affecting just one element of the hazard it is useful to understand what proportion of the national average likelihood is attributable to each of these areas. Approximately four percent of the harms for the hazard are from explosions. The rest are from fire.

Further reading

As with the above sections some appropriate sources have been provided below. However, there is further guidance detailed in Part 3.

BIP 2044:2020 - The Design, Installation, Commissioning and Maintenance of Fire Detection and Fire Alarm Systems in Domestic Premises. A Guide to BS 5839-6:2019. Available at: www.bsigroup.com

British Standard BS5266-1:2016 – Code of practice for the emergency lighting of premises. Available at: www.bsigroup.com

British Standard BS5839-6 – Fire detection and fire alarm systems for buildings. Code of practice for the design, installation, commissioning and maintenance of fire detection and fire alarm systems in domestic premises. Available at: www.bsigroup.com

HM Government (2010) The Building Regulations 2010 Fire Safety – Approved Document B. Available at: www.gov.uk

HM Government (2010) The Building Regulations 2010 Combustion Appliances and Fuel Storage Systems – Approved Document J. Available at: www.gov.uk

Office for National Statistics (2020) Detailed analysis of fires attended by fire and rescue services. London: HMSO

5. Flames, Hot Surfaces, Etc.

Description of the hazard

This hazard covers the threats of:

- burns from contact with controlled flames or fire, or contact with hot objects, either directly or through heating/ignition of clothing, and
- scalds from contact with hot liquids and vapours.

It does not include burns and scalds resulting from exposure to uncontrolled combustion and explosions. These are covered by the Fire and Explosions hazard.

Vulnerable group and the national average scores

Flames, Hot Surfaces, Etc. – Average likelihood and harm outcomes for all persons **aged 5 years and under.**							
Dwelling type and age		Average likelihood 1 in	Spread of harm outcomes				Average HHSRS scores
			Extreme %	Severe %	Serious %	Moderate %	
Houses	Pre 1920s	200 (183)	0	1	20	79	39 (37) Low risk
	1920-45	200 (197)	0	5	20	75	59 (42) Low risk
	1946-79	200 (161)	0	1	20	79	39 (43) Low risk
	Post 1979	200 (237)	0	1	20	79	39 (29) Low risk
Flats	Pre 1920s	300 (253)	0.1	5	20	74.9	42 (42) Low risk
	1920-45	300 (315)	0.2	0	20	79.8	29 (23) Low risk
	1946-79	200 (166)	0	2	20	78	44 (60) Low risk
	Post 1979	100 (142)	0	0	30	70	97 (62) Low risk
All dwellings		**200 (187)**	**0**	**1**	**20**	**79**	**39 (40) Low risk**

Note – Scale point values are shown, with the national average values for likelihoods and their corresponding final scores (determined using actual harm outcome values rather than scale point values) provided in brackets. Data quality is satisfactory with hospital episode statistics distinguishing between exposure to different surfaces, flames and vapours. Without general practice data, moderate harms were estimated based on ratios between moderate harms and other harms for this hazard.

Summary box – Flames, Hot Surfaces, Etc.

Vulnerable group – Those aged 5 years and under

Groups other than vulnerable group at greater risk – Older people, those with pre-existing disabilities or health conditions, households on low incomes and ethnic minorities.

Main issues to look for – Small kitchens or poorly laid out cooking facilities, fireplaces which still are being used, solid fuel heating appliances, unguarded heating pipework at low levels, lack of thermostatic mixer devices on showers and bath taps.

Risk reduction measures – Guarding on hot surfaces or hot water/space heating appliances, thermostatic mixer devices on showers and bath taps, redesign of kitchen facilities.

Health effects

A little over 15,000 injuries involving burns and scalds occur each year in domestic environments. Burns and scalds vary in magnitude. The nature of the injuries, types of treatments and potential for complications such as infection of the wound site mean that a large proportion of these injuries will require significant medical treatment and some result in fatalities. Approximately a fifth of injuries will require some form of hospital treatment.

The severity of harm is dependent on the depth and the area covered. This in turn is influenced by the temperature of the hot object or liquid, the duration of exposure to the heat source, the time taken to cool the affected tissue after exposure and the corrective action taken after the harmful event. The nature of the hot liquid or material a person comes into contact with will influence the heat transmission.

Even superficial burns and scalds are likely to result in scarring. The pain from the injury and subsequent disfigurement can cause lasting psychological harms such as Acute Stress Disorder or Post-Traumatic Stress Disorder for the victim, and psychological harms for those close to the victim. Parents of burned children may suffer from anxiety, depression, reduced self-confidence, and lack of energy.

Children and older people are the most like to be affected by this hazard. Young children have less risk awareness than adults. They have a relatively small body area, and their small height means they are commonly below hot objects. They have thinner skin, lower blood volume and can suffer higher levels of distress, increasing the severity of harms when they occur. Scald injuries in children under five years usually affect the front of the body including the face, arms and upper trunk. Older children are more likely to result in injuries to the lower trunk, legs and hands.

Older people may have pre-existing medical conditions such as arthritis and dementia which make a harmful occurrence more likely. Reduced reaction times and slower healing will increase the severity of harms when they occur. Health outcomes from burns are usually more serious than for all other age groups.

Causes

Scalds account for half of childhood burn injuries. These are most likely to occur in the kitchen. The contents of cooking pans and hot oil may also be spilt on children from chip pans and deep fryers.

Half of all scald injuries are caused by a hot beverage. The most common mechanism of injury is from a young child reaching up and pulling over a vessel of hot liquid.

Excessively hot bath or shower water is another source of exposure. Hot water temperatures above 44^{o}C present a risk of scalding, particularly to young children. Poor supervision of very young children when bathing may result in burns, but these are usually superficial in nature. Older adults with psychomotor disorders are also more prone to this type of exposure. Their injuries tend to be more serious than children's, with more extensive and deeper burns and a greater chance of mortality. In adults the lower parts of the body are most likely to be injured.

Cookers and stoves also cause injuries when occupiers come into contact with heated parts. Burns of this type are most likely to affect the hands and most likely to occur in under-fives. Fires and heaters may cause burns from occupiers falling into them or from clothing catching fire. This may also occur when adults are using gas cookers.

Sharing of kitchen facilities with other households and kitchens with poor layouts or inadequate working space will increase the chance of accidental injury. Kitchen facilities in bedsits may be inadequately separated from living or sleeping areas. Inadequate provision of sockets in kitchen areas may also result in kettles and other appliances being sited in non-kitchen areas, contributing to the potential for a harmful occurrence. Failure to make adequate provision for cooking facilities can result in poorly sited or improvised facilities which increase the risk of harms.

Where a kitchen is remote from the unit of accommodation or eating area, there will be an increased risk of burns and scalds associated with carrying hot food and beverages from the kitchen to the accommodation or eating area. This will be increased where obstacles such as stairs are encountered.

Burns/scalds are more likely in children from ethnic minorities, households on low incomes and those with pre-existing disabilities or health conditions. Adults from ethnic minorities and those with pre-existing disabilities or health conditions are more likely to suffer burns in a domestic situation. Burns are slightly more likely in boys than in girls.

Behavioural factors

HHSRS inspections should consider the risks posed by the dwelling itself. It can be assumed that children may not always be adequately supervised, exposing them to the hazard.

Relevant matters and baseline indicators affecting the likelihood and harm outcomes

Other hazards impacting the likelihood and/or harm outcomes

Crowding and Space – Overcrowded conditions will increase the likelihood of all forms of domestic accident and kitchens with inadequate space will increase the chance of accidents.

Relevant baseline indicators (accompanying notes are in Appendix 1)

3.2 An adequate supply of heated running water shall be provided to sinks, wash-hand basins, baths and showers. Hot water storage tanks shall be set at a minimum temperature of 60°C. At bath taps and shower heads, the maximum temperature shall be 45°C to prevent accidental scalding.

5.3 Sufficient work surface shall be provided for food preparation. Sufficient cabinets and/or shelves sufficient to store occupant or visitors' food that does not require refrigeration, and eating, drinking and food-preparation equipment. Cabinets shall have well-fitting doors and no gaps between any surfaces. The work surface, work-surface edges, cabinets and shelves shall be of sound construction and furnished with surfaces that are impervious to water, smooth and cleanable.

5.4 For cooking food, a 4-ring hob (or 2-ring in bedsit-type accommodation) with oven and grill properly installed with all necessary connections for safe and efficient operation, which shall be maintained in good working condition.

5.5 Where an oven or hob is not provided, there must be a dedicated space with a suitable connection to either gas or electricity that meets the requirement of the relevant regulations.

13.3 Any open fires or flames as a source of heat must be adequately guarded to ensure any accidental falls or trips do not result in contact with the open flames. Where there is risk of prolonged contact with hot surfaces of more than 43oC, adequate guarding must be provided to prevent contact.

14.5 Gas appliances and flues provided for occupants are safe for continued use.

14.6 Every habitable room shall have at least 2 separate and remote double electric sockets that are suitably located for use. Kitchens shall have at least 4 suitably located double sockets.

15.2 Hot water cylinder, if present, must be insulated with a minimum 50mm jacket if not pre-insulated, and it must be fitted with a tank thermostat.

15.4 Every dwelling shall have a properly installed heating system in good and safe working condition that is capable of safely and adequately heating all habitable rooms, bathrooms and WC rooms. The system must be capable of heating the main living area to 21°C and the remaining habitable rooms to a temperature of 18°C when the external temperature is minus 1°C, and the system should not allow the temperature to exceed 25°C in any room during the heating season.

15.5 Heating and hot water must be capable of being controlled effectively and timed to operate by the occupiers.

Other matters affecting the likelihood of a harmful occurrence include:

- Unprotected hot surfaces – exposed surfaces to fixed appliances or pipework with surface temperatures of 43^{o}C or more.
- Thermostatic taps – no thermostatically controlled taps or incorrectly set thermostatically controlled mixer taps or anti-scald devices.
- Kitchen layout – poor layout or inadequate space to kitchen, in particular where cooker or worktop is sited close to a door or thoroughfare.
- Worktop space by cookers – lack of worktop space next to cookers and on either side of hobs.
- Inadequate separation – of kitchen from living or sleeping areas.

Other matters affecting the severity of the harm outcome include:

- Surface/liquid temperature – the temperature of the hot liquid or surface.
- Exposure – the length of time exposed to the heat source.

Preventative measures

There should be adequate guarding of any open flame and hot surfaces on space and water heating appliances. The temperature of exposed surfaces of radiators, pipework, hot water tanks, taps, storage, and electric convector heaters should be limited to a maximum of 43^{o}C or be appropriately guarded where a person (usually a child or older person) could become trapped against the hot surface. If surfaces are likely to become particularly hot such as those on a fireplace or wood burning stove the room layout and guarding arrangements should limit any unintentional contact with those surfaces.

Hot water heating, storage and distribution systems will need to be kept above 60°C to prevent the development of *Legionella*. Thermostatic mixer devices can be fitted to outlets to deliver water between 43°C and 45°C. This is more important for baths and showers than for wash hand basins and sinks. Kitchen sinks may require higher water temperatures. Instantaneous boiling water taps are found in some kitchens. These should be designed and sited to prevent accidental operation. Hot water taps in kitchens should be limited to not more than 60°C.

Kitchens should be of adequate size and layout to ensure that cookers and worktops are safely sited away from doors, thoroughfares, and other potentially hazardous areas. They should be designed for the expected number of users, to limit the chances of collisions involving hot items.

Where accommodation houses particularly high-risk groups such as sheltered housing for older people, those with mental health conditions and learning difficulties, the surface temperature of accessible heating appliances and pipework should be a maximum of 43°C or it should be appropriately guarded/located to prevent burns.

Other considerations for assessment of this hazard

Assessors should consider burns and scalds associated with the dwelling structure, fixtures, fittings and appliances. Assessors should weigh the extent to which a harmful occurrence would be attributable to the deficiencies in the dwelling and the likely exposure to those causes of harm resulting from routine occupation of the dwelling.

Further reading

HM Government (2021) The Building Regulations 2010 Sanitation, Hot Water Safety and Water Efficiency – Approved Document F. Available at: www.gov.uk

HM Government (2010) The Building Regulations 2010 Combustion Appliances and Fuel Storage Systems – Approved Document J. Available at: www.gov.uk

The Health and Safety Executive web site contains safety alerts and guidance on hot water systems and *Legionella* which has relevance in a domestic environment (see the web site at www.hse.gov.uk).

6. Collisions, Entrapment and Ergonomics

Description of the hazard

This hazard covers risks of physical injury from operation of or movement around parts of the dwelling. It includes:

- trapping body parts in architectural features such as doors
- collision with objects such as architectural glazing, windows, low ceilings and doors, and
- physical strain associated with functional space and the use of the dwelling (e.g. door handles which are difficult to turn, or window catches which are hard to reach).

Falls caused through occupiers standing on portable steps or furniture to operate difficult to access window catches, or to access high cupboards, shelving and hard to reach fittings which may need occasional maintenance (such as light fittings and smoke alarms) should be dealt with under this hazard. Where an ergonomic hazard is caused as a result of trying to avoid or negotiate another hazard such as a fall hazard, an assessment should be undertaken for both hazards.

Vulnerable group and the national average scores

Collisions, Entrapment and Ergonomics – Average likelihood and harm outcomes for **persons of all ages.**							
Dwelling type and age		Average likelihood 1 in	Spread of harm outcomes				Average HHSRS scores
			Extreme %	Severe %	Serious %	Moderate %	
Houses	Pre 1920s	20 (22)	0	0.2	5	94.8	132 (113) Moderate risk
	1920-45	20 (23)	0	0.2	5	94.8	132 (108) Moderate risk
	1946-79	20 (17)	0	0.1	5	94.9	127 (140) Moderate risk
	Post 1979	20 (23)	0	0.2	5	94.8	132 (111) Moderate risk
Flats	Pre 1920s	50 (42)	0	0.1	5	94.9	51 (54) Low risk
	1920-45	50 (44)	0	0.1	5	94.9	51 (48) Low risk
	1946-79	20 (24)	0	0.2	5	94.8	132 (106) Moderate risk
	Post 1979	20 (18)	0	0.1	10	89.9	200 (182) Moderate risk
All dwellings		**20 (21)**	**0**	**0.2**	**5**	**94.8**	**132 (121) Moderate risk**

Note – Scale point values are shown, with the national average values for likelihoods and their corresponding final scores (determined using actual harm outcome values rather than scale point values) provided in brackets. Overall, there is a reasonably strong evidence base to underpin the above figures. Data quality is satisfactory, with hospital episode statistics distinguishing between accidents involving striking against or being struck by different types of objects. A limitation of the data was that the hospital episode data did not distinguish between where accidents occurred at home and elsewhere, except where vehicles were involved. This made it difficult to attribute harms to domestic situations.

Summary box – Collisions, Entrapment and Ergonomics

Vulnerable group – All ages

Groups other than vulnerable group at greater risk – All age groups are affected by this hazard, but children under ten years of age are far more likely to suffer injury from collision and entrapment than any other group. Children and young adults are more likely to collide with door glazing. Older people and those living with cognitive impairment are more likely to suffer injury from poor ergonomics in the domestic environment.

Main issues to look for – Glass panes in doors, stiff, hard to operate fixtures and fittings, powerful self-closing mechanisms on doors and gates, inadequate indoor living space (particularly in kitchens and bathrooms), damaged sash cords or poorly balanced sash weights, cupboards, shelves and light fittings which are difficult to access, low ceilings or low projections which someone may walk into.

Risk reduction measures – Repair or replacement of stiff, hard to operate controls for fixtures and fittings (particularly on taps, doors and windows), close any gaps over 100mm in guarding, fit guarding on any windows which open over paths, provide visibility strips on large areas of glazing, ensure glazing in doors or glazing at less than 800mm from floor level is protected or able to withstand impacts, move shelves, cupboards and light fittings to more accessible locations and install finger-pinch protection devices (particularly on self-closing doors and gates). Lack of functional space may require larger changes to the structure or design of the dwelling.

Health effects

Collisions are the greatest cause of accidents in children. Entrapment and collision injuries in children under ten years of age are most commonly associated with doors and gates. Mechanisms of injury are likely to include trapping part of the body causing fingertip or nail injuries (sometimes with fractures) and movement related accidents, causing collisions with doors and gates. Severe harms are more likely in children from lower socio-economic backgrounds and are more likely to occur in boys than girls.

Young adults and children are at greater risk from harms associated with collision and entrapment associated with architectural glazing and windows. Adults of all ages are at risk of collision with low architectural features (e.g. low ceilings in attic conversions). People suffering from cognitive decline (e.g. Alzheimer patients) may display a diminished capacity to react to obstructions in their environment, making impacts more likely.

Harms from this hazard extend to psychological impacts following the initial injury. Injured children can experience loss of confidence, flashbacks, loss of motivation, self-consciousness, boredom and frustration as a result of their injury. These harms are also relevant in the context of an injury to an adult. Caring for injured children can also place extra burdens on adults in a household, contributing to stress and fatigue in adults.

In 2019-20 there were 36,307 hospital episodes as a result of collision and entrapment including bruising, abrasions, crushing injuries, broken bones, dislocations, head injuries, lacerations and puncture wounds. When levels of all classes of harms are considered, these factors account for around 800,000 harmful incidents each year.

Included in this hazard but considerably less likely than collision and entrapment, are harmful incidents associated with physical strain and subsequent harm outcomes from interaction with the physical space and structural elements of the dwelling. These injuries are due to poor ergonomics in the residential environment. They include difficulties operating fixtures, fittings and appliances, particularly where they require a resident to lean awkwardly or stand on furniture to reach a handle, catch or switch.

Causes

Young children are vulnerable to accidents because they cannot always correctly judge the risk during activities. Injury arises from the amount of energy which is transmitted during the collision with an object and its density or hardness. The area of distribution where the transmission of energy occurs also dictates the likelihood of injury, which is reduced if the impact is spread over a large part of the body. Where an object has sharp edges, puncture wounds or lacerations can occur. Many of these accidents are related to the design and maintenance of housing, particularly rental housing provided to those on low incomes.

There is always an inherent risk of entrapment by doors and windows, but certain features can affect that risk. Finger trapping injuries and collisions with doors or gates will be more likely where there is a door closer present, particularly if it has a powerful mechanism. Trapping injuries are also more likely when doors and windows pivot (rather than being hinged). Missing or deteriorated sash cords, or poorly balanced sash window weights may cause sash windows to close unexpectedly. Swelling of wooden frames/doors and lack of maintenance can also make doors and windows difficult to operate, causing strain injuries.

Where guarding over drops, gaps in stairs, window openings and other architectural features provides openings which a child can squeeze through they may become stuck, causing injuries.

Doors opening into passages, paths, small rooms, or stairs can be a collision hazard. Doors to wall hung cupboards over worktops in kitchens can also be a collision hazard. Windows which project over pathways close to buildings can also be a collision hazard.

Collisions with large, glazed areas occur because humans navigate and orient themselves using visual information and spatial perception that is frequently reliant upon the presence of walls, fences, etc. for orientation. Humans are more inclined to disregard transparent barriers during this process. Unlike the way humans detect shape or colour, the ways in which humans register the presence of transparent barriers are guided by a combination of visual cues such as reflections, cracks or traces of dirt on transparent surfaces, or the perceiver's experience-based expectations (such as the presence of a surrounding frame), familiarity with the environment, or natural caution having previously suffered a collision with an invisible barrier.

Collisions may also arise from a lack of adequate space to undertake daily activities, particularly in bathing areas and kitchens. Low ceilings, doorways and projections at head-height such as those found in attic conversions, or the underside of an open-plan staircase can cause head injuries. Children also need space to play around any furniture, which may be more difficult in modern dwelling layouts where there is less space for living and dining purposes and reduced provision for storage.

Partially completed renovations, damage or disrepair may expose parts of the structure, or prevent effective functioning of fixtures, fittings and appliances which can contribute towards this hazard.

Stiff, hard to operate controls for fixtures and fittings (e.g. door handles) increase the risk of strain injuries, as do fixtures and fittings which require occupiers to lean awkwardly or reach due to the height or position of the fixture or fitting (e.g. window latches). Sometimes operating a fixture or fitting may lead to falls. High cupboards, shelves and other fixtures may require occupiers to stand on chairs to access them. Low fittings/ceilings may force occupiers to stoop or lean, which can be demanding on the physique of older residents. All these issues become more problematic for older occupiers, particularly where there is loss of strength and dexterity due to arthritis.

Asphyxiation from entanglement in the cords on window blinds causes a small number of injuries to children each year.

Behavioural factors

Young children are by far the most likely to be injured through collision and entrapment under this hazard. When assessing this hazard consideration should be given to what contribution the structure gives to the likelihood and harm outcomes when natural childhood behaviour is taken into account.

Relevant matters and baseline indicators affecting the likelihood and harm outcomes

Other hazards impacting the likelihood and/or harm outcomes

Falls hazards - An ergonomic hazard may be caused as a result of trying to avoid or negotiate another hazard such as a collision or a fall hazard.

Crowding and Space – Overcrowding and insufficient living space will increase the risk from this hazard as inadequate living space will make collisions more likely.

Lighting – A lack of adequate light will increase the chance of accidents under this hazard.

Relevant baseline indicators (accompanying notes are in Appendix 1)

1.1 Externally, every foundation, roof, ridge line, flashing, fascia, soffit and bargeboard, exterior staircase, exterior wall/fence shall be safe to use and capable of supporting the intended design loads and load effects and shall be in a proper state of structural repair.

Internally, every wall, floor, ceiling, inside stair, porch, accessory structure, door, window and window glass shall be safe to use and capable of supporting the intended design loads and load effects, and shall be in a proper state of structural repair.

5.1 Every dwelling/HMO shall have a kitchen or dedicated adequate space for the storage, preparation and cooking of food, equipped and provided for the sole use of that dwelling/HMO.

5.4 For cooking food, a 4-ring hob (or 2-ring in bedsit-type accommodation) with oven and grill properly installed with all necessary connections for safe and efficient operation, which shall be maintained in good working condition.

7.3 The floor area of any room in the dwelling used as sleeping accommodation by one person aged 10 years or over must not be less than 6.51 m^2.

The floor area of any room in the dwelling used as sleeping accommodation by two persons must not be less than 10.22 m^2.

The floor area of any room in the dwelling used as sleeping accommodation by one person aged under 10 years must not be less than 4.64 m^2.

Any room in the dwelling with a floor area of less than 4.64 m^2 must not be used as sleeping accommodation.

Depending on the gender of household members, their relationship and the size of rooms, a dwelling containing one bedroom is considered suitable for up to two persons, irrespective of age. A dwelling containing two bedrooms is suitable for up to four persons. One containing three bedrooms is suitable for up to six persons and one containing four bedrooms suitable for up to seven persons.

7.4 The ceiling height of any habitable room shall be at least 2100mm. In a habitable room with a sloping ceiling, at least one-half of the floor area shall have a ceiling height of at least 2100mm. If any part of a habitable room has a ceiling height lower than 1500mm, its floor area shall be excluded when calculating the floor area. For the purposes of this requirement, basement or subfloor rooms are excluded.

8.1 Internal doors leading between areas of a single dwelling must provide a sufficient barrier to the spread of smoke and fire (where appropriate). Any glazing in doors must respond safely to collision and must be designed for functionality to avoid strains or entrapment when in use, and must be maintained in good repair. All bathrooms and WC room doors must be fitted with a suitable lock and must not contain clear glass.

11.5 All door and window frames and furniture shall operate properly and be in a good state of repair, with no open joints or compromised seals between the windows/doors and adjacent walls.

12.2 Internal and external stairs must be safe, secure, in sound condition, free from defects and projections and well maintained. External stairs must be designed to allow water to drain away from the steps.

12.5 Minimum headroom on a staircase shall be 1900mm.

13.1 Every stairway, porch, patio, landing, balcony walkway, terrace and hall located more than 600mm above an adjacent area shall have a structurally sound guard, between 900mm and 1100mm high, measured vertically from the floor. The guard shall be firmly fastened, capable of supporting normally imposed loads and in good condition. Balusters with a minimum thickness of 10mm shall be placed at intervals that do not allow passage of a sphere greater than 100mm in diameter. There shall be no climbable cross-pieces.

13.2 All windows with an opening section greater than 100mm, through which a person may fall a single storey or more, shall have a fall-prevention device that restricts opening to less than 100mm. It must be possible to overcome this restriction easily when the windows in question are required to be escape windows, under the building regulations.

14.1 Every habitable room shall have adequate natural lighting.

14.2 Every hall, stairs and landing within the house, and every room used, or intended for use, by the occupant of the house shall have a suitable and adequate means of artificial lighting that is controllable and accessible which can allow lighting to be turned on and off and bulbs/fixtures to be changed and maintained safely. Two-way or PIR-activated lighting shall be provided to any internal staircase.

14.3 Light switches that control ceiling- or wall-type electric light fixtures shall be located conveniently in each room for safe use.

16.4 All means of ventilation shall be maintained in good repair and working order.

Other matters affecting the likelihood and severity of harm outcomes include:

- Door closer defects – overly powerful mechanisms.
- Door location – doors opening out into small circulation areas, corridors, landings or staircases.
- Window design defects – difficult operation of opening lights and window catches.
- Window location – windows opening across pathways.
- Glass – lack of safety glass or toughened glass in areas of glass which are vulnerable to impact
- Glass – large areas of glazing which without markings/surrounds to make them apparent to people moving through the building
- Low headroom to doors – under 1.9 metres.
- Low headroom or projections – due to attic conversions or other architectural features providing obstacles less than 2100mm from floor level.
- Position of amenity – inappropriate positioning of a wash hand basin, bath, shower, bidet and/or toilet.
- Space for amenity – inadequate functional space for the use of amenities.
- Kitchen worktops – inappropriate positioning of a worktop and/or sink.
- High level storage – inappropriate siting of a shelf or wall cupboard.
- Electric switch/sockets/light fittings – inappropriate siting of electric switch and/or socket outlet, or light fittings.

Preventative measures

Large areas of clear glazing in areas where they may be subject to impacts should be guarded, marked and/or constructed of toughened or laminated glass, to reduce the risk of injury. Glass panes less than 800mm above floor level should be protected by guarding or composed of toughened glass.

Installation of finger-pinch protection devices will reduce the risk of injury, particularly on doors and gates with self-closing mechanisms. Doors fitted with closers (e.g. fire doors) should not close with excessive force. The use of two-stage door closers will help to avoid doors closing with excessive force.

Doors should be designed to swing in the direction of most frequent travel to reduce the risk of collision. Exit doors at top of staircases should swing away from the staircase and landings should provide sufficient space to accommodate the swing of any door close to the staircase, without pushing a person on the stairway into a precarious position while the door is being used.

Windows opening outwards over walkways or circulation paths should have permanent guarding/opening restrictors, or walkways/paths should be moved to reduce the risk of collision with the open window.

The layout of the dwelling and its fixtures and fittings should minimise the risk of collisions and the need for awkward stooping and bending when moving around the dwelling and using its amenities. Fixtures, fittings and appliances should be located at appropriate levels, with sufficient space and ease of operation to facilitate their use without strain or risk of collision. Operable parts should be able to be manipulated without the need for gripping tightly, or powerful pinching/twisting wrist movements.

Cupboards, shelves and windows mechanisms should be sited where they can be easily reached, without posing collision hazards. Doors and windows should be maintained in good repair such that they can be opened and closed easily. Controls should be easily accessible without awkward

reaching or leaning. The force required to operate them should not be excessive. Where counterweight mechanisms are used in sash windows, they should be appropriately weighted, and sash cords should be well-maintained. Cords for blinds should be kept short, or capable of being tied off with cleats which keep the cords out or reach of small children.

In kitchens, shelves and cupboards should not necessitate occupiers standing on stools or chairs to access items. Carousel units/pull-out shelves in corner cupboards will reduce the need for awkward bending and reaching. Using levers for door handles and taps makes operation easier for all age groups.

Other considerations for assessment of this hazard

Assessment for this hazard may overlap with Crowding and Space. Where there is insufficient living space to allow normal movement around the dwelling and activities expected, particularly in bathrooms and kitchens, it may contribute towards the risk to health from this hazard.

This hazard is an amalgamation of two hazards from the last version of HHSRS. Assessors should conduct a whole dwelling assessment covering all aspects of this hazard, but if there are issues affecting just one element of the hazard it is useful to understand what proportion of the national average likelihood is attributable to each of these areas. Less than one percent of harms are associated with the position and operability of amenities. The rest of the harms are due to collisions and entrapment.

Further reading

British Standard BS6262-4 – Glazing for buildings. Code of practice for safety related to human impact. Available at: www.bsigroup.com

British Standard BS8213-1 – Windows, doors and rooflights. Design for safety in use and during cleaning of windows, including door-height windows and roof windows. Code of practice. Available at: www.bsigroup.com

Buxton, P. (2018) Metric Handbook – Planning and Design Data. London: Routledge. Available at: www.routledge.com

HM Government (2013) The Building Regulations 2010 Protection from Falling, Collision and Impact – Approved Document K. Available at: www.gov.uk

HM Government (2021) The Building Regulations 2010 Access to and use of buildings – Approved Document M. Available at: www.gov.uk

7. Structural Collapse and Falling Elements

Description of the hazard

This hazard covers the threat of collapse of all or part of a dwelling. It includes elements of the building fabric being displaced or falling due to failures of fixings, disrepair and the effects of weather. Structural failure may occur internally or externally. In the latter situation members of the public may also be put at risk.

Collapses triggered through Fire and Explosions should be assessed under that hazard.

Vulnerable group and the national average scores

Structural Collapse and Falling Elements – Average likelihood and harm outcomes for **persons of all ages.**							
Dwelling type and age		Average likelihood 1 in	Spread of harm outcomes				Average HHSRS scores
			Extreme %	Severe %	Serious %	Moderate %	
Houses	Pre 1920s	5,000 (5,718)	0.2	0.5	10	89.3	1 (<1) Low risk
	1920-45	5,000 (4,759)	0.2	0	10	89.8	1 (<1) Low risk
	1946-79	5,000 (5,514)	0.2	0	10	89.8	1 (<1) Low risk
	Post 1979	5,000 (7,765)	0.2	0	5	94.8	1 (<1) Low risk
Flats	Pre 1920s	5,000 (12,729)	0.5	0	10	89.5	2 (<1) Low risk
	1920-45	5,000 (11,159)	0.5	0	10	89.5	2 (<1) Low risk
	1946-79	5,000 (7,691)	0.5	0	10	89.5	2 (<1) Low risk
	Post 1979	5,000 (7,797)	0.5	0	10	89.5	2 (<1) Low risk
All dwellings		**5,000 (5,900)**	**0.2**	**0.1**	**10**	**89.7**	**1 (<1) Low risk**

Note – Scale point values are shown, with the national average values for likelihoods and their corresponding final scores (determined using actual harm outcome values rather than scale point values) provided in brackets. Data quality for these averages is satisfactory. The main issue with the hospital episode data used is that hospital episodes involving being struck by objects had to be distributed between this hazard and "Collisions, Entrapment and Ergonomics" on a proportionate basis, because structual collapse was not specified in the cause of the hospital episode.

Summary box – Structural Collapse and Falling Elements

Vulnerable group – All ages

Groups other than vulnerable group at greater risk – There is no evidence that any particular group is at greater risk from this hazard.

Main issues to look for – Signs of progressive structural movement from subsidence or progressive failure of structural elements of the dwelling, loose, inadequate or deteriorated fixtures or fastenings affixing elements of the building structure, fixtures and fittings, failure of render and deterioration of mortar, concrete or stone/brickwork due to weathering or chemical attack, poorly affixed light fittings, shelves and cupboards, wet and dry rot and sources of moisture which may damage ceiling plaster.

Risk reduction measures – Underpinning, stitching for cracks in walls, repointing, replacement lintels, repair or replacement of fixtures and fittings, weatherproofing of the structure, effective handling of fresh and foul water within the dwelling, including provision of shower curtains/screens and sealed junctions with impervious surfaces around amenities using water such as baths, showers, sinks and wash hand basins. Inspection and regular maintenance of the building structure, fixtures, fittings and appliances.

Health effects

The total collapse of all or part of a dwelling is an extremely rare event and more likely to occur in outbuildings which tend not to be as well maintained as the main living structure. Failure of fixings etc. resulting in objects falling from the building is more likely that total structural failure. These may fall and strike either the dwelling occupiers or members of the public. This is also very rare, as a person must be in the vicinity when the fall of the building element occurs.

When injury occurs from structural collapse and falling elements, the harms will vary from minor bruising to death. Falling elements may threaten the occupiers or members of the public using the space around the building. When there is a danger of collapse of all or part of a structure this will have a detrimental impact on the mental health of the occupier, causing fear and anxiety.

Causes

Injury from collapse of ceiling plasterwork following a water leak is the most likely source of harms under this hazard. Injuries caused by poorly affixed fixtures, fittings and internal finishes falling and striking occupiers are the next most likely cause of a harmful event (e.g. falling light fittings, kitchen cabinets or shelving). Fixtures and fittings may also fail due to being subject to loads beyond those they were designed for. Persistent damp may also cause wet and dry rots, progressively reducing the strength of timberwork making up the floors, ceilings, fixtures and fittings inside the property, causing them to fail.

Externally, all elements of the external structure should be considered, but detachment of elements of the building fabric due to the action of weather and/or poor maintenance is more likely. These include roofing slates, eaves gutters, coping stones on parapet walls, ariels and satellite dishes, loose render, etc. Elements of buildings may fall due to design/construction faults causing progressive failures of structural elements over time (e.g. rusting of poorly protected steel reinforcement in

concrete). Buildings allowed to fall into states of advanced decay (sometimes referred to as ruinous and dilapidated premises) may be subject to larger scale collapse or falling building elements.

Boundary and retaining walls may start to lean if improperly designed or constructed. The action of weather and corrosive elements in the soil can also leading to a loss of structural integrity.

Cob (sometimes referred to as clom) structures may suffer a catastrophic collapse if walls are subjected to persistent penetrating damp, softening the wall structure and potentially causing a slip-plane to form as the clay-rich earth takes on moisture.

Behavioural factors

Occupiers may fail to exercise caution when bathing, or when using water consuming appliances, resulting in the escape of water. Assessors should consider if water damage (e.g. water damage to a plaster ceiling) is attributable to deficiencies in the structure of the dwelling or its fixtures, fittings and appliances.

Relevant matters and baseline indicators affecting the likelihood and harm outcomes

Other hazards impacting the likelihood and/or harm outcomes

Damp and Mould Growth – Leaks around plumbing installations and the persistent exposure of areas to water may result in structural damage.

Relevant baseline indicators (accompanying notes are in Appendix 1)

1.1 Externally, every foundation, roof, ridge line, flashing, fascia, soffit and bargeboard, exterior staircase, exterior wall/fence shall be safe to use and capable of supporting the intended design loads and load effects and shall be in a proper state of structural repair.

Internally, every wall, floor, ceiling, inside stair, porch, accessory structure, door, window and window glass shall be safe to use and capable of supporting the intended design loads and load effects, and shall be in a proper state of structural repair.

2.1 Every drainage fixture, stack, vent, water, waste and sewer pipe shall be properly installed, maintained in a safe and functional order and kept free from obstructions, leaks and defects. The drainage system must have suitable rodding or access points to allow clearance of blockages.

4.2 A suitably located WC in good working condition, that is sealed to the waste pipe and affixed to the floor or close-coupled, shall be properly connected to both the dwelling's water supply and a waste pipe, leading to an approved sewage system or private waste disposal system.

4.3 A dedicated wash-hand basin that is located in the same room as the WC or immediately adjacent shall be in good working condition, with a stable connection to the wall or secure attachment to the floor that is properly connected to the heated and unheated potable water supply and a sealed trap leading to a waste pipe. The wash-hand basin must be adequately sealed with a flexible sealant to prevent leakage and damage to the adjacent areas.

4.7 There must be a cleanable, non-absorbent water-resistant material on floor surfaces and extending on bathroom walls at least 300mm above a bath and 1800mm above the floor of a shower or shower tray. Such materials on walls and floors shall form a watertight joint with each other and with the bathtub or shower tray. Any shower shall have a shower screen, curtain or return wall that prevents water spillage to the floor.

5.3 Sufficient work surface shall be provided for food preparation. Sufficient cabinets and/or shelves sufficient to store occupant or visitors' food that does not require refrigeration, and eating, drinking

and food-preparation equipment. Cabinets shall have well-fitting doors and no gaps between any surfaces. The work surface, work-surface edges, cabinets and shelves shall be of sound construction and furnished with surfaces that are impervious to water, smooth and cleanable.

