

GOOD HOMES ALLIANCE - OVERHEATING TOOL - RETROFIT & EXISTING HOMES

WORKED EXAMPLES ACCOMPANYING TOOL BETA VERSION

20.05.2022

EARLY STAGE OVERHEATING TOOL - RETROFIT and existing homes

WORKED EXAMPLE: Retrofit and loft extension, Victorian end terrace, central London

Overview: End-terrace close to park and gardens. Suspended timber floors, solid walls. Dual aspect South (onto back garden) and North (onto road). The busy road prevents openings on the front side most of the time due to noise. The GF kitchen at the back is highly glazed, with high-level openings and shading from trees and walls on each side. All rooms have windows with wide openings (sash or side), but no trickle vents or extract fans - the score here reflects active management of ventilation by the occupant.

Pre-retrofit: 1 occupant for 1 bedroom, 1 occupant at home most of the day. Bedroom is at the front so window closed most of the time due to noise.

Post-retrofit: Retrofit works include replacement of glazed kitchen doors at the back + mansard extension + roof replacement to new build insulation levels. 1 occupants for 2 bedrooms, at home most of the day. Relatively highly glazed mansard room, with external shading (scored here as planned, but not yet installed). The bedroom is now at the back, over the garden, so bedroom windows can be left open at night. Roof and extension walls are insulated to new build levels.

GHA score: 26 points pre-retrofit and 24 points post-retrofit i.e. both within "medium" risk, with a small reduction in risk through retrofit.

Comparison with modelling: n/a

Comparison with in-use feedback: the house performed well pre-retrofit, only hot after several consecutive heatwave days. A significant overheating mitigating factor is the high-level openings on the GF onto the garden, which the occupant leaves open at night to cool down the house. The post-retrofit performance is unknown as the works are recent; even with continued management of GF night-time openings and of the shading and openings, it is expected that the new top floor bedroom, which is south-facing, could experience overheating: this may justify a higher GHA risk score even if the issue is localised, but the tool scores as a whole house; this may need "flagging" alongside the whole house tool.

Left pre-retrofit, right post-retrofit. Shading on top floor not yet installed.



HIGH RISK 32 and over	MEDIUM RISK 22-31	LOW RISK 21 and below
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TOTAL SCORE	26	24
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Sum of contributing factors:	45	46	Sum of mitigating factors:	19	22
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KEY FACTORS INCREASING THE LIKELIHOOD OF OVERHEATING	SCORING SCALE	PRE-RETROFIT	POST-RETROFIT	KEY FACTORS REDUCING THE LIKELIHOOD OF OVERHEATING	SCORING SCALE	PRE-RETROFIT	POST-RETROFIT
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Regional and local context

#1 Where is the scheme in the UK? <i>See guidance for map</i>	London and South East	8	8
	Northern England, Scotland and Northern Ireland	0	
	Rest of England and Wales	4	
#2 Is the site likely to see an Urban Heat Island effect? <i>See guidance for details</i>	Central / "high heat risk" London	6	6
	Outer / "lower heat risk" London, Birmingham, Manchester	4	
	Other cities, towns and dense sub-urban	2	

scoring note: using postcode, orange on GLA heat map

Site characteristics

#4 Does the site have barriers to windows opening? - Noise / acoustic risks: see guidance for details - Poor air quality / smells e.g. near factory, car park or very busy road - Security risks / crime - Adjacent to heat rejection plant - Occupants unlikely to operate windows often enough to purge heat e.g. in weak physical condition, with reduced ability, or low sensitivity / awareness of need	Day time: significant barriers on all or the large majority of windows and openings	16	8	8
	Day time: constraints on around half of the windows and openings	8		
	Day time: some constraints, but not on the majority of windows and openings	4		
	Night time: significant barriers on all or the large majority of windows and openings	16		
#5 Are immediate surrounding surfaces in majority pale in colour, or blue/green? Consider horizontal and vertical surfaces within 10m of the scheme.	Yes, the large majority of surfaces	2	1	1
	Yes, approximately half of the surfaces.	1		
	Yes, but only to some of the solar-exposed areas.	1		