12.1 Every interior and exterior stairway, ramp, deck, porch, balcony walkway, terrace, landing and hall shall be maintained structurally sound, in good repair, properly anchored and capable of supporting the imposed loads.

12.2 Internal and external stairs must be safe, secure, in sound condition, free from defects and projections and well maintained. External stairs must be designed to allow water to drain away from the steps.

13.1 Every stairway, porch, patio, landing, balcony walkway, terrace and hall located more than 600mm above an adjacent area shall have a structurally sound guard, between 900mm and 1100mm high, measured vertically from the floor. The guard shall be firmly fastened, capable of supporting normally imposed loads and in good condition. Balusters with a minimum thickness of 10mm shall be placed at intervals that do not allow passage of a sphere greater than 100mm in diameter. There shall be no climbable cross-pieces.

17.1 Every foundation, roof, roofing component, exterior wall, floor, door, skylight and window shall be watertight, weathertight, free of persistent dampness or moisture and in good condition.

18.1 The property and all structures and areas within the curtilage of the property shall be free of pest infestation, with no features present that will attract and support pests. Inspection shall take place to ensure a pest-free environment.

Other matters affecting the likelihood of harm outcomes include:

- Loose fittings or fixtures – loose cupboards or shelves

Other matters affecting the severity of the harm outcome include:

- Height above ground – the height of the building or of the element above the ground or floor.
- Size/weight of element – the size, weight and nature of the object or element likely to fall.

Preventative measures

The building structure, including all fixtures and fittings should be designed and maintained to ensure they have sufficient strength to support their own load and any reasonably expected loadings and the reasonably foreseeable long-term use of the dwelling. External elements such as roof finishes and wall coverings, fixtures (e.g. guttering) and coping stones should be capable of tolerating the effects of the weather, be firmly affixed and kept in good repair. Internal fixtures such as lights, cupboards and shelves should be firmly affixed and capable of withstanding expected loads from reasonably foreseeable long-term use of the dwelling.

Facilities making use of hot and cold water should be capable of containing the water and channelling it away safely. They should be sealed where they meet their surroundings. Pipework should be maintained such that leaks are prevented. The floors in wet rooms or other areas likely to suffer from regular spillage of water should be impervious to water and sealed where they meet the surrounding walls.

Balconies, walkways, landings and stairs/steps should have guarding which can withstand the expected loadings and wear and tear without collapse.

Other considerations for assessment of this hazard

Assessors should consider all elements of the building fabric, including its fixtures, fittings and appliances when assessing the hazard. Destructive testing and the expertise of a structural engineer or other specialist may be necessary to determine the extent of the risk from this hazard. This would normally be carried out by the dwelling owner/manager.

Dangerous trees and other vegetation which may fall due to adverse weather situations cannot be considered as part of the assessment. Ice and snow breaking off the structure or causing collapse of a structure could only be considered if the structure was not capable of withstanding the expected loading, or if ice build-up was due to water being produced by the dwelling itself or its inability to channel water safely (e.g. leaking eaves guttering).

Assessors should note that the local authority department responsible for enforcing the legislation around dangerous structures may need to be informed when a Structural Collapse and Falling Elements hazard is found to pose a significant risk to health.

Further reading

HM Government (2013) The Building Regulations 2010 Structure – Approved Document A. Available at: www.gov.uk

The Local Authority Building Control web site provides a range of information on Building Control in England and Wales (available at www.labc.co.uk). It may be referred to for further information on dangerous structures and the role of Building Control in relation to such matters.

8. Electrical Hazards

Description of the hazard

This hazard covers risk to health from shock and burns resulting from exposure to electricity, including exposure to lightning strikes.

This hazard does not cover risk to health from fires started due to electricity. This is covered under the Fire and Explosions hazard.

Vulnerable group and the national average scores

Electrical Hazards – Average likelihood and harm outcomes for all persons **aged 5 years and under.**							
Dwelling type and age		Average likelihood 1 in	Spread of harm outcomes				Average HHSRS scores
			Extreme %	Severe %	Serious %	Moderate %	
All dwellings		**5,000 (20,966)**	**0.5**	**10**	**50**	**39.5**	**6 (1) Low risk**

Note – Scale point values are shown, with the national average values for likelihoods and their corresponding final scores (determined using actual harm outcome values rather than scale point values) provided in brackets. The low number of harmful events and a reduction in the availability of data on Serious and Moderate harm outcomes have required a number of assumptions to be made. This means that the data for the above averages is relatively weak. It should be noted however, that the hospital episode data used in this analysis did identify exposure to electrical current as a cause and did distinguish patients aged under 5 years from older patients. The data quality remains quite weak due to moderate harms being estimated based on known ratios to other harms rather than being able to use general practice data.

Summary box – Electrical Hazards

Vulnerable group – Those aged 5 years and under.

Groups other than vulnerable group at greater risk – During pregnancy, the unborn child is at greater risk from an electric shock.

Main issues to look for – Damaged, deteriorated and out of date electrical installations and appliances, lack of regular inspection and testing of electrical installations and appliances, inadequate earthing, access to live conductors, meters, consumer units and surface mounted cables near floor level.

Risk reduction measures – Regular inspection and testing of electrical installations and appliances, updating electrical installations including the use of residual current devices in consumer units, increasing numbers of sockets, repair of damaged or deteriorated parts, moving meters, cables and consumer units to locations inaccessible to young children.

Health effects

Very small electrical currents will produce a numbness, tingling or ‘jolt’ sensation, such as that produced by the discharge of static electricity. Larger currents experienced in electrocutions involving household appliances and mains electricity have a greater effect on the body. The majority of injuries from electrocution in a domestic environment are Serious or Moderate, involving burns

and/or falls. Burns are caused by resistance to the passage of electricity, causing heating of the body's tissues as electricity passes through them. They are most likely at the point of contact with a live electrical conductor but may occur at any point in the pathway electricity takes through the body. The level of burns will be influenced by the amount of current the body is exposed to and the duration of the exposure. Falls may be caused by loss of muscular control as a result of the flow of electrical current through the body. Those suffering shocks may also experience headache, confusion and seizures.

Alternating current used in UK mains electricity is capable of causing harm at lower levels than direct current and is more likely to cause tetanic (sustained) muscle contraction which can prevent the victim from being able to release their grip on the source of electrical energy.

Severe or Extreme harm outcomes usually result from electricity passing through the chest, disrupting the regular contractions of the heart or respiratory muscles. Again, the level of harm will be influenced by the amount of current the body is exposed to and the duration of the exposure. Currents of 20-50 milliamps passing through the chest can cause paralysis of the respiratory muscles and currents of 50-100 milliamps can cause ventricular fibrillation. Internal organ damage and cessation of heart contractions can occur at 2 amps.

Dry skin will have a higher resistance to electricity than wet skin. The presence of water may prolong the exposure to the electric current and will make it more likely that current will move past the skin barrier to deeper structures, causing more extensive injuries.

Young children are more likely to suffer electric shocks due to their inquisitive nature and poor levels of risk perception. In pregnant women the unborn foetus is also at elevated risk.

Lightning hits the ground/water in and around the UK around 300,000 times per year. Thirty to sixty people are struck by lightning in the UK every year. Lightning strikes cause burns, collision and falls injuries in most cases, and on average result in 2-3 fatalities per year. Lightning is more likely to strike males as they are more likely to be in an outdoor environment due to leisure and working activities. Almost all injuries from lightning occur outdoors. Injury from lightning is extremely unlikely in a domestic situation.

Causes

Contact with live electrical conductors will cause a shock, allowing current to pass through the body to earth. Deficiencies in electrical appliances including plugs, leads, powered hand tools and kitchen appliances caused over 80% of hospital episodes resulting from electrical hazards in dwellings and contact with powered lawnmowers caused around 8% (2019-20 data). Exposure due to deficiencies with electrical wiring and installations makes up less than 10% of hospital episodes resulting from electrical hazards in dwellings.

More modern electrical consumer units contain Residual Current Devices (RCDs), but older units may rely on circuit breakers or fuses, resulting in more harmful outcomes when a shock occurs.

Cables in vulnerable locations such as on the surface of skirting boards where they may be damaged by hoovering and electrical meters or consumer units near to floor level (where they are easily accessible to young children) will increase the likelihood of contact with live components. Gaps in insulated coverings for sockets and other components of the electrical installations at the dwelling will provide a route of access to live conductors which may be explored by young children.

Where electrics are combined with water the risk will increase. Water will increase the likelihood of current flowing to earth, triggering safety mechanism such as circuit breakers, but if this does not

occur then the water itself may potentially conduct electricity, increasing the risk of occupiers coming into contact with a source of electrical current. Where devices have been earthed to the plumbing system and this itself is not earthed, it can increase the number of live surfaces which can cause electrocution. Failure to fit supplementary earth bonding will increase the risk of this type of situation occurring and of other metal building components becoming a source of electrocution due to electrical faults within the dwelling.

Behavioural factors

Occupiers may become accustomed to defective or dangerous electrics, or they may not have the ability to address these deficiencies (for example in rental accommodation). Owners and occupiers may undertake unauthorised and sometimes dangerous work with electrical devices and distribution systems such as bridging electric meters. They may also cause damage to insulating casings resulting in easier access to live components and may come into contact with live electrical conductors through misadventure during home renovations and cutting through electrical cables when using power tools.

Relevant matters and baseline indicators affecting the likelihood and harm outcomes

Other hazards impacting the likelihood and/or harm outcomes

Damp and Mould Growth – Damp will usually cause corrosion of electrical conductors and connections. Water from damp and leaks will usually cause electrics to short, triggering safety devices in the consumer unit and stopping the flow of current. Very occasionally a source of damp may flow in such a way that it can form a link between a live conductor and an occupier.

Relevant baseline indicators (accompanying notes are in Appendix 1)

5.4 For cooking food, a 4-ring hob (or 2-ring in bedsit-type accommodation) with oven and grill properly installed with all necessary connections for safe and efficient operation, which shall be maintained in good working condition.

5.5 Where an oven or hob is not provided, there must be a dedicated space with a suitable connection to either gas or electricity that meets the requirement of the relevant regulations.

14.4 All electrical installations, including fixtures and fittings, must be maintained in good repair.

14.6 Every habitable room shall have at least 2 separate and remote double electric sockets that are suitably located for use. Kitchens shall have at least 4 suitably located double sockets.

17.1 Every foundation, roof, roofing component, exterior wall, floor, door, skylight and window shall be watertight, weathertight, free of persistent dampness or moisture and in good condition.

17.3 No single room in any of the property shall have an observable level of damp or mould growth or deterioration of internal finishes that exceeds 5% of the wall and/or ceiling surface.

18.1 The property and all structures and areas within the curtilage of the property shall be free of pest infestation, with no features present that will attract and support pests. Inspection shall take place to ensure a pest-free environment.

19.2 All electrical equipment supplied by landlords in rented residential premises is safe and compliant with current UK requirements for safety of domestic electrical products; all electrical appliances supplied by the landlord are subject to testing in line with the IET Code of Practice for In-service Inspection and Testing of Electrical Equipment (Fifth Edition) unless they are under one year old and display a UKCA/CE marking.

19.4 The electrical installation should have been inspected and tested within the last 5 years.

Other matters affecting the likelihood and severity of harm outcomes include:

- Fuses and meters – inappropriately sited consumer units and meters.
- Presence of water – electrical installations in close proximity to water, including areas of damp.
- Lightning protection system – lack of, or defective system to buildings at significant risk of lightning strikes.

Preventative measures

Protection from electric shock is provided by insulation and/or isolation. Live parts must be covered by a non-conducting material. Exposed metal parts of electrical installations such as casings must be earthed so that if there is a fault, current will flow directly to earth. Other exposed metalwork such as gas and water pipes may need to be connected to the main earth terminal, along with ducting, central heating and air conditioning systems and exposed metal structural parts of the building. This is particularly important in bathrooms.

Electrical cables and installation componentry should be protected from damage. Consumer units and electric meters should be placed in locations where they cannot be accessed by young children. Damaged or holed insulating covers for electrical installations should be repaired.

Use of a consumer unit with RCD protection will provide additional protection. The RCD is capable of detecting some (but not all) faults in the electrical system and disconnecting the supply of electricity before a specified amount of current has flowed (measured in milliamps). RCD protection is particularly important where electricity is used in outdoor locations.

Additional protection is required in locations where water is likely to be present, including kitchens, bathrooms and other areas where occupiers could be in contact with electricity and water. Bathrooms have protected zones with restrictions on what can be fitted in those locations. Bathroom sockets should be limited to 12-volt AC connections (e.g. shaver sockets).

Electrical installations and appliances should be inspected regularly by a suitably qualified person. Inspection reports should be obtained and recommendations for actions to reduce the risk to health should be followed.

Lightning strikes in residential premises are rare. Tall and isolated buildings and those in locations more prone to lightning strikes should be assessed for the risk of a lightning strike. Where appropriate a lightning protection system should be fitted to carry lightning strikes to earth.

Other considerations for assessment of this hazard

Visual inspection of electrical installations will help to identify defects, but many defects will not be immediately apparent. Five-yearly electrical inspection and portable appliance testing records can be used to help inform the assessment of this hazard. Assessors should require the responsible person (usually the owner) to use the services of an electrician certified to inspect the work of others, where additional examination is deemed necessary. Alongside wiring installations, assessors should consider all electrical items which are the responsibility of the owner.

Further reading

British Standard BS7671:2018 – Requirements for electrical installations. IET wiring regulations. Available at: www.bsigroup.com

British Standard BS EN 62305-1 & 2 – Protection against lightning. General principles & risk management. Available at: www.bsigroup.com

HM Government (2013) The Building Regulations 2010 Electrical Safety – Approved Document P. Available at: www.gov.uk

PHYSIOLOGICAL REQUIREMENTS

9. Excess Cold

Description of the hazard

This hazard covers threats to health from sub-optimal indoor living temperatures.

Vulnerable group and the national average scores

Excess cold – Average likelihood and harm outcomes for all persons aged 65 years and over.							
Dwelling type and age		Average likelihood 1 in	Spread of harm outcomes				Average HHSRS scores
			Extreme %	Severe %	Serious %	Moderate %	
Non-HMOs	Pre 1920s	1,000 (765)	30	5	20	45	311 (460) Moderate risk
	1920-45	500 (652)	30	5	20	45	623 (540) Moderate risk
	1946-79	1,000 (832)	30	5	20	45	311 (423) Moderate risk
	Post 1979	1,000 (787)	30	5	20	45	311 (447) Moderate risk
HMOs	Pre 1920s	500 (742)	30	5	20	45	623 (474) Moderate risk
	1920-45	1,000 (765)	30	5	20	45	311 (460) Moderate risk
	1946-79	1,000 (900)	30	5	20	45	311 (391) Moderate risk
	Post 1979	1,000 (1,192)	30	5	20	45	311 (295) Moderate risk
All dwellings		**1,000 (855)**	**30**	**5**	**20**	**45**	**311 (411) Moderate risk**

Note – Scale point values are shown, with the national average values for likelihoods and their corresponding final scores (determined using actual harm outcome values rather than scale point values) provided in brackets. Data quality for these averages is reasonably strong. Excess winter deaths of persons aged 65 years and over were estimated for 2020 by applying a regression analysis to ONS Mortality data from 1999-2019. A Public Health England fuel poverty report from 2014 suggested that 20% of these deaths were due to excessively cold dwellings. This was applied to the excess winter deaths figure. The total number of harms due to excessive cold was determined assuming that 34% of all such harms were Severe harms.

Summary box – Excess Cold

Vulnerable group – Those aged 65 years and over

Groups other than vulnerable group at greater risk – Smokers, those with pre-existing health conditions or disabilities, those with moderate to high alcohol consumption, the very young and 45-65 year olds.

Main issues to look for – Inadequate loft, wall and floor insulation, large areas of single glazing, inadequate or missing central heating, inefficient or particularly expensive forms of heating, excessive ventilation/drafts, lack of control over heating, damp, low Energy Performance Certificate rating.

Risk reduction measures – Central heating with occupier controls (consider affordability and design of heating), insulation of the roof, walls and floor, double glazed windows and doors, draft proofing, ventilation controls, resolution of the causes of damp.

Health effects

A healthy indoor temperature is around 21°C, although cold is not generally perceived until the temperature drops below 19°C. For vulnerable groups including older people, a small risk of adverse health effects begins once the temperature falls below 19°C. Below 18°C the reaction of the body to the cooler temperature includes an increase in blood pressure which increases the risk of cardiovascular and cerebrovascular events. Serious health risks occur below 16°C, with a much greater risk of respiratory and cardiovascular conditions. Below 12°C the burden on the cardiovascular system further increases and if temperatures persist below 10°C the risk of hypothermia becomes appreciable.

The UK has one of the highest excess winter mortality levels in Europe. There are approximately 30,000 more deaths between December and March than expected from the death rates in other months of the year. The UK's winter mortality rates vary substantially between years, showing some correlation with levels of influenza-like illnesses in the population. Despite improved thermal insulation in the housing stock, excess winter deaths remain greater in Britain than in most other countries in Europe.

Relative temperature change during cold periods has a greater effect than absolute low temperature levels. Cold spells with outdoor temperatures remaining below monthly averages for at least three days are accountable for a more than a two-fold increase in cardiovascular events. The effects of the lower temperatures become apparent within around a week.

In England up to half of deaths come from cardiovascular disease and half of the remaining deaths come from respiratory disease. Smokers, those with pre-existing medical conditions and those with moderate or greater alcohol consumption are at a greater risk from cold related ill health. Hypothermia accounts for a very small proportion of excess winter mortality.

Although there are some excess winter deaths in all age groups, health effects become significant for those in the 45+ age group. The risk increases with age in a roughly linear pattern up to the 85+ age group, after which there is a marked increased risk.

Low temperatures can impair the thermoregulatory system of older people, and the very young whose thermoregulatory system is not yet fully developed. Both these groups may spend a greater time indoors in cold weather. Older people and infants will not move about as much as other groups.

Cold air streams may affect the respiratory tract and can slow the heart temporarily, increasing cardiovascular strain. When the whole body is cooled, blood pressure increases. The effect of cold air on the bronchial lining and immune system can reduce resistance to infection. Sleeping in cold bedrooms has been shown to substantially increase the risk to health. The symptoms of rheumatoid arthritis can be worsened by cold.

Low indoor living temperatures also have a psychosocial impact on the occupiers of cold dwellings. These may be direct effects causing stress, depression, anxiety, reduced levels of satisfaction with living conditions and social isolation through reluctance to accommodate guests. Those experiencing fuel poverty may also experience feeling of lack of control over their living environment as they are forced to make compromises on fuel costs to meet other household expenses.

Causes

The percentage rise in deaths in winter is greater in dwellings with low energy efficiency ratings. There is also a relationship between risk and the age of the property, with risk being greatest in dwellings with solid walls, typical of pre-1920s properties. Risk is lowest in the more energy efficient dwellings built after 2000 as they are subject to the tightening of energy efficiency requirements in the Building Regulations around this time. Absence of central heating also shows some association with an increased risk of excess winter deaths.

Greater excess cold related deaths are associated with low indoor temperatures and poor thermal efficiency. Energy costs to maintain optimal indoor living temperatures are more likely to affect occupiers of poorly insulated properties, those with more expensive forms of heating (such as peak-rate electrical heaters, LPG heaters, or those supplied by prepayment meters) and those living in under-occupied properties. Between 30% and 50% of excess winter mortality is attributable to housing.

The energy efficiency of a dwelling depends on the thermal insulation of the structure, on the fuel type, and the size and design of the means of heating and ventilation. Any disrepair or dampness to the dwelling and any disrepair to the heating system may affect their efficiency and effectiveness. The exposure and orientation of the dwelling are also relevant. Dwellings with more external walls or those exposed to prevailing wind and weather conditions will lose heat quicker.

Some forms of insulating material, such as glass fibre, will settle over a period and become less effective as a result. Poorly fitted insulation may have gaps between sections of material allowing heat loss. As water readily conducts heat, excess moisture content (dampness) of the walls and floors will reduce the thermal insulation provided. The effectiveness of most forms of insulating material will become compromised by moisture. Dampness will also affect the thermal insulation of clothing and bedding, increasing the risk. Where there is more moisture present, more energy will be needed to heat the dwelling, reducing the effectiveness of the heating system.

Excess ventilation causes heat loss and reduces air temperatures. It also causes draughts, increasing discomfort. Excess ventilation and drafts may be caused by too large or inappropriately sited permanent wall or window openings intended for ventilation, ill-fitting/deteriorated windows and doors, large areas of single glazing, or other building elements with high thermal conductivity whose low temperatures cool nearby air, causing drafts. Drafts increase the internal temperature required

for occupiers to attain equivalent levels of thermal comfort when compared to dwellings with lower levels of internal air movement.

Some level of ventilation is essential to prevent the build-up of indoor air pollutants and to remove moisture generated by normal activities such as bathing and cooking. This should be within the control of the occupier and appropriately sited to allow both background levels of passive ventilation and purge ventilation on demand when required by the occupier.

Behavioural factors

A desire to reduce heating costs may cause occupiers to avoid making full use of the heating in their dwelling.

A stoic and often embedded attitude to living with low indoor temperatures can cause individuals to expose themselves to excessively cold temperatures in ignorance of the impact it has on their health. This may persist even after heating and insulation improvements have been provided in their living accommodation. Assessors may wish to provide advice on the importance of healthy indoor living temperatures to occupiers and are encouraged to make referrals to relevant organisations for support and advice with fuel costs and energy efficiency, separately to any actions taken under the HHSRS.

Relevant matters and baseline indicators affecting the likelihood and harm outcomes

Other hazards impacting the likelihood and/or harm outcomes

Damp and Mould Growth – Damp will reduce the thermal efficiency of the walls, insulation and structural elements of the dwelling. High levels of moisture will also reduce the insulative effectiveness of clothing and bedding and may reduce the effectiveness of the heating system.

Relevant baseline indicators (accompanying notes are in Appendix 1)

4.8 Ventilation for the bathroom must be provided by mechanical extraction that is ducted to the outside of the building, in line with Baseline Indicator 16.1.

5.6 Suitable facilities for the effective and safe removal of fumes and moisture-laden air to the external air by means of a cooker hood or extractor fan; a cooker hood that only recycles the odour through an active carbon filter would not be acceptable, it must vent to outside. A mechanical extractor would be the normal mechanism for this function, in line with Baseline Indicator 16.1.

6.1 Where the dwelling does not contain a secure and private garden or yard for the exclusive use of that dwelling, a dryer (vented or recirculation type), or dedicated space to install a dryer, or access to a communal dryer facility must be provided.

8.1 Internal doors leading between areas of a single dwelling must provide a sufficient barrier to the spread of smoke and fire (where appropriate). Any glazing in doors must respond safely to collision and must be designed for functionality to avoid strains or entrapment when in use, and must be maintained in good repair. All bathrooms and WC room doors must be fitted with a suitable lock and must not contain clear glass.

11.2 Access doors to dwellings should have adequate locks. Doors must be solid external grade and fitted with a minimum of a mortice deadlock to BS 3621, openable from the inside without a key. There must be a means for occupiers to view visitors without opening the door, either by means of a viewer within the door or by a glazed pane adjacent or close to the entrance door. All rear doors should be fitted with a mortice dead lock to BS 3621 or 2 security bolts.

11.5 All door and window frames and furniture shall operate properly and be in a good state of repair, with no open joints or compromised seals between the windows/doors and adjacent walls.

14.4 All electrical installations, including fixtures and fittings, must be maintained in good repair.

14.5 Gas appliances and flues provided for occupants are safe for continued use.

15.1 Structural thermal insulation shall be provided to minimise heat loss. Where there is a loft space, insulation shall be provided as detailed:

- A minimum 250mm of loft insulation (assumed to be mineral wool or similar).

15.3 If the walls are of cavity wall construction, they must be insulated unless professional examination confirms to do so is technically unfeasible, due to either their condition or location in terms of wind-driven rain, or the width of the cavity being less than 40mm.

15.4 Every dwelling shall have a properly installed heating system in good and safe working condition that is capable of safely and adequately heating all habitable rooms, bathrooms and WC rooms. The system must be capable of heating the main living area to 21°C and the remaining habitable rooms to a temperature of 18°C when the external temperature is minus 1°C, and the system should not allow the temperature to exceed 25°C in any room during the heating season.

15.5 Heating and hot water must be capable of being controlled effectively and timed to operate by the occupiers.

16.1 The air exhausted from a bathroom, WC room, kitchen, clothes dryer or basement must be provided by mechanical ventilation or by a correctly designed and installed natural ventilation system, as required by Part F of the Building Regulations. In addition, it shall not be vented into any other parts of the building's habitable space or an attic; such air shall discharge directly to the outdoors but not near any intake on the building exterior.

16.4 All means of ventilation shall be maintained in good repair and working order.

17.1 Every foundation, roof, roofing component, exterior wall, floor, door, skylight and window shall be watertight, weathertight, free of persistent dampness or moisture and in good condition.

17.3 No single room in any of the property shall have an observable level of damp or mould growth or deterioration of internal finishes that exceeds 5% of the wall and/or ceiling surface.

Other matters affecting the likelihood and severity of harm outcomes include:

- Lack of thermostatic radiator valves – enabling temperatures to be varied between rooms.
- Settling of insulation – compression of the thermal insulating material reducing its effectiveness.
- Amount of ventilation – inadequate, excessive, or inappropriate provision for thorough ventilation.
- Ventilation controls – inadequate means of controlling the ventilation.
- Draughts – uncontrollable draughts and those situated to cause discomfort.

Preventative measures

Structural thermal insulation should be provided. Walls and roofs provide the greatest areas of heat loss followed by windows and doors and then floors. When insulating a dwelling the roof is often the easiest part of the structure to insulate. To insulate solid walls of properties typical of pre-1920s housing they must be clad with insulating materials either externally or internally. Improvements to

heating and insulation of the building structure should be considered in order of anticipated cost and practicality. Older 'hard to treat' properties may require substantial investment to improve their energy efficiency to a point where the risk to health is reduced to a satisfactory level. A whole house assessment should be carried out and appropriate measures installed to avoid remedial measures creating other problems such as penetrating damp and inadequate ventilation.

The level of insulation necessary is in part dependent on geographical location and exposure, position in relation to other dwellings and buildings, and orientation. South facing glazing can be used to increase solar heat gain and save energy but should be used alongside shade and ventilation measures to prevent excessive heat gain in warmer weather.

Heating should be controllable by the occupants, and safely and properly installed and maintained. It should be appropriate to the design, layout and construction, such that the whole of the dwelling can be adequately and efficiently heated. The cost of running the heating system at a rate where it would provide a temperature of 21°C in the living room, 22°C in the bathroom and 18°C in all other parts of the dwelling must be such that the cost would be reasonable and proportionate for the current and potential occupier(s) of the property to afford.

There should be means for ensuring low level background ventilation without excessive heat loss or draughts. It should be controllable, properly installed and maintained, and appropriate to the particular part of the dwelling. There should be means for rapid ventilation during periods of high temperatures and at times of high combustion fume and moisture production in kitchens and bathrooms. Mechanical heat recovery ventilation systems provide a means of reducing heat loss whilst ensuring adequate levels of ventilation.

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 unhealthy indoor temperatures (or poor thermal comfort) and should be provided with controls to allow the occupants to regulate the temperature within their dwelling at all times, not just during daytime hours.

Other considerations for assessment of this hazard

Assessing excess cold must involve consideration of anticipated internal living temperatures occupiers are likely to encounter over a 12-month period. Indoor living temperatures will be the result of a combination of the dwelling itself and the behaviour of its occupiers. Capturing measurements of indoor living temperatures at the time of inspection (or over a period of time using a data logger) may be helpful to provide evidence of living conditions. An assessment should be made considering the expected indoor living temperatures in a dwelling and their fluctuations over a whole calendar year due to changes in the seasons and weather over that period. Assessment must take account of the provision of the above-mentioned factors.

When considering excess cold due to poor thermal insulation, excess heat may also be a concern.

Further reading

Chartered Institute of Environmental Health (2019) CIEH excess cold enforcement guidance. London: Chartered Institute of Environmental Health. Available at: www.cieh.org

HM Government (2021) The Building Regulations 2010 Approved Document L - Conservation of Fuel and Power – guidance for dwellings. Available at: www.gov.uk

HM Government (2021) The Building Regulations 2010 Approved Document F - Ventilation - guidance for dwellings. Available at: www.gov.uk

10. Radiation

Description of the hazard

This hazard covers threat to health from exposure to radon gas and its radioactive decay products, through inhalation and in water.

Leakage from microwave ovens may also be covered by this hazard, where the microwave is provided by the property owner.

There is no clear evidence of a risk to health from exposure to low level electro-magnetic fields from mobile phone signals, Bluetooth and wi-fi, nearby electricity pylons, cathode ray tube televisions, radio transmitters and other sources of non-ionising electromagnetic radiation normally found in or near to domestic dwellings.

Vulnerable group and the national average scores

Radiation (Radon) – Average likelihood and harm outcomes for all persons **aged 60-64 years following lifetime exposure to radon gas.**						
Measured radon level ($Bq.m^{-3}$)	Average likelihood 1 in	Spread of harm outcomes				Average HHSRS scores
		Extreme %	Severe %	Serious %	Moderate %	
800	300 (277)	90	10	0	0	3,033 (3,285) High risk
400	500 (518)	90	10	0	0	1,820 (1,757) High risk
200	1,000 (1,000)	90	10	0	0	910 (910) Moderate risk
150	1,000 (1,322)	90	10	0	0	910 (688) Moderate risk
100	2,000 (1,961)	90	10	0	0	455 (464) Moderate risk
50	5,000 (3,902)	90	10	0	0	182 (233) Moderate risk
25	5,000 (7,853)	90	10	0	0	182 (116) Moderate risk
All dwellings ($20 Bq.m^{-3}$)	**5,000 (22,776)**	**90**	**10**	**0**	**0**	**182 (40) Moderate risk**

Note – Scale point values are shown, with the national average values for likelihoods and their corresponding final scores (determined using actual harm outcome values rather than scale point values) provided in brackets. Data quality for these averages is weak. The averages were derived from values quoted in published literature for lung cancer deaths attributable to exposure to radon. The analysis did not distinguish between smokers and non-smokers. The original HHSRS averages use the 60-64 age bracket so that format has been retained in the update.

Summary box – Radiation

Vulnerable group – All persons aged 60 years and over with a lifetime exposure to radon gas

Groups other than vulnerable group at greater risk – Smokers

Main issues to look for – High background levels of radon in the local area and high radon measurements from within the dwelling, lack of passive ventilation openings in walls, doors and windows, cracked solid floors or suspended timber floors (particularly where they have inadequate under-floor ventilation) and open chimneys and other sources of air movement providing continuous extraction of air from the upper parts of the dwelling such that they draw soil gas into the structure. Where radon protection measures are installed, these may be defective or inadequate. Perished seals on microwaves may allow radiation to escape.

Risk reduction measures – Radon protection measures including radon-proof barriers can be fitted during construction of the dwelling or extensions to the dwelling, but these are harder to install in existing structures. Protection measures for existing dwellings include radon sumps fitted under the ground floor, which are continuously ventilated to the outside air, and positive pressure ventilation systems incorporating heat recovery, which will provide an increased rate of air changes in the dwelling, to reduce radon gas accumulation. Measures must be tailored to the individual dwelling. Microwaves with deteriorated seals allowing the escape of microwave radiation should be safely disposed of.

Health effects

Radiation has two forms:

- Ionising – including alpha, beta and gamma radiation. Alpha particles have the highest energy, but due to their size they are easily stopped by liquids and solids. Gamma radiation has the lowest energy but has the greatest ability to penetrate even solids. Ionising radiation will interact with DNA causing genetic mutations.
- Non-ionising – including microwave and radio-frequency radiation. This does not have sufficient energy to damage DNA material directly.

Radon gas produces alpha particles as part of its natural radioactive decay process. Radon gas is a ubiquitous natural air pollutant produced by the radioactive decay of uranium-238 present in the ground. Radon gas is chemically inert, colourless and odourless. It exists in low concentrations outdoors, but indoors concentrations of radon may be higher. Radon levels may be higher in some locations due to the local geology.

Radon gas and its decay products (also radioactive) usually enters the body through inhalation but may be ingested when it is dissolved in drinking water. Radon's radioactive decay products produce alpha particles which are strongly ionising. Alpha radiation has limited effect on the outside of our body. When it enters the body, it exposes our soft tissues to this radiation which causes damage even at low levels of exposure. This causes mutations which may result in cancers, or facilitates the harmful processes initiated by other carcinogens. The dose-response relationship from exposure is linear at low concentrations.

Radon is a major cause of lung cancer. Annually, approximately 1,100 deaths lung cancer in the UK (3.3% of all deaths from lung cancer) are related to radon in the home. Over 85% of these deaths arise from radon concentrations below 100Bq/m^3. Radon has a synergistic effect with smoking, such that when smokers are exposed to radon gas the risk of lung cancer is increased beyond that due to radon or smoking alone. Six out of seven deaths from lung cancer attributable to radon were caused jointly by radon and active smoking. The lifelong risk of lung cancer from radon is 25 times higher in smokers.

The UK Health Security Agency recommends that radon levels should be reduced in homes where the average annual radon level is more than 200Bqm^{-3}, the 'Action Level.' The Target Level following remediation of excessive radon levels in a building/implementation of radon protection measures in new buildings is 100Bqm^{-3}. The average level of radon in UK homes is approximately 21 Bqm^{-3}.

Causes

Natural sources cause 85% of the total exposure to ionising radiation in the UK. Exposure to radon gas in buildings is the dominant source of this exposure. Exposure to dissolved radon gas in drinking water has only been found in significant quantities in private water supplies in areas where there are high levels of radon gas. Radon has not been found in levels which pose a threat to health in public drinking water supplies.

Radon levels vary depending on the geology of the area. Those with the highest radon potential are identified as 'Affected Areas.' Radon levels can also vary widely between houses in a given street and even between rooms within a house. The movement of air through buildings creates a slight suction which can draw air through gaps in the floor. Holes in the damp proof membrane, cracks in solid floors and suspended timber floors all allow air to be drawn from the underlying ground, into the house. The gas tends to accumulate in the lower levels of the building, particularly where there are low levels of ventilation. Forced ventilation (e.g. extractor fans) and open chimneys can increase the problem if there are no air inlets in walls, as they will reduce the air pressure in the house, drawing more soil gas into the house.

Damage to microwave doors and seals may cause leakage of microwave radiation during cooking. The likelihood of damage to human health from leaked microwave radiation is likely to be very low.

Behavioural factors

Smoking has a major impact on the risk to health from radon gas exposure, but due to the data the HHSRS is based on the vulnerable group can only be determined based on age. It cannot consider lifestyle choices.

Relevant matters and baseline indicators affecting the likelihood and harm outcomes

Other hazards impacting the likelihood and/or harm outcomes

There is insufficient evidence to show that other hazards impact significantly on the risk to health from radiation, however a noisy external environment may discourage occupiers from opening windows for ventilation.

Relevant baseline indicators (accompanying notes are in Appendix 1)

1.1 Externally, every foundation, roof, ridge line, flashing, fascia, soffit and bargeboard, exterior staircase, exterior wall/fence shall be safe to use and capable of supporting the intended design loads and load effects and shall be in a proper state of structural repair.

Internally, every wall, floor, ceiling, inside stair, porch, accessory structure, door, window and window glass shall be safe to use and capable of supporting the intended design loads and load effects, and shall be in a proper state of structural repair.

3.1 An approved potable water supply system shall provide an adequate amount of running water under pressure to all fixtures simultaneously. Supplies in individual bedsits/dwellings/flats must have their own controllable supply of water or the ability to store water.

16.2 All habitable rooms must have at least one window, door or skylight which opens to the outside and can be fixed in an open position. In addition, ventilation may also be provided by the presence of trickle vents, air bricks or passive stack ventilation.

16.3 In each habitable room, the size of the openable windows, doors and skylights together must be at least 5% of the floor area of that room.

16.4 All means of ventilation shall be maintained in good repair and working order.

17.1 Every foundation, roof, roofing component, exterior wall, floor, door, skylight and window shall be watertight, weathertight, free of persistent dampness or moisture and in good condition.

17.4 Dwellings must not have radon concentrations greater than 200 Becquerels per cubic metre.

Other matters affecting the likelihood and severity of harm outcomes include:

- Background radon levels – high radon levels in the local area (Affected Area)
- Timber ground floor – ground floor of suspended timber construction, particularly if without adequate sub-floor ventilation.
- Disrepair to solid floor – holed, cracked or other disrepair to a solid ground floor.
- Lack of damp proof membrane – lack of or defective damp proof membrane to solid floor.
- Sealing around services – inadequate sealing around service entry points, and similar disrepair.
- Ventilation rates – high ventilation rates in the upper levels of the dwelling.
- Open chimneys – use of open fires, open chimneys and wood burning stoves without additional through-the-wall ventilation.
- Lack of or disrepair to remedial measures – lack of remedial measures or disrepair to any remedial measures, such as a radon sump or associated fan in areas with high radon levels.
- Extractor fans – continuous use of extractor fans in kitchens, bathrooms or WCs.
- Private water supply – particularly if from a borehole or well.

Preventative measures

New buildings with any elevated risk of radon should be constructed with a radon-proof barrier, usually provided through modification of the damp proof membrane and damp-proof course. Extra measures may be required in radon Affected Areas such as positive pressure ventilation systems and radon sumps.

Radon monitoring in existing dwellings is typically performed by the installation of etched track detectors, although other methods of detection can be used. Etched track detectors are usually placed in the living room and bedrooms of the dwelling, for a period of three months. These are then sent for analysis by the UK Health Security Agency or a private organisation, who identify tracks made on the detectors by emissions of alpha particles, and from these tracks they can determine average levels of radon in the dwelling.

Existing dwellings where radon has been detected in concentrations over 200Bqm^{-3} will require remediation measures. Remediation measures should be considered in dwellings where concentrations are over 100Bqm^{-3} or where the occupier has a history of smoking. Retrospective radon reduction measures may involve under-floor ventilation, whole-dwelling positive air pressure ventilation systems, or the installation of a radon sump under the floor of the dwelling, with a low power fan to remove gas from the sump and disperse it into the open air.

Other considerations for assessment of this hazard

Radon levels vary dramatically even between properties of identical construction over a small geographical area. The only way to determine actual levels of radon is through measurement. High background radon levels in the local area and any of the above relevant matters indicate the need for radon measurements to be undertaken. Measurements over a typical period of at least three months, using multiple detectors, will provide an indication of the prevailing radon levels in the dwelling. These can be carried out at any time of the year, but levels may be higher during colder months as windows and doors will be closed for longer periods, allowing radon to accumulate in the dwelling. The average annual radon level is estimated by applying a seasonal correction factor to compensate for this variation.

Further reading

HM Government (2013) The Building Regulations 2010 Site Preparation and Resistance to Contaminants and Moisture – Approved Document C. Available at: www.gov.uk

HM Government (2021) Building Regulation 2010 Ventilation - Approved Document F - guidance for dwellings. Available at: www.gov.uk

The UK Health Security Agency has a range of publications on radon and radon protection measures. It also hosts the UK radon web area containing a range of relevant information (www.ukradon.org).

11. Damp and Mould Growth

Description of the hazard

This hazard covers threats to health associated with the increased prevalence of house dust mites and mould or fungal growths resulting from dampness and/or high humidity environments. It includes threats to mental health and social well-being which may be caused by living with the presence of damp, damp staining and/or mould growth. It also covers threats to occupier health from flooding.

Where water ingress is caused by defective drainage it should be assessed under this hazard and Domestic Hygiene.

Vulnerable group and the national average scores

Damp and Mould Growth – Average likelihood and harm outcomes for all persons **aged 14 years and under.**							
Dwelling type and age		Average likelihood 1 in	Spread of harm outcomes				Average HHSRS scores
			Extreme %	Severe %	Serious %	Moderate %	
Non-HMOs	Pre 1920s	1,000 (765)	0	1	10	89	5 (6) Low risk
	1920-45	300 (390)	0	1	10	89	16 (13) Low risk
	1946-79	2,000 (1,721)	0	1	10	89	2 (3) Low risk
	Post 1979	1,000 (1,146)	0	1	10	89	5 (4) Low risk
HMOs	Pre 1920s	1,000 (794)	0	1	10	89	5 (6) Low risk
	1920-45	500 (712)	0	1	10	89	10 (7) Low risk
	1946-79	1,000 (794)	0	1	10	89	5 (6) Low risk
	Post 1979	1,000 (1,291)	0	1	10	89	5 (4) Low risk
All dwellings		**1,000 (826)**	**0**	**1**	**10**	**89**	**5 (6) Low risk**

Note – Scale point values are shown, with the national average values for likelihoods and their corresponding final scores (determined using actual harm outcome values rather than scale point values) provided in brackets. Data quality is satisfactory. English Housing Survey data from 2001 to 2019 was used to forecast the percentage of dwellings in England with serious damp / mould problems in 2020. This was combined with an estimate of the number of under 14-year-olds who suffer a potentially fatal asthma attack in England per year as well as an estimate of the number of dwellings in England with at least one dweller aged 14 or under. A published meta-analysis was used to provide an estimate that damp and mould elevated the risk of asthma by 40%, allowing the assumption that 40 out of every 140 potentially fatal asthma attacks were attributable to damp and mould.

Summary box – Damp and Mould Growth

Vulnerable group – Those aged 14 years and under

Groups other than vulnerable group at greater risk – Atopic individuals, those sensitised to microbial pollutants (particularly dust mites), asthmatics, immunocompromised individuals, pregnant women and their unborn foetus.

Main issues to look for – Water ingress from rising/penetrating damp, plumbing leaks, condensation, inadequate heating provision and insulation, low Energy Performance Certificate rating.

Flooding may arise from inadequate or obstructed provision for dealing with surface water drainage, through blockages to foul water pipework or through area-based flooding events.

Risk reduction measures – Maintenance and repair of the dwelling structure, fixtures and fittings to prevent water ingress from the surrounding environment and unwanted escape of water from amenities within the dwelling, improvement of the structure where its design provides inadequate levels of water resistance (e.g. provision of an injected damp proof course), ensuring adequate heating and insulation, adequate ventilation (particularly in the bathroom and kitchen) and provision of clothes drying facilities with adequate provision for handling moisture vapour.

Flooding may be prevented through adequate provision for surface water drainage, regular maintenance of plumbing and drainage, measures to prevent blockages and protection of pipework from frost. Flood barriers may be required to prevent water ingress where flooding originates from high rainfall or tides.

Health effects

Damp has both physiological and psychological impacts on health. Physiological health impacts arise from increased levels of microbiological pollutants in the domestic environment. These include fungi, bacteria, endotoxins, mycotoxins, viruses and fragments of all of these. The health impacts will vary due to the type of microbial pollutants occupiers are exposed to, their own vulnerability to these pollutants and the level, and frequency of exposure endured. The most common effects are allergic reactions, but microbial pollutants may also cause other forms of irritation of the respiratory tract and some mycotoxins may be carcinogenic in nature.

Exposure to microbial contaminants from damp and humid living conditions is clinically associated with respiratory symptoms and immunological reactions including respiratory infections, allergies (allergic rhinitis), asthma, bronchitis, shortness of breath, wheeze, hypersensitivity pneumonitis, allergic alveolitis and mould infections in susceptible individuals.

Prolonged exposure to higher concentrations of allergens will increase the likelihood of sensitisation in atopic individuals (those with a predetermined tendency to sensitisation) and may sensitise non-atopic individuals. Once sensitised, relatively low concentrations of the allergen can trigger allergic symptoms. Repeated exposure can lead to the development of asthma.

Approximately 12% of the UK population have been diagnosed with asthma. Asthma is more common in children and in some cases does not persist into later life. Asthma accounts for 60,000

hospital admissions in the UK annually. In 2018 approximately 1,400 people died of an asthma attack.

Allergens found in the faecal pellets of dust mites are one of the most common triggers of asthma. These allergens will trigger an allergic reaction in around a third of children exposed to them (and much higher levels in atopic children who suffer from asthma and are sensitised to house dust mite allergens).

Volatile organic compound production from microbial and chemical sources will increase in damp and humid environments. Some substances will emit more volatile organic compounds in damp and humid environments and moist air is capable of retaining many of these compounds in higher concentrations than in dry air. The impact of volatile organic compounds on health is covered in greater detail under the hazard of Indoor Air Pollutants.

Exposure to mould and bacteria and their spores, endotoxins and mycotoxins pose an increased risk to health for immunocompromised individuals. Some fungi can colonise the respiratory tract of susceptible individuals, particularly asthmatics.

Toxins from bacteria and moulds can cause inflammatory responses. Infection with viable bacteria, fungi, moulds and viruses will also be more likely, due to the greater persistence of most viruses and micro-organisms in a damp and humid environment.

Damp and mould growth can have significant social and psychological impacts on dwelling occupiers. These can be difficult to separate from wider psychological impacts associated with low incomes and fuel poverty. Factors which lead to deterioration in wellbeing, fear and potentially depression in occupiers include anxiety over living conditions, feelings of helplessness and lack of control over their living environment (due to limited finances or reliance on a landlord to correct the source of damp), damage to belongings caused by damp and mould growth, stigma associated with living in cold and damp conditions, ongoing difficulties with aspects of daily life such as drying clothes and concern over the impact living in damp living conditions is having on their health. Social isolation can be caused by odours, and poor appearance of the internal living environment due to damp and mould growth, discouraging occupiers from allowing guests to enter the dwelling. These feelings will be exacerbated where damp living conditions are combined with concerns over the affordability of fuel and the presence of cold living conditions.

Flooding must be considered under damp and mould growth. This may be localised to the dwelling or spread over the area the dwelling is situated in. Flooding is a dramatic form of damp and is becoming more likely due to climate change. It presents a range of health effects depending on the extent and rapidity of the flooding.

Flooding has strong psychological effects on occupiers. The loss of a person's home and the psychosocial impact this has on occupiers, trauma from the experience and secondary stressors experienced after the event (e.g. insurance arrangements and construction/maintenance work). Psychological harms include PTSD, anxiety, depression and reduction in levels of wellbeing. The extent of their effect varies with the level of losses/damage caused by the flooding, whether there is adequate insurance cover and the level of social support available for those affected by the flooding. Flooding can exacerbate mental health effects already present before the event. Mental health effects from flooding may be long-term.

Other health effects from flooding depend on the extent of the event. The abovementioned respiratory impacts from damp in the dwelling will be accompanied by risk of communicable disease

either directly from contaminated water (e.g. norovirus), or through increases in zoonotic and vector borne diseases (e.g. leptospirosis). Catastrophic flooding incidents may increase the risk from physical injury, hypothermia and asphyxia. Children, immunocompromised individuals, pregnant women and their unborn foetus are at greater risk from these issues.

Causes

Dust mite populations will increase where the relative humidity is above 50%. Moulds can grow where the indoor relative humidity persistently exceeds 70%. Moulds and fungi can also grow in areas of localised damp due to water ingress, causing both wet and dry rots.

Where there is fungal and mould growth this will increase the levels of spores occupiers are exposed to. The increased attention towards energy efficiency in dwellings and the rising fuel costs have resulted in a reduction in levels of background ventilation in the housing stock, affecting the removal of moisture and airborne pollutants from dwellings.

Water vapour in one part of a dwelling may move to other parts of the dwelling. There should be continuous low-level background ventilation. Small reductions in the ventilation rate below 0.5 air changes per hour can greatly increase the dust mite population. Increasing the rate to above 0.7 air changes per hour can also lead to an increase in the mite population where a dwelling is not adequately heated. Dwellings with high occupant density and small room sizes may require increased ventilation and heating/insulation to prevent problems.

Moisture production can also be influenced by the design, construction and repair of the dwelling. Sources of damp include water introduced during construction, plumbing faults, rainwater and ground water leaking into the structure or entering the property through capillary action (rising damp) and tracking along building materials (usually due to faults in the building structure). Water may accumulate inside the structure due to condensation. Salt accumulation from previous damp problems can cause building materials to become hygroscopic, attracting more moisture. Older dwellings are likely to have solid walls which are less insulating and more susceptible to water penetration. They may also lack an effective damp proof course.

Cooler air will hold less moisture and colder properties are more likely to suffer from higher relative humidities. Colder dwellings will not be able to hold as much water in the air, reducing the effectiveness of ventilation at removing moisture from the living environment. Cold surfaces in dwellings will cool air which comes into contact with those surfaces. As the temperature of the air drops the relative humidity will increase. It may pass the ‘dew point,’ causing moisture in the air to condense out as liquid on that surface. Where construction materials are poorly insulating, they may cause cold bridging, resulting in localised condensation.

Failure of seals caused by movement where baths and showers meet the surrounding surfaces (and sometimes at the drainage outlet) are a common source of damp and can be hard to identify until the damp starts to appear below the bathing facilities. This can contribute towards collapse of ceilings (covered under the Structural Collapse and Falling Elements hazard).

Failure to adequately insulate water pipework and storage vessels can result in condensation forming on their surfaces. It can also result in catastrophic release of water during periods of sub-zero temperatures when water freezes and expands, rupturing plumbing and causing water leaks. Leaking plumbing can cause rapid escape of water into a dwelling, or between dwellings in flatted accommodation.

Lead has become a relatively expensive metal. Theft of leadwork from the outside of a dwelling can cause rapid rainwater ingress and damage to the dwelling. If the leadwork is easily accessible, theft may be repeated when the leadwork is replaced.

Blockages in drainage or failures of drainage to handle the volumes of water travelling through it may cause localised flooding. Extreme weather and tidal water may cause water to flow into multiple dwellings.

Areas with high groundwater may experience flooding of basements and under-floor cavities.

Behavioural factors

Occupiers produce up to a kilo of water vapour a day, mainly through perspiration and breathing, bathing, cleaning, cooking and drying of laundry. Dwellings must be able to cope with normal moisture production from these sources without persistently high relative humidities. Dwellings must also be adequately heated and ventilated to remove this moisture. Assessors should consider whether occupier behaviour is having a disproportionate effect on levels of damp in the property, or if increased levels of damp are attributable to inadequacies in the dwelling itself.

Whilst addressing issues associated with the dwelling under the HHSRS, assessors may need to provide separate guidance to occupiers on how to manage moisture production from domestic activities.

Relevant matters and baseline indicators affecting the likelihood and harm outcomes

Other hazards impacting the likelihood and/or harm outcomes

Crowding and space – Overcrowded living conditions can lead to moisture burden above what the dwelling is designed to safely deal with, causing condensation and high humidities.

Excess cold – Cold surfaces are more prone to condensation. Cold living conditions will impair the dwelling's ability to drive off moisture from sources of penetrating damp and normal daily activities such as cooking and bathing. Windows are less likely to be opened to remove moist air as occupiers will be more inclined to preserve any warmth inside the property. Cold conditions will contribute to the health effects of damp and mould growth.

Intruders – Occupiers may not feel safe to open windows to ventilate the property, particularly where these do not have window restrictors or bars and are in easily accessible locations.

Noise – Sources of external noise will prevent occupiers from leaving windows open to ventilate the property.

Relevant baseline indicators (accompanying notes are in Appendix 1)

2.1 Every drainage fixture, stack, vent, water, waste and sewer pipe shall be properly installed, maintained in a safe and functional order and kept free from obstructions, leaks and defects. The drainage system must have suitable rodding or access points to allow clearance of blockages.

2.3 There shall be adequate provision for surface- and foul-water drainage for the size and maximum occupancy of the dwelling. All drains and gullies shall be covered by a suitable grille or cover to prevent the build-up of debris restricting the natural operation of the system.

2.4 All rainwater pipes shall discharge properly into the drainage system or soakaway. Rodding or access points shall be available to allow the clearance of any blockage.

3.3 The WC cistern overflow should discharge externally unless designed by the manufacturer to discharge internally through the cistern or pan.

4.3 A dedicated wash-hand basin that is located in the same room as the WC or immediately adjacent shall be in good working condition, with a stable connection to the wall or secure attachment to the floor that is properly connected to the heated and unheated potable water supply and a sealed trap leading to a waste pipe. The wash-hand basin must be adequately sealed with a flexible sealant to prevent leakage and damage to the adjacent areas.

4.4 A fixed bath or shower in good working condition which does not leak and is properly connected to the heated/unheated potable water supply as appropriate, and a waste pipe that does not leak. The bath or shower must be adequately sealed with a flexible sealant to prevent leakage.

4.7 There must be a cleanable, non-absorbent water-resistant material on floor surfaces and extending on bathroom walls at least 300mm above a bath and 1800mm above the floor of a shower or shower tray. Such materials on walls and floors shall form a watertight joint with each other and with the bathtub or shower tray. Any shower shall have a shower screen, curtain or return wall that prevents water spillage to the floor.

4.8 Ventilation for the bathroom must be provided by mechanical extraction that is ducted to the outside of the building, in line with Baseline Indicator 16.1.

5.2 A kitchen sink in good working condition that is properly connected to heated and unheated water supplies and waste pipes, and has an area for draining wet cutlery and utensils which is connected to a waste outlet and sealed with flexible waterproof sealant. Any provided dishwasher and components of the sink, including disposal and water filtration devices, shall be in good working condition and properly connected. All feeds must have isolator valves to allow for maintenance.

5.6 Suitable facilities for the effective and safe removal of fumes and moisture-laden air to the external air by means of a cooker hood or extractor fan; a cooker hood that only recycles the odour through an active carbon filter would not be acceptable, it must vent to outside. A mechanical extractor would be the normal mechanism for this function, in line with Baseline Indicator 16.1.

5.9 A kitchen floor in good condition, with a sealed, water-resistant, non-absorbent and cleanable surface.

6.1 Where the dwelling does not contain a secure and private garden or yard for the exclusive use of that dwelling, a dryer (vented or recirculation type), or dedicated space to install a dryer, or access to a communal dryer facility must be provided.

15.1 Structural thermal insulation shall be provided to minimise heat loss. Where there is a loft space, insulation shall be provided as detailed:

- A minimum 250mm of loft insulation (assumed to be mineral wool or similar).

15.3 If the walls are of cavity wall construction, they must be insulated unless professional examination confirms to do so is technically unfeasible, due to either their condition or location in terms of wind-driven rain, or the width of the cavity being less than 40mm.

15.4 Every dwelling shall have a properly installed heating system in good and safe working condition that is capable of safely and adequately heating all habitable rooms, bathrooms and WC rooms. The system must be capable of heating the main living area to 21°C and the remaining habitable rooms to a temperature of 18°C when the external temperature is minus 1°C, and the system should not allow the temperature to exceed 25°C in any room during the heating season.

15.5 Heating and hot water must be capable of being controlled effectively and timed to operate by the occupiers.

16.1 The air exhausted from a bathroom, WC room, kitchen, clothes dryer or basement must be provided by mechanical ventilation or by a correctly designed and installed natural ventilation system, as required by Part F of the Building Regulations. In addition, it shall not be vented into any other parts of the building's habitable space or an attic; such air shall discharge directly to the outdoors but not near any intake on the building exterior.

16.2 All habitable rooms must have at least one window, door or skylight which opens to the outside and can be fixed in an open position. In addition, ventilation may also be provided by the presence of trickle vents, air bricks or passive stack ventilation.

16.3 In each habitable room, the size of the openable windows, doors and skylights together must be at least 5% of the floor area of that room.

16.4 All means of ventilation shall be maintained in good repair and working order.

17.1 Every foundation, roof, roofing component, exterior wall, floor, door, skylight and window shall be watertight, weathertight, free of persistent dampness or moisture and in good condition.

17.2 The building's drainage system, such as footing or foundation drains, gutters, downspouts, rainwater collection containers or other elements shall direct water away from the structure.

17.3 No single room in any of the property shall have an observable level of damp or mould growth or deterioration of internal finishes that exceeds 5% of the wall and/or ceiling surface.

Other matters affecting the likelihood and severity of harm outcomes include:

- Energy efficiency – inadequate heating and insulation of the dwelling, poor Energy Performance Certificate rating.
- Exposed water tanks and pipework – inadequate frost protection.
- Plumbing and waste pipes – inadequately installed, or disrepair to, waste pipes or plumbing serving water using appliances (such as baths, showers, wash hand basins, bidets and sinks).
- Roof and sub-floor spaces – inadequate ventilation.
- Small rooms sizes – may result in high occupant density.
- Flooding - Dwelling situated in a location prone to flooding.

Preventative measures

Dwellings should be warm, dry and well-ventilated. Indoor relative humidity should be between 40% and 60% except for short periods where it will fluctuate due to factors such as bathing and cooking. This range is the optimum to limit growth of house dust mites and moulds. It is also the recognised comfort zone.

The structure of the dwelling should be maintained free from rising and penetrating damp and free from persistent condensation. Damp ingress may be due to design and construction defects, or it may be due to disrepair. The cause(s) of damp can sometimes be difficult to determine and may have more than one source. Where excessive levels of damp and high humidities are found in a dwelling a thorough examination should be undertaken to identify the root cause(s). Remedial actions may require maintenance measures (e.g. clearing guttering) and measures to retrospectively improve watertightness of the building envelope (e.g. installing an injected damp proof course).

Plumbing faults and inadequate sealing around bathing facilities, kitchen sinks and wash hand basins can cause damp inside a property. Fitting waterproof finishes around facilities subject to splashing and preventing excessive movement (which can cause failure of seals where facilities meet surrounding surfaces) will reduce the risk of water escaping. Providing impervious finishes to bathroom and kitchen floors, sealed where they meet surrounding walls and appliances, will provide a secondary means of containing water spillage. Plumbing should be well maintained and free from leaks. Plumbing should be insulated to prevent pipework/storage tanks from freezing in cold weather. Some plumbing will attract condensation, such as cold-water pipework and WC cisterns. Where this begins to accumulate to an unacceptable level it may be necessary to insulate these components.

Breaks in joins in rainwater guttering and blockages in guttering from leaves etc. are common causes of damp ingress. The rainwater goods should be of adequate size for the volume of water they are expected to handle. They should be securely mounted, well maintained and capable of safely carrying precipitation away from the dwelling, either into a drainage inlet or other proper means of disposal. Rainwater goods should be periodically examined and cleared of debris to ensure blockages are prevented.

Roof and underfloor spaces should be properly ventilated to ensure timber remains relatively dry. This will minimise the chance of fungal infection or infestation with boring insects. Timberwork in these locations may require treatment to reduce the likelihood of damage by fungal or pest species.

The dwelling should be able to cope with normal occupant moisture producing activities without persistently high relative humidities. There should be adequate heating and insulation to keep the dwelling warm and sufficient ventilation to remove moisture-laden air during periods of peak production, without having to open windows. Cooking and bathing areas should have forced extraction to the outside air, or adequate passive stack ventilation. Clothes drying facilities should be suitably ventilated to the outside air or fitted with an appropriate condenser. There should be adequate background ventilation to safely carry away ongoing moisture production by residents. Background ventilation should not interfere with the thermal comfort of occupiers.

Mechanical heat recovery ventilation systems may be used where there is a need to avoid heat loss from ventilation of the property. These systems can allow an increased air change rate (around 0.9 air changes per hour) without significant heat loss. Where a property has had high levels of damp and mould in the past and it is difficult to prevent recurrence of mould growth, installation of a mechanical heat recovery ventilation system may be sufficient to suppress indoor humidity levels without excessive heat loss from the dwelling.

Flooding prevention is a complex area. The Environment Agency has mapped areas across England which are likely to be affected by rainfall related flooding. Flood mitigation measures and flood defences are likely to affect multiple dwellings and where they do so part of the remedial measures will sit outside of the HHSRS. However, individual dwelling measures may help to reduce damage during periods of high water. These include changes to surface water drainage channels and pipework, air brick covers, barrier gates, defensive walls, door barriers and sumps to gather water with automated pumps to remove it.

Other considerations for assessment of this hazard

HHSRS dwelling assessments should consider damp and mould growth associated with the dwelling structure, fixtures, fittings and appliances which are the responsibility of the owner. Assessors should consider the risk to health this could pose when the occupiers are producing normal levels of

moisture from domestic activities. The dwelling should be able to manage these levels of moisture without occupiers having to run dehumidifiers and leave windows open for protracted periods of time.

Occupiers may have to take additional actions to warm and ventilate the property to expel moisture from the dwelling, which has accumulated due to deficiencies in the dwelling (e.g. using a dehumidifier). Remedial measures required under the HHSRS should be such that the period for which these additional measures are required is finite.

Additional examination (e.g. the use of damp measurements from within walls) may be necessary to identify sources of damp. Destructive examination should normally be undertaken by the building owner/manager.

Flooding will contribute to many of the HHSRS hazards including the Excess Cold, Domestic Hygiene, Water Supply and Electricity hazards. Where there is flooding, separate assessments may also be required under the relevant hazard. Area based action to address flooding is outside the scope of the HHSRS, but measures to address flooding specific to the dwelling being inspected or the building it is located within are within the scope of the HHSRS. The underlying principle of the HHSRS is that the dwelling should provide a safe and healthy environment for any potential occupier or visitor. The dwelling should provide protection from all potential hazards in the local external environment, including weather conditions, ground conditions and pollution.

Further reading

British Standard BS5250 – Management of moisture in buildings. Code of practice. Available at: www.bsigroup.com

British Standard BS8102 – Code of practice for protection of below ground structures against water from the ground. Available at: www.bsigroup.com

HM Government (2010) The Building Regulations 2010 Site Preparation and Resistance to Contaminants and Moisture – Approved Document C. Available at: www.gov.uk

HM Government (2021) The Building Regulations 2010 Ventilation – Approved Document F – guidance for dwellings. Available at: www.gov.uk

HM Government (2021) The Building Regulations 2010 Conservation of Fuel and Power – Approved Document L – guidance for dwellings. Available at: www.gov.uk

World Health Organisation (2009) WHO guidelines for indoor air quality: Dampness and mould. Available at: www.who.int

The Government's www.gov.uk web site contains a range of information on flooding and resilience measures and guidance on resistance to moisture in buildings.

12. Lead

Description of the hazard

This covers threats to health from the ingestion of lead.

Vulnerable group and the national average scores

Lead – Average likelihood and harm outcomes for all persons **aged 3 years and under.**							
Dwelling type and age		Average likelihood 1 in	Spread of harm outcomes				Average HHSRS scores
			Extreme %	Severe %	Serious %	Moderate %	
Non-HMOs	Pre 1920s	5,000 (70,432)	0	1	10	89	1 (>1) Low risk
	1920-45	5,000 (73,408)	0	1	10	89	1 (>1) Low risk
	1946-79	5,000 (179,561)	0	1	10	89	1 (>1) Low risk
	Post 1979	5,000 (323,852)	0	1	10	89	1 (>1) Low risk
HMOs	Pre 1920s	5,000 (69,747)	0	1	10	89	1 (>1) Low risk
	1920-45	5,000 (60,821)	0	1	10	89	1 (>1) Low risk
	1946-79	5,000 (115,278)	0	1	10	89	1 (>1) Low risk
	Post 1979	5,000 (107,722)	0	1	10	89	1 (>1) Low risk
All dwellings		**5,000 (105,306)**	**0**	**1**	**10**	**89**	**1 (>1) Low risk**

Note – Scale point values are shown, with the national average values for likelihoods and their corresponding final scores (determined using actual harm outcome values rather than scale point values) provided in brackets. There is limited data on blood lead content in UK children. The area is subject to widespread under-reporting. The likelihood estimates were updated using Public Health England data on cases of lead exposure to children aged under 5 in 2017. This allowed harms to those aged 3 or under to be estimated.

Summary box – Lead

Vulnerable group – Those aged 3 years and under

Groups other than vulnerable group at greater risk – Pregnant women, older people, children with pica.

Main issues to look for – Flaking or damaged paintwork in/on pre-1980s properties, lead pipework, lower pH water supply, lead contamination of soil from manmade or naturally occurring sources.

Risk reduction measures – Removal or painting over of damaged paintwork using appropriate precautions, and replacement of lead pipework. Covering or removing lead contaminated soil.

Health effects

In a domestic environment lead exposure is most likely to come from paint. The next most likely source is water pipework. Lead may also originate from contaminated soil either due to natural concentrations of lead in the local environment, or through contamination from flaking external house paint, nearby industrial processes and roads (due to historical use of lead in fuel), or through previous use of the land the property was constructed on.

Lead is most likely to be ingested by young children (more commonly in boys) through eating flakes of paint (pica) or dust. It has toxic effects on the nervous system and blood production. Continued exposure will cause reduced cognitive abilities, reducing Intelligence Quotient (IQ) even at low blood lead levels. It can also cause behaviour problems and delay sexual maturation or puberty onset in adolescence. Four to five times as much lead is absorbed by children's bodies compared to adults, but it still presents a threat to adults and exposure to lead in later life can lead to nerve and kidney damage and infertility.

Pregnant women and foetuses are more vulnerable to harm from lead consumption. Older people are also more vulnerable to health effects than younger adults as lead may be released from bone changes due to aging, so toxic effects may be observed at relatively low exposures.

Although monitoring and reporting of lead exposure in workplaces has improved considerably, levels of awareness and therefore reporting of incidents of high levels of lead exposure from domestic situations varies across the UK, causing cases to be overlooked.

Causes

Ingestion of flaking lead-based paint by children, or intake of paint fumes and dust during the removal of lead-based paint are the main routes of exposure. Lead pigments were widely used in domestic paints until the 1960s, however lead pigments were not fully removed from commonly used paints until the early 1980s. When redecorating, older paints are usually covered with newer colours so paint containing lead pigments will remain underneath more modern paints. Hot stripping and sanding of old paint results in exposure to particles and fumes. Paint may also peel due to damage/deterioration of the surface finish, or damp ingress causing paint to lose adherence to the surface. Young children may ingest flaking paint or chew on edges/objects covered with a lead-based paint product.

HHSRS considers contamination of water after it has been delivered to the premises, where it becomes the responsibility of the owner. Lead contamination in domestic water supplies originates from older lead pipework or the use of lead-based solder for joints in pipework. Where water has high plumbosolvency capabilities, lead will be dissolved and is more likely to be ingested by dwelling occupiers. Lead ingestion through domestic water supplies is far less likely than exposure from paint.

Contaminated soil may be inhaled when gardening. It may be ingested by children playing in the area or eaten when consuming poorly cleaned vegetables grown in contaminated soil. The evidence that lead is absorbed by food products grown in contaminated ground is mixed, but this still presents a potential pathway for lead to enter the body. Lead-rich soils may also contain other harmful contaminants which are more readily absorbed by plants and animals. The chemical makeup of soils and plant species will influence the absorption of lead by plants.

Behavioural factors

Exposure to lead in paint requires ingestion or inhalation, both occur mostly through occupier behaviour. Assessors must consider likely mechanisms of exposure that are attributable to the dwelling structure, fixtures and fittings. It must be assumed children are not always supervised, so would have access to sources of flaking paint which they may ingest. Assessors should note that lead present in/on old toys and furnishings would not be considered under the HHSRS.

Relevant matters and baseline indicators affecting the likelihood and harm outcomes

Other hazards impacting the likelihood and/or harm outcomes

Although damp may cause paint to lose adherence to a surface there is insufficient evidence it significantly impacts on the likelihood of a harmful event from this hazard.

Relevant baseline indicators (accompanying notes are in Appendix 1)

3.1 An approved potable water supply system shall provide an adequate amount of running water under pressure to all fixtures simultaneously. Supplies in individual bedsits/dwellings/flats must have their own controllable supply of water or the ability to store water.

Other matters affecting the likelihood and severity of harm outcomes include:

- Old paintwork – the presence of old paint likely to contain lead.
- Disrepair to old paint – damage and/or flaking of old paintwork likely to contain lead.
- Lead pipework – the presence of such pipework for domestic water.
- Plumbosolvent water – water of high acidity likely to dissolve lead in pipes.
- Contamination of soil – either through human activity or naturally occurring mineral content of the ground.

Preventative measures

If paintwork is sound then it can be painted over, but if it has deteriorated then it should be removed, taking appropriate precautions to prevent the spread of airborne particles. Sanding and hot stripping should be avoided. Although lead is no longer used in most paints, it may still be present in older layers of paint and in specialist paints used for restoring older buildings.

Lead pipework should be removed from all residential buildings and replaced with copper or plastic alternatives.

Where sampling suggests there are high levels of lead in the grounds and environment surrounding a dwelling, consideration must be given to methods to break the source-pathway-receptor chain, for instance through hard landscaping of the contaminated soil.

Other considerations for assessment of this hazard

Sampling will be necessary to confirm if there is lead present in loose paint, soil or drinking water. Sampling will assist in tracing the source of lead exposure where a resident is suffering from lead poisoning.

Further reading

Public Health England (2014) Lead: Health Effects, Incident Management and Toxicology – multiple sources. Also, Lead Exposure in Children Surveillance System annual reports. These are provided on the www.gov.uk web site.

13. Indoor Air Pollutants

Description of the hazard

This hazard covers threats to health from exposure to:

- uncombusted fuel gas (uncontrolled ignition of this gas is covered under the Fire and Explosions hazard);
- carbon monoxide (from controlled combustion);
- nitrogen dioxide (from controlled combustion);
- sulphur dioxide (from controlled combustion);
- smoke (including particulate matter, from controlled combustion);
- volatile organic compounds; and
- biocides – (chemicals used to treat timber and mould growth in dwellings but not chemicals used to treat insect and animal infestations).

Threats to health from radon gas are dealt with under the Radiation hazard. Threats to health from asbestos fibres are dealt with under the Asbestos (and Manufactured Mineral Fibres) hazard. These have not been included in the Indoor Air Pollutants as they have very different spreads of harm outcomes and mechanisms of injury.

Vulnerable group and the national average scores

Indoor Air Pollutants – Average likelihood and harm outcomes for **persons of all ages.**							
Dwelling type and age		Average likelihood 1 in	Spread of harm outcomes				Average HHSRS scores
			Extreme %	Severe %	Serious %	Moderate %	
Non-HMO houses	Pre 1920s	2,000 (1,719)	0	0	5	95	1 (1) Low risk
	1920-45	2,000 (1,660)	0	0	2	98	1 (1) Low risk
	1946-79	1,000 (1,419)	0	0	2	98	2 (1) Low risk
	Post 1979	5,000 (5,701)	0.1	0.1	5	94.8	1 (<1) Low risk
HMOs and flats	Pre 1920s	2,000 (1,984)	0	0.1	5	94.9	1 (1) Low risk
	1920-45	2,000 (1,741)	0	0.1	2	97.9	1 (1) Low risk
	1946-79	1,000 (1,101)	0	0	2	98	2 (2) Low risk
	Post 1979	5,000 (5,605)	0.1	0.2	5	94.7	1 (<1) Low risk
All dwellings		**2,000 (1,832)**	**0**	**0.1**	**5**	**94.9**	**1 (1) Low risk**

Note – Scale point values are shown, with the national average values for likelihoods and their corresponding final scores (determined using actual harm outcome values rather than scale point values) provided in brackets. Health effects from this hazard category are likely to be under-estimated, as poisoning may have been unrecognised and unreported. There is currently no formal quantification of mortality and morbidity associated only with exposure to indoor air pollution at home in the UK, apart from carbon monoxide. There are only national estimates for exposure to air

pollution. A range of assumptions have been made which mean the data for the above averages is relatively weak. The hospital episode data identified exposure to and poisoning by various relevant factors. However, these did not map onto this combined hazard or its components directly.

Summary box – Indoor Air Pollutants

Vulnerable group – All ages

Groups other than vulnerable group at greater risk – Young children, those over 60 years of age, those who are pregnant, unborn babies in the womb, , and those with pre-existing medical conditions such as anaemia, heart or lung conditions.

Main issues to look for – Poorly installed or maintained gas installations and appliances or other fuel combustion appliances, poorly installed or maintained flue arrangements, inadequate/inappropriate ventilation (particularly in areas containing non-room sealed appliances), yellow/orange gas flames, unexpected soot staining around combustion appliances, lack of regular inspection and testing for fuel combustion appliances, lack of carbon monoxide detectors, use of construction and decoration materials producing high levels of volatile organic compounds, use of biocides in living spaces. Dwellings located in urban areas close to traffic and industrial activities which allow ingress of external pollutants.

Risk reduction measures – Installation, inspection and maintenance of fuel combustion installations and appliances (including gas storage) in accordance with the relevant guidelines for the type of fuel and purpose of the appliance. Carbon monoxide alarms. Provision of ventilation in accordance with current Building Regulations. Avoidance of high volatile organic compound materials and biocides or provision of thorough ventilation if their use is necessary.