#3 Do the site surroundings feature significant blue/green infrastructure, or is it a coastal location? Proximity to green spaces and large water bodies has beneficial effects on local temperatures. As guidance, score 2 mitigation points for at least 50% of surroundings within a 100m radius to be blue/green, or a site in a coastal area.	Yes	2	0	0
	No	0		

scoring note: this is conservative scoring, as satellite views show nearly 50% green

#6 Are there existing tall trees or buildings that shade solar-exposed glazed areas? Really significant shading from trees and surroundings may be scored under #16, as external shading, but with caution e.g. deciduous trees in mid-season offer little protection.	Yes, to all or a majority of solar-exposed areas	2	2	1
	Yes, but only to some of the solar-exposed areas.	1		

scoring note: no change to external shading from tree and neighbouring external wall, but the retrofit extension means new exposed glazed area, not shaded by tree. Neighbouring walls on both sides heavily shade the GF solar-exposed areas - this is counted under #16.

Occupancy characteristics

#7 Are the homes occupied for long hours or over-occupied, or likely to be? <i>Single-room homes should in general be treated as one-bedroom dwellings, but users may wish to take a more cautious approach for very small homes, and score for "over-occupancy" if 2 people occupy them.</i>	Long occupancy hours with more than one adult: score 3 per adult, over the first adult <i>e.g. score 0 for 1 long occupancy adult, 3 for 2 long occupancy adults etc</i>	3x	0	0
	High occupancy density i.e. more than 2 people per bedroom: score 3 per occupant over 2-per-bedroom total.	3x	0	0

#8 Are the homes under-occupied, or likely to be? "Under occupancy" is taken here as less than 1 person per bedroom, based on total number of occupants and bedrooms - whether or not occupants share a bedroom, bedrooms are used as offices etc.	Low occupancy density: score 2 per occupant under the total number of bedrooms. <i>e.g. score 0 for 2 occupants in a 2-bed flat; 2 for 1 occupant in a 2-bed flat; 4 for 2 occupants in a 4-bed house</i>	2x	0	2
	High occupancy density: score 3 per occupant over 2-per-bedroom total.			

scoring note: no change in number of occupants, but the retrofit has created an additional room, with one bedroom now used as office

Scheme characteristics and dwelling design

#9 Are the dwellings flats, or another higher-risk typology? Flats and bungalows often combine risk factors such as dwelling size and heat gains from surrounding areas or the roof.	Flats	6		
	Bungalows	4		
	Mid-terrace, end terrace	1	1	1
	Detached or semi-detached house	0		

#10 Does the heating system create a risk of high internal heat gains? Community / district heating can create a risk due to hot pipework operating during the summer, especially if it runs across internal areas (e.g. corridors), leading to heat gains and higher temperatures in these areas and ultimately into adjacent dwellings. Individual heating systems can create a risk too, for example if they are poorly controlled, or if there is a hot water store with poor levels of insulation. The scoring should consider both space heating and DHW provision. <i>See guidance for more detail e.g. on electric heating systems.</i>	Communal / district heating: <u>Scoring route 1: not much information on the scheme / early design stage:</u> Score 7 for scheme details unknown or unlikely to be best practice OR Score 2 for best practice e.g. following CIBSE CP1 2020 "Best Practice", or ambient loop, and no store in apartments. <u>Scoring route 2: information on the scheme is available:</u> Score 2 if long corridors without overheating mitigation, 1 if corridors with effective overheating mitigation, 0 if very short/no internal corridors, or low temperature distribution PLUS Score 3 if poorly insulated store, 1 if well insulated store, and 0 if no store PLUS Score 1 if poorly insulated distribution (incl. HIU), 0 if insulated distribution (incl. HIU) PLUS Score 1 if poor controls, 0 if good controls.	up to 7		
	Individual heating & hot water systems: Score 3 for poorly insulated store, 1 for well insulated store, and 0 for no store PLUS Score 1 for poorly insulated / long distribution, 0 for insulated / efficient distribution PLUS Score 1 for poor controls, 0 for good controls.	up to 5	1	1

scoring notes: old existing distribution, not insulated; combi boiler, good level of control