Health effects

Outdoor air pollutants are recognised as an important public health issue, with between 28,000 and 36,000 deaths each year attributed to long-term exposure. There is strong evidence that air pollution causes the development of coronary heart disease, stroke, respiratory disease and lung cancer, and exacerbates asthma. Dwellings situated close to sources of outdoor air pollution will be at risk from ingress of these pollutants, affecting the internal air quality in the dwelling.

In developed countries people spend most of their time indoors and of that time the majority is spent in the residential environment. Exposure to the above indoor air pollutants is associated with irritation of the upper airway system as well as respiratory, cardiovascular, neurological, and carcinogenic diseases.

Leaks of uncombusted fuel gas (such as Liquified Petroleum Gas) and lack of ventilation can cause the gas to build up in dwellings. It can displace air, reducing the available oxygen occupiers need to breathe. The normal level of oxygen is 21%. When levels reach 14% asphyxiation can occur. Mortality rate from this issue in England is between 10 and 40 deaths per year.

When full or partial combustion of solid, liquid and gaseous fuels occurs, gaseous and particulate combustion products are produced. These are harmful to health if they are allowed to accumulate in residential environments. These products include carbon monoxide, oxides of nitrogen and sulphur, and smoke (including particulate matter). Particulate matter produced by combustion may be

harmful in itself or may carry substances on its surface which are detrimental to health. Particulate matter is produced in greater quantities by liquid and solid fuel combustion. The phasing out of sales of wet wood and coal for domestic use will help to alleviate levels of particulate matter and sulphur dioxide in residential environments.

Carbon monoxide is formed by combustion in the absence of sufficient oxygen to form carbon dioxide. Haemoglobin has a greater affinity for carbon monoxide than it does for oxygen. When inhaled the carbon monoxide adheres to haemoglobin in the blood, preventing oxygen uptake. When removed from the source of carbon monoxide, the time taken for the concentration of carbon monoxide in the blood to half is 2-6 hours.

At low concentrations it causes headaches, reduced attention span, short-term memory loss, dizziness, weakness, nausea, confusion, disorientation, and/or fatigue. At high concentrations it can cause unconsciousness and death. In people with ischaemic heart disease carbon monoxide can cause chest pain. It can also impair foetal development. Chronic exposure has been linked to brain damage, dementia and heart disease. At low concentrations carbon monoxide poisoning is often misdiagnosed as influenza or depression. Misdiagnosis of morbidity and mortality from carbon monoxide makes absolute numbers difficult to ascertain, but mortality from accidental non-fire related carbon monoxide poisonings in England and Wales is around 20 deaths per year, and hospital admission rates are between 200 and 250 per year. Poisonings exhibit seasonal variability, with more admissions occurring over the winter months. Higher admission rates were observed in the north of England.

Nitrogen dioxide, sulphur dioxide and particulate matter (PM2.5 and PM10) can cause irritation and damage to the lining of the airways. This damage can cause wheezing, coughing, trigger asthma attacks and increase sensitivity to allergens. At higher concentrations damage can make the respiratory passages more vulnerable to infections and can cause inflammation and irritation to the eyes, nose, throat and lungs. Long-term exposure to nitrogen dioxide or particulate matter has been linked to cardiovascular disease, respiratory disease (COPD) and decreased lung function.

Other gaseous pollutants may be introduced into the home in furniture and construction materials and decorative products such as paints. Volatile organic compounds (VOCs) include formaldehyde and chemicals found in paints and adhesives. At low concentrations they can cause short-term irritation and allergic reactions to the eyes, nose, skin and respiratory tract and can trigger asthma attacks. At higher concentrations they can cause shortness of breath, headaches, nausea, dizziness and drowsiness. Long-term exposure has been linked to increased risk of cancer including acute myeloid leukaemia and cancer of the lungs.

Biocides may be used to prevent the growth or development of insects, fungi, moulds and bacteria. They can be applied as a protectant prior to mould germinating on a surface, or as an eradicant once the mould has developed on a surface. A range of substances have been used as biocides, to treat timber and moulds. Governmental restrictions have reduced the range and toxicity of products available for timber treatment.

The main route of exposure to biocides is through inhalation, when they have not been allowed to disperse following application, but some will carry on being released into the air for many years. Skin contact, and ingestion can also cause adverse health effects, but these routes of exposure are more likely to occur at the time of application. The harm caused depends on the compound used in the preservative. Harms from biocides can include eye, respiratory tract and skin irritation and liver, blood and neurological effects. Biocides can also act as carcinogens and endocrine disruptors. The

risk of harm from biocides is around a tenth of the risk of harm from the other indoor air pollutants covered by this hazard category.

Young children and those over 60 years of age are at greater risk of harm as a result of exposure to the above indoor air pollutants. Pregnant women, unborn foetuses and those with pre-existing medical conditions such as anaemia, heart or lung conditions (particularly asthma) are also at greater risk. Health effects are more likely for those in lower socio-economic groups.

Causes

Leaks of uncombusted fuel gas are most likely to originate from damaged or poorly fitted gas transmission fittings and pipework, or poorly fitted and maintained gas appliances. Dwellings relying on 'bottled' gas are more likely to have poorly sealed or damaged fittings in their gas storage area as they are subject to mechanical damage and wear over time and potential faults when connecting new gas cylinders. Older gas cookers may not be fitted with safety devices to stop the flow of gas when there is no flame. When gas does leak, it can contribute to the risk of Fire and Explosions.

Incomplete combustion occurs when combustion happens in the absence of sufficient oxygen, resulting in the production of carbon monoxide (and other pollutants). When natural gas is burning it should burn with a blue flame, but a yellow or orange flame and the deposition of soot indicate combustion is incomplete. Carbon monoxide alarms may not be present to warn occupiers of accumulations, reducing the likelihood that exposure will be noticed.

High concentrations of combustion related air pollutants (gases and particles) can occur with malfunctioning or inappropriately used flued and unflued domestic appliances (e.g. boilers, heaters, fires, stoves and ovens), which burn carbon containing fuels (such as coal, coke, gas, kerosene and wood). All fuel combustion appliances will produce harmful gases and smoke. Most oil and gas fuelled water and space heating appliances are now room sealed, however this is not always the case. Some older gas fires are still in use and portable 'bottled' gas heaters may be found in residential environments. Gas cookers also produce fumes which may accumulate in a dwelling where there is insufficient ventilation to remove fumes during cooking. Solid fuel stoves and open fires are common. Leaks in flues and anything which inhibits the flow of combustion products through the flue will increase the risk of occupiers being exposed to harmful gases and particulates.

Harmful combustion products may move through structures, entering the dwelling from neighbouring premises. Dwellings sited near sources of traffic or industrial activities may also allow ingress of airborne pollutants through windows and other points where air is able to enter the structure (airbricks, cracks, gaps around doors, etc.).

When an open fire has reduced to embers, the fire may produce insufficient heat for the chimney to draw effectively, causing combustion products to be emitted into the room. Chimneys may also fail to draw adequately through poor design. Weather conditions can cause the passage of air to flow down the chimney flue, pushing combustion products into the dwelling. Flues may also develop cracks, allowing combustion products to leak into the building(s) bordering the flue, if the flue isn't fitted with a suitable liner.

When extraction fans and extracting cooker hoods are sited in the same room as space or water heaters which are not room sealed, they will reduce the pressure in the room, preventing combustion products from escaping safely through the flue, drawing them into the room. Inadequate flue sizes or flues obstructed by build-up of residues on the flue walls or other problems such as nesting birds, will result in inadequate flow of combustion products through the flue, increasing the risk of them moving out into living spaces.

VOCs are organic compounds whose composition makes it possible for them to evaporate under normal indoor conditions of temperature and pressure. They are found naturally in the environment, (e.g. in manure from cattle) or can be produced by artificial sources. VOCs are primarily used in the manufacture of paints, varnishes, adhesives, pharmaceuticals and refrigerants, although they may be released from furnishings (e.g. upholstery, carpet, vinyl flooring, composite wood products) and household products such as polish, cleaning products and air fresheners. They are also found in personal care products such as hairsprays, deodorants and perfumes and are released by smoking, cooking and burning of wood.

Formaldehyde is one of the most common VOCs with a detrimental effect on human health. It is commonly found in solvents, bonding agents, adhesives, pressed wood products (e.g. plywood), foam insulation and cushioning, and decorating products. It can be released into the air through 'off-gassing' from these products and through the combustion of fossil fuels and wood.

Biocide exposure is most likely to occur during the initial treatment with the biocidal product. If these compounds are not applied following the manufacturer's guidelines, then they may harm the person applying the compound, or the dwelling occupiers. Failure to allow fumes to disperse adequately prior to occupation of the dwelling will also provide a route for exposure. Whilst use of many of the more toxic biocides has been restricted since the writing of the last HHSRS 'Operating Guidance' (2006) some will carry on being released into the air for many years, causing low level exposure to dwelling occupiers.

Concentrations of all these indoor air pollutants will increase in colder weather as doors and windows are kept open for shorter periods, reducing levels of ventilation to the dwelling. Use of air conditioners in warmer weather may also allow air pollutants to accumulate, due to reduced levels of ventilation of the dwelling.

Behavioural factors

During colder months occupiers will make less use of windows to ventilate the home and will favour retaining warmed air in the building, to reduce heating costs. Occupiers may also fail to open windows to remove combustion fumes from cooking appliances if there is a security risk or the dwelling is situated in a noisy external environment.

Solid fuel stoves and open fires require tending by users. Initial lighting of fires, the period before the fire is producing higher levels of heat and when there is an addition of new fuel are points at which combustion products may flow into rooms. The dwelling should be able to manage these emissions without significant risk to health.

Relevant matters and baseline indicators affecting the likelihood and harm outcomes

Other hazards impacting the likelihood and/or harm outcomes

Damp and Mould Growth – Damp conditions increase chemical degradation of some compounds used in building construction and finishes, increasing emissions of VOCs. Moist air can hold greater levels of some VOCs.

Any hazard which inhibits the effective ventilation of the property may contribute to this hazard.

Relevant baseline indicators (accompanying notes are in Appendix 1)

4.8 Ventilation for the bathroom must be provided by mechanical extraction that is ducted to the outside of the building, in line with Baseline Indicator 16.1.

5.4 For cooking food, a 4-ring hob (or 2-ring in bedsit-type accommodation) with oven and grill properly installed with all necessary connections for safe and efficient operation, which shall be maintained in good working condition.

5.5 Where an oven or hob is not provided, there must be a dedicated space with a suitable connection to either gas or electricity that meets the requirement of the relevant regulations.

5.6 Suitable facilities for the effective and safe removal of fumes and moisture-laden air to the external air by means of a cooker hood or extractor fan; a cooker hood that only recycles the odour through an active carbon filter would not be acceptable, it must vent to outside. A mechanical extractor would be the normal mechanism for this function, in line with Baseline Indicator 16.1.

8.1 Internal doors leading between areas of a single dwelling must provide a sufficient barrier to the spread of smoke and fire (where appropriate). Any glazing in doors must respond safely to collision and must be designed for functionality to avoid strains or entrapment when in use, and must be maintained in good repair. All bathrooms and WC room doors must be fitted with a suitable lock and must not contain clear glass.

14.5 Gas appliances and flues provided for occupants are safe for continued use.

15.4 Every dwelling shall have a properly installed heating system in good and safe working condition that is capable of safely and adequately heating all habitable rooms, bathrooms and WC rooms. The system must be capable of heating the main living area to 21°C and the remaining habitable rooms to a temperature of 18°C when the external temperature is minus 1°C, and the system should not allow the temperature to exceed 25°C in any room during the heating season.

15.6 Water heaters, wood stoves and other devices that employ combustion-burning fuel shall be vented to the outside of the structure in an approved manner that meets the manufacturer specification and in compliance with applicable standards and shall be supplied with sufficient air to support the continuous complete combustion of fuel and prevent back-draughting or the emission of harmful gases to any internal or enclosed spaces. The chimney must be maintained in accordance with the manufacturer requirements, including sweeping and inspection.

15.7 Where appropriate (when burning fossil fuels as heating, hot water provision, or for cooking) a hard-wired CO detector with battery back-up must be installed in the room containing the appliance.

16.1 The air exhausted from a bathroom, WC room, kitchen, clothes dryer or basement must be provided by mechanical ventilation or by a correctly designed and installed natural ventilation system, as required by Part F of the Building Regulations. In addition, it shall not be vented into any other parts of the building’s habitable space or an attic; such air shall discharge directly to the outdoors but not near any intake on the building exterior.

16.2 All habitable rooms must have at least one window, door or skylight which opens to the outside and can be fixed in an open position. In addition, ventilation may also be provided by the presence of trickle vents, air bricks or passive stack ventilation.

16.3 In each habitable room, the size of the openable windows, doors and skylights together must be at least 5% of the floor area of that room.

16.4 All means of ventilation shall be maintained in good repair and working order.

17.5 Only biocidal products approved by the Biocidal Products Regulations may be used within the dwelling and done so in accordance with the approved manufacturer's instructions.

19.3 An annual gas safety check should have been undertaken within the last 12 months with a satisfactory result. Any heating provided by LPG shall be inspected annually by a suitably qualified engineer.

19.5 There should be sufficient, properly designed and appropriately sited smoke and heat detectors with alarms in every dwelling. These should be properly maintained and regularly tested.

Other matters affecting the likelihood and severity of harm outcomes include:

- Siting of appliances – locations adjacent to windows or doors where there is a risk of flames blowing out, allowing continued emission of uncombusted gas where a safety cut-out has not been installed.
- Gas detector and carbon monoxide detector provision – the lack of correctly sited detectors or defects with those detectors.
- Flueless appliances – fuel burning appliances, including cookers and heaters.
- Flue outlet siting – sited adjacent to openable window or vent.
- Extractor fans – in rooms with open flued appliances.
- Ventilation lobby – no lobby between a garage and living accommodation, where the garage is used for motor vehicles.
- VOC emitting materials/treatments – the use of materials/treatments during construction, alteration or maintenance which emit high levels of volatile organic compounds.
- Use of biocides – particularly in living areas.
- Dwelling location – close to an external source of air pollution.

Preventative measures

Gas should be supplied by an authorised supplier and should be of standard composition and pressure. Gas supplies should have an appropriate pressure regulator, meter (where appropriate) and properly fitted distribution system which is sealed and pressure tested. Pipework and fittings should be protected from damage.

Where liquified petroleum gas is used, storage facilities should be sited away from windows and other ventilation points, be well ventilated and should be constructed such that cylinders can be replaced from outside the building. Liquified petroleum gas is heavier than air so ventilation should allow gas to drain away, particularly where floor level is below adjacent ground level. Such storage arrangements should be regularly inspected and maintained. Appropriately sited gas detectors should be provided to warn occupiers if there is a build-up of gas in the dwelling.

All combustion points will release harmful gases and particulate matter into the residential environment. Combustion appliances should be regularly inspected and maintained. Gas storage, delivery systems and appliances should be inspected and serviced annually by a Gas Safe registered engineer with the appropriate qualifications to assess the installations being checked. Oil and solid fuel burning appliances and their flues should also be correctly installed and maintained by a suitably qualified person.

Where rooms contain combustion appliances, they should be provided with an adequate air supply for combustion, be appropriately sited and be connected to adequately sized flues to safely remove combustion gases. Rooms containing combustion appliances should be provided with adequate and appropriate ventilation to remove combustion products which have accumulated inside the dwelling and to allow combustion products to escape through flues where appropriate. Flues should be checked regularly and kept clear. Flue outlets should be sited away from openings such as windows.

Room sealed appliances taking air for combustion from outside and discharging combustion gases outside will reduce the likelihood of gases escaping into living areas.

Carbon monoxide alarms should be provided where combustion appliances are used for space and water heating. Detectors should be properly sited, regularly tested and maintained.

Emissions of volatile organic compounds and biocides should be controlled at source, through selection of materials and compounds used in dwelling construction and maintenance which present less risk to health from these substances. Where they cannot be avoided, they can be removed from the dwelling through adequate provision of passive and active ventilation measures. Ventilation requirements set out in accordance with current Building Regulations guidelines should be sufficient for this purpose, but extra ventilation may be required where paints, glues and solvents have just been used. Use of biocides and products known to produce VOCs should be made in accordance with manufacturer guidelines. The use of many products has been restricted under both UK and EU regulations and directives. Labelling schemes are also improving information on these compounds for consumers. Legislation on such products is likely to vary over time.

Changes in building regulations have led to increased use of mechanical ventilation with heat recovery (MVHR) systems. These can substantially increase ventilation rates, reducing exposure to pollutants from indoor sources. They can also help to provide ventilation (with filtration where it is required) to reduce exposure to air pollution in the environment surrounding the dwelling.

Other considerations for assessment of this hazard

Assessors are unlikely to be qualified to determine levels of safety of gas installations and fuel combustion appliances. Inspections should initially look for appropriate checks and maintenance. Where these are missing and/or there are indicators of problems, an appropriately qualified person should be appointed (usually by the responsible party [typically the owner]) to inform the assessment and provide their findings to the assessor.

If the accumulation of uncombusted fuel gas is anticipated, then a separate assessment under Fire and Explosions should be made. Immediate action may be necessary.

This hazard is an amalgamation of hazards from the last version of HHSRS. Assessors should conduct a whole dwelling assessment covering all aspects of this hazard, but if there are issues affecting just one element of the hazard it is useful to understand what proportion of the national average likelihood is attributable to each of these areas. Approximately 55% of harms were from carbon monoxide, with the remainder coming from the other Indoor Air Pollutants.

Further reading

British Standard BS5440 1&2 Flueing and ventilation for gas appliances of rated input not exceeding 70kW net (1st, 2nd and 3rd family gases). Available at: www.bsigroup.com

British Standard BS6891 – Specification for the installation and maintenance of low pressure gas installation pipework of up to 35mm (R1 ¼) on premises. Available at: www.bsigroup.com

British Standard BS7880 – Code of practice for draught control of existing doors and windows in housing using draft strips. Available at: www.bsigroup.com

Department for Communities and Local Government (2011) Domestic Ventilation Compliance Guide. Available at: www.labc.co.uk

HM Government (2021) The Building Regulations 2010 Ventilation – Approved Document F – guidance for dwellings. Available at: www.gov.uk

HM Government (2010) The Building Regulations 2010 Combustion Appliances and Fuel Storage Systems – Approved Document J. Available at: www.gov.uk

NICE (2020) Indoor Air Quality at Home NICE Guideline. Available on the www.nice.org.uk web site.

Public Health England (2019) Indoor air quality guidelines for selected volatile organic compounds (VOCs) in the UK. London: Public Health England. Available at: www.gov.uk

Health and Safety Executive – provide information on biocides authorised/approved for use in the UK and guidance on labelling of biocidal products. See the www.hse.gov.uk web site.

World Health Organisation – WHO guidelines for indoor air quality: Selected pollutants (2010) available from the World Health Organisation Regional Office for Europe and the WHO global air quality guidelines (2021) available from the www.who.int web site.

14. Excess Heat

Description of the hazard

This hazard includes threats to health from excessively high indoor air temperatures.

Vulnerable group and the national average scores

Excess Heat – Average likelihood and harm outcomes for all persons **aged 65 years and over.**							
Dwelling type and age		Average likelihood 1 in	Spread of harm outcomes				Average HHSRS scores
			Extreme %	Severe %	Serious %	Moderate %	
Houses	All ages	-	30	10	30	30	-
Flats	Pre 1920s	5,000 (4,050)	30	10	30	30	64 (80) Low risk
	1920-45	5,000 (6,072)	30	10	30	30	64 (54) Low risk
	1946-79	5,000 (8,768)	30	10	30	30	64 (37) Low risk
	Post 1979	5,000 (7,420)	30	10	30	30	64 (44) Low risk
All dwellings		**5,000 (60,722)**	**30**	**10**	**30**	**30**	**64 (5) Low risk**

Note – Scale point values are shown, with the national average values for likelihoods and their corresponding final scores (determined using actual harm outcome values rather than scale point values) provided in brackets. The likelihood estimates were updated using hospital episodes due to excessive natural heat suffered by those aged 65 years and over in 2019-20.

Summary box – Excess Heat

Vulnerable group – Those aged 65 years and over

Groups other than vulnerable group at greater risk – Very young children, older people, those with pre-existing physical and mental health conditions, obese persons, those on certain medications, people with mobility difficulties, those misusing drugs or alcohol and those from lower socio-economic groups.

Main issues to look for – Poorly insulated structures (particularly rooms under uninsulated roofs), lack of ventilation (particularly at night), high levels of solar heat gain through windows, structures which capture heat using high levels of insulation, inadequate heating controls and the use of building materials with low thermal mass which don't adequately regulate temperature changes in the dwelling.

Risk reduction measures – External shading, structural insulation, high thermal mass building components, adequate ventilation (particularly cross-ventilation), mechanical ventilation where windows can't be opened (due to noise, air pollution or security concerns), adequate ventilation and heating controls, air conditioning, use of building materials and finishes to reflect solar radiation.

Health effects

As temperatures rise, thermal stress on the body increases, initially triggering defence mechanisms such as perspiration. If temperatures remain high, they will place increased stress on the cardiovascular and respiratory systems. This can lead to hyperthermia, heat exhaustion, heat stroke and cardiovascular events such as an ischaemic stroke. Dehydration is a problem primarily for older persons and the very young.

High temperatures may increase the risk of premature births and stillbirths. Heat-related mortality increases with temperature increase. Morbidity and mortality will occur much sooner after exposure to sustained high temperatures than health effects from cold indoor temperatures.

The impact of raised indoor air temperatures will vary with factors such as ventilation, air movement, relative humidity, radiant heat and factors individual to the occupier being exposed.

Susceptibility to exposure to excess heat varies between individuals and is influenced by levels of behavioural adaptations to high temperatures. Very young children, older persons (particularly those over 75 years of age), people with pre-existing mental health conditions, obese persons, those on certain medications, people with mobility difficulties, those with cardiovascular, respiratory or renal disease, people with diabetes, those with substance use issues and those from lower-socioeconomic groups are at greater risk from excess heat. Those who spend a greater amount of time inside the home (particularly those with limited mobility) will be at greater risk. There is evidence that those who live alone are at greater risk from heat.

Causes

Global warming is producing greater fluctuations in weather patterns and more commonly occurring extreme weather events, including heatwaves. Absolute maximum temperatures will vary across England but are likely to be higher in large urban areas than in rural locations. Urban heat islands will increase prevailing temperatures in large urban areas by as much as 4^{o}C. Higher average temperatures have been measured in areas with lower levels of urban vegetation.

Although people's tolerance of high ambient temperatures varies, there are a number of common causes of high indoor temperatures which will be uncomfortable and potentially dangerous, particularly for those in the vulnerable age group. Air temperature, air velocity, humidity, mean radiant temperature (the mean temperature of exposed surfaces in the room), direct contact with a heat source, clothing level and physical activity level all contribute to thermal comfort. Within a dwelling, electrical equipment, cooking, heating of water and the occupiers themselves will provide sources of heat.

Older dwellings and those with poor levels of thermal insulation will be more likely to experience increased heat levels in summer weather. Buildings with thicker walls with higher thermal mass will be better able to regulate indoor temperatures during short periods of high temperatures, but those with poor wall insulation which are exposed to sustained solar radiation will be more likely to re-radiate that thermal energy into the habitable areas of the dwelling. This may cause internal living temperatures to remain high during the night. Rooms immediately below an uninsulated roof will be at greater risk of high temperatures during the day.

Lack of shading around the property will help to increase the temperature gain from solar radiation. Where properties have south or south-west facing glazing, this will provide a source of passive solar gain, particularly where walls and floors behind those windows are dark in colour and composed of materials with a high thermal mass. These parts of the structure will retain more heat and re-radiate

it over time. Blinds will only reflect some of the radiant heat gain. Skylights and Velux windows will also provide a source of passive solar gain.

Modern properties built after the millennium have higher levels of insulation and airtightness. Existing properties are being retrospectively insulated and sealed to improve their energy efficiency. The heat production from indoor living activities and heat from passive solar gain can be trapped inside the structure, causing high temperatures.

Occupiers may have little control over domestic heating and hot water in larger buildings or shared dwellings. Low levels of thermal insulation to pipework serving hot water storage and distribution systems can also provide an additional and unwanted source of heating.

Noisy external environments will make occupiers reluctant to open doors and windows. Ground floor windows are less likely to be opened where there is a lack of defendable space outside the dwelling, or they are sited near a thoroughfare and do not have opening restrictors or bars. Lack of adequate openable windows will prevent effective ventilation and air movement in rooms. Lack of cross-ventilation will also limit ventilation in the dwelling. There may be a greater requirement for ventilation in rooms with large areas of glazing and south facing windows.

Where the ventilation system or its controls are faulty, or there is a lack of adequate means of controlling heating or cooling systems, there will be an increased risk of high indoor temperatures.

Dwellings in multi-occupied buildings are more likely to be affected by excessively high indoor temperatures.

Behavioural factors

Occupier behaviour is an important factor in managing indoor living temperatures. External air pollution, noise, fear of intruder entry and the risk of children falling from open windows may limit how much occupiers use windows for ventilation.

Relevant matters and baseline indicators affecting the likelihood and harm outcomes

Other hazards impacting the likelihood and/or harm outcomes

Noise – Occupiers will be less likely to open doors and windows where there is an external source of noise.

Intruders – Occupiers will be less likely to open doors and windows where there is a fear of intruder entry.

Falling Between Levels - Where windows/access to balconies present a risk of falls for children, they are less likely to be left open.

Relevant baseline indicators (accompanying notes are in Appendix 1)

4.8 Ventilation for the bathroom must be provided by mechanical extraction that is ducted to the outside of the building, in line with Baseline Indicator 16.1.

5.6 Suitable facilities for the effective and safe removal of fumes and moisture-laden air to the external air by means of a cooker hood or extractor fan; a cooker hood that only recycles the odour through an active carbon filter would not be acceptable, it must vent to outside. A mechanical extractor would be the normal mechanism for this function, in line with Baseline Indicator 16.1.

8.1 Internal doors leading between areas of a single dwelling must provide a sufficient barrier to the spread of smoke and fire (where appropriate). Any glazing in doors must respond safely to collision and must be designed for functionality to avoid strains or entrapment when in use, and must be

maintained in good repair. All bathrooms and WC room doors must be fitted with a suitable lock and must not contain clear glass.

10.2 The noise level inside the dwelling caused by steady external noise sources must not exceed:

- 07:00 to 23:00 – 40 dBLAeq,T16 in the living room and bedroom area, and 45 dBLAeq,T16 in the dining room/area
- 23:00 to 07:00 – 35 dBLAeq,T8 in the bedroom

11.5 All door and window frames and furniture shall operate properly and be in a good state of repair, with no open joints or compromised seals between the windows/doors and adjacent walls.

15.1 Structural thermal insulation shall be provided to minimise heat loss. Where there is a loft space, insulation shall be provided as detailed:

- A minimum 250mm of loft insulation (assumed to be mineral wool or similar).

15.2 Hot water cylinder, if present, must be insulated with a minimum 50mm jacket if not pre-insulated, and it must be fitted with a tank thermostat.

15.3 If the walls are of cavity wall construction, they must be insulated unless professional examination confirms to do so is technically unfeasible, due to either their condition or location in terms of wind-driven rain, or the width of the cavity being less than 40mm.

15. Every dwelling shall have a properly installed heating system in good and safe working condition that is capable of safely and adequately heating all habitable rooms, bathrooms and WC rooms. The system must be capable of heating the main living area to 21°C and the remaining habitable rooms to a temperature of 18°C when the external temperature is minus 1°C, and the system should not allow the temperature to exceed 25°C in any room during the heating season.

15.5 Heating and hot water must be capable of being controlled effectively and timed to operate by the occupiers.

16.1 The air exhausted from a bathroom, WC room, kitchen, clothes dryer or basement must be provided by mechanical ventilation or by a correctly designed and installed natural ventilation system, as required by Part F of the Building Regulations. In addition, it shall not be vented into any other parts of the building's habitable space or an attic; such air shall discharge directly to the outdoors but not near any intake on the building exterior.

16.2 All habitable rooms must have at least one window, door or skylight which opens to the outside and can be fixed in an open position. In addition, ventilation may also be provided by the presence of trickle vents, air bricks or passive stack ventilation.

16.3 In each habitable room, the size of the openable windows, doors and skylights together must be at least 5% of the floor area of that room.

16.4 All means of ventilation shall be maintained in good repair and working order.

Other matters affecting the likelihood and severity of harm outcomes include:

- Thermal mass – building fabric without sufficient thermal mass to effectively regulate temperature fluctuations.

- Orientation of glazing – large areas of south facing glazing in rooms/dwellings not appropriately designed to handle the passive solar heat gain they produce. Single aspect designs will have higher peak solar gains.
- Cross ventilation – lack of cross ventilation.
- External shading – lack of external shading.
- Dwelling location – where heat levels from the surrounding environment are increased (e.g. urban heat islands, reflection from surrounding buildings) or where external factors inhibit effective ventilation of the structure.

Preventative measures

The structure of the dwelling should provide sufficient thermal insulation having regard to its construction, geographical location, location in relation to other dwellings and buildings, and its orientation.

External shutters, permanent vegetation, tinting of windows, deep window reveals, overhangs, brise-soleils, and awnings will reduce solar heat gains and together with energy-efficient retrofitting, can reduce heat-related mortality. Green roofs and photovoltaic cells can also limit solar gain.

Solar control low emissivity coatings on glass can reduce heat transfer without significantly affecting the penetration of visible light. Providing light colours on building surfaces will also reduce solar gain by reflecting more solar energy. Using lighter colours will have greatest effect on external surfaces but should also be considered for internal surfaces in rooms with large areas of south facing glazing, where surfaces are not required to be dark coloured for passive heat gain in cooler weather. Finishing these surfaces with less thermally massive construction materials will reduce the amount of radiant heat they absorb and re-radiate. Consideration should be given to how to balance the requirement for heat gain and loss to stabilise indoor living temperatures. Solutions may require a mixture of measures such as ventilation, thermally massive construction components, insulation, and external shading to regulate temperature gain in periods of hotter weather.

Air conditioning (or other cooling technologies) may be provided, but passive approaches such as purge ventilation through openable windows and structural insulation are more energy efficient, so should be considered before relying on more energy intensive solutions. These should be controllable by the occupier, or where they are part of an intelligent building design they must be inspected and maintained to ensure they are functioning effectively. Mechanical ventilation and air conditioning can be used where windows are unlikely to be left open, such as when dwellings are sited where there are high levels of external noise or pollution, or there are security/falls issues. Systems must be appropriate for the size and design of the rooms they serve and not too noisy when in operation. They should be well maintained and controllable by the occupier. Mechanical heat recovery ventilation systems are unlikely to provide sufficient ventilation to cool the dwelling during periods of very high temperatures unless they are specially designed for such situations.

Fans will promote air circulation and heat loss through perspiration but are only effective where the air temperature and humidity is low enough to provide cooling (<32^{o}C and <35%). Fans do not replace the need for adequate ventilation. They should be well maintained and under the control of the occupier.

Cross-ventilation will improve the ability of the structure to remove warm air. Purge ventilation requirements may exceed those in the Building Regulations Approved Document F and the baseline indicators.

There should be adequate controls to the heating system, particularly where the dwelling is relying on a shared heating system. This should have sufficient control for occupiers to be able to vary the temperature between rooms and allow all occupiers to maintain safe and comfortable internal temperatures. Heating and hot water systems should be insulated where appropriate.

Other considerations for assessment of this hazard

Hazard assessment should consider the provision of ventilation, particularly at night. Also relevant is the thermal capacity of the structure, levels of insulation and the level of solar gain. Destructive examination or documentary evidence may be required to ascertain levels of insulation where it is suspected that rooms are immediately under uninsulated roofs.

Capturing measurements of indoor living temperatures at the time of inspection (or over a period of time using a data logger) may be helpful to capture evidence of living conditions. An assessment should be made considering expected fluctuation of indoor living temperatures in a dwelling over a whole calendar year. Assessment must take account of the provision of the above-mentioned factors.

When considering excess heat due to poor thermal insulation, excess cold may also be a concern. Remedial measures should consider the threat from both hazards to balance heat levels in the structure in both warm and cold weather conditions.

Further reading

Dengel, A., Swainson, M., Ormandy, D. and Ezratty, V. (2016) Guidance document: Overheating in dwellings. Watford: Building Research Establishment. Available at: www.bregroup.com

Chartered Institute of Building Services Engineers (CIBSE) (2015) Guide A: Environmental Design. London: CIBSE. Available at: www.cibse.org

Chartered Institute of Building Services Engineers (CIBSE) (2016) Guide B: Heating, Ventilating, Air Conditioning and Refrigeration. London: CIBSE. Available at: www.cibse.org

HM Government (2021) The Building Regulations 2010 Ventilation – Approved Document F – guidance for dwellings. Available at: www.gov.uk

HM Government (2021) The Building Regulations 2010 Conservation of Fuel and Power – Approved Document L – guidance for dwellings. Available at: www.gov.uk

HM Government (2021) The Building Regulations 2010 Overheating – Approved Document O. Available at: www.gov.uk

15. Asbestos and Manufactured Mineral Fibres

Description of the hazard

This hazard covers the presences of and exposure to asbestos fibres and manufactured mineral fibres in dwellings and their curtilage.

Vulnerable group and the national average scores

Asbestos and Manufactured Mineral Fibres – Average likelihood and harm outcomes for **persons of all ages.**							
Dwelling type and age		Average likelihood 1 in	Spread of harm outcomes				Average HHSRS scores
			Extreme %	Severe %	Serious %	Moderate %	
	Pre-1920s	-	20	1	0	79	-
	1920-45	5,000 (60,896)	20	1	0	79	40 (3) Low risk
	1946-79	5,000 (15,685)	20	1	0	79	40 (12) Low risk
	Post 1979	-	20	1	0	79	-
All dwellings		**5,000 (30,448)**	**20**	**1**	**0**	**79**	**40 (6) Low risk**

Note - Scale point values are shown, with the national average values for likelihoods and their corresponding final scores (determined using actual harm outcome values rather than scale point values) provided in brackets. The above figures have been generated from hospital episode statistics and contain a number of assumptions. The quality of the above data is moderate and includes values from different sources to estimate lung cancer deaths and the percentage of these that would have occurred due to exposure to asbestos in domestic dwellings

Summary box – Asbestos and Manufactured Mineral Fibres

Vulnerable group – All ages

Groups other than vulnerable group at greater risk – Smokers

Main issues to look for – The presence of asbestos containing materials, particularly where they are friable, in poor condition, or sited in locations where they are likely to be disturbed.

Risk reduction measures – Identify the location and condition of asbestos containing materials, ensure they are effectively sealed, in good condition and not likely to be damaged or disturbed. Label them and keep a record of where they are in the building. Encapsulation or removal may be necessary when leaving materials in situ presents a significant risk to health. The ultimate responsibility for identification and management of asbestos in a building rests with the building owner/manager.

Health effects

Asbestos is a naturally occurring mineral fibre which is resistant to heat, fire, chemical and biological degradation and is mechanically strong. There are three main types of asbestos:

- Chrysotile (white asbestos) – the most commonly used form of asbestos
- Crocidolite (blue asbestos)
- Amosite (brown asbestos)

Tremolite, Anthophyllite and Actinolite asbestos are also found in construction and insulation materials, but their use was far less common.

All forms present a significant risk to health, but amphibole fibres (Crocidolite, Amosite, Tremolite, Anthophyllite and Actinolite) are more hazardous to health than Chrysotile asbestos fibres. The main route of exposure is through inhalation, with the risk from ingestion and skin contact being far lower. Around 5,000 deaths are attributed to asbestos each year in the UK, with the majority occurring in males over 60 years of age. This includes all forms of exposure, with approximately two-thirds of mesothelioma deaths being attributed to asbestos exposure at work. Evidence on the level of exposure to asbestos in domestic situations is limited and is subject to widespread under-reporting.

Inhalation of asbestos fibres causes pleural disease (pleural plaques and fibrosis in the lungs), lung cancer, mesothelioma (cancer of the pleura, the lining around the lungs or less frequently, cancer of the peritoneum) and far more rarely cancer of the larynx, pharynx, ovary, stomach and colorectum. Each of these conditions typically occurs decades after the first exposure to asbestos. Pleural plaques may occur ten years after exposure and are likely to go unidentified. Lung cancer and mesothelioma typically occur 20-50 years after exposure.