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SCORING SCALE	PRE-RETROFIT	POST-RETROFIT
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SCORING SCALE	PRE-RETROFIT	POST-RETROFIT
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Solar heat gains and shading

#13 What is the solar-exposed glazing ratio for the dwellings? The scoring considers glazing on solar-exposed areas i.e. orientations facing east, south, west, and anything in between, as well as horizontal glazing and highly glazed features such as conservatories. Wherever possible it is also useful to consider the proportion of glazing to floor area. Additional risk points are recommended if the glazing offers particularly low solar protection, taken here for glazing g-values of 0.75 or above. This is likely only to apply to original clear single glazing. <i>See guidance for details and illustrations.</i>	Solar exposed glazing-to-facade >65%. If solar-exposed glazing areas are less than 18% of floor area, the number of points may be reduced, but should be at least 14 points. Solar exposed glazing-to-facade >50%. If solar-exposed glazing areas are less than 14% of floor area, the number of points may be reduced, but should be at least 8 points.	24 (+4 if high g-value)		
	Solar exposed glazing-to-facade >35%.	14 (+2 if high g-value)	9	14
	Solar exposed glazing-to-facade < 35%, BUT glazing-to-floor > 10%.	8 (+1 if high g-value)		
	Horizontal glazing, rooflight: score 3 per rooflight (typical window size i.e. approx 1-2m ²). Large ones should be attributed more points, as if there were several.	4		
	Highly glazed feature e.g. conservatory, enclosed glazed balcony	3x	0	0
		14 (+2 if high g-value)	0	0

scoring note: the south facade is over 50% glazed post-retrofit counted from inside; the larger areas were single glazed, very clear, so taken point for high g-value. The glazing proportion against floor area is just over 14%, so no adjustment was taken, as relatively cautious scoring.

#11 Do dwellings have high exposed thermal mass AND a means for secure and quiet night ventilation? This should apply to at least the bedrooms and main living room. Score with caution, as it relies on occupants awareness and behaviour.	Yes	2	2	2

#12 Do floor to ceiling heights allow ceiling fans, now or in the future ? This should be scored if it covers at least the bedrooms and main living room. Score with caution, as fans rely on occupants awareness and behaviour.	>2.8m, and fans installed and likely to be used	4	2	0
	>2.8m, fans not installed	2		

scoring note: this has changed through the retrofit, as the new bedroom in the mansard extension has a relatively low ceiling height.

#14 Is there useful external shading or other protection from solar gains through glazing? This considers shading to solar exposed (east, south, west) glazing, and the scoring depends on glazing proportions, as per #13. Shading may include dedicated devices, balconies, facade articulation etc. See guidance on "full" and "part". While movable shading in general offers a number of benefits for occupants, it should be scored with caution as it relies on occupants awareness of the feature, and their behaviour. Solar control glass or solar film, and internal blinds, can also help reduce heat gains, but they potentially have a number of drawbacks such as affecting light transmittance or air flow (see guidance for details). They should therefore be used with caution where other options are limited, not as primary solar gains mitigation strategy. In addition, it is recommended NOT to take their mitigation point benefits if those of external shading are already accounted for.	External shading:	Full shade	Part shade		
	Glazing-to-facade >65%.	12	6		
	Glazing-to-facade >50%.	8	4	4	8
	Glazing-to-facade >35%.	4	2		
	Glazing-to-facade < 35% BUT glazing-to-floor > 10%.	2	1		
	On rooflights (per rooflight scored under #11)	2x	1x		
	On highly glazed features e.g. conservatories (top & sides)	8	4		
	Solar film / Low g-value (below 0.5) / Internal blinds				
	Glazing-to-facade >65%.	6			
	Glazing-to-facade >50%.	4			
	Glazing-to-facade >35%.	2			
	Glazing-to-facade < 35% BUT glazing-to-floor > 10%.	1			
On rooflights (per rooflight scored under #11)	1x				
On highly glazed features e.g. conservatories (top & sides)	4				

scoring notes: pre-retrofit, the main glazed area was on the ground floor and was heavily shaded by trees and neighbouring wall. Post-retrofit, the top floor is not overshadowed by trees, but is due to have external movable shading.

Infiltration, ventilation and effectiveness of openings

#15 What is the aspect of the dwellings? Dual aspect dwellings make effective ventilation easier and more likely.	Single aspect	6		
	Corner aspect, or dual aspect which is deep or with convoluted air path	3	0	0
	Dual aspect	0		

#16 What are the infiltration, background and purge ventilation provisions? This assesses the contribution of infiltration and minimum purge and background ventilation to overheating risk - see guidance for details and illustrations. This should be assessed whether or not, for Building Regulations compliance, Part F requirements apply to the project. "High leak features" include fireplaces, suspended uninsulated timber floors, cat flap, unsealed letter box through door, no or poor sealing around doors and windows. ** IMPORTANT NOTE: where ventilation is assessed NOT to meet Part F provisions, action is recommended for air quality purposes, whether or not it is required by Building Regulations and regardless of this overheating risk assessment.	Purge requirements are not met, in at least 1 habitable room **	8	0	0
	Purge requirements are met in all habitable rooms	0		
	Very leaky building e.g. at least 3 "high leak features" If test available: >12 m3/m2/hr at 50Pa	0		
	Average or very airtight building, but with suitable background ventilation provision (natural or mechanical), at least equivalent to Part F requirements.	0		
	Average airtightness, WITHOUT suitable background ventilation provision meeting Part F requirements ** If test available: 5-10 m3/m2/hr at 50Pa	1	0	1
	Very airtight building, WITHOUT suitable background ventilation provision meeting Part F requirements. ** This would apply to an exemplar retrofit e.g. Enerphit If test available: below 3m3/m2/hr at 50Pa	2		
Mechanical Ventilation with Heat Recovery and no / ineffective summer bypass	4			

scoring notes: very leaky pre-retrofit (leaky doors, cat flap, suspended timber floor, fireplaces ...); much more sealed post-retrofit, but still with suspended timber floors and fireplaces. No trickle vents nor fans, so scored conservatively as airtightness not known.

Energy Efficiency Characteristics

#18 Wall insulation	Un-insulated, or likely to be poor / partial	0		
	External Wall Insulation	0	0	0
	Internal or Cavity Wall Insulation.	1		

scoring note: solid brick walls

#19 Roof and loft insulation Roofs can be a significant source of heat gains to top floor dwellings and rooms, and adding insulation can help reduce these. Coverings such as bitumen and lead can get very hot and exacerbate risk, particularly if the roof is poorly insulated.	Houses, bungalows, top floor flats: No or minimal (<50mm) insulation: 2 points PLUS 1 point if roof covering likely to get hot	2 or 3		
	Houses, bungalows, top floor flats: Some insulation (>100mm): 1 point PLUS 1 point if roof covering likely to get hot	1 or 2	3	0
	Houses, bungalows, top floor flats: New build levels of insulation e.g. new loft roof, exemplar retrofit. All flats except top floor flats	0		

scoring note: poorly insulated pre-retrofit, with concrete tile covering. Post-retrofit: highly insulated, and green roof

#20 Windows This considers window U-value. Solar control properties of glazing are considered under #13 and #14.	Single glazed	0		
	Existing double glazed, or single + secondary	2	1	3
	Similar to new build standards	3		

scoring note: this is scored cautiously. Some windows pre-retrofit were already single+secondary, but the large kitchen doors were single glazed. Not all post-retrofit windows are "new-ish equivalent", but the larger glazing areas are, and the others are single+good secondary.