Asbestosis may be caused by high levels of exposure to asbestos. This is a chronic lung condition where breathing in asbestos fibres causes scarring of the lungs over a period of many years. This is more likely to occur in an occupational setting. Exposure to this level of asbestos fibres is very unlikely in a residential environment.

Exposure to asbestos is one of the leading causes of lung cancer after smoking. Lung cancer has very poor survival rates and there is no known cure for mesothelioma. Lung cancer cases associated with asbestos exposure are estimated to be similar in number to mesothelioma cases. Pleural plaques and pleural thickening themselves are not particularly harmful. If discovered, they may cause anxiety about the risk of more serious asbestos-related conditions as their presence is associated with the later development of lung cancer. There is no threshold safe lower limit of exposure to asbestos.

Risk to health increases with levels of exposure. Those at greatest risk from asbestos exposure in a domestic environment are children and adults with long-term exposure to asbestos fibres well above ambient levels. Smokers are at an increased risk of lung cancer due to the synergistic effects of asbestos exposure and smoking on the development of lung cancer.

Manufactured mineral fibres include rockwool and glass fibre blanket. They are skin, eye and respiratory irritants and have been linked to dermatitis. Manufacturers have developed more benign versions of these materials. Handling manufactured mineral fibres will liberate fibres. These may be inhaled, become embedded in clothing or may come into contact with eyes and skin, causing irritation.

Causes

Asbestos has been used in construction for many years and its use in the UK was only banned completely in 1999. The peak of its use was in the 1960s. Asbestos can be used on its own or combined with other substances to form elements of a building's fabric, fixtures, fittings and appliances. Its flexibility meant its use was widespread.

Asbestos in good condition can be relatively safe if left undisturbed and should not result in production of fibres above ambient background levels. In a domestic setting it may be damaged or deteriorated, or it may be disturbed, liberating fibres. It may also be found in friable and loose forms such as on pipe lagging and roof insulation, where the fibres are poorly bonded together, increasing the likelihood of their liberation through vibration, air movement, etc.

Asbestos containing materials were used as a fireproofing material in insulating boards, wall panels boards, ceiling tiles and plaster. It can also be found in partition walls, fireproofing panels in fire doors, lift shaft linings, soffits and panels below windows. Asbestos was used as a material in floor tiles, toilet cisterns, fire blankets, textured plasterwork, sleeves around pipework or flues and electrical insulators in consumer units. Asbestos cement was commonly used in corrugated roofing sheets, flues, guttering and downpipes and sewerage pipework. Asbestos materials look very similar to non-asbestos containing materials. Testing is required to confirm if a material or item contains asbestos.

In most traditionally built properties constructed before 1999 some parts of the building are likely to contain asbestos, but these are often not in locations where they are likely to be disturbed. In non-traditionally constructed dwellings (particularly those built between 1945 and 1980) there may be large amounts of amphibole asbestos products. These are more likely to be in places where they will be disturbed. The peak of asbestos use was during the 1960s, so properties built or heavily altered during this period are very likely to have some asbestos containing materials.

Exposure during home renovation and maintenance work is most likely, as this will disturb intact asbestos containing materials, but accidental damage and deterioration are still sources of fibre release.

Manufactured mineral fibres are most commonly found in loft and wall insulation and in sound/thermal insulation in flooring and partitions. Again, exposure is most likely during home renovation and maintenance work, or when using attic spaces for storage. The fibres do not remain in the body so the risk to health is minimal.

Behavioural factors

Exposure to asbestos fibres is most likely during home renovation or maintenance work. The long latency time between exposure and onset of symptoms contributes to complacency and ignorance of the risks posed by asbestos. This can result in high-risk behaviours around asbestos containing materials.

Relevant matters and baseline indicators affecting the likelihood and harm outcomes

Other hazards impacting the likelihood and/or harm outcomes

There is insufficient evidence to suggest other hazards impact significantly on the hazard of Asbestos and Manufactured Mineral Fibres.

Relevant baseline indicators (accompanying notes are in Appendix 1)

1.1 Externally, every foundation, roof, ridge line, flashing, fascia, soffit and bargeboard, exterior staircase, exterior wall/fence shall be safe to use and capable of supporting the intended design loads and load effects and shall be in a proper state of structural repair.

Internally, every wall, floor, ceiling, inside stair, porch, accessory structure, door, window and window glass shall be safe to use and capable of supporting the intended design loads and load effects, and shall be in a proper state of structural repair.

1.2 All asbestos-containing material shall be maintained non-friable and free from any defects such as holes, cracks, tears and/or looseness that may allow the release of fibres into the environment. Any friable or damaged asbestos identified shall be removed. An asbestos register for each dwelling shall be created and kept up to date.

Other matters affecting the likelihood and severity of harm outcomes include

- Date of construction – housing, particularly flats, built/renovated between 1920 and 1979.
- Presence of asbestos – particularly in accessible positions.
- Unsealed asbestos – unsealed asbestos-based materials.
- Unlabelled asbestos – unlabelled asbestos-based materials.
- Condition of asbestos – asbestos in a damaged or deteriorated condition.
- Presence of manufactured mineral fibres – in accessible positions.

Preventative measures

Asbestos is hazardous and should not be present in dwellings, however where asbestos containing materials are found in dwellings, their removal will liberate fibres so will also pose an additional risk to health. Asbestos may be manged *in situ* if it is:

- in good condition;
- not likely to be damaged; and/or
- not likely to be worked on or disturbed.

Management of asbestos materials involves:

- identifying the location and condition of asbestos;
- ensuring it is effectively sealed;
- making it inaccessible to prevent occupiers damaging the sealing surface;
- labelling; and
- keeping a record of the location of asbestos in the building.

Where asbestos is damaged or likely to be damaged or disturbed an assessor should consider if it should be repaired, sealed, enclosed or removed. Most work with asbestos containing materials should be done by a contractor licenced by the Health and Safety Executive. Their web site (www.hse.gov.uk) provides further guidance on working with asbestos containing materials and safe disposal of asbestos containing materials.

Where manufactured mineral fibres are found they should be left undisturbed. The most likely source of exposure is from roof insulation.

Other considerations for assessment of this hazard

The widespread use of asbestos containing materials in residential construction up to the 1980s, potential use before its ultimate prohibition in 1999, and illicit use of asbestos containing materials after this date make it very difficult to identify asbestos containing materials without sampling and microscopic analysis by a competent person. Assessors should request any existing asbestos survey for the dwelling and make use of specialists in this area to sample and examine suspected asbestos containing materials as part of their assessment of this hazard. Unaided visual inspection cannot usually be relied upon. Asbestos containing materials are hard to distinguish from similar non-asbestos containing materials.

Assessors should consider the condition of suspected asbestos containing materials, the likelihood of disturbance and the potential for fibre release as part of the HHSRS assessment. The ultimate

responsibility for sampling, and the asbestos assessment and management plan usually rests with the building owner and/or manager.

Further reading

The Health and Safety Executive web site contains guidance on asbestos and its management (www.hse.gov.uk/asbestos).

PROTECTION AGAINST INFECTION

16. Domestic Hygiene

Description of the hazard

This hazard covers:

- poor design, layout and construction such that a dwelling cannot be readily kept clean and hygienic;
- access into and harbourage within the dwelling for pests;
- inadequate and unhygienic provision for storing and disposal of household waste;
- threats of infection from inadequate facilities for the storage, preparation and cooking of food;
- threats of infection from inadequate or defective personal washing and clothes washing facilities;
- threats of infection from inadequate or defective provision for sanitation and drainage; and
- mental health impacts from any of these issues.

Adequacy and contamination of the water supply and *Legionella* issues are covered separately under the Water Supply hazard.

Vulnerable group and the national average scores

Domestic Hygiene – Average likelihood and harm outcomes for **persons of all ages.**							
Dwelling type and age		Average likelihood 1 in	Spread of harm outcomes				Average HHSRS scores
			Extreme %	Severe %	Serious %	Moderate %	
Non-HMO houses	Pre 1920s	2,000 (1,545)	0	2	20	78	4 (5) Low risk
	1920-45	2,000 (1,731)	0	1	20	79	4 (4) Low risk
	1946-79	2,000 (2,048)	0	1	10	89	2 (3) Low risk
	Post 1979	3,000 (3,583)	0	1	10	89	2 (1) Low risk
HMOs and flats	Pre 1920s	1,000 (1,390)	0	2	20	78	9 (5) Low risk
	1920-45	1,000 (1,497)	0	2	20	78	9 (5) Low risk
	1946-79	2,000 (1,859)	0	1	10	89	2 (4) Low risk
	Post 1979	3,000 (2,764)	0	1	10	89	2 (2) Low risk
All dwellings		**2,000 (1,858)**	**0**	**1**	**10**	**89**	2 (4) **Low risk**

Note – Scale point values are shown, with the national average values for likelihoods and their corresponding final scores (determined using actual harm outcome values rather than scale point values) provided in brackets. It is difficult to make a direct connection between the dwelling and relevant health impacts for these issues. The process used to derive these averages contains a number of assumptions. This likelihood estimate was determined using hospital episodes caused by

gastro-intestinal disease and rat bites in 2019-20, call outs recorded by the British Pest Control Agency in 2015-16, as well as cases of food poisoning in 2009-10 reported by NHS Digital. The food poisoning data were adjusted to only include cases in domestic dwellings. This was done using research on settings of food poisoning cases and how often people eat in different locations.

Summary box – Domestic Hygiene

Vulnerable group – All ages

Groups other than vulnerable group at greater risk – Older people, those with pre-existing medical conditions, immunocompromised persons, pregnant women, those in shared accommodation, those in lower socioeconomic groups.

Main issues to look for – Inadequate food preparation, bathing, clothes washing and WC facilities and anything to do with the dwelling itself, which could discourage effective hygiene practices, inadequate waste storage arrangements, blocked or defective drainage (and wastewater treatment facilities where relevant), access points for pests and evidence of infestation.

Risk reduction measures – Provision of appropriate kitchen, bathing, WC and clothes washing facilities, easily cleanable internal environment, adequate domestic waste storage arrangements, effective facilities to handle wastewater, pest-proofing of the outer envelope of the building.

Health effects

Harm from problems with domestic hygiene is most commonly caused by pathogens entering the body. These can cause gastro-intestinal illnesses varying from mild stomach upsets to death, typically due to dehydration from vomiting and diarrhoea. The majority of milder gastro-intestinal infections go unreported, but of reported cases at least half originate in the domestic environment. In the UK there are between 1 million and 2.4 million cases of foodborne illness each year.

Infections can affect all age groups, but the young (particularly infants) may be more at risk due to a lack of awareness of the dangers from infection, resulting in greater exposure to pathogens. Older people, pregnant women and those with underlying health conditions (particularly immunocompromised individuals) are at greater risk from infections. Those sharing facilities in HMOs are more likely to be affected, as are lower socio-economic groups. Lower socioeconomic groups are more likely to live in 'disadvantaged' conditions with higher levels of overcrowding, sub-optimal washing and WC facilities, have inflexible employment and low household incomes, making treatment and isolation of infected individuals more difficult. These groups are also more likely to have co-morbidities.

Where insect (e.g. ants and cockroaches) or animal pests (e.g. rats and mice) inhabit a dwelling, they can mechanically transfer pathogenic organisms, contaminating surfaces and foodstuffs. Some can bite occupiers (e.g. bed bugs). Insect pests can also carry pathogenic organisms, infecting dwelling occupiers through direct contact, or exposure to their bodily wastes and secretions. Some occupiers suffer allergies to specific animal or pest species. Contact with cockroaches can cause dermatitis, rhinitis, bronchitis and asthma.

Animal pests and their nests can harbour biting insects. Birds, rats and mice can all carry pathogenic organisms. These vary between species and include *Salmonella spp*, *Listeria spp*, *Cryptosporidium parvum* (Cryptosporidiosis), *Toxoplasma gondii* (Toxoplasmosis) and *Leptospira spp* (Weil's disease). Once infection has affected one dwelling occupier it may be passed to other occupiers either through direct exposure to the affected individual or through indirect exposure through what that occupier has come into contact with (through fomites or food preparation and drinks).

Unhygienic living conditions will also impact on mental health. Occupiers may suffer from phobias related to the pest species or associated with the cleanliness of their living environment. Odours, risk of infection, poor appearance of a dwelling, inadequate kitchen facilities, living with pest species and obvious sources of infection can be a cause of stress, anxiety and depression. They can also lead to social isolation and can cause tension between occupiers of shared accommodation. Mental health effects may be heightened where the occupier has little control over the situation.

Causes

The majority of the health impacts from this hazard area are from communication of pathogenic organisms. These occur through three main routes:

- Direct contact (including the faecal-oral route) with a person or organism's bodily fluids and waste.
- Indirect contact through contaminated surfaces (e.g. door handles and kitchen cloths).
- Ingestion of contaminated substances such as food and drink products.

Respiratory infections may be passed through inadequate ventilation, poor hand hygiene, indirect contact with contaminated items and direct contact with infectious individuals. There is a greater risk where dwellings are shared with other occupiers.

Whilst most dwellings will have a complete set of kitchen facilities, bedsits, accommodation where some meals are provided, and non-standard conversions of buildings to provide living accommodation may result in inadequate facilities being provided, forcing occupiers into poor food hygiene practices. Unfurnished accommodation may lack suitable space or electrical sockets for fridges, freezers and cookers.

Worktop space may not be large enough to avoid using the same surface for the preparation of raw and ready-to-eat foodstuffs, particularly when common appliances such as microwaves, kettles and toasters are present on worktops. Sinks, surfaces and storage facilities, walls and floors may not be composed of easily cleansable materials. They may be damaged or deteriorated, or contain cracks or holes, making cleaning difficult and providing harbourage for pests and pathogens. White goods such as fridges and cookers may be similarly damaged or deteriorated or may not function adequately making them difficult to clean or preventing effective temperature control during food storage and preparation. There may be inadequate hot and cold running water to sinks.

In bathroom facilities there may be inadequate hot and cold running water to bathing appliances and wash hand basins, discouraging full use of these amenities. Water closets may be insufficient in number, defective or may not have a wash hand basin in the same room, discouraging effective hand hygiene. Damaged or deteriorated WCs, wash hand basins, bathing facilities and surrounding wall and floor finishes may make them difficult to clean and provide harbourage for pathogens.

Sharing of facilities for food preparation and personal hygiene, and sharing living accommodation with infected persons will increase the chance of infections spreading. This will be exacerbated with

poor cleaning practices and any deficiencies which inhibit effective hygiene practices or increase the likelihood of cross contamination.

Foul water drainage may leak or may become blocked, resulting in occupiers being exposed to waste and odours.

Rodents are perpetual inhabitants of sewers and watercourses, from where they can readily gain access to drains and the curtilage of buildings. Access to buildings can be gained through burrowing from underneath the structure or through squeezing through gaps in the structure such as vents, timber floors and poorly fitting or damaged doors and windows. They may also gnaw at plastics and timber to force access to a structure. Service ducts and holes around pipes provide routes for pest movement, including the movement of insects.

Accumulations of human waste and garbage will cause offensive odours and attract pests. Domestic waste production is approximately 20kg per household per week. Adequate provision for storage and separation of waste may not be provided. In HMO accommodation occupiers may be unaware of local waste presentation guidelines or may rely on others to put out waste for collection, allowing waste to accumulate. Accessible kitchen waste and unwashed recyclables are common sources of food for pest species.

Behavioural factors

Individual behaviour has a strong impact on the exposure to and communication of infections. The dwelling structure, fixtures and fittings should make good food safety and general hygiene behaviours as simple and easy as possible. For example, a wash hand basin within a WC would be more likely to be used than one which required the user to enter a neighbouring room to wash their hands.

Drainage systems may become blocked through careless practices and the processes in septic tanks may be negatively affected by the use of caustics (e.g. bleach). This sort of behaviour may require action outside of HHSRS, to address these issues.

Both septic tanks and cess pits will require regular monitoring and may require occasional emptying.

Assessors must consider what factors are attributable to the dwelling itself and may be considered under a HHSRS assessment. Hoarding behaviour will threaten domestic hygiene but is outside the scope of the HHSRS.

Relevant matters and baseline indicators affecting the likelihood and harm outcomes

Other hazards impacting the likelihood and/or harm outcomes

Water Supply – An inadequate supply of water to a dwelling will inhibit cleaning and personal hygiene practices. A contaminated water supply will cause infection directly (as detailed under the Water Supply hazard) and will make proper cleansing of surfaces more difficult.

Damp and Mould Growth – High levels of moisture will provide a favourable environment for proliferation of insect pests and food spoilage.

Crowding and Space – Overcrowding will increase the likelihood of this hazard through increased communication of disease, increased volume of waste production and decreased cleanliness due to over-occupation of the living environment.

Relevant baseline indicators (accompanying notes are in Appendix 1)

Drainage

2.1 Every drainage fixture, stack, vent, water, waste and sewer pipe shall be properly installed, maintained in a safe and functional order and kept free from obstructions, leaks and defects. The drainage system must have suitable rodding or access points to allow clearance of blockages.

2.2 Every waste pipe shall be connected to a public sewer system, an approved private sewage disposal system or the dwelling's greywater system. No WC waste pipe shall be connected to a greywater system.

2.3 There shall be adequate provision for surface- and foul-water drainage for the size and maximum occupancy of the dwelling. All drains and gullies shall be covered by a suitable grille or cover to prevent the build-up of debris restricting the natural operation of the system.

2.4 All rainwater pipes shall discharge properly into the drainage system or soakaway. Rodding or access points shall be available to allow the clearance of any blockage.

2.5 All access covers to drainage and other services shall be fitted with suitable flush-mounted covers adequately marked to indicate purpose.

3.3 The WC cistern overflow should discharge externally unless designed by the manufacturer to discharge internally through the cistern or pan.

Bathroom/WC facilities

3.1 An approved potable water supply system shall provide an adequate amount of running water under pressure to all fixtures simultaneously. Supplies in individual bedsits/dwellings/flats must have their own controllable supply of water or the ability to store water.

3.2 An adequate supply of heated running water shall be provided to sinks, wash-hand basins, baths and showers. Hot water storage tanks shall be set at a minimum temperature of 60°C. At bath taps and shower heads, the maximum temperature shall be 45°C to prevent accidental scalding.

4.1 Every dwelling/HMO shall have a private bathroom, equipped and provided for the sole use of that dwelling/HMO.

4.2 A suitably located WC in good working condition, that is sealed to the waste pipe and affixed to the floor or close-coupled, shall be properly connected to both the dwelling's water supply and a waste pipe, leading to an approved sewage system or private waste disposal system.

4.3 A dedicated wash-hand basin that is located in the same room as the WC or immediately adjacent shall be in good working condition, with a stable connection to the wall or secure attachment to the floor that is properly connected to the heated and unheated potable water supply and a sealed trap leading to a waste pipe. The wash-hand basin must be adequately sealed with a flexible sealant to prevent leakage and damage to the adjacent areas.

4.4 A fixed bath or shower in good working condition which does not leak and is properly connected to the heated/unheated potable water supply as appropriate, and a waste pipe that does not leak. The bath or shower must be adequately sealed with a flexible sealant to prevent leakage.

4.5 Where a shower is fitted separate to the bath, a purposely designed shower tray must be fitted so that the step into the tray is no greater than 150mm. All waste outlets and connections shall be sealed and free from defects.

4.6 A constant supply of heated and unheated water to all wash-hand basins, baths and shower facilities must be supplied and a direct drainage connection with waste trap be in good working order and free from defects and sealed where necessary. Water supply pipes must have isolation valves to allow for maintenance.

4.7 There must be a cleanable, non-absorbent water-resistant material on floor surfaces and extending on bathroom walls at least 300mm above a bath and 1800mm above the floor of a shower or shower tray. Such materials on walls and floors shall form a watertight joint with each other and with the bathtub or shower tray. Any shower shall have a shower screen, curtain or return wall that prevents water spillage to the floor.

4.8 Ventilation for the bathroom must be provided by mechanical extraction that is ducted to the outside of the building, in line with Baseline Indicator 16.1.

Kitchen facilities

5.1 Every dwelling/HMO shall have a kitchen or dedicated adequate space for the storage, preparation and cooking of food, equipped and provided for the sole use of that dwelling/HMO.

5.2 A kitchen sink in good working condition that is properly connected to heated and unheated water supplies and waste pipes, and has an area for draining wet cutlery and utensils which is connected to a waste outlet and sealed with flexible waterproof sealant. Any provided dishwasher and components of the sink, including disposal and water filtration devices, shall be in good working condition and properly connected. All feeds must have isolator valves to allow for maintenance.

5.3 Sufficient work surface shall be provided for food preparation. Sufficient cabinets and/or shelves sufficient to store occupant or visitors' food that does not require refrigeration, and eating, drinking and food-preparation equipment. Cabinets shall have well-fitting doors and no gaps between any surfaces. The work surface, work-surface edges, cabinets and shelves shall be of sound construction and furnished with surfaces that are impervious to water, smooth and cleanable.

5.4 For cooking food, a 4-ring hob (or 2-ring in bedsit-type accommodation) with oven and grill properly installed with all necessary connections for safe and efficient operation, which shall be maintained in good working condition.

5.5 Where an oven or hob is not provided, there must be a dedicated space with a suitable connection to either gas or electricity that meets the requirement of the relevant regulations.

5.6 Suitable facilities for the effective and safe removal of fumes and moisture-laden air to the external air by means of a cooker hood or extractor fan; a cooker hood that only recycles the odour through an active carbon filter would not be acceptable, it must vent to outside. A mechanical extractor would be the normal mechanism for this function, in line with Baseline Indicator 16.1.

5.7 Fridge and freezer or fridge-freezer, if provided, shall be in good working condition, of sufficient size to store occupants' food that requires refrigeration, and capable of maintaining a temperature less than 6°C but more than 0°C. The freezer section shall be capable of maintaining a temperature below -18°C.

5.8 If a refrigerator is not provided, adequate space and connections for the occupants' installation and operation of a refrigerator shall be provided.

5.9 A kitchen floor in good condition, with a sealed, water-resistant, non-absorbent and cleanable surface.

14.6 Every habitable room shall have at least 2 separate and remote double electric sockets that are suitably located for use. Kitchens shall have at least 4 suitably located double sockets.

Pests

18.1 The property and all structures and areas within the curtilage of the property shall be free of pest infestation, with no features present that will attract and support pests. Inspection shall take place to ensure a pest-free environment.

General

8.1 Internal doors leading between areas of a single dwelling must provide a sufficient barrier to the spread of smoke and fire (where appropriate). Any glazing in doors must respond safely to collision and must be designed for functionality to avoid strains or entrapment when in use, and must be maintained in good repair. All bathrooms and WC room doors must be fitted with a suitable lock and must not contain clear glass.

11.1 Adequate external lighting shall be provided to all means of access including entrances and external refuse stores, providing good visibility when there is no daylight.

11.2 Access doors to dwellings should have adequate locks. Doors must be solid external grade and fitted with a minimum of a mortice deadlock to BS 3621, openable from the inside without a key. There must be a means for occupiers to view visitors without opening the door, which could include a functioning smart doorbell of some kind, a viewer within the door or by a glazed pane adjacent or close to the entrance door. All rear doors should be fitted with a mortice dead lock to BS 3621 or 2 security bolts.

14.2 Every hall, stairs and landing within the house, and every room used, or intended for use, by the occupant of the house shall have a suitable and adequate means of artificial lighting that is controllable and accessible which can allow lighting to be turned on and off and bulbs/fixtures to be changed and maintained safely. Two-way or PIR-activated lighting shall be provided to any internal staircase.

15.5 Heating and hot water must be capable of being controlled effectively and timed to operate by the occupiers.

16.1 The air exhausted from a bathroom, WC room, kitchen, clothes dryer or basement must be provided by mechanical ventilation or by a correctly designed and installed natural ventilation system, as required by Part F of the Building Regulations. In addition, it shall not be vented into any other parts of the building's habitable space or an attic; such air shall discharge directly to the outdoors but not near any intake on the building exterior.

16.4 All means of ventilation shall be maintained in good repair and working order.

17.1 Every foundation, roof, roofing component, exterior wall, floor, door, skylight and window shall be watertight, weathertight, free of persistent dampness or moisture and in good condition.

17.3 No single room in any of the property shall have an observable level of damp or mould growth or deterioration of internal finishes that exceeds 5% of the wall and/or ceiling surface.

Other matters affecting the likelihood and severity of harm outcomes include:

Drainage

- Ventilation of pipes – inadequate ventilation to a soil or waste pipe.

- Private sewerage system – missing or defective private foul sewage treatment system or private foul sewage storage cistern.
- Soakaway – missing, defective or badly located soakaway for surface water.
- Recycling system – defects to greywater or rainwater recycling system.

Bathroom/WC facilities

- WC siting – inappropriate or inconvenient location of a WC.
- Macerator defects – defective mechanism to a WC.
- Earth/chemical closet defects – including means of deodorising closets and emptying them from outside the dwelling.
- Seat/lid to toilet – missing or non-impervious seat and/or lid to a lavatory pan.
- Ventilation to compartment – inadequate ventilation to the compartment or room housing a toilet.
- Door to compartment – missing or defective lockable door to the compartment.

Pests

- Design, construction or maintenance deficiencies – access points such as unprotected openings, cracks, gaps and holes and harbourage points created through poor design and/or construction or use of materials vulnerable to gnawing. Improperly terminated drainage pipework allowing rodent access to the building and its curtilage.
- Lack of access to parts of the structure – inadequate access for treatment and prevention of infestations
- Open vent pipes – missing guards to drainage vent pipes.

Domestic waste

- Internal and external refuse areas – the lack of, or defects to, any refuse storage space or lack of a clearly defined area for external waste storage containers.
- Refuse chutes etc. – the lack of, or defects to means of disposal of refuse to each floor of multi-occupied buildings.
- Disrepair to waste storage facilities – or dampness to the facilities.
- Inadequate storage - inadequately sized waste bins and storage facilities.

General

- Shared facilities – facilities shared by more than one household.
- Removal of facilities – facilities in furnished dwellings (e.g. fridges) may fall into disrepair or may be removed from the dwelling.
- Water seals – inadequate water seals to WC basins and/or drainage inlets.

Preventative measures

The design, construction and maintenance of a dwelling should enable it to be kept clean, preventing the build-up of dirt and dust which may enable organisms to multiply. Bathing, WC and food preparation and storage facilities should have smooth, impervious, hard-wearing and easily cleansable surfaces, sealed at junctions and be free from cracks and crevices. Surfaces should be free from damage and disrepair.

Bathing facilities and wash hand basins should be securely installed and capable of withstanding the weight of users and water. They should be adequate in number for the intended occupation of the dwelling and be provided with sufficient hot and cold running water and drainage. Wash hand basins should be sufficient in number for the intended occupation of the dwelling and sited in the same

room as sanitary accommodation and in any bath or shower room. The room(s) housing the bathing facilities should have an opaque door with internal lock to provide privacy.

WCs should be sited within one floor of any living accommodation and should be of sufficient number for the occupation of the dwelling. WC facilities should have an adequate flushing mechanism with sufficient supply of water and drainage and be provided with an opaque door and internal lock for privacy. Where earth closets or chemical closets are used, they should have adequate deodorising substance and hygienic arrangements for containment and disposal of accumulated solid and liquid waste from outside the dwelling. Toilets should have a hinged seat and lid in good repair and formed of an impervious material. Toilets should be capable of carrying the weight of users and be constructed of impervious and easily cleansable materials.

Any macerator should be provided with an adequate electricity supply and water and should be maintained in a hygienic and functional condition.

Kitchen facilities should have a layout and sufficient space, including worktop space and provision for cooking/storage facilities, to allow the safe storage and preparation of food using hygienic practices. In multiply occupied housing there should be sufficient facilities to allow those sharing a kitchen to cook simultaneously. There should be adequate provision for gas/electricity and electrical outlets for cookers, fridges, freezers, kettles or other appliances used in food preparation.

Kitchen sinks should have adequate hot and cold running water and drainage. They should be of adequate size, with a drainer taking wastewater to the sink or drainage pipework. They should be securely installed and capable of taking the weight of the water and kitchen equipment, and be constructed of hardwearing, smooth, impervious materials which are capable of being easily cleansed and are free from damage and disrepair.

There should be space for a washing machine with an appropriate power socket, water supply and drainage. There should also be clothes drying facilities, preferably both inside and outside the dwelling. Vented tumble driers must be vented to the outside without the need to open a window.

Kitchens, bathrooms, WCs and earth closets should be adequately ventilated to the outside air and be provided with sufficient lighting and heating.

Foul water pipework and WCs should have appropriate water traps. Foul water pipework must be of sufficient size and carry waste safely to the point of disposal. Pipework should be ventilated away from windows/vents or provided with an appropriate valve to prevent escape of foul odours. Foul water pipework systems should be designed to avoid unwanted siphonage and avoid blockages during normal use. Foul water drainage should be well maintained and free from obstructions.

Where greywater recycling systems are used there should be an appropriately constructed container for wastewater with an overflow connected to the mains drainage system or a soakaway. Cess pits and septic tanks should be of adequate size and free from leaks. Septic tanks should be connected to an appropriately located and constructed soakaway.

The external envelope and floors of a dwelling should be free of cracks and unprotected holes. Where breaches of the walls, floor and roof are necessary these should be protected from pest ingress. Unoccupied spaces within the dwelling (e.g. lofts and under-floor spaces) should be capable of being effectively sealed off from the living areas and should be accessible for treatment of infestations.

There should be suitable and sufficient provision for the storage of refuse awaiting collection. Storage should be readily accessible, should not cause hygiene/odour problems and should be designed and maintained to reduce possible invasion by pests. Shared refuse facilities in blocks of flats with more than four storeys may use communal waste chutes discharging into large containers in the communal waste store.

Other considerations for assessment of this hazard

Assessors should consider the potential for infestation of the dwelling over the next 12 months.

In multi-occupied premises sharing of facilities should be considered and its potential impact on domestic hygiene, particularly around ease of cleansing of the dwelling and communication of infection.

The national averages reflect what are generally good domestic hygiene levels across the housing stock so where there are problems the risk will be elevated well above the average.

Hoarding can threaten domestic hygiene but cannot be considered under the HHSRS. Assessors must consider what factors are attributable to the dwelling itself and may be considered under a HHSRS assessment.

This hazard is an amalgamation of three hazards (Domestic hygiene, Pests and Refuse; Personal hygiene, Sanitation and Drainage; and Food safety) from the last version of HHSRS. Assessors should conduct a whole dwelling assessment covering all aspects of this hazard, but if there are issues affecting just one element of the hazard it is useful to understand what proportion of the national average likelihood is attributable to each of these areas. Approximately 35% of the harms for the hazard are from factors associated with domestic hygiene, pests and refuse, 17% are from factors associated with personal hygiene, sanitation and drainage, and 48% are from factors associated with food safety.

Further reading

British Standard BS6465-1, 2 & 3 – Sanitary installations. Available at: www.bsigroup.com

British Standard BS8000-0 – Workmanship on construction sites. Introduction and general principles. Available at: www.bsigroup.com

British Standard BS5906 – Waste management in buildings. Code of practice. Available at: www.bsigroup.com

HM Government (2016) The Building Regulations 2010 Sanitation, Hot Water Safety and Water Efficiency – Approved Document G. Available at: www.gov.uk

HM Government (2010) The Building Regulations 2010 Drainage and waste disposal – Approved Document H. Available at: www.gov.uk

17. Water Supply

Description of the hazard

This hazard covers the quality and adequacy of the supply of water within a dwelling for drinking and domestic purposes (e.g. cooking, washing, cleaning and sanitation). It includes threats to health from contamination with bacteria, protozoa, parasites, viruses and chemical pollutants. This hazard includes consideration of the threat to health from *Legionella*.

This hazard does not consider the threat to health from radon gas in water. This is dealt with under the Radiation hazard. Contamination of water supplies with lead from water distribution systems is dealt with under the Lead hazard.

The quality of mains water supplied from public mains is outside the HHSRS assessment and is subject to separate controls.

Vulnerable group and the national average scores

Water Supply – Average likelihood and harm outcomes for **persons of all ages.**							
Dwelling type and age		Average likelihood 1 in	Spread of harm outcomes				Average HHSRS scores
			Extreme %	Severe %	Serious %	Moderate %	
Non-HMOs	Pre 1920s	5,000 (289,307)	0	1	10	89	1 (<1) Low risk
	1920-45	5,000 (228,190)	0	1	10	89	1 (<1) Low risk
	1946-79	5,000 (380,656)	0	1	10	89	1 (<1) Low risk
	Post 1979	5,000 (988,330)	0	1	10	89	1 (<1) Low risk
HMOs	Pre 1920s	5,000 (238,085)	0	1	10	89	1 (<1) Low risk
	1920-45	5,000 (219,629)	0	1	10	89	1 (<1) Low risk
	1946-79	5,000 (499,209)	0	1	10	89	1 (<1) Low risk
	Post 1979	5,000 (161,360)	0	1	10	89	1 (<1) Low risk
All dwellings		**5,000 (318,737)**	**0**	**1**	**10**	**89**	**1 (<1) Low risk**

Note - Scale point values are shown, with the national average values for likelihoods and their corresponding final scores (determined using actual harm outcome values rather than scale point values) provided in brackets. The likelihood estimate was updated using cases of Legionnaires disease in 2018 reported by the Health and Safety Executive and E-coli cases in 2018 reported by Public Health England. The Health and Safety Executive estimated that half of all Legionnaires cases originate in dwellings. The E-coli values were adjusted from an estimated percentage of cases that originated in dwellings according to the Health Protection Agency. Finally, these figures were scaled down to be representative of the 1% of dwellings that have private water supplies (based on Drinking Water Inspectorate data).

Summary box – Water Supply

Vulnerable group – All ages

Groups other than vulnerable group at greater risk – Young children, older people, and immuno-compromised individuals.

Main issues to look for – Private water supplies (particularly those using a surface water source), uncovered water tanks, inappropriate materials in water distribution systems, dead ends and rarely used water outlets where pipe runs remain between 20°C and 45°C in larger multi-occupied buildings.

Risk reduction measures – Regular testing of private water supplies and maintenance of water purification apparatus and distribution systems, covering of water tanks, replacement of inappropriate materials in water distribution systems, removal of dead ends in pipework systems, *Legionella* testing and treatment of rarely used pipework and outlets in larger buildings.

Health effects

The UK has well-established and effective water supply and sewerage systems serving the majority of its dwellings, resulting in very low levels of morbidity and mortality from problems with contamination of water supplies through microbial or chemical means. When contamination is found it is most likely to affect private water supplies.

One percent of the English population are served by private water supplies. There were 36,913 private water supplies on local authority records in 2020. These supplies may be drawn from surface water or underground sources. Where they are drawn from surface water, they may be subject to seasonal fluctuations in water levels. Approximately 150 litres of water are required per person, per day for all personal and domestic purposes and periods of extended drought can cause inadequacies of supply. Extreme weather events may also threaten mains water supplies.

At typical internal dwelling temperatures adults will require 1.6-2.5 litres of water per day to remain healthy. Mild dehydration is associated with fatigue, headaches, dry skin, constipation, bladder infections and poor concentration.

The quality of private water supplies is improving. In 2020 3.6% failed to reach minimum water quality standards (down from 9.6% in 2010). Of those which failed 3.9% of supplies sampled in 2020 were found to contain *E. coli*, suggesting faecal contamination of the water source for approximately 3,462 users. Periodic testing of private water supplies is needed to identify pollution and faults with water treatment measures. These tests are fallible, for instance they may not occur at times of high contamination and may not test adequately for chemical contaminants, resulting in failures to detect exposures to pathogenic elements. Contamination may not cause illness in dwelling occupiers so may go unnoticed. Microbial contaminants may be more likely to cause illness in those who do not drink the water regularly.

In the UK, the main threats to health from water result from microbial contamination. Pathogenic organisms which affect drinking water typically cause gastro-intestinal illness. *Campylobacter*, *Cryptosporidium, Clostridium perfringens and E.coli* are common causes of gastro-intestinal illness associated with drinking water in England. Health effects include stomach cramps, diarrhoea,

vomiting, raised temperature, dehydration and in extreme cases can result in kidney failure or death.