#17 Do windows and openings support effective ventilation? Larger, effective and secure openings help dissipate heat - see guidance for details and illustrations. This is scored in a similar way as #16 by reference to Part F requirements for purge ventilation, whether or not they apply from a regulatory perspective. See guidance for details on schemes in northern England, Scotland and Northern Ireland, where potentially additional mitigation points may be scored for night-time ventilation.			= Part F purge provision	Part F purge + 50%	Part F purge + 100%		
	Single aspect			6	8		
	Corner aspect			5	7	6	6
	Dual aspect			4	6		

scoring notes: in practice post-retrofit, effective area and ease of opening have reduced since the installation of secondary sash windows, so with unknown, elderly or less able occupants, this would need to be scored more cautiously

#21 Ground floor insulation Ground temperature is relatively constant throughout the year, and this can provide beneficial cooling in the summer, particularly in the case of suspended floors.	Houses, bungalows, ground floor flats: Un-insulated suspended floor, ventilated		2		
	Houses, bungalows, ground floor flats: Un-insulated slab, or minimal insulation		1	2	2
	Houses, bungalows, ground floor flats: Insulated slab, or insulated suspended floor. All upper floor flats.		0		

EARLY STAGE OVERHEATING TOOL - RETROFIT and existing homes

WORKED EXAMPLE: Existing, Victorian mid-terrace house, London

Overview: Victorian mid-terrace, central London, back garden. Dual aspect East & West, shaded on one side by taller row of buildings. 4 occupants for 4 bedrooms (i.e. 3 actually used as bedrooms, and 1 as home office), 1 occupant at home most of the day. Small kitchen extension at the back, quite highly glazed; small top floor extension for bedroom at the back, reasonably glazed; 3 rooflights with internal blinds. All windows have trickle vents and they open well. The house is on a quiet street off the main road, and there are few restrictions to openings: only some small windows are typically left closed due to noise or security.

GHA score: 31 points, "medium" risk, nearly "high".

Comparison with modelling: n/a

Comparison with in-use feedback: the house generally performs well, but there is occasional overheating in some rooms, so this is consistent with a high "medium" risk score. The rooflights are noted by occupants to lead to high heat gains, even with internal blinds. Because the GHA tool is a whole house tool rather than looking at individual rooms, an experienced user may use the questions to identify likely rooms at higher risk, and/or this could be investigated through dynamic modelling.



HIGH RISK 32 and over	MEDIUM RISK 22-31	LOW RISK 21 and below
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TOTAL SCORE	31
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Sum of contributing factors:	49	14	Sum of mitigating factors:	18	0
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KEY FACTORS INCREASING THE LIKELIHOOD OF OVERHEATING	SCORING SCALE	PRE-RETROFIT	POST-RETROFIT	KEY FACTORS REDUCING THE LIKELIHOOD OF OVERHEATING	SCORING SCALE	PRE-RETROFIT	POST-RETROFIT
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PAGE 1

Regional and local context

#1 Where is the scheme in the UK? <i>See guidance for map</i>	London and South East	8	8
	Northern England, Scotland and Northern Ireland	0	
	Rest of England and Wales	4	
	Central / "high heat risk" London	6	
#2 Is the site likely to see an Urban Heat Island effect? <i>See guidance for details</i>	Outer / "lower heat risk" London, Birmingham, Manchester	4	6
	Other cities, towns and dense sub-urban	2	

scoring note: orange on GLA climate heat risk map

Site characteristics

#4 Does the site have barriers to windows opening? - Noise / acoustic risks: see guidance for details - Poor air quality / smells e.g. near factory, car park or very busy road - Security risks / crime - Adjacent to heat rejection plant - Occupants unlikely to operate windows often enough to purge heat e.g. in weak physical condition, with reduced ability, or low sensitivity / awareness of need	Day time: significant barriers on all or the large majority of windows and openings	16	4
	Day time: constraints on around half of the windows and openings	8	
	Day time: some constraints, but not on the majority of windows and openings	4	
#5 Are immediate surrounding surfaces in majority pale in colour, or blue/green? Consider horizontal and vertical surfaces within 10m of the scheme.	Yes, the large majority of surfaces	2	1
	Yes, approximately half of the surfaces.	1	

#3 Do the site surroundings feature significant blue/green infrastructure, or is it a coastal location? Proximity to green spaces and large water bodies has beneficial effects on local temperatures. As guidance, score 2 mitigation points for at least 50% of surroundings within a 100m radius to be blue/green, or a site in a coastal area.	Yes	2	0
	No	0	

scoring note: this is conservative scoring, as satellite views show nearly 50% green

Occupancy characteristics

#7 Are the homes occupied for long hours or over-occupied, or likely to be? <i>Single-room homes should in general be treated as one-bedroom dwellings, but users may wish to take a more cautious approach for very small homes, and score for "over-occupancy" if 2 people occupy them.</i>	Long occupancy hours with more than one adult: score 3 per adult, over the first adult <i>e.g. score 0 for 1 long occupancy adult, 3 for 2 long occupancy adults etc</i>	3x	0
	High occupancy density i.e. more than 2 people per bedroom: score 3 per occupant over 2-per-bedroom total.	3x	0

#8 Are the homes under-occupied, or likely to be? "Under occupancy" is taken here as less than 1 person per bedroom, based on total number of occupants and bedrooms - whether or not occupants share a bedroom, bedrooms are used as offices etc.	Low occupancy density: score 2 per occupant under the total number of bedrooms. <i>e.g. score 0 for 2 occupants in a 2-bed flat; 2 for 1 occupant in a 2-bed flat; 4 for 2 occupants in a 4-bed house</i>	2x	0
	Yes, to all or a majority of solar-exposed areas		
#6 Are there existing tall trees or buildings that shade solar-exposed glazed areas? Really significant shading from trees and surroundings may be scored under #16, as external shading, but with caution e.g. deciduous trees in mid-season offer little protection.	Yes, but only to some of the solar-exposed areas.	1	1

Scheme characteristics and dwelling design

#9 Are the dwellings flats, or another higher-risk typology? Flats and bungalows often combine risk factors such as dwelling size and heat gains from surrounding areas or the roof.	Flats	6	1	
	Bungalows	4		
	Mid-terrace, end terrace	1		
	Detached or semi-detached house	0		

#10 Does the heating system create a risk of high internal heat gains? Community / district heating can create a risk due to hot pipework operating during the summer, especially if it runs across internal areas (e.g. corridors), leading to heat gains and higher temperatures in these areas and ultimately into adjacent dwellings. Individual heating systems can create a risk too, for example if they are poorly controlled, or if there is a hot water store with poor levels of insulation. The scoring should consider both space heating and DHW provision. <i>See guidance for more detail e.g. on electric heating systems.</i>	Communal / district heating: <u>Scoring route 1: not much information on the scheme / early design stage:</u> Score 7 for scheme details unknown or unlikely to be best practice OR Score 2 for best practice e.g. following CIBSE CP1 2020 "Best Practice", or ambient loop, and no store in apartments. <u>Scoring route 2: information on the scheme is available:</u> Score 2 if long corridors without overheating mitigation, 1 if corridors with effective overheating mitigation, 0 if very short/no internal corridors, or low temperature distribution PLUS Score 3 if poorly insulated store, 1 if well insulated store, and 0 if no store PLUS Score 1 if poorly insulated distribution (incl. HIU), 0 if insulated distribution (incl. HIU) PLUS Score 1 if poor controls, 0 if good controls.	up to 7	2	
	Individual heating & hot water systems: Score 3 for poorly insulated store, 1 for well insulated store, and 0 for no store PLUS Score 1 for poorly insulated / long distribution, 0 for insulated / efficient distribution PLUS Score 1 for poor controls, 0 for good controls.	up to 5		