Potentially harmful chemical contaminants may include disinfectants used in water treatment, hydrocarbons and minerals such as iron, arsenic, lead and nickel. Most chemical contaminants have threshold concentrations above which harm may occur. Levels of lead and nickel in excess of these threshold concentrations were found in 3.1% of private supply samples collected in England during 2020. Levels of nitrate above the safety standard were found in 7.7% of private water supply tests, levels of fluoride above the safety standard were found in 3.5% of tests and levels of pesticides above the safety standards were found in 0.26% of supplies tested for pesticide contamination.

Health effects from chemical contaminants are dependent on the contaminant. They include gastro-intestinal conditions, cancer, kidney damage, allergic reactions, dental fluorosis (from fluoride), endocrine disruption, reproductive issues and neurological disorders. The impact of lead in drinking water is dealt with under the HHSRS hazard of Lead.

Legionella may grow in water distribution systems from public or private supplies and may proliferate in appliances using water such as shower heads and Jacuzzis. The pathogen can cause respiratory infections, coughs, chest pains, influenza-like symptoms (Pontiac fever), acute pneumonia (Legionnaire's disease) and can result in mortality in 10% of cases. It can also cause wound infections from contact with contaminated water. Young children, older people and immuno-compromised individuals are at an increased risk from *Legionella*. Infection is most likely from inhalation of aerosolised water droplets. Infection in a domestic situation is rare, with an average of between 200 and 300 cases per year occurring in a community setting.

Causes

Private water supplies cover a minority of the population and are more likely to be found in rural areas. Although mains water can become contaminated, private water supplies are more likely to suffer from contamination. Private water supplies from surface or near-surface sources (water courses, springs and land drains) are subject to wide fluctuations in levels of contamination. Periods of high rainfall can wash contaminants into surface water, which may overwhelm water treatment measures. Deeper sources from wells and boreholes may be chemically contaminated but are less likely to suffer from organic contaminants unless there is a fault with the borehole/well or water extraction and distribution system.

Water pressure may be affected by a low vertical range between the source of water and the point of its use. It can also be affected by pipe diameters, leaks and build-up of mineral deposits in distribution systems. Supplies from surface water sources may be subject to seasonal fluctuations or severe weather events, reducing the amount of available water. These impacts may be sustained, reducing or cutting off the water supply for days or weeks at a time.

Private water supplies may employ settlement tanks, filters and ultra-violet lights to make water safe to drink. These systems require maintenance and can fail. They may also be inadequate for the volume of water or level and type of contamination in the water source. Contamination may vary due to changes in local land use and pathways of water movement before it is collected for domestic use. Systems may require modification over time.

Drinking water may be held in tanks, as part of the water storage and distribution system. When these tanks are inadequately insulated, they may freeze in colder weather and if not covered adequately, they may be contaminated (e.g. by animals falling into them).

Legionella bacteria are present throughout the UK. They will usually remain at low levels but can thrive in water between 20°C and 45°C. Legionella can be dispersed into the air by water droplets such as those from showers or spa baths, causing infection of the respiratory passages and lungs. This is the most likely route for transmission of Legionnaire's disease in homes.

Where pipework runs are short and they are regularly used, *Legionella* are less likely to accumulate to a point where they pose a problem. In larger buildings long pipe runs, dead-ends and infrequently used showers are examples of locations where water can remain at room temperature or slightly higher, then be drawn off, leading to exposure to potentially harmful levels of *Legionella* bacteria. Jacuzzi and whirlpool baths have become popular in residential situations and can create aerosols. If baths are of the type where water is left in the bath (such as when baths are situated in gardens) and water not adequately treated, *Legionella* may multiply to levels where they can pose a significant risk of infection.

Pathogens may proliferate in filters attached to taps, or in a plumbed-in water filter.

Behavioural factors

Private water supplies are subject to local authority and private testing. Testing may be proactive but is often reactive and dependent on the owners/occupiers. There is evidence of a lack of awareness of the risks from a poor-quality water supply amongst some private water supply users. This can lead to inadequate testing and treatment.

Relevant matters and baseline indicators affecting the likelihood and harm outcomes

Other hazards impacting the likelihood and/or harm outcomes

There is insufficient evidence to suggest other hazards impact significantly on the risk to health from the Water Supply hazard. Lead and radon contamination of water supplies are dealt with under the Lead and Radiation hazard categories.

Relevant baseline indicators (accompanying notes are in Appendix 1)

3.1 An approved potable water supply system shall provide an adequate amount of running water under pressure to all fixtures simultaneously. Supplies in individual bedsits/dwellings/flats must have their own controllable supply of water or the ability to store water.

3.2 An adequate supply of heated running water shall be provided to sinks, wash-hand basins, baths and showers. Hot water storage tanks shall be set at a minimum temperature of 60°C. At bath taps and shower heads, the maximum temperature shall be 45°C to prevent accidental scalding.

3.3 The WC cistern overflow should discharge externally unless designed by the manufacturer to discharge internally through the cistern or pan.

4.1 Every dwelling/HMO shall have a private bathroom, equipped and provided for the sole use of that dwelling/HMO.

5.1 Every dwelling/HMO shall have a kitchen or dedicated adequate space for the storage, preparation and cooking of food, equipped and provided for the sole use of that dwelling/HMO.

18.1 The property and all structures and areas within the curtilage of the property shall be free of pest infestation, with no features present that will attract and support pests. Inspection shall take place to ensure a pest-free environment.

Other matters affecting the likelihood and severity of harm outcomes include:

- Water temperature – water stored at an inappropriate temperature.

- Defective pipework etc. – inappropriate materials used for pipework, storage tanks, or fittings.
- Contamination of tanks – inadequate protection against contamination of water storage tanks.
- Water treatment defects – poor maintenance of water treatment equipment or inadequate provision of water treatment equipment.
- Water softening system – poor maintenance of water softening system.

Preventative measures

Drinking water should be wholesome and the supply to and within the dwelling should not be interrupted, except in emergencies.

The entire installation (taps, pipework, storage tanks, water treatment apparatus, etc.) should not adversely affect the quality of the water:

- by allowing ingress of contamination;
- by stagnation, particularly at high temperatures (for example from dead ends in pipework);
- by materials in contact with the water being unsuitable for the purpose (e.g. tar lined tanks);
- as a result of backflow of water from water fittings, or water using appliances, into pipework connected to mains or to other fittings and appliances; and/or
- by cross-contamination between pipework conveying water supplied for drinking water with pipes conveying water from some other source.

Cold water taps at kitchen sinks and wash hand basins should provide a supply of water which is safe and wholesome or be marked as being unsuitable for drinking. Kitchen sinks must be fitted with a cold water tap which supplies potable water. Such taps should be supplied directly from a safe water supply and distribution system. Where that system is not fed by mains water it must be subject to regular sampling and analysis. Where drinking water in a large building is provided from a distribution system involving a storage tank, that water should also be subject to regular testing and the tank should be properly covered.

Ion exchange systems can be used to remove some chemical contaminants such as nitrate and fluoride.

Water should be provided at a pressure which is adequate to supply appliances simultaneously. A booster pump or water tank can be used where local pressure is low.

To prevent *Legionella* growth hot water should be kept above 55^{o}C and cold water should be kept below 20^{o}C. Thermostatic mixer valves can be used to reduce the risk of scalding at points of water use. Hot and cold water sources should be used regularly to prevent accumulation of *Legionella* in pipework. Dead ends in pipework should be avoided. Where the above cannot be managed, such as when occupation of the dwelling is infrequent, or in larger dwellings, it may be necessary to test for *Legionella* and treat elements of the system with biocides (e.g. shower heads) to reduce the risk of exposure. *Legionella* is more likely to be found in multi-occupied buildings due to the size and design of water distribution systems in such buildings.

Water softeners introduce sodium into the water. Where a water softening treatment system is installed, there should be a tap providing unsoftened water for drinking and cooking.

Water filters should be fitted properly, and the filter cartridge changed regularly, in compliance with the manufacturer's instructions.

Rainwater or greywater used for flushing toilets should be treated by filtration and disinfection. Maintenance is required to ensure the treatment remains effective and the supply is kept separate from any potable water.

Water poverty can be alleviated through installation of a water meter.

Other considerations for assessment of this hazard

Private water supplies are subjected to testing, but this can only provide information on levels of contamination at the time of testing, making risk assessment difficult as contamination can increase with environmental changes such as high rainfall or changes in land usage. Assessors cannot assume that appropriate levels of testing are being undertaken when dealing with private water supplies.

Further reading

British Standard BS EN 806 – Specification for installations inside buildings conveying water for human consumption. Available at: www.bsigroup.com

British Standard BS8525 – Greywater systems. Available at: www.bsigroup.com

British Standard BS8580-1 – Water quality. Risk assessments for *Legionella* control. Code of practice. Available at: www.bsigroup.com

British Standard BS8580-2 – Water quality. Risk assessments for *Pseudomonal aeruginosa* and other waterborne pathogens. Code of practice. Available at: www.bsigroup.com

Clapham, D. (2010) Householder's guide to private water supplies. Marlow, Buckinghamshire: Foundation for Water Research. Available at: www.fwr.org

HM Government (2016) The Building Regulations 2010 Sanitation, Hot Water Safety and Water Efficiency – Approved Document G. Available at: www.gov.uk

HM Government (2010) The Building Regulations 2010 Drainage and Waste Disposal – Approved Document H. Available at: www.gov.uk

The European Guidelines Working Group (2017) European technical guidelines for the prevention, control and investigation of infections caused by *Legionella* species. Brussels: The European Centre for Disease Control and Prevention. Available at: www.ecdc.europa.eu/en

PSYCHOLOGICAL REQUIREMENTS

18. Crowding and Space

Description of the hazard

This hazard covers the risk to health associated with inadequate facilities and space within the dwelling for living, sleeping and normal household life, considering the potential occupation and the actual occupation of the dwelling.

Vulnerable group and the national average scores

Crowding and Space – Average likelihood and harm outcomes for **persons of all ages.**							
Dwelling type and age		Average likelihood 1 in	Spread of harm outcomes				Average HHSRS scores
			Extreme %	Severe %	Serious %	Moderate %	
Houses	Pre 1920s	5,000 (8,423)	10	5	30	55	23 (18) Low risk
	1920-45	5,000 (9,696)	10	5	30	55	23 (16) Low risk
	1946-79	5,000 (10,314)	10	5	30	55	23 (15) Low risk
	Post 1979	5,000 (15,235)	10	5	30	55	23 (10) Low risk
Flats	Pre 1920s	5,000 (5,709)	10	5	30	55	23 (27) Low risk
	1920-45	5,000 (9,138)	10	5	30	55	23 (17) Low risk
	1946-79	3,000 (3,442)	10	5	30	55	38 (45) Low risk
	Post 1979	-	10	5	30	55	-
All dwellings		**5,000 (9,696)**	**10**	**5**	**30**	**55**	**23 (16) Low risk**

Note – Scale point values are shown, with the national average values for likelihoods and their corresponding final scores (determined using actual harm outcome values rather than scale point values) provided in brackets. Health effects from crowding are difficult to isolate from other factors impacting on the health of people in crowded living situations. Data from ACORN was used in identifying crowding and combined with an expected harm rate from the National Housing Federation.

Summary box – Crowding and Space

Vulnerable group – All ages

Groups other than vulnerable group at greater risk – Those who spend most time at home including older people, very young children, those with mobility impairments, their carers and people who work or study from home. Ethnic minorities and those in large urban areas are more likely to live in crowded conditions.

Main issues to look for – Inadequate provision of amenities, particularly in HMO dwellings, under-sized rooms or poor layout of rooms reducing the available floor space, lack of opportunities for privacy (particularly when using bathing and WC facilities), obstructed traffic routes and amenity spaces due to inadequate storage. Assessors must consider the actual occupation and compare this to the expected occupation of the dwelling.

Risk reduction measures – Levels of amenities and the size and design of living areas can be changed to better suit the occupation of the property. Undersized bedrooms may need to be repurposed for other uses. Solutions for crowding and lack of space are likely to be individual to the property and living situation being considered. Reduction of the numbers of occupiers living at the dwelling may be a solution through proactive measures or natural occupier turnover.

Health effects

The English Housing Survey gave an average of 829,000 households (3.5% of all dwellings) that were overcrowded between 2017-18 and 2019-20 (occupied in excess of the bedroom standard set out in the Housing Act 1985). Overcrowding is more likely in social and privately rented accommodation than in owner-occupied accommodation. In 2019-20 8.7% of social rented and 6.7% of private rented accommodation was overcrowded, but only 1.2% of owner-occupied accommodation was overcrowded. Levels of overcrowding in rented accommodation have risen gradually since the millennium but have remained relatively static in owner-occupied accommodation. Overcrowding under the above criteria is more likely in ethnic minority groups and those living in large urban areas.

Connections have been found between crowding and a range of physiological conditions and mental health disorders. Crowding can result in increased heart rate and perspiration, increased levels of heart disease in later life, increased levels of respiratory conditions, increased levels of stress, anxiety and depression, difficulty sleeping, reduction of tolerance leading to conflict and relationship problems, and a reduction in the ability to concentrate. Crowding can make work and study at home more difficult, affecting learning and productivity. Crowding is linked to reduced educational attainment in children. Crowded conditions are also linked to increased risk of accidents, increased moisture burden in the dwelling, increased levels of indoor air pollution, and the spread of contagious diseases such as gastrointestinal infections, *Helicobacter pylori* infections, meningitis, tuberculosis, influenza and COVID-19 (SARS-CoV-2).

Those who spend more time at home will be affected most by this hazard including older people, the very young, mobility impaired persons and their carers and people who work or study from home. There should be sufficient space for social interaction between members of a household and private time spent away from other household members. This is particularly important during childhood and puberty. Small children need at least as much space as an adult, but the need for privacy begins to develop from the age of eight and will be fully formed during puberty.

Adverse housing conditions experienced in the first years of life are most likely to have a long-term impact on health. Early childhood is a critical period in which housing conditions can have a significant impact on an individual's life chances and crowded living conditions may harm children's development and education, and their levels of confidence. Crowding also has a negative impact on occupiers' sense of home.

The need for social and private space will vary with individual and cultural perceptions. Those living as separate households are likely to have a greater need for private space than those living as a single household. Couples living in shared accommodation will have a greater requirement for private space. Lack of private space can have a detrimental effect on relationship formation, inhibiting the growth of romantic relationships and potentially delaying or preventing the starting of families.

Causes

Crowded living conditions may result from a range of individual factors reflecting the wide range of circumstances encountered across the housing stock. Crowding is more likely where there are shortages of available housing. Occupiers on lower incomes or with unstable income sources may reduce their housing costs by occupying smaller living spaces or sharing living spaces with others. This may be through occupier intention, or as a result of the actions of owners/managers of rental accommodation. Availability and cost of housing may also limit options for developing families to move out of shared accommodation (with family or other households) into their own dwellings, or for offspring to leave the parental home.

In some situations, dwellings are created or subdivided without following appropriate planning and building regulations processes. Units of accommodation may be formed without adequate storage and living space, or without adequate levels of amenities. This accommodation may be unsuitable for the numbers living there or may be unsuitable for any person to live there as their only or main dwelling (e.g. bedrooms in garages and outbuildings).

Children need space to play within a property or near to the property in a garden or nearby park. This may be more difficult in modern dwelling layouts where there can be limited space for living purposes and reduced provision for storage and outdoor space.

The risk of domestic accidents is greater where there is insufficient space for the occupiers, particularly in areas such as kitchens. Where people, belongings and furniture are crowded together, it may not be possible to keep circulation space or functional space around appliances clear.

Harms may be caused by moisture production at levels above what the dwelling is designed to safely deal with, causing condensation and high humidities. Fires are more likely as cramped living conditions make ignition from overloading of sockets and cables/extension leads, and placing of clothes or furniture too close to sources of heat more probable.

Transmission of infection is more probable in a crowded property where people live in closer proximity and crowding causes subsequent difficulties in cleaning the interior environment and handling the increased production of waste.

In multi-occupied accommodation most of these issues will be compounded by the sharing of some spaces in the dwelling. In terms of privacy, a higher standard may be expected where facilities are shared with other households. For example, a bathroom door without a lock may be acceptable in a single household but would be unacceptable in a shared bathroom in an HMO.

Behavioural factors

Whilst a proportion of overcrowding is caused by a lack of choice of better alternatives for the occupiers, some occupiers will always seek to reduce their housing costs through living in smaller and non-typical housing situations, or through sharing with others out of choice. Assessors must consider the actual occupation of the dwelling for this hazard and the mode of occupation rather than the motivations for occupation when determining the HHSRS score.

Relevant matters and baseline indicators affecting the likelihood and harm outcomes

Other hazards impacting the likelihood and/or harm outcomes

Crowded living conditions will impact on the risk to health from other hazards. Risk to health will be increased for both Crowding and Space and any of the infection or accident-related hazard types, particularly where they present a greater than average threat to health in a crowded dwelling.

Relevant baseline indicators (accompanying notes are in Appendix 1)

4.1 Every dwelling/HMO shall have a private bathroom, equipped and provided for the sole use of that dwelling/HMO.

5.1 Every dwelling/HMO shall have a kitchen or dedicated adequate space for the storage, preparation and cooking of food, equipped and provided for the sole use of that dwelling/HMO.

5.3 Sufficient work surface shall be provided for food preparation. Sufficient cabinets and/or shelves sufficient to store occupant or visitors' food that does not require refrigeration, and eating, drinking and food-preparation equipment. Cabinets shall have well-fitting doors and no gaps between any surfaces. The work surface, work-surface edges, cabinets and shelves shall be of sound construction and furnished with surfaces that are impervious to water, smooth and cleanable.

7.1 A bedroom shall not be the only passageway to the only bathroom in a dwelling unit with more than one bedroom.

7.2 A bathroom or WC room shall not be the only passageway to any habitable room, hall, basement or the exterior of the dwelling.

7.3 The floor area of any room in the dwelling used as sleeping accommodation by one person aged 10 years or over must not be less than 6.51 m^2.

The floor area of any room in the dwelling used as sleeping accommodation by two persons must not be less than 10.22 m^2.

The floor area of any room in the dwelling used as sleeping accommodation by one person aged under 10 years must not be less than 4.64 m^2.

Any room in the dwelling with a floor area of less than 4.64 m^2 must not be used as sleeping accommodation.

Depending on the gender of household members, their relationship and the size of rooms, a dwelling containing one bedroom is considered suitable for up to two persons, irrespective of age. A dwelling containing two bedrooms is suitable for up to four persons. One containing three bedrooms is suitable for up to six persons and one containing four bedrooms suitable for up to seven persons.

7.4 The ceiling height of any habitable room shall be at least 2100mm. In a habitable room with a sloping ceiling, at least one-half of the floor area shall have a ceiling height of at least 2100mm. If any part of a habitable room has a ceiling height lower than 1500mm, its floor area shall be excluded

when calculating the floor area. For the purposes of this requirement, basement or subfloor rooms are excluded.

8.1 Internal doors leading between areas of a single dwelling must provide a sufficient barrier to the spread of smoke and fire (where appropriate). Any glazing in doors must respond safely to collision and must be designed for functionality to avoid strains or entrapment when in use, and must be maintained in good repair. All bathrooms and WC room doors must be fitted with a suitable lock and must not contain clear glass.

Other matters affecting the likelihood and severity of harm outcomes include:

- Living area – lack of living area of an adequate size for the household or potential household.
- Inadequate provision of amenities – lack of appropriately sited, equipped and sized bathroom(s), kitchen(s) or WC(s).
- Washing area/WC door – no door to the personal washing area, or lock on door, or glazed door.
- Number of bedrooms – inadequate number of bedrooms for the household or potential household.
- Bedroom size – inadequate size of bedrooms for the number of occupiers.
- Bedroom location – inappropriately sited bedrooms.
- Recreational space – lack of indoor space and safe outdoor recreational space for children.

Preventative measures

Within a dwelling there should be sufficient space for the separation of different household activities either by physical separation or by a clearly defined space within a larger space. Open-plan arrangements are appropriate for a single person or a couple but may not be suitable for a larger household, particularly where the dwelling is occupied as an HMO. The degree of separation required for different household activities will be influenced by the mode of occupation of the property.

For larger households bedrooms should lead off a circulation space and should be large enough to be usable for sleeping and for study or relaxation away from the other members of the household. This is particularly important where dwellings are shared by multiple households (e.g. HMOs) and rooms are occupied by couples.

The dwelling should be judged as a whole when considering its suitability for the number of occupants. The layout, provision of amenities, amount of habitable space and available storage should be appropriate for the mode of occupation of the dwelling. There should be adequate open floor space which is of a shape which allows maximum use of the floor area. There should be adequate space which can be kept clear for movement and activities. There also is a need for some indoor and outdoor recreational space for accommodation housing children.

Lost space due to en-suite facilities should still leave adequate floor space in bedrooms. Split level arrangements with sleeping platforms to accommodate inadequate space or poor room layouts should be avoided. Only rooms designated as bedrooms or bed/sitting rooms should be used for sleeping purposes. Circulation spaces such as hallways, landings and other rooms such as kitchens, bathrooms, or cellars, roof spaces, inappropriately modified outbuildings, etc. are unsuitable for use as sleeping / living accommodation.

There should be sufficient provision for sleeping having regard to the numbers likely to be accommodated in the dwelling. Part X of the Housing Act 1985 covers overcrowding, the room standard and the space standard and may be used as a guide.

To provide for adequate privacy each bath/shower should be sited in a bathroom/shower room and each WC should be sited in a bathroom or separate WC compartment. These facilities should always be provided with an opaque lockable door.

No unit of accommodation should be occupied on the basis of a divided or shared tenancy or licence requiring sharing of the room. The sharing of a room for sleeping purposes by persons who are neither related nor living as a married couple or partners should be avoided. Sharing of bedroom facilities on a shift basis should not occur.

Other considerations for assessment of this hazard

This hazard requires two assessments. The first is an assessment of the dwelling disregarding the current occupation. It should consider the size and layout of the dwelling, the above baseline indicators, relevant matters and any other relevant factors, based on the occupancy level that typically might be expected to use the dwelling. The second assessment (uniquely for this hazard) is of the dwelling based on its actual level of occupation. This should consider the level and type of occupation, dwelling layout and dimensions, provision of amenities and above-mentioned factors and compare them to the occupancy level that typically might be expected in that dwelling.

When considering the gender of occupiers, assessors should have made themselves aware of the latest guidance on gender and gender classification.

Further reading

Buxton, P. (2018) Metric Handbook – Planning and Design Data. London: Routledge. Available at: www.routledge.com

Department for Levelling Up, Housing and Communities (2015) Technical Housing Standards – Nationally Described Space Standard. Available at: www.gov.uk

19. Entry by Intruders

Description of the hazard

This hazard covers the difficulties in keeping a dwelling secure against unauthorised entry and the maintenance of defensible living space. It includes harms from intruder entry and the fear of an intruder entering the dwelling.

Vulnerable group and the national average scores

Entry by Intruders – Average likelihood and harm outcomes for **persons of all ages.**							
Dwelling type and age		Average likelihood 1 in	Spread of harm outcomes				Average HHSRS scores
			Extreme %	Severe %	Serious %	Moderate %	
Flats	Council	10 (12)	0	0.1	10	89.9	400 (311) Moderate risk
	HMOs	20 (18)	0	0.1	10	89.9	200 (208) Moderate risk
All dwellings		**50 (59)**	**0**	**0.1**	**10**	89.9	**80 (63) Low risk**

Note – Scale point values are shown, with the national average values for likelihoods and their corresponding final scores (determined using actual harm outcome values rather than scale point values) provided in brackets. Data quality is reasonably good. Relying solely on burglaries reported to the police may under-estimate the actual number of burglaries. For this reason, the Crime Survey for England and Wales has been used to determine the above figures.

Summary box – Entry by Intruders

Vulnerable group – All ages

Groups other than vulnerable group at greater risk – Those living in urban areas, households occupied by young adults, older people and single parent households.

Main issues to look for – High levels of crime and poverty in the local area, lack of defensible space, poorly overlooked doors and windows, weak security measures including poor or missing locks (including locks to rooms in HMOs), insubstantial door and window construction or disrepair in doors and windows and ease of access to the dwelling from neighbouring alleyways etc.

Risk reduction measures – Target hardening measures including locks on accessible windows and doors, reinforcing of front and rear doors, burglar alarms, security lighting, video surveillance, high fences/walls, and unnavigable overgrowth where the boundaries of a property are easily accessible, spy holes or other means of identifying those approaching front doors and intercom systems for larger buildings.

Health effects

There has been a significant decline in burglaries in England and Wales since the millennium, with burglary levels dropping from 1,357,000 in 2002-3 to 699,000 in 2018-19. Other forms of theft from households have shown a similar downward trend.

The potential health effects are:

- the fear of possible burglary occurrence or recurrence;
- the stress and anguish caused by a burglary; and
- injuries caused to occupiers by an intruder (aggravated burglary).

The offender may be a stranger, but it is also very likely that they are known to the victim. Intruder entry may be as a result of domestic violence or may involve some association with the perpetrator. The offence of burglary includes stealing or attempting to steal anything in the building or inflicting or attempting to inflict grievous body harm on any person in the building.

By breaking into people's homes and potentially interfering with their personal belongings, burglars violate people's subjective sense of security. As a result, the victims of domestic burglary from all age groups may suffer from physical and/or psychological harms due to the burglary. Older people with declining physical well-being are at a higher risk of being severely affected by such events.

Burglary and the fear of intruder entry causes emotional distress for occupiers. In order of likelihood the types of emotional response to burglary include:

- feelings of anger
- annoyance
- shock
- fear
- loss of confidence or feelings of vulnerability
- difficulty sleeping
- anxiety or panic attacks, and
- depression.

These responses may result in a sense of vulnerability and a fear of becoming a victim again. Victims may experience post-traumatic stress disorder (PTSD). The extent of the psychological damage is reinforced if the victims are female, had introduced preventative measures prior to the incident, were burgled repeatedly, saw and/or heard the offenders, lost a large amount of money and/or other valuables, or experienced major damage to the property.

Physical injury from aggravated burglary is rarer but remains a significant contributor to the harm outcomes from this hazard.

Causes

Economically disadvantaged households are at a higher risk of burglary. Urban areas have higher rates of burglaries and burglaries are more common in social housing and the private rented sector, particularly HMO properties. The risks are associated more with socio-economic factors, than with physical attributes such as the estate design and home security, but poor security measures will put dwellings at higher risk of intruder entry. Burglary rates vary (sometimes dramatically) over quite small geographical areas. Dwellings in areas with high unemployment and low-incomes and those in areas with high levels of vandalism, graffiti, litter, and homes in poor condition are more likely to be affected. Private and social rented properties are also more likely to be affected. HMO properties are more likely to be targeted by burglars. Occupiers of HMOs must also consider the potential for intruder entry and theft from people living in the same building or visiting other occupiers. Methods of securing individual bedrooms may be absent or poor.

Territoriality, surveillance, access control and maintenance all affect the house, street and neighbourhood level characteristics, and play a role in making some properties more vulnerable to domestic burglary. The distinction between public and private space that defines the ownership of a dwelling may be seen as territorial. Enclosed spaces that are clearly marked as private convey a higher degree of territoriality. Lack of this defensible space around a dwelling can make intruder entry more likely.

Surveillance is defined as the ability to monitor the activities around a house and its surrounding areas by its owner and neighbours. The surveillance of a dwelling will be lower where it is less visible to its neighbours, increasing the likelihood of it being targeted for burglary. The operational task of regulating the entry of individuals into a particular enclosure or demarcated territory is defined as access control. The risk of burglary is closely associated with the ease of access to a building and the effort required to commit the crime. Dwellings located on accessible and permeable street networks are usually more vulnerable to burglary. Houses are more likely to be burgled than flats. Finally, a higher level of disrepair and deterioration of the local environment helps promote anti-social behaviours, making it more vulnerable to crimes.

The Office for National Statistics overview of burglary and household theft trends published in 2017 found that more than two-thirds of domestic burglaries take place during the week and three-fifths occur during the evening and at night. In over half of incidents of domestic burglary in a dwelling someone was at home at the time, however distraction burglaries represent less than 5% of burglaries.

Burglars commonly use the following methods to gain entry to the property:

- forced a window or door lock;
- entry through an unlocked door;
- broke/cut a panel on a door;
- broke the glass of a door or window;
- pushed past the person opening the door;
- the intruder had a key;
- used false pretences to gain access; and
- pushed open a window.

The most commonly used break-in method was forcing a door lock, accounting for one-third of the burglaries in 2019/20.

Whilst force is used to gain entry in the majority of burglaries, HMOs are more prone to failures to properly secure the property whilst occupiers are absent, as occupiers assume others have undertaken these tasks. Privately rented/HMO dwellings occupied by young adults also present a more tempting target for burglars due to the range of valuable goods available.

Burglars target properties based on the evaluation of the perceived risks and benefits associated with breaking into those properties. Burglars' interest in breaking into a property may increase if the perceived risks and efforts associated with committing the crime are lower when compared to the perceived gains.

Burglary includes forced entry and violence towards an occupier. This form of intruder entry may be associated with domestic violence. The perpetrator may also be known to the victim.

Behavioural factors

As stated above, failure to properly secure dwellings will increase the likelihood of entry by intruders. During warmer weather daytime burglaries may also occur where intruders take advantage of windows and doors being left open for ventilation. Awareness that other occupiers are failing to secure a property will increase the fear of intruder entry. Assessors should be aware of how the dwelling and its security facilities will be used by occupiers.

Relevant matters and baseline indicators affecting the likelihood and harm outcomes

Other hazards impacting the likelihood and/or harm outcomes

There is poor evidence of other hazards having a significant impact on the likelihood and harm outcomes from this hazard. However, measures for Fire and Explosions should be considered alongside those for the Intruders hazard, as security measures may impede evacuation in the event of a fire. All hazards whose likelihood and/or harm outcomes are reduced through ventilation will have a bearing on the Intruders hazard, as intruders may use open windows and doors to access the dwelling.

Relevant baseline indicators (accompanying notes are in Appendix 1)

7.1 A bedroom shall not be the only passageway to the only bathroom in a dwelling unit with more than one bedroom.

9.1 External yards, paths, steps, accessways and surrounds within the curtilage of the dwelling shall be in good repair, even and well drained. Accessways must be suitable non-slip surfaces, have adequate lighting and should not have slopes of sufficient gradient to present a falls risk. This includes consideration to unevenness, trip risks and poor slip resistance, to any steps or surfaces within external space that is provided, to the front door, yard and garden.

Where there are drops of more than 300mm from paths, patios, steps, terraces or garden areas guarding will be necessary where there are high risks of falling.

All boundaries should be clearly defined and enclosed by well-maintained and suitable walls or fences. This also applies to structure, accessways, security doors and lifts.

11.1 Adequate external lighting shall be provided to all means of access including entrances and external refuse stores providing good visibility when there is no daylight.

11.2 Access doors to dwellings should have adequate locks. Doors must be solid external grade and fitted with a minimum of a mortice deadlock to BS 3621, openable from the inside without a key. There must be a means for occupiers to view visitors without opening the door, either by means of a viewer within the door or by a glazed pane adjacent or close to the entrance door. All rear doors should be fitted with a mortice dead lock to BS 3621 or 2 security bolts.

11.3 Windows in accessible locations must be provided with suitable window locks.

11.4 Dwellings with a common entrance door shall have a door entry system allowing a visitor to contact the dwelling. It shall allow a visitor to ring any selected dwelling within the particular system and/or building and hold a two-way simultaneous conversation between the visitor and occupant of the dwelling. It will allow the occupant to see and identify the visitor and their location.

11.5 All door and window frames and furniture shall operate properly and be in a good state of repair, with no open joints or compromised seals between the windows/doors and adjacent walls.

14.4 All electrical installations, including fixtures and fittings, must be maintained in good repair.

16.2 All habitable rooms must have at least one window, door or skylight which opens to the outside and can be fixed in an open position. In addition, ventilation may also be provided by the presence of trickle vents, air bricks or passive stack ventilation.

17.1 Every foundation, roof, roofing component, exterior wall, floor, door, skylight and window shall be watertight, weathertight, free of persistent dampness or moisture and in good condition.

Other matters affecting the likelihood and severity of harm outcomes include:

- Location – high level of poverty and crime in the area.
- Defensible space – both public and private around the dwelling.
- Lighting – on pedestrian routes to an estate or immediate neighbourhood, or around the dwelling.
- Pedestrian routes – definition of routes to an estate or immediate neighbourhood.
- Housing layout – no natural unobtrusive view of neighbouring dwellings.
- Door chains – lack of or broken chains to external doors.
- Burglar alarms – lack of or defective alarm system.
- Insubstantial construction – access points to the dwelling, outbuildings and boundaries which are of insubstantial construction.

Preventative measures

Assessors are unlikely to be able to influence aspects outside of the dwelling being assessed, but the layout of the areas surrounding a dwelling have an impact on this hazard. Providing defensible space around dwellings, provision of well-lit and defined pedestrian routes, reducing graffiti and litter, ensuring dwellings have a natural view of neighbouring properties and closing off back lanes and alleyways through alley gating schemes will all aid in reducing levels of crime. A range of behavioural and area improvements can also be made to improve the appearance of an area and feelings of safety in that area. These measures will increase confidence in using public spaces, increasing footfall across the area, improving levels of natural surveillance. Such measures may be carried out alongside HHSRS assessment and remedial measures. Assessors should consider relevant local crime statistics as part of their assessment and adapt any remedial measures accordingly.

The dwelling itself should be capable of being secured against unauthorised entry, which will deter and delay introducers, making the occupants feel safer. Window locks, security lights, extra locks on doors, spy holes, chains on front doors and reinforcing the construction of doors will reduce the likelihood of harm. Providing dwellings with defensible space in the form of walled/fenced yards and gardens will improve feelings of security.

Where the rear of a dwelling borders open land, a back lane or other thoroughfare, higher walls/fences and accumulations of brambles or other difficult to navigate overgrowth or barriers will deter offenders and improve the sense of security of external defensible space around the dwelling. Target hardening measures (e.g. additional locks, alarms and reinforcing of access points) and security lighting around outbuildings will also improve feelings of safety.

Video surveillance in doorbells and over areas surrounding the dwelling will improve feelings of security. When combined with signage it can deter intruders. Burglar alarms also improve feelings of security and can deter intruders.

Where dwellings are sited in areas with higher crime and burglary rates security measures should be increased accordingly. However, conspicuous security measures such as bars on windows and barbed wire or razor wire can contribute to feelings of insecurity and fear. A balance must be sought

between what is required to ensure feelings of safety, whilst providing adequate security. That balance must also consider other requirements such as the need for adequate ventilation and fire safety.

Multiple occupancy buildings including flats and HMOs should include consideration of the mode of occupation and the level of security enjoyed by the individual units of accommodation within the building. Stout entry doors to flats, bedsits and bedrooms, with adequate provision for occupiers to securely lock their doors will reduce the risk of harm. This must be balanced against the need to escape in the case of a fire. Larger buildings should have an intercom system with audio and/or video capability to allow occupiers to identify visitors and control access to the building. Where this is provided, consideration should be given to the need for access for postal and other deliveries.

Other considerations for assessment of this hazard

Measures to prevent burglary often inhibit the ability of occupiers to escape in the case of a fire and may contribute to inadequate ventilation to removal of hot, humid or polluted air from dwellings. Consideration must be given to how to balance these sometimes conflicting requirements when assessing risk and determining remediation measures.

Further reading

British Standard BS8220-1 – Guide for security of buildings against crime. Dwellings. Available at: www.bsigroup.com

HM Government (2015) The Building Regulations 2010 Security in Dwellings – Approved Document Q. Available at: www.gov.uk

Secured by Design is a police-owned security initiative that provides crime prevention and security information. It can be accessed at www.securedbydesign.com

20. Noise

Description of the hazard

This hazard covers threats to physical and mental health from exposure to noise inside a dwelling or within its curtilage.

Vulnerable group and the national average scores

Noise – Average likelihood and harm outcomes for **persons of all ages.**							
Dwelling type and age		Average likelihood 1 in	Spread of harm outcomes				Average HHSRS scores
			Extreme %	Severe %	Serious %	Moderate %	
Non-HMOs	Pre 1920s	300 (286)	0	1	10	89	16 (16) Low risk
	1920-45	300 (328)	0	1	10	89	16 (14) Low risk
	1946-79	300 (354)	0	1	10	89	16 (13) Low risk
	Post 1979	300 (354)	0	1	10	89	16 (13) Low risk
HMOs	Pre 1920s	200 (234)	0	1	10	89	24 (20) Low risk
	1920-45	300 (252)	0	1	10	89	16 (18) Low risk
	1946-79	300 (316)	0	1	10	89	16 (15) Low risk
	Post 1979	1000 (780)	0	1	10	89	5 (6) Low risk
All dwellings		**300 (339)**	**0**	**1**	**10**	**89**	**16 (14) Low risk**

Note – Scale point values are shown, with the national average values for likelihoods and their corresponding final scores (determined using actual harm outcome values rather than scale point values) provided in brackets. Health effects from noise may be indirect so are not always directly linked to noise when they are recorded, particularly for Serious and Moderate harm outcomes. Overall, data quality is reasonably good, although the number of noise complaints reported to local authorities may under-estimate or over-estimate the number of incidents where harm resulted.

Summary box – Noise

Vulnerable group – All ages

Groups other than vulnerable group at greater risk – Those who spend a greater amount of time at home, shift workers, older people and children.

Main issues to look for – High levels of noise in the environment of the dwelling, layouts where bedrooms are next to living rooms or noisy parts of shared buildings, noisy equipment or facilities, use of insubstantial construction materials, disrepair allowing sound penetration, poorly fitting windows/doors.

Risk reduction measures – Secondary glazing or double/triple glazing, ducted ventilation systems, carpets to reduce noise from footfall, provision of extra layers to walls and ceilings, using materials such as rockwool or plasterboard to improve sound insulation, moving plumbing, changing room uses to avoid bedrooms being located next to noisy areas.

Health effects

Unwanted noise have a detrimental effect on people, including sleep disturbance, ischemic heart disease, cognitive impairment of children and tinnitus.

Road traffic and aircraft noise have been linked with hypertension and cardiovascular disease but the main health impacts from unwanted noise are psychological, including stress and poor concentration. These effects are most likely in larger urban areas. Aircraft, railway, construction and neighbourhood noise can all cause annoyance and sleep disturbance.

The body of a sleeping person will still respond to environmental stimuli, even if they remain asleep. Disturbance from environmental noise can have an effect on the quality of sleep, interrupting the normal cycle of episodes of REM sleep. This effect reduces after the first five hours of sleep. Noise can also shorten periods of sleep, causing delays in falling asleep at levels as low as 45dB(A) and causing premature final awakening.

Neighbourhood noise may come from recognisable sources or may be emotive in nature which may catch the attention of the listener, independent of its intensity. The level of annoyance can be related to the specific relationship that exists between the noise producer and the noise receiver. This can also be the case within dwellings when noise from different occupier's activities penetrates the structure. Irritability and extreme aggravation over neighbourhood noise may result in more extreme harm outcomes such as suicide and assault.

Those who spend greater periods of time at home are more at risk from environmental noise, as are shift workers. Older people complain about noise more than younger adults, but evidence around the impact it has on their sleep is inconclusive, as their sleep is more likely to be disturbed for other reasons. Children have an awakening threshold approximately 10dB(A) higher than adults, but their cardiovascular sensitivity to environmental noise is similar to that of older people. High levels of environmental noise can cause reduced cognitive ability in children. This reduction will persist for some time after exposure to the noise has ceased.

Causes

Data collected by the Chartered Institute of Environmental Health in 2019-20 indicated that there were 67 noise complaints to local authorities per 10,000 head of population. Noise originating from within the home, or the immediate environment of the home is a common cause of complaint with reports suggesting up to 80% of people in the UK are exposed to unwanted noise in their homes.

People vary greatly in their sensitivity and tolerance to noise. Tolerance may in part be determined by age, sex, working status, lifestyle and personality. Different types of noise will affect people in different ways. Noise during the night is less likely to be tolerated than noise during the day and will have a greater impact on health. Unusually loud, continuous noises, those which are connected with inconsiderate behaviour (e.g. amplified music and shouting), noises with uncertain sources and sources of noise which are emotive such as arguments, or noises which induce a fear response are less likely to be tolerated. Once an occupier is sensitised to a particular type of noise it may cause a stronger response even at low decibel levels.

Extraction fans, macerators, impact noise and water moving through internal pipework in dwellings can cause irritation. Poor noise insulation around sleeping rooms can lead to disturbance. This may be a particular problem where the room is situated next to a living room or other part of a dwelling structure where noise levels are likely to be higher. Flats and HMOs may have living rooms and kitchens directly under or over bedrooms. Differences in lifestyle, inconsiderate behaviour or lack of awareness by occupiers of their impact on others may lead to levels of noise which will disturb other occupiers.

Clear standards for noise penetration within and between dwellings have only been a requirement of more recent Building Regulations. The layout and structure of the dwelling and its internal floor finishes can impact on the level of noise transmission. For instance, ventilation, service ducting, cracks in walls and floors and poorly fitting doors can facilitate the passage of sound through a structure. Lightweight building materials will absorb less sound energy than denser wall, door and floor materials. Tiled or boarded floors will result in greater impact noise than carpeted floor finishes.

Behavioural factors

The HHSRS focuses on the structure of the dwelling, which should provide reasonable levels of acoustic insulation from exterior and interior sources of noise. It does not consider unreasonable noise levels generated by inconsiderate behaviour, such as the playing of loud amplified music, or the use of power tools at inappropriate times, or for long durations.

Relevant matters and baseline indicators affecting the likelihood and harm outcomes

Other hazards impacting the likelihood and/or harm outcomes

Excess heat – High temperatures may require occupiers to improve ventilation in their dwelling through opening doors and windows, reducing levels of sound insulation from the exterior structure.

All hazards which may encourage occupiers to open windows and doors for ventilation will contribute towards the hazard of Noise, where there are external sources of noise affecting the dwelling.

Relevant baseline indicators (accompanying notes are in Appendix 1)

1.1 Externally, every foundation, roof, ridge line, flashing, fascia, soffit and bargeboard, exterior staircase, exterior wall/fence shall be safe to use and capable of supporting the intended design loads and load effects and shall be in a proper state of structural repair.

Internally, every wall, floor, ceiling, inside stair, porch, accessory structure, door, window and window glass shall be safe to use and capable of supporting the intended design loads and load effects, and shall be in a proper state of structural repair.

8.1 Internal doors leading between areas of a single dwelling must provide a sufficient barrier to the spread of smoke and fire (where appropriate). Any glazing in doors must respond safely to collision and must be designed for functionality to avoid strains or entrapment when in use, and must be maintained in good repair. All bathrooms and WC room doors must be fitted with a suitable lock and must not contain clear glass.

10.1 All new flats/flat conversions must comply fully with current building regulations in respect of sound insulation. Older flats/flat conversions should comply with all relevant building regulations relating to noise.

10.2 The noise level inside the dwelling caused by steady external noise sources must not exceed:

- 07:00 to 23:00 – 40 dBLAeq,T16 in the living room and bedroom area, and 45 dBLAeq,T16 in the dining room/area
- 23:00 to 07:00 – 35 dBLAeq,T8 in the bedroom

11.5 All door and window frames and furniture shall operate properly and be in a good state of repair, with no open joints or compromised seals between the windows/doors and adjacent walls.

15.5 Heating and hot water must be capable of being controlled effectively and timed to operate by the occupiers.

16.4 All means of ventilation shall be maintained in good repair and working order.

Other matters affecting the likelihood and severity of harm outcomes include:

- Site of dwelling – located in a particularly noisy environment.
- Internal arrangement – placing sleeping rooms next to living rooms or other sources of noise either within the dwelling, or due to the position of rooms in multiple occupancy developments such as flats.
- Floor finishes – producing increased levels of impact noise.
- Disrepair or construction/design– of windows, doors, floors and walls, etc. which allows increased noise penetration.
- Siting of plumbing – inappropriate siting of plumbing fittings and/or facilities.
- Equipment – noisy equipment or facilities.
- Door closers – overly powerful mechanisms resulting in banging.

Preventative measures

World Health Organisation guidelines give a maximum noise level of 30 dB(A) during the night for good quality sleep and 40dB(A) of annual average noise levels outside of bedrooms to prevent adverse health effects from noise. Daytime outdoor noise levels of 50dB(A) are recommended to prevent annoyance. Where levels of internal or external noise exceed these thresholds the fabric of the property should be capable of reducing the levels of noise entering the bedroom and living areas of the property. For instance, a flat over a noisy bar sited next to a busy road should have a dividing floor between the bar and the flat, engineered to reduce the sound transmission, and external walls, roof, doors, windows and ventilation measures which are sufficient to reduce the transmission of traffic noise to levels where they did not threaten the health of occupiers significantly.

Double glazing, triple glazing and secondary glazing will help to reduce penetration of sound energy from outside sources. The effectiveness of secondary glazing is influenced by the distance between the glass panes. Secondary glazing panes should be correctly distanced from primary glazing. Thickness of doors and windows, and the airtightness of the seal between opening parts and the frame will influence the effectiveness of doors and windows at preventing penetration of sound energy. Lobbies behind external doors can reduce the passage of sound.

Ducted ventilation systems and/or air conditioners may be required to provide adequate ventilation and reduce need for windows to be kept open where dwellings are sited near roads, railways, airports and other sources of noise.

The impact of noise from plumbing can be reduced by siting pipework away from sensitive locations or avoiding siting bathrooms and WCs over living rooms and bedrooms. Acoustic insulation can be placed around bathrooms/WCs and their pipework to reduce unwanted sound transmission.

If bedrooms are situated next to sources of noise, the wall, ceiling and floor structure should be constructed to reduce the passage of noise to an acceptable level. Partitions between dwellings should also be constructed to prevent noise from differing lifestyles and living patterns from disturbing neighbouring dwellings. Solutions to reduce noise penetration will vary depending on the situation. Commonly used materials for reducing sound penetration include rockwool, neoprene and plasterboard. Good workmanship is important in ensuring solutions are effective. Carpeted floor finishes with an underlay will also reduce noise from footfall.

Green space can reduce the perceived impact of noise, but aside from placing greater distance between the source of noise and the listener, vegetation will have a limited impact on noise transmission.

Other considerations for assessment of this hazard

The HHSRS focuses on the structure of the dwelling which should provide reasonable levels of acoustic insulation from exterior and interior sources of noise. Extra acoustic insulation may be required if the dwelling is located near a major source of external noise such as a road or railway. Minimum acoustic insulation levels set out under the current Building Regulations may not be sufficient in all situations and may need to be exceeded in order to adequately protect the health of the occupiers from this hazard. Levels of acoustic insulation from the original construction or refurbishment of the dwelling may provide inadequate protection from internal noise transmission.

It may be difficult to differentiate noise penetration originating from deficiencies within the dwelling itself, when conducting an assessment under this hazard. Noise level measurements should also take this into account so far as is reasonably practicable. If noise level measurements and recordings are used to inform an assessment of this hazard, they should only form a part of the assessment of this hazard. Assessments should consider all factors contributing to the hazard.

Further reading

HM Government (2010) The Building Regulations 2010 Resistance to Sound – Approved Document E. Available at: www.gov.uk

Houthuijs, D., Swart, W. & van Kempen, E. (2018) Implications of environmental noise on health and wellbeing in Europe. Bilthoven: European Topic Centre on Air Pollution and Climate Change Mitigation

World Health Organisation (2009) Night noise guidelines for Europe. Copenhagen: World Health Organisation Regional Office for Europe

21. Lighting

Description of the hazard

This hazard covers the threats to physical and mental health associated with inadequate natural and/or artificial light. It includes the psychological effect associated with the view from the dwelling through glazing.

Failure of indoor lighting resulting in falls should be dealt with under the relevant falls hazard(s).

Vulnerable group and the national average scores

Lighting – Average likelihood and harm outcomes for **persons of all ages.**							
Dwelling type and age		Average likelihood 1 in	Spread of harm outcomes				Average HHSRS scores
			Extreme %	Severe %	Serious %	Moderate %	
All dwellings		**5,000 (20,000)**	**0.1**	**1**	**10**	**88.9**	**1 (<1) Low risk**

Note – Scale point values are shown, with the national average values for likelihoods and their corresponding final scores (determined using actual harm outcome values rather than scale point values) provided in brackets. The nature of this hazard makes attributing health impacts to residential environments difficult. The likelihood estimate was updated by combining a series of estimates reported in public sources. The sources were an NHS estimate for seasonal affective disorder (SAD) from 2020, a BUPA estimate for the percentage of SAD cases that are classed as depression from 2019, a National Institute for Health and Care Excellence estimate of the percentage of depression cases that are severe, and an English Housing Survey estimate of the percentage of dwellings with basements. Figures were restricted to dwellings with basements.

Summary box – Lighting

Vulnerable group – All ages

Groups other than vulnerable group at greater risk – Older people, those less able to leave the dwelling and those with impaired vision.

Main issues to look for – Rooms below ground level and attic flats, externally obstructed windows, dwellings with no outlook from windows, inadequate natural or artificial light levels, small windows to habitable rooms, unwanted penetration of light from external light sources.

Risk reduction measures – Unwanted external lighting sources can be screened out with physical obstructions such as blackout curtains/blinds, defects with artificial lighting may require moving lighting fixtures, adding extra fixtures or replacing defective units, windows may be added to rooms or existing windows enlarged/moved to improve light penetration and outlook. Where dwellings are below ground level remedial works to improve daylight penetration and provide a view of the surroundings may not be reasonably practicable.

Health effects

Exposure to natural light is important for wellbeing and the control of circadian rhythms. Lack of exposure to natural light can have adverse psychological impacts on dwelling occupiers. It has been linked to seasonal affective disorder and can result in depression and interference with circadian rhythms. Exposure to adequate levels of natural light aids in establishing stable sleep patterns and

can improve the quality of sleep. Occupiers can leave a dwelling to gain this exposure, but as most time is spent inside the dwelling it is important that there is adequate access to natural light in habitable areas of the dwelling, particularly for those who are less able to leave their home due to age or ill health.

Lack of light, or glare from light (for example where sunlight reflects from neighbouring structures) can result in headaches, visual discomfort and eye strain. The time taken for eyes to adjust to changes in light level increases with age. Inadequate or excessive levels of light and rapid changes in light intensity will affect older people and those with impaired vision more than other groups.

Where dwellings are in locations without an outlook, such as in subterranean levels of buildings, there may be no windows with a view of the neighbouring areas. In other situations, windows may face onto neighbouring walls. Occupants of these dwellings may suffer from feelings of isolation and depression.

Intrusive artificial external light sources can make it difficult for occupiers to control and reduce light levels in the evening and at night, affecting melatonin production and interfering with their ability to sleep. Occupiers require control over levels of artificial lighting at all times to adapt lighting levels to suit their requirements. Light levels of more than 5 lux at night have been linked to an increase in levels of depression.

Flicker caused by certain types of artificial light can cause discomfort and may trigger symptoms in pre-existing medical conditions such as photosensitive epilepsy.

Exposure to light sources producing high levels of blue light has been linked to delayed sleep and a poorer quality of sleep by some studies but at the time of writing, evidence for this effect remained inconclusive.

Causes

The size, shape and position of windows, room layout, objects obstructing daylight (e.g. trees) and the colour of surfaces in the room will all impact on the amount of daylight reaching different parts of rooms. Smaller windows and windows positioned nearer the floor will allow less light into the room. Darker colours on external surfaces reflecting light into the dwelling and internal surfaces reflecting light around the dwelling will reduce the level of natural in the dwelling.

The worst problems with Lighting are often found where dwellings are located wholly at basement level or where dwellings are entirely at attic level and are fitted solely with skylights/Velux type windows. These situations allow occupiers no view of the surrounding area. This may also be an issue in shared dwellings where occupiers have a bedroom/bedsit in a basement or attic where they spend most of their time but are only able to access windows with a view of the dwelling's surroundings in a common kitchen or dining room, which would be used for limited periods of the day.

External streetlights, security lights in neighbouring buildings (particularly where these are turned on by motion sensors), nearby stadium lighting and other light sources can penetrate habitable rooms where they are not fitted with adequate screening at source, or at the dwelling (e.g. blinds or blackout curtains).

Poorly positioned artificial lighting within a dwelling and reflection of light from neighbouring dwellings can cause glare and shadows within a dwelling, interfering with the ability to move around the dwelling and carry out routine tasks.

Poorly maintained fluorescent lighting and LED lights may flicker. They may also cause humming or buzzing noises, produce light at high light temperatures, or with a poor colour rendering index, providing an environment that is less aesthetically pleasing to occupiers. LED lights vary in their light temperature and colour rendering index. Older LED lights may produce declining levels of light over time.

Behavioural factors

Leaving the dwelling, even for short periods of time will substantially reduce the health impact of problems with low levels of natural light entering the dwelling. However, assessors cannot assume that occupiers will leave the dwelling to take advantage of these benefits.

Relevant matters and baseline indicators affecting the likelihood and harm outcomes

Other hazards impacting the likelihood and/or harm outcomes

There is insufficient evidence of a significant impact on this hazard from other HHSRS hazards.

Relevant baseline indicators (accompanying notes are in Appendix 1)

8.1 Internal doors leading between areas of a single dwelling must provide a sufficient barrier to the spread of smoke and fire (where appropriate). Any glazing in doors must respond safely to collision and must be designed for functionality to avoid strains or entrapment when in use, and must be maintained in good repair. All bathrooms and WC room doors must be fitted with a suitable lock and must not contain clear glass.

11.1 Adequate external lighting shall be provided to all means of access including entrances and external refuse stores, providing good visibility when there is no daylight.

11.5 All door and window frames and furniture shall operate properly and be in a good state of repair, with no open joints or compromised seals between the windows/doors and adjacent walls.

14.1 Every habitable room shall have adequate natural lighting.

14.2 Every hall, stairs and landing within the house, and every room used, or intended for use, by the occupant of the house shall have a suitable and adequate means of artificial lighting that is controllable and accessible which can allow lighting to be turned on and off and bulbs/fixtures to be changed and maintained safely. Two-way or PIR-activated lighting shall be provided to any internal staircase.

14.3 Light switches that control ceiling- or wall-type electric light fixtures shall be located conveniently in each room for safe use.

14.4 All electrical installations, including fixtures and fittings, must be maintained in good repair.

16.2 All habitable rooms must have at least one window, door or skylight which opens to the outside and can be fixed in an open position. In addition, ventilation may also be provided by the presence of trickle vents, air bricks or passive stack ventilation.

16.3 In each habitable room, the size of the openable windows, doors and skylights together must be at least 5% of the floor area of that room.

Other matters affecting the likelihood and severity of harm outcomes include:

- Obstruction – of windows by buildings or other features.
- Size, shape and position – inadequate size, inappropriate shape and/or position of windows preventing reasonable penetration of daylight into the room.

- Position of artificial lighting – inadequate means and/or inappropriate siting of artificial lighting.
- Glare etc. – artificial lighting causing glare, shadows, inappropriate light temperature for the environment, poor colour rendering index and/or flickering.
- Window view – inappropriate shape and/or size of window preventing views of outside.
- Outlook – lack of reasonable view through living room windows.

Preventative measures

The layout of the dwelling, size, shape, position and orientation of any windows should allow sufficient access for sunlight. There should be sufficient natural light during daylight hours for normal domestic tasks to be carried out without eyestrain (e.g. reading a book). Windows which are larger and closer to the ceiling will give more natural light penetration. External obstruction of windows should not prevent adequate natural light penetration (e.g. in basement and sub-ground level rooms, or those whose windows are obstructed by significant levels of vegetation).

Occupiers should also have the ability to control the level of light in their dwelling. They should have a good access to daylight in habitable rooms and at be able to reduce the light levels within habitable rooms in the evening and at night. Artificial lighting should be under the control of occupiers at all times and should be of sufficient quality to allow domestic activities to be undertaken without eyestrain and without creating glare or shadows. Room lighting should be suitable for the activities undertaken in that location. For instance, a fluorescent light may be adequate in a kitchen, but it would not be suitable as the only source of light in a living room or bedroom.

Windows should be large enough and at a level where occupiers are provided with a reasonable view of the surroundings, when in a seated position in the living areas of the dwelling. Window heads should be above the eye level of a standing adult of average height. Glazing should provide a view which is clear, undistorted and neutrally coloured. Views should be over at least six metres of space outside of the windows of one room, with a view of the landscape outside the building. Ideally, they should allow supervision of outside recreational areas and for security purposes, of the means of access to the dwelling. Rooms such as bathrooms and WCs should provide adequate levels of privacy for occupiers.

Where dwellings have no views of their surroundings and inadequate light penetration, retrospectively providing these may require substantial changes to the building envelope such as moving windows or may require relandscaping surrounding yards or gardens. This may not always be feasible (e.g. if the building is listed or borders a public highway).

Other considerations for assessment of this hazard

Assessments should cover the whole dwelling and may require the use of a light meter.

Further reading

British Standard BS EN 17037 – Daylight in buildings. Available at: www.bsigroup.com

Appendix 1 – Baseline indicators

1	Structural Condition	
	Baseline Indicators	**Guidance Notes**
1.1	Externally, every foundation, roof, ridge line, flashing, fascia, soffit and bargeboard, exterior staircase, exterior wall/fence shall be safe to use and capable of supporting the intended design loads and load effects and shall be in a proper state of structural repair. Internally, every wall, floor, ceiling, inside stair, porch, accessory structure, door, window and window glass shall be safe to use and capable of supporting the intended design loads and load effects, and shall be in a proper state of structural repair.	The structural elements of a house should exhibit no signs of recent or fresh movement; evidence to the contrary may indicate to the assessor that the house may be at risk from either partial or total collapse. The main structural elements of a house are: • Roof structures and other roof features • Chimneys • Load-bearing walls including external walls • Lintels, sills and mullions, and wall ties • Floors and stairs • Load-bearing beams and columns • Foundations **Relevant hazards:** Falling on Stairs etc.; Falling Between Levels; Collisions, Entrapment and Ergonomics; Structural Collapse and Falling Elements; Radiation; Asbestos; Noise.
1.2	All asbestos-containing material shall be maintained non-friable and free from any defects such as holes, cracks, tears and/or looseness that may allow the release of fibres into the environment. Any friable or damaged asbestos identified shall be removed. An asbestos register for each dwelling shall be created and kept up to date.	Any materials that contain asbestos, such as old thermoplastic tiles, insulation, cement board and/or insulation should be assessed for condition and any signs of disturbance or damage. Typical locations would be cement garages/sheds, cement roofing sheets, ceiling Artex plaster and service conduits. **Relevant hazard:** Asbestos (and MMFs).

2	Drainage	
	Baseline Indicators	**Guidance Notes**
2.1	Every drainage fixture, stack, vent, water, waste and sewer pipe shall be properly installed, maintained in a safe and functional order and kept free from obstructions, leaks and defects. The drainage system must have suitable rodding or access points to allow clearance of blockages.	All drainage and sewer connections should be visually inspected where access allows to ensure that there are no obvious signs of deterioration of any seals and that any fixings that reduce the risk of contamination to the property are in good condition. If possible, the WC should be activated, or water discharged through a wash-hand basin to observe the free flow of water through the system. **Relevant hazards:** Structural Collapse and Falling Elements; Damp and Mould Growth; Domestic Hygiene.

2.2	Every waste pipe shall be connected to a public sewer system, an approved private sewage disposal system or the dwelling's greywater system. No WC waste pipe shall be connected to a greywater system.	The outlets should, where possible, be identified and checked for a proper sealed connection. No WC waste pipe shall be connected to a greywater system. **Relevant hazard:** Domestic Hygiene.
2.3	There shall be adequate provision for surface- and foul-water drainage for the size and maximum occupancy of the dwelling. All drains and gullies shall be covered by a suitable grille or cover to prevent the build-up of debris restricting the natural operation of the system.	The inspection should include any signs that effluence is collecting in the drainage chamber, or that there are signs of overflowing around inspection chambers or drainage outlets. Drains and gullies should be covered by suitable grilles or grates to prevent debris collecting and should be of suitable size for the number of pipes draining into them. There should also be suitably located and adequate numbers of inspection chambers and access points such as rodding eyes. **Relevant hazards:** Falls on the Level, Damp and Mould Growth, Domestic Hygiene.
2.4	All rainwater pipes shall discharge properly into the drainage system or soakaway. Rodding or access points shall be available to allow the clearance of any blockage.	All rainwater and grey pipes must connect and drain effectively into a drain or gulley which should have a suitable grate and trap. There should be no rainwater pipes that discharge directly onto a path or solid surface unless it is channelled towards a soakaway or gulley. **Relevant hazards:** Falls on the Level; Damp and Mould Growth; Domestic Hygiene.
2.5	All access covers to drainage and other services shall be fitted with suitable flush-mounted covers adequately marked to indicate purpose.	There should be no raised lip or edge that could result in tripping or obstruction. All covers shall be securely fixed and tightened to reduce the risk of accidental displacement. Inspection chambers internal to the dwelling must be accessible and should be airtight sealed. **Relevant hazards:** Falls on the Level; Domestic Hygiene.

3	**Plumbing System**	
	Baseline Indicators	**Guidance Notes**
3.1	An approved potable water supply system shall provide an adequate amount of running water under pressure to all fixtures simultaneously. Supplies in individual bedsits/dwellings/flats must have their own controllable supply of water or the ability to store water.	Most dwellings in England are supplied by a registered water supplier licensed by Ofwat and overseen by the Drinking Water Inspectorate. There are, however, a number of dwellings served by private water supplies, where local authorities act as the regulators. To be adequate, the water supply should be readily available and of sufficient pressure and continuity. Water must be available from at least one tap inside the dwelling. The first tap off the supply pipe (usually the kitchen tap) must provide sufficient pressure to fill a 4.5 litre (1 gallon) bucket with water in 30 seconds. There should be no interruption to the supply unless caused by maintenance or repair works. The water supply must be potable or wholesome as defined by the appropriate regulations. Approved public water supplies are governed by the Water Supply (Water Quality) Regulations 2016. Private water supplies are governed by the Private Water Supplies Regulations 2016. Wholesomeness is defined by regulations with reference to chemicals and micro-organisms, which set out maximum levels and concentrations that water must comply with. Laboratory analysis is the only way to properly test whether water is wholesome. There should be a functioning stop tap allowing the water to be turned off in the event of a leak. Supplies in individual bedsits/dwellings/flats must have their own controllable supply of water or the ability to store water. **Relevant hazards:** Radiation; Lead; Domestic Hygiene; Water Supply.
3.2	An adequate supply of heated running water shall be provided to sinks, wash-hand basins, baths and showers. Hot water storage tanks shall be set at a minimum temperature of 60°C. At bath taps and shower heads, the maximum temperature shall be 45°C to prevent accidental scalding.	The hot water supply from a domestic hot water tank or combi boiler should be checked for thermostatic control and set to these temperatures. Electric showers, mixer taps, thermostatic taps, boilers and other water-heating equipment should be checked for controls and that they operate as designed. Calcification in hard-water areas can interfere with temperature controls. Water, if stored, must have an anti-legionella heating cycle above 60°C. **Relevant hazards:** Flames, Hot Surfaces, Etc.; Domestic Hygiene; Water Supply.

3.3	The WC cistern overflow should discharge externally unless designed by the manufacturer to discharge internally through the cistern or pan.	The WC cistern overflow should be located and identified as meeting the requirements of the standard. If it seen to discharge internally, the system must be identified and checked as meeting the manufacturer requirements. The cistern should not be continually filling and should be controlled by a working and maintained ballcock-and-valve system. There should be an access point for emergency maintenance for hidden cisterns. **Relevant hazards:** Damp and Mould Growth; Domestic Hygiene; Water Supply.

4	**Sanitary Facilities: Bathroom**	
	Baseline Indicators	**Guidance Notes**
4.1	Every dwelling/HMO shall have a private bathroom, equipped and provided for the sole use of that dwelling/HMO.	Every dwelling shall have a private bathroom, equipped and provided for the sole use of that property, with the following: • WC (unless provided separately) • Wash-hand basin • Bath or shower **Relevant hazards:** Domestic Hygiene; Water Supply; Crowding and Space.
4.2	A suitably located WC in good working condition, that is sealed to the waste pipe and affixed to the floor or close-coupled, shall be properly connected to both the dwelling's water supply and a waste pipe, leading to an approved sewage system or private waste disposal system.	The WC should be flushed to ensure it is in good working condition. The outlet should be checked to ensure it is sealed to the waste pipe and affixed to the floor properly by checking for movement. The WC shall be connected to both the dwelling's water supply and a waste pipe leading to an approved sewage system or private waste disposal system. **Relevant hazards:** Structural Collapse and Falling Elements; Domestic Hygiene.
4.3	A dedicated wash-hand basin that is located in the same room as the WC or immediately adjacent shall be in good working condition, with a stable connection to the wall or secure attachment to the floor that is properly connected to the heated and unheated potable water supply and a sealed trap leading to a waste pipe. The wash-hand basin must be adequately sealed with a flexible sealant to prevent leakage and damage to the adjacent areas.	A dedicated wash-hand basin located in the same room as the WC or immediately adjacent, that when operated is shown to be in good working condition, connections either to the wall or secure attachment to the floor are inspected for movement, and that it is properly connected to the heated and unheated potable water supply and the sealed trap leading to a waste pipe is checked for leaks when the tap is running without the plug inserted. **Relevant hazards:** Structural Collapse and Falling Elements; Damp and Mould Growth; Domestic Hygiene.

4.4	A fixed bath or shower in good working condition which does not leak and is properly connected to the heated/unheated potable water supply as appropriate, and a waste pipe that does not leak. The bath or shower must be adequately sealed with a flexible sealant to prevent leakage.	The fixed bath or shower should be inspected for being in good working order by running both the heated and unheated water taps to ensure that they supply adequate flow of water and that when removed the water discharges into the drainage system without undue delay and does not leak. **Relevant hazards:** Damp and Mould Growth; Domestic Hygiene.
4.5	Where a shower is fitted separate to the bath, a purposely designed shower tray must be fitted so that the step into the tray is no greater than 150mm. All waste outlets and connections shall be sealed and free from defects.	Any purposely designed shower tray must be fitted so that the step into the tray is no greater than 150mm, which is measured from the finish floor level to the lip of the shower tray. **Relevant hazards:** Falls on the Level; Domestic Hygiene.
4.6	A constant supply of heated and unheated water to all wash-hand basins, baths and shower facilities must be supplied and a direct drainage connection with waste trap be in good working order and free from defects and sealed where necessary. Water supply pipes must have isolation valves to allow for maintenance.	The source of heated and unheated water should be located, and taps operated to ensure that adequate supply is delivered, and that any wastes or traps function as designed when the water is discharged. Feeds should have isolator valves to allow for maintenance. **Relevant hazard:** Domestic Hygiene.
4.7	There must be a cleanable, non-absorbent water-resistant material on floor surfaces and extending on bathroom walls at least 300mm above a bath and 1800mm above the floor of a shower or shower tray. Such materials on walls and floors shall form a watertight joint with each other and with the bathtub or shower tray. Any shower shall have a shower screen, curtain or return wall that prevents water spillage to the floor.	The floor covering or surface shall be vinyl or similar impervious covering that is easy to clean and is suitably sealed at the connections with any other item such as the bath, shower tray, WC or wash-hand basin. The walls shall be protected by either ceramic tiles or other suitable material that is cleansable, impermeable, and sealed at all connections with the bath, shower, tray or ceiling (if full height). **Relevant hazards:** Falls on the Level; Structural Collapse and Falling Elements; Damp and Mould Growth; Domestic Hygiene.
4.8	Ventilation for the bathroom must be provided by mechanical extraction that is ducted to the outside of the building, in line with Baseline Indicator 16.1.	The ventilation provision in the bathroom shall be by mechanical extraction ducted to the outside. **Relevant hazards:** Excess Cold; Damp and Mould Growth; Indoor Air Pollutants; Excess Heat; Domestic Hygiene.

5	**Sanitary Facilities: Kitchen**	
	Baseline Indicators	**Guidance Notes**
5.1	Every dwelling/HMO shall have a kitchen or dedicated adequate space for the storage, preparation and cooking of food, equipped and provided for the sole use of that dwelling/HMO.	Every dwelling shall have a kitchen or dedicated adequate space for the storage, preparation and cooking of food, equipped and provided for the sole use of that property, with the following: • Kitchen sink • Sufficient work surfaces and food storage facilities • Cooking facilities **Relevant hazards:** Collisions, Entrapment and Ergonomics; Domestic Hygiene; Water Supply; Crowding and Space.
5.2	A kitchen sink in good working condition that is properly connected to heated and unheated water supplies and waste pipes, and has an area for draining wet cutlery and utensils which is connected to a waste outlet and sealed with flexible waterproof sealant. Any provided dishwasher and components of the sink, including disposal and water filtration devices, shall be in good working condition and properly connected. All feeds must have isolator valves to allow for maintenance.	The kitchen sink taps should be operated to ensure an adequate water supply, both heated and unheated, and that the waste pipes when water is being discharged allow the water to discharge in a timely manner, and it is directed into an appropriate drainage connection. Any provided dishwasher and components of the sink, including disposal and water filtration devices, shall be in good working condition and properly connected. This should be checked by operating the system. Feeds should have isolator valves to allow for maintenance, and the kitchen sink should be sealed with clean water-resistant sealant. **Relevant hazards:** Damp and Mould Growth; Domestic Hygiene.

5.3	Sufficient work surface shall be provided for food preparation. Sufficient cabinets and/or shelves sufficient to store occupant or visitors' food that does not require refrigeration, and eating, drinking and food-preparation equipment. Cabinets shall have well-fitting doors and no gaps between any surfaces. The work surface, work-surface edges, cabinets and shelves shall be of sound construction and furnished with surfaces that are impervious to water, smooth and cleanable.	All kitchens shall be of such a layout and size to adequately enable the safe storage, preparation and cooking of food. In kitchens for exclusive use of up to two occupiers, a worktop of 1000mm length and 600mm depth must be provided as a minimum, and 1500mm and depth of 600mm per five persons sharing, or part thereof. Worktops should be securely fixed and, where practicable, be adjacent to the cooker. Each individual shall be provided with a dry-goods storage cupboard of at least 0.24m^3 capacity. Cupboards under sinks are not suitable and cannot be used for dry-goods storage. All cabinets shall be opened and closed to ensure that they have well-fitting doors. There should be no gaps between any surfaces where food or dirt could collect. The work surface, work-surface edges, cabinets and shelves shall be visually inspected to ensure there are no signs of damage that could allow dirt or debris to collect, and that they are smooth and impervious to ensure they are cleanable. **Relevant hazards:** Flames, Hot Surfaces, Etc; Structural Collapse and Falling Elements; Domestic Hygiene, Crowding and Space.
5.4	For cooking food, a 4-ring hob (or 2-ring in bedsit-type accommodation) with oven and grill properly installed with all necessary connections for safe and efficient operation, which shall be maintained in good working condition.	The hob, oven and grill shall be properly installed with all necessary connections for safe and efficient operation and shall be maintained in good working condition. These should be provided with an electrical of gas safety certificate. Electric hobs should be installed on their own ring main and gas cookers should be suitably affixed to the wall with a chain or bracket. They should also be suitably located, for example, with work surface either side and not near doors or openable windows. Refer to local HMO amenity standards. There may be occasions where a 2-ring hob is considered appropriate for the space, and this may be acceptable provided it is fitted as detailed above and not portable. **Relevant hazards:** Flames, Hot Surfaces, Etc; Collisions, Entrapment and Ergonomics; Electricity; Indoor Air Pollutants; Domestic Hygiene.
5.5	Where an oven or hob is not provided, there must be a dedicated space with a suitable connection to either gas or electricity that meets the requirement of the relevant regulations.	A minimum width of 650mm should be available to house the hob and oven, with either dedicated electrical connection via a fused spur or a dedicated gas connection. They should also be suitably located, for example, not near doors or openable windows. **Relevant hazards:** Flames, Hot Surfaces, Etc; Electricity; Indoor Air Pollutants; Domestic Hygiene.

5.6	Suitable facilities for the effective and safe removal of fumes and moisture-laden air to the external air by means of a cooker hood or extractor fan; a cooker hood that only recycles the odour through an active carbon filter would not be acceptable, it must vent to outside. A mechanical extractor would be the normal mechanism for this function, in line with Baseline Indicator 16.1.	There shall be a cooker hood or extractor fan, that is vented to the outside to remove any odour or moisture from the kitchen. It should be inspected by operating the system on and off. An extractor fan suitably rated would be the normal mechanism for this function. If the method of extraction is via a cooker hood, then the hood should be located over the cooking area with the ability to illuminate it. There must be filters provided that are cleanable or replaceable, and thus reduce the build-up of grease. **Relevant hazards:** Excess Cold; Damp and Mould Growth; Indoor Air Pollutants; Excess Heat; Domestic Hygiene.
5.7	Fridge and freezer or fridge-freezer, if provided, shall be in good working condition, of sufficient size to store occupants' food that requires refrigeration, and capable of maintaining a temperature less than 6°C but more than 0°C. The freezer section shall be capable of maintaining a temperature below -18°C.	Fridge and freezer or fridge-freezer, if provided, should be in good working condition, of sufficient size to store occupants' food that requires refrigeration, and capable of maintaining a temperature less than 6°C but more than 0°C. The freezer section shall be capable of maintaining a temperature below -18°C. A visual inspection of the fridge or freezer should be made and the rating (shown in * of the freezer section) should be recorded. **Relevant hazard:** Domestic Hygiene.
5.8	If a refrigerator is not provided, adequate space and connections for the occupants' installation and operation of a refrigerator shall be provided.	If a refrigerator is not provided, adequate space and connections for the occupants' installation and operation of a refrigerator shall be provided. Based on the dimensions of a standard floor-mounted free-standing fridge (845 × 560 × 635mm (H × W × D)) should be allowed, with an additional 50mm clearance all round. **Relevant hazard:** Domestic Hygiene.
5.9	A kitchen floor in good condition, with a sealed, water-resistant, non-absorbent and cleanable surface.	The kitchen floor should be visually inspected, ensuring that its perimeter and connection to kitchen cupboards or fixtures is sealed, it is constructed of water-resistant, non-absorbent and cleanable surface. This would normally be tiles or vinyl flooring. **Relevant hazards:** Falls on the Level; Damp and Mould Growth; Domestic Hygiene.

6	Clothes Drying Facilities	
	Baseline Indicator	**Guidance Note**
6.1	Where the dwelling does not contain a secure and private garden or yard for the exclusive use of that dwelling, a dryer (vented or recirculation type), or dedicated space to install a dryer, or access to a communal dryer facility must be provided.	Where the dwelling does not contain a secure and private garden or yard for the exclusive use of that house, a dryer (vented or recirculation type), or dedicated space to install a dryer, or access to a communal dryer facility. **Relevant hazards:** Excess Cold; Damp and Mould Growth.

7	Space	
	Baseline Indicators	**Guidance Notes**
7.1	A bedroom shall not be the only passageway to the only bathroom in a dwelling unit with more than one bedroom.	This element is failed if a person must enter another person's bedroom to access the only bathroom. **Relevant hazards:** Crowding and Space; Intruders.
7.2	A bathroom or WC room shall not be the only passageway to any habitable room, hall, basement or the exterior of the dwelling.	Any habitable room, hall, basement or the exterior of the dwelling should not be accessed purely by means of access via a bathroom or WC room. **Relevant hazard:** Crowding and Space.

7.3	The floor area of any room in the dwelling used as sleeping accommodation by one person aged 10 years or over must not be less than 6.51 m^2. The floor area of any room in the dwelling used as sleeping accommodation by two persons must not be less than 10.22 m^2. The floor area of any room in the dwelling used as sleeping accommodation by one person aged under 10 years must not be less than 4.64 m^2. Any room in the dwelling with a floor area of less than 4.64 m^2 must not be used as sleeping accommodation. Depending on the gender of household members, their relationship and the size of rooms, a dwelling containing one bedroom is considered suitable for up to two persons, irrespective of age. A dwelling containing two bedrooms is suitable for up to four persons. One containing three bedrooms is suitable for up to six persons and one containing four bedrooms suitable for up to seven persons.	The floor area shall be measured from facing edge of skirting boards and excludes chimney recesses, door arcs, etc., and excludes ceiling heights of less than 1500mm. The room sizes indicated by the standard are the minimum acceptable sizes to be considered suitable for sleeping purposes, large, shared spaces shouldn't usually be considered suitable mitigation for undersized rooms. Where there is more than one occupant in the dwelling, sharing rooms may not be an appropriate expectation, dependant on the age, gender and relationship of the occupants. Where rooms meet these sizes, it will not always follow that there isn't an issue with crowding and/or space, as this assessment is about more than room sizes. Alongside sufficiently sized bedrooms, there must also be sufficient space in the dwelling to allow for recreation, study and personal privacy. It will therefore not usually be appropriate to use all habitable rooms as bedrooms. Indoor and outdoor play and recreation space is necessary in accommodation housing children. Outdoor play space should be readily visible from within the dwelling and safely separated from public and neighbouring areas. Within a dwelling there should be sufficient space for the separation of different household activities, either by physical separation or by a clearly defined space within a larger space. The degree of separation is partly dependent on the number of people who can be expected to share the space and whether they are expected to be part of the same household. Open-plan arrangements may be acceptable for dwellings for a single person or for a couple but not for dwellings intended for larger households. For larger households, physical separation of living, cooking, dining and even sleeping areas is more necessary. For such households, bedrooms should lead off a circulation space and should be large enough to be usable for sleeping and for studying or relaxing away from the other members of the household. **Relevant hazards:** Collisions, Entrapment and Ergonomics; Crowding and Space.

7.4	The ceiling height of any habitable room shall be at least 2100mm. In a habitable room with a sloping ceiling, at least one-half of the floor area shall have a ceiling height of at least 2100mm. If any part of a habitable room has a ceiling height lower than 1500mm, its floor area shall be excluded when calculating the floor area. For the purposes of this requirement, basement or subfloor rooms are excluded.	The ceiling height of any habitable room shall be measured to be at least 2100mm. In a habitable room with a sloping ceiling, at least one-half of the floor area shall have a ceiling height of at least 2100mm. If any part of a room has a ceiling height lower than 1500mm, its floor area shall not be considered in calculating the floor area of the room. For the purposes of this requirement basement or subfloor rooms are excluded. **Relevant hazards:** Collisions, Entrapment and Ergonomics; Crowding and Space.

8	**Internal Doors**	
	Baseline Indicator	**Guidance Note**
8.1	Internal doors leading between areas of a single dwelling must provide a sufficient barrier to the spread of smoke and fire (where appropriate). Any glazing in doors must respond safely to collision and must be designed for functionality to avoid strains or entrapment when in use, and must be maintained in good repair. All bathrooms and WC room doors must be fitted with a suitable lock and must not contain clear glass.	Any glazing must respond safely to collision, in line with the principles set out in Approved Document K, doors must be designed for functionality to avoid strains or entrapment when in use, and must be maintained in good repair. To provide a sufficient barrier, non fire doors should still be well fitting and of solid construction. **Relevant hazards:** Falls on the Level; Fire and Explosions; Collisions, Entrapment and Ergonomics; Excess Cold; Indoor Air Pollutants; Excess Heat; Domestic Hygiene; Crowding and Space; Noise; Lighting.

9	**External Space**	
	Baseline Indicator	**Guidance Note**
9.1	External yards, paths, steps, accessways and surrounds within the curtilage of the dwelling shall be in good repair, even and well drained. Accessways must be suitable non-slip surfaces, have adequate lighting and should not have slopes of sufficient gradient to present a falls risk. This includes consideration to unevenness, trip risks and poor slip resistance, to any steps or surfaces within external space that is provided, to the front door, yard and garden. Where there are drops of more than 300mm from paths, patios, steps, terraces or garden areas guarding will be necessary where there are high risks of falling. All boundaries should be clearly defined and enclosed by well-maintained and suitable walls or fences. This also applies to structure, accessways, security doors and lifts.	The external areas shall be inspected to ensure that there are no tripping or falling hazards from paths, ramps or thresholds such as raised edges or undue unevenness. Any drops from paths, patios, steps, staircases, terraces, or garden areas that present a falls risk must have guarding in place. All boundaries and structure, accessways, security doors and lifts should be clearly defined and enclosed by well-maintained and suitable walls or fences. They should be checked for stability and condition. **Relevant hazards:** Falls on the Level; Falling on Stairs etc.; Falling Between Levels; Fire and Explosions; Intruders.

10	**Noise**	
	Baseline Indicators	**Guidance Notes**
10.1	All new flats/flat conversions must comply fully with current building regulations in respect of sound insulation. Older flats/flat conversions should comply with all relevant building regulations relating to noise.	All new flats/flat conversions should comply fully with current Building Regulation Approved Document E (available at www.gov.uk) in respect of sound insulation; this should be checked against any building regulations approval completion notice. Older flats/flat conversions should comply as fully as possible with current building regulations. **Relevant hazard:** Noise.

10.2	The noise level inside the dwelling caused by steady external noise sources must not exceed: • 07:00 to 23:00 – 40 dBLAeq,T16 in the living room and bedroom area, and 45 dBLAeq,T16 in the dining room/area • 23:00 to 07:00 – 35 dBLAeq,T8 in the bedroom	The decibel scale and various noise indicators are used to quantify noise exposure levels. However, they are not intuitive and for people not familiar with their use can result in difficulties understanding them. A sound's unpleasantness depends upon its loudness, frequency content, duration, intermittence, predictability and source. Individuals find different sounds annoying, so no single measure can predict the reactions of everybody. The limits here refer to decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound. The background noise level in a typical living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A). We specify the limit sound pressure level as LAeq, T: the equivalent continuous sound level – the sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period (T – either 16 hours or 8 hours). LAeq, T is used to describe many types of noise and can be measured directly with an integrating sound-level meter. It has been decided to include sound pressure levels as Baseline Indicators as most people now have smart phones where sound-level apps can be downloaded for no cost. While these meters are of course not calibrated or tested meaning any results they offer should be treated with a degree of caution, they do offer helpful indicators as to whether the noise limits are likely to be exceeded. If they do show noise levels which are likely to exceed the Baseline Indicators, then further investigation should be carried out by someone competent using appropriate equipment. The equipment to be used for measuring noise levels should: a) Conform to the accuracy requirements specified in BS EN ISO 140, BS EN ISO 10140 or BS 4142, as applicable; or b) If not stated, meet Class 2 or better (see BS EN 61672-1, BS EN 61672-2 and BS EN 60942). When measuring the internal ambient noise levels, if applicable, any room should have adequate ventilation (e.g. trickle vents should be open) during assessment. Should the minimum noise levels be exceeded, all reasonable noise control measures should be designed and implemented to ensure that the noise levels are met, along with local or national noise management policies, as appropriate.

		Relevant hazards: Excess Heat; Noise.

11	**Security**	
	Baseline Indicators	**Guidance Notes**
11.1	Adequate external lighting shall be provided to all means of access including entrances and external refuse stores, providing good visibility when there is no daylight.	External lighting should be designed to provide illuminance levels that enable householders to perform outdoor visual tasks efficiently and accurately, especially during the night. The lighting must be controlled to avoid operation during daylight hours, where there is sufficient daylight in or around the dwelling. Lighting must be controllable by the householder. External lighting should not cause a nuisance to other properties, be suitable for external use and located at a height for easy maintenance. Adequate lighting may be provided by public or street lighting. **Relevant hazards:** Falls on the Level; Falling on Stairs etc.; Fire and Explosions; Domestic Hygiene; Intruders; Lighting.
11.2	Access doors to dwellings should have adequate locks. Doors must be solid external grade and fitted with a minimum of a mortice deadlock to BS 3621, openable from the inside without a key. There must be a means for occupiers to view visitors without opening the door, by means of, for example, a functional smart doorbell, a viewer within the door or by a glazed pane adjacent or close to the entrance door. All rear doors should be fitted with a mortice dead lock to BS 3621 or 2 security bolts.	Doors must be solid external grade and fitted with a minimum of a mortice deadlock to BS 3621 openable from the inside without a key. There must be a means for occupiers to view visitors without opening the door, either by means of a viewer within the door or by a glazed pane adjacent or close to the entrance door. All rear doors should be fitted with a mortice dead lock to BS 3621 or 2 security bolts. **Relevant hazards:** Falls on the Level; Fire and Explosions; Excess Cold; Domestic Hygiene; Intruders.
11.3	Windows in accessible locations must be provided with suitable window locks.	Windows in accessible locations should be provided with suitable window locks, operated with a key and be free from defect. The windows should be opened, closed, and locked to ensure that the requirement is met. **Relevant hazard:** Intruders.

11.4	Dwellings with a common entrance door shall have a door entry system allowing a visitor to contact the dwelling. It shall allow a visitor to ring any selected dwelling within the particular system and/or building and hold a two-way simultaneous conversation between the visitor and occupant of the dwelling. It will allow the occupant to see and identify the visitor and their location.	The common entrance system should be inspected and operated to ensure that it allows a visitor to ring any selected dwelling within the particular system and/or building and hold a two-way simultaneous conversation between the visitor and occupant of the dwelling. The internal display should be checked to ensure that it will allow the occupant to see and identify the visitor and their location. If the dwelling occupant can clearly see the visitor from their flat, for example through window or internal door viewer, video communication is not necessary. **Relevant hazard:** Intruders.
11.5	All door and window frames and furniture shall operate properly and be in a good state of repair, with no open joints or compromised seals between the windows/doors and adjacent walls.	All door and window frames and furniture should be operated to ensure that they open and close freely, and should be checked to ensure they are in a good state of repair, with no loose hinges, ironmongery or glass units. Windows should close fully flush to the frame. All panes of glass must be in good repair, with no cracks or holes. **Relevant hazards:** Falling Between Levels; Collisions, Entrapment and Ergonomics; Excess Cold; Excess Heat; Intruders; Noise; Lighting.

12	**Walking Surfaces**	
	Baseline Indicators	**Guidance Notes**
12.1	Every interior and exterior stairway, ramp, deck, porch, balcony walkway, terrace, landing and hall shall be maintained structurally sound, in good repair, properly anchored and capable of supporting the imposed loads.	All elements listed in this requirement should be visually inspected and any fixings and anchoring points checked for no movement. There should be no signs of movement or instability when used normally. **Relevant hazards:** Falls on the Level; Falling on Stairs etc.; Falling Between Levels; Fire and Explosions; Structural Collapse and Falling Elements.
12.2	Internal and external stairs must be safe, secure, in sound condition, free from defects and projections and well maintained. External stairs must be designed to allow water to drain away from the steps.	The stairs should be inspected, including any handrail, treads, risers and balustrading for defects and looseness, and designed to allow water to drain away from the steps. They should be checked for any signs of movement, loose fixings, rot or deterioration from infestation. **Relevant hazards:** Falling on Stairs etc.; Fire and Explosions; Collisions, Entrapment and Ergonomics; Structural Collapse and Falling Elements.

12.3	Stair coverings must be securely and safely fastened. Treads on exterior stairways shall have non-slip surfaces, be firmly fixed and cover at least 75% of each tread.	Stair coverings must be securely and safely fastened, using a proprietary fixing such as carpet gripper of carpet rods. Treads on exterior stairways shall have non-slip surfaces and be firmly fixed in place, covering at least 75% of the useable surface of each tread. **Relevant hazard:** Falling on Stairs etc..
12.4	Every interior and exterior stairway with four or more risers shall have at least one structurally sound continuous handrail installed, between 900mm and 1000mm high, measured from the pitch line to the top of the handrail. The handrail shall be firmly fastened, capable of supporting a load of 140kg and in good condition.	Every interior and exterior stairway with four or more risers shall have at least one structurally sound continuous handrail installed, between 900mm 1000mm high, measured from the pitch line to the top of the handrail. The handrail shall be firmly fastened, capable of supporting a load of 140kg and in good condition. **Relevant hazard:** Falling on Stairs etc..
12.5	Minimum headroom on a staircase shall be 1900mm.	Minimum headroom on a staircase should be 1900mm, measured from the line of the staircase. **Relevant hazards:** Falling on Stairs etc.; Collisions, Entrapment and Ergonomics.
12.6	There shall be landings at the top and bottom of all internal and external flights of stairs, with a minimum width of 750mm and length of 500mm.	There should be landings at the top and bottom of all flights of stairs, with a minimum width of 750mm and length of 500mm. The measurements of these landings should be checked. **Relevant hazard:** Falling on Stairs etc..

13	**Guards**	
	Baseline Indicators	**Guidance Notes**

13.1	Every stairway, porch, patio, landing, balcony walkway, terrace and hall located more than 600mm above an adjacent area shall have a structurally sound guard, between 900mm and 1100mm high, measured vertically from the floor. The guard shall be firmly fastened, capable of supporting normally imposed loads and in good condition. Balusters with a minimum thickness of 10mm shall be placed at intervals that do not allow passage of a sphere greater than 100mm in diameter. There shall be no climbable cross-pieces.	Every stairway, porch, patio, landing and/or balcony located more than 600mm above an adjacent area shall have a structurally sound guard, between 900mm and 1100mm high, measured vertically from the floor. The guard shall be firmly fastened, capable of supporting normally imposed loads, and in good condition. Balusters with a minimum thickness of 10mm shall be placed at intervals that do not allow passage of a sphere greater than 100mm in diameter. There shall be no climbable cross-pieces. **Relevant hazards:** Falling on Stairs etc.; Falling Between Levels; Collisions, Entrapment and Ergonomics; Structural Collapse and Falling Elements.
13.2	All windows with an opening section greater than 100mm, through which a person may fall a single storey or more , shall have a fall-prevention device that restricts opening to less than 100mm. It must be possible to overcome this restriction easily when the windows in question are required to be escape windows, under the building regulations.	All windows with an opening section through which a person may fall a single storey or more, particularly where floor-to-sill height is less than 800mm shall have a fall-prevention device that restricts opening to 100mm maximum. These measurements must be checked for compliance. The operation of how to overcome this restriction shall be checked to ensure that it is easy and quick to be released when the windows in question are required to be escape windows, under the building regulations. **Relevant hazards:** Falling Between Levels; Fire and Explosions; Collisions, Entrapment and Ergonomics.

13.3	Any open fires or flames as a source of heat must be adequately guarded to ensure any accidental falls or trips do not result in contact with the open flames. Where there is risk of prolonged contact with hot surfaces of more than 43°C, adequate guarding must be provided to prevent contact.	A suitable fireguard shall be in place that is sturdy and sufficiently strong to remain in place in the event of a trip or fall by any resident or visitor to the property. It should be capable of being removed safely and easily, to facilitate the maintenance of the open fireplace. Log burners and solid-fuel appliances with hot surfaces should also be considered here. Contact with surfaces above 43°C can lead to serious injury. Many radiators and associated pipework are likely to operate at temperatures which may present a burn risk. However, the focus here is on situations where there is risk of prolonged contact which often occurs because people have fallen and are unable to move, or are trapped by furniture. Where assessment identifies that people may come into prolonged contact with surfaces greater than 43 °C, such equipment should be designed or covered to prevent contact. Surface-mounted pipework which is exposed at low level, that is, within 2 m of the floor, presents an additional risk if it is carrying water above 43°C and should be securely insulated or 'boxed in'. This includes vertical and horizontal pipe runs. Where guards are used to prevent contact with hot surfaces, such as radiators, the size of the mesh should be carefully selected to prevent small hands penetrating and contacting the heat emitter. **Relevant hazards:** Falls on the Level; Flames, Hot Surfaces, Etc.

14	Lighting and Services	
	Baseline Indicators	**Guidance Notes**
14.1	Every habitable room shall have adequate natural lighting.	Every habitable room shall have adequate natural lighting that allows a newspaper to be read during daylight hours without strain or the need for artificial lighting. As a general guide, the total size of glazed openings in a habitable room should not be less than $\frac{1}{10}^{th}$ of the floor area, and some part of the window should be at least 1750mm above floor area. **Relevant hazards:** Falls on the Level; Collisions, Entrapment and Ergonomics; Lighting .
14.2	Every hall, stairs and landing within the house, and every room used, or intended for use, by the occupant of the house shall have a suitable and adequate means of artificial lighting that is controllable and accessible which can allow lighting to be turned on and off and bulbs/fixtures to be changed and maintained safely. Two-way or PIR-activated lighting shall be provided to any internal staircase.	Every hall, stairs and landing within the house, and every room used, or intended for use, by the occupant of the house shall have a suitable and adequate means of controllable and accessible artificial lighting which can allow lighting to be turned on and off and bulbs/fixtures to be changed and maintained safely. **Relevant hazards:** Falls on the Level; Falling on Stairs etc.; Falling Between Levels; Fire and Explosions; Collisions, Entrapment and Ergonomics; Domestic Hygiene; Lighting.
14.3	Light switches that control ceiling- or wall-type electric light fixtures shall be located conveniently in each room for safe use.	Light switches that control ceiling- or wall-type electric light fixtures shall be located conveniently in every room for safe use. Two-way lighting should be provided to any internal staircase. **Relevant hazards:** Falls on the Level; Fire and Explosions; Collisions, Entrapment and Ergonomics; Lighting.
14.4	All electrical installations, including fixtures and fittings, must be maintained in good repair.	Electrical installations, fixtures and fittings must be checked for looseness and signs of deterioration or discolouration, and show no signs of being overloaded. An up-to-date EICR shall be evidenced and shall be satisfactory. **Relevant hazards:** Electricity; Excess Cold; Intruders; Lighting.
14.5	Gas appliances and flues provided for occupants are safe for continued use.	An up-to-date gas safety certificate completed by a competent person shall be evidenced. **Relevant hazards:** Fire and Explosions; Flames, Hot Surfaces, Etc; Excess Cold; Indoor Air Pollutants.

14.6	Every habitable room shall have at least 2 separate and remote double electric sockets that are suitably located for use. Kitchens shall have at least 4 suitably located double sockets.	Every habitable room shall have at least 2 separate and remote double electric sockets, that are located on opposite and or adjacent walls and the kitchen a minimum of 4 double sockets in convenient locations, relating to the worktops and food preparation areas. **Relevant hazards:** Falls on the Level; Fire and Explosions; Flames, Hot Surfaces, Etc; Electricity; Domestic Hygiene.

15	**Heating and Insulation**	
	Baseline Indicators	**Guidance Notes**
15.1	Structural thermal insulation shall be provided to minimise heat loss. Where there is a loft space, insulation shall be provided as detailed: A minimum 250mm of loft insulation (assumed to be mineral wool or similar).	Where there is a loft space, insulation shall be provided as detailed: • Minimum of 250mm depth, with any loft hatch insulated and sealed to avoid draughts. • Insulation should provide a U-value 0.16 W/m^{2}K (Watts per metre square Kelvin). This is equivalent to around 250–270mm of mineral wool insulating material, but the thickness will be dependent upon the material used: the use of other suitable materials is permitted. **Relevant hazards:** Excess Cold; Damp and Mould Growth; Excess Heat.
15.2	Hot water cylinder, if present, must be insulated with a minimum 50mm jacket if not pre-insulated, and it must be fitted with a tank thermostat.	Hot water cylinder if present, must be insulated with a minimum 50mm jacket if not pre-insulated, and it must be fitted with a tank thermostat. **Relevant hazards:** Flames, Hot Surfaces, Etc.; Excess Heat.
15.3	If the walls are of cavity wall construction, they must be insulated unless professional examination confirms to do so is technically unfeasible, due to either their condition or location in terms of wind-driven rain, or the width of the cavity being less than 40mm.	If the walls are of cavity wall construction, they must be insulated unless professional examination confirms it is technically unfeasible. It may be possible to identify if the wall has been insulated by the presence of insulation insertion holes on the external leaf of the building. Insulation may include cavity wall injected insulation or internal wall thermal boarded with suitable interstitial insulation. Cavity walls should also have weep holes or airbricks to allow the structure to breathe and prevent interstitial damp. **Relevant hazards:** Excess Cold; Damp and Mould Growth; Excess Heat.

15.4	Every dwelling shall have a properly installed heating system in good and safe working condition that is capable of safely and adequately heating all habitable rooms, bathrooms and WC rooms. The system must be capable of heating the main living area to 21°C and the remaining habitable rooms to a temperature of 18°C when the external temperature is minus 1°C, and the system should not allow the temperature to exceed 25°C in any room during the heating season.	Every dwelling shall have a properly installed heating system in good and safe working condition that is capable of safely and adequately heating all habitable rooms, bathrooms, and WC rooms. The system must be capable of heating the main living room to 21°C, and the remaining habitable rooms to a temperature of 18°C when the external temperature is -1°C, and the system should not allow the temperature to exceed 25°C in any room during the heating season. **Relevant hazards:** Falls on the Level; Falling on Stairs etc.; Fire and Explosions; Flames, Hot Surfaces, Etc; Excess Cold; Damp and Mould Growth; Indoor Air Pollutants; Excess Heat.
15.5	Heating and hot water must be capable of being controlled effectively and timed to operate by the occupiers.	The presence of a system or heating timing control shall be confirmed, and the system is capable of having the heating and hot water operated independently. **Relevant hazards:** Flames, Hot Surfaces, Etc; Excess Cold; Damp and Mould Growth; Excess Heat; Domestic Hygiene; Noise.
15.6	Water heaters, wood stoves and other devices that employ combustion-burning fuel shall be vented to the outside of the structure in an approved manner that meets the manufacturer specification and in compliance with applicable standards and shall be supplied with sufficient air to support the continuous complete combustion of fuel and prevent back-draughting or the emission of harmful gases to any internal or enclosed spaces. The chimney must be maintained in accordance with the manufacturer requirements, including sweeping and inspection.	Any heating system of this type shall be proven to meet the regulations by the presence of a certificate provided by a suitably competent person as defined by the building regulations. **Relevant hazard:** Indoor Air Pollutants.
15.7	Where appropriate (when burning fossil fuels as heating, hot water provision, or for cooking) a hard-wired CO detector with battery back-up must be installed in the room containing the appliance.	The burning of fossil fuels can lead to escape of carbon monoxide, which can cause harm and death. In every room that has a fossil fuelled appliance or heater a hard-wired CO detector with battery back-up must be installed. **Relevant hazard:** Indoor Air Pollutants.

16	Ventilation	
	Baseline Indicators	**Guidance Notes**
16.1	The air exhausted from a bathroom, WC room, kitchen, clothes dryer or basement must be provided by mechanical ventilation or by a correctly designed and installed natural ventilation system, as required by Part F of the Building Regulations. In addition, it shall not be vented into any other parts of the building's habitable space or an attic; such air shall discharge directly to the outdoors but not near any intake on the building exterior.	All extract and ventilation systems should be either vented externally directly through the wall, or via a ducting system that meets the manufacturer requirements and specifications. **Relevant hazards:** Excess Cold; Damp and Mould Growth; Indoor Air Pollutants; Excess Heat; Domestic Hygiene.
16.2	All habitable rooms must have at least one window, door or skylight which opens to the outside and can be fixed in an open position. In addition, ventilation may also be provided by the presence of trickle vents, air bricks or passive stack ventilation.	All doors, windows or skylights shall be inspected and checked to ensure that there is a suitable and propriety means of fixing them in an open position. Rooms can also include trickle vents in windows, passive airbricks or passive stack ventilation. **Relevant hazards:** Radiation; Damp and Mould Growth; Indoor Air Pollutants; Excess Heat; Intruders; Lighting.
16.3	In each habitable room, the size of the openable windows, doors and skylights together must be at least 5% of the floor area of that room.	The size of the openable windows, doors and skylights should be measured and added together to calculate the total area. This must then be checked against the floor area of that room and be shown to be at least 5% of the floor area of that room. **Relevant hazards:** Radiation; Damp and Mould Growth; Indoor Air Pollutants; Excess Heat; Lighting.
16.4	All means of ventilation shall be maintained in good repair and working order.	The ventilation system shall be operated to ensure it is working, and inspected for any build-up of grease, dust or other debris, and have sufficient draw to provide sufficient air exchange. Check that air bricks and passive ventilation have not been removed, sealed or blocked. **Relevant hazards:** Collisions, Entrapment and Ergonomics; Excess Cold; Radiation; Damp and Mould Growth; Indoor Air Pollutants; Excess Heat; Domestic Hygiene; Noise.

17	Moisture and contaminant Control	
	Baseline Indicators	**Guidance Notes**
17.1	Every foundation, roof, roofing component, exterior wall, floor, door, skylight and window shall be watertight, weathertight, free of persistent dampness or moisture and in good condition.	All the elements of this section should be visually inspected for obvious defects and signs of damp. Specific attention should be made to ensure that there are no signs of moisture penetration through any of the elements. **Relevant hazards:** Structural Collapse and Falling Elements; Electricity; Excess Cold; Radiation; Damp and Mould Growth; Domestic Hygiene; Intruders.
17.2	The building's drainage system, such as footing or foundation drains, gutters, downspouts, rainwater collection containers or other elements shall direct water away from the structure.	The drainage system shall be checked for operation; this can be done by activation of the WC and/or wash-hand basins and kitchen sink in the property to evidence the water running away through the drainage system. **Relevant hazard:** Damp and Mould Growth.
17.3	No single room in any of the property shall have an observable level of damp or mould growth or deterioration of internal finishes that exceeds 5% of the wall and/or ceiling surface.	All rooms should be inspected and any signs of mould growth of or damp ingress shall be measured to ensure that it does not exceed 5% of any of the wall and/or ceiling surfaces. This is assessed on a room-by-room basis and not accumulatively. **Relevant hazards:** Electricity; Excess Cold; Damp and Mould Growth; Domestic Hygiene.
17.4	Dwellings must not have radon concentrations greater than 200Bq per cubic metre.	Dwellings must not have radon concentrations greater than 200Bq per cubic metre, being the action level the government recommends radon mitigation works should be carried out. High radon levels are limited to particular geographic areas, as demonstrated by the UK Health Security Agency's radon affected maps: https://www.ukradon.org/information/ukmaps. If the dwelling is located in an area of elevated radon potential, then the level of radon should be tested. If this is found to exceed 200Bq per cubic metre, then remedial works should be undertaken to reduce this to below 100Bq per cubic metre. **Relevant hazard:** Radiation.

17.5	Only biocidal products approved by the Biocidal Products Regulations may be used within the dwelling and done so in accordance with the approved manufacturer's instructions.	Biocidal products are used to protect people and animals, preserve goods, stop pests like insects or rodents and control viruses, bacteria and fungi through a chemical or biological action. Biocidal products are controlled by the GB Biocidal Products Regulation, which make sure that when biocidal products are used properly, they do not harm people, pets or the wider environment. Every product containing the biocidal active substance must be authorised for each specific formulation (e.g. liquid, spray, etc.), intended use (e.g. control of ticks or mosquitos) and user category (e.g. professional users or general public). Members of the general public should never use biocidal products that are only intended for professional users. This is because professional users are required to have had the appropriate information, instruction and training to be able to use such products. Additionally, professional users are required to hold specific certification for some professional-use products. **Relevant hazard:** Indoor Air Pollutants.

18	**Pest Management**	
	Baseline Indicator	**Guidance Note**
18.1	The property and all structures and areas within the curtilage of the property shall be free of pest infestation, with no features present that will attract and support pests. Inspection shall take place to ensure a pest-free environment.	The property and all structures and areas within the curtilage of the property shall be free of pest infestation with no features present that will attract and support pests. Inspection shall take place to ensure a pest-free environment, and adequate pest-proofing should be undertaken. **Relevant hazards:** Structural Collapse and Falling Elements; Electricity; Domestic Hygiene; Water Supply.

19	**Fire Safety**	
	Baseline Indicators	**Guidance Notes**
19.1	Any furniture or soft furnishings that are provided by the landlord should comply with the Furniture and Furnishings (Fire) (Safety) Regulations 1988, inclusive of being correctly labelled for fire resistance.	Legislation available at available at www.legislation.gov.uk **Relevant hazard:** Fire and Explosions.

19.2	All electrical equipment supplied by landlords in rented residential premises is safe and compliant with current UK requirements for safety of domestic electrical products; all electrical appliances supplied by the landlord are subject to testing in line with the IET Code of Practice for In-service Inspection and Testing of Electrical Equipment (Fifth Edition) unless they are under one year old and display a UKCA/CE marking.	Code of practice available at https://shop.theiet.org **Relevant hazards:** Fire and Explosions; Electricity.
19.3	An annual gas safety check should have been undertaken within the last 12 months with a satisfactory result. Any heating provided by LPG shall be inspected annually by a suitably qualified engineer.	**Relevant hazards:** Fire and Explosions; Indoor Air Pollutants.
19.4	The electrical installation should have been inspected and tested within the last 5 years.	**Relevant hazards:** Fire and Explosions; Electricity.
19.5	There should be sufficient, properly designed and appropriately sited smoke and heat detectors with alarms in every dwelling. These should be properly maintained and regularly tested (Additional guidance provided).	See fire detection systems guidance below **Relevant hazards:** Fire and Explosions; Indoor Air Pollutants.
19.6	The escape route from bedrooms through habitable rooms should either be avoided, or mitigated, by other provisions.	The continued use of escape windows will create inclusivity issues and should not be a preferred solution. **Relevant hazard:** Fire and Explosions.
19.7	Egress through doors/windows that are required for means of escape should not require the use of a key or a code.	**Relevant hazard:** Fire and Explosions.

Appendix 2 - Minimum grade and category of fire detection and fire alarm systems

System Grades

Grade A mains + standby battery

Grade A systems incorporate equipment for the reception, indication, control and relaying of signals originating from fire detectors and any manual call points connected to the equipment, and for the

activation of fire alarm devices. The CIE is of an identical nature to that used in systems designed in accordance with BS 5839-1 for protection of non-domestic premises, such as offices, shops and other commercial premises. The system will also incorporate a battery that will operate a Grade A system for 72 hours in the event of mains failure. This normally necessitates relatively large batteries, which might need to be housed in a separate supply unit.

Grade D mains + standby battery

- D1: Tamper-proof battery
- D2: User-replaceable battery

Grade F battery only

- F1: Tamper-proof primary battery
- F2: User replaceable battery

System Categories

Category LD1 System

A system installed throughout the premises, incorporating detectors in all circulation areas that form part of the escape routes from the premises, and in all rooms and areas, other than those with negligible sources of ignition, such as toilets, bathrooms and shower rooms.

Category LD2 System

A system incorporating detectors in all circulation areas that form part of the escape routes from the premises, and in all specified rooms or areas that present a high fire risk to occupants, including any kitchen and the principal habitable room.

Category LD3 System

A system incorporating detectors in all circulation areas that form part of the escape routes from the dwelling.

Rented single-family dwellings and shared houses with no floor greater than 200m^2 in area

New or materially altered premises

- Bungalow
- Flat
- Two-storey house
- Maisonette, other than as below
- Three-storey house

Grade D1 **Category LD2**

Maisonette with any floor above 4.5m from ground level and no alternative means of escape

Grade D1 **Category LD1**

Four or more storey house

Grade A **Category LD1**

Existing premises

- Bungalow
- Flat
- Two-storey house
- Maisonette (other than as below)
- Three-storey house

Grade D1 **Category LD2**

Maisonette with any floor above 4.5m from ground level and no alternative means of escape

Grade D1 **Category LD1**

Four or more storey house

Grade D1 **Category LD1**

Rented single-family dwellings and shared houses with one or more floors greater than 200m^2 in area

New or materially altered premises

- Bungalow
- Flat

Grade D1 **Category LD2**

- Two-storey house
- Maisonette (other than as below)
- Three-storey house

Grade A **Category LD2**

- Four-or-more storey house
- Maisonette with any floor above 4.5m from ground level and no alternative means of escape

Grade A **Category LD1**

Existing premises

- Bungalow
- Flat
- Two-storey house
- Maisonette, other than as below
- Three-storey house

Grade D1 **Category LD2**

Four-or-more storey house

Grade A **Category LD1**

Maisonette with any floor above 4.5m from ground level and no alternative means of escape

Grade D1 **Category LD1**

Houses in multiple occupation

New or materially altered premises or existing premises

HMOs of one or two storeys with no floor greater than 200m^2 in area

Grade D1 Category LD1 (LD 2 for existing)

- Other HMOs
- Individual dwelling units, within the HMO, comprising a single room, which include cooking facilities (bedsits)
- Individual dwelling units, within the HMO, comprising a single room, which do not include cooking facilities (bedsits)

Grade D1 Category LD1

- Individual dwelling units, within the HMO, comprising two or more rooms
- Communal areas of the HMO

Grade A Category LD2, with detectors sited in accordance with the recommendations of BS 5839-1:2017 for a Category L2 system

Specialised Housing

Sheltered housing

- Individual dwelling units

Grade D2 Category LD1 (LD2 for existing)

- Communal areas

Grade A in accordance with the recommendations of BS 5839-1:2017 for a Category L4 or L5 system

Supported housing

- Single-storey
- Two-or-more storeys and not more than four bedrooms

Grade D1 Category LD1

Two-or-more storeys and more than four bedrooms

Grade A Category LD1

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Ministry of Housing, Communities and Local Government