#11 Do dwellings have high exposed thermal mass AND a means for secure and quiet night ventilation? This should apply to at least the bedrooms and main living room. Yes Score with caution, as it relies on occupants awareness and behaviour.		2	2	

#12 Do floor to ceiling heights allow ceiling fans, now or in the future ? This should be scored if it covers at least the bedrooms and main living room. Score with caution, as fans rely on occupants awareness and behaviour.	>2.8m, and fans installed and likely to be used	4	2	
	>2.8m, fans not installed	2		

PAGE 2	SCORING SCALE	PRE-RETROFIT	POST-RETROFIT
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SCORING SCALE	PRE-RETROFIT	POST-RETROFIT
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Solar heat gains and shading

#13 What is the estimated average glazing ratio for the dwellings? The scoring considers glazing on solar-exposed areas i.e. orientations facing east, south, west, and anything in between, as well as horizontal glazing and highly glazed features such as conservatories. Wherever possible it is also useful to consider the proportion of glazing to floor area. Additional risk points are recommended if the glazing offers particularly low solar protection, taken here for glazing g-values of 0.75 or above. This is likely only to apply to original clear single glazing. <i>See guidance for details and illustrations.</i>	Solar exposed glazing-to-facade >65%. If solar-exposed glazing areas are less than 18% of floor area, the number of points may be reduced, but should be at least 14 points. Solar exposed glazing-to-facade >50%. If solar-exposed glazing areas are less than 14% of floor area, the number of points may be reduced, but should be at least 8 points.	24 (+4 if high g-value) 14 (+2 if high g-value) 8 (+1 if high g-value)	4	
	Solar exposed glazing-to-facade >35%. Solar exposed glazing-to-facade < 35%, BUT glazing-to-floor > 10%.	4		
	Horizontal glazing, rooflight: score 3 per rooflight (typical window size i.e. approx 1-2m ²). Large ones should be attributed more points, as if there were several.	3x		
	Highly glazed feature e.g. conservatory, enclosed glazed balcony	14 (+2 if high g-value)		

scoring notes: reasonable proportions of glazing-to-facade area, but windows are tall and the extension areas are more highly glazed, so glazing-to-floor is over 10%. Four rooflights

#14 Is there useful external shading or other protection from solar gains through glazing? This considers shading to solar exposed (east, south, west) glazing, and the scoring depends on glazing proportions, as per #13. Shading may include dedicated devices, balconies, facade articulation etc. See guidance on "full" and "part". While movable shading in general offers a number of benefits for occupants, it should be scored with caution as it relies on occupants awareness of the feature, and their behaviour. Solar control glass or solar film, and internal blinds, can also help reduce heat gains, but they potentially have a number of drawbacks such as affecting light transmittance or air flow (see guidance for details). They should therefore be used with caution where other options are limited, not as primary solar gains mitigation strategy. In addition, it is recommended NOT to take their mitigation point benefits if those of external shading are already accounted for.	External shading:	Full shade	Part shade		
	Glazing-to-facade >65%.	12	6		
	Glazing-to-facade >50%.	8	4	1	
	Glazing-to-facade >35%.	4	2		
	Glazing-to-facade < 35% BUT glazing-to-floor > 10%.	2	1		
	On rooflights (per rooflight scored under #11)	2x	1x	3	
	On highly glazed features e.g. conservatories (top & sides)	8	4	0	
	Solar film / Low g-value (below 0.5) / Internal				
	Glazing-to-facade >65%.	6		0	
	Glazing-to-facade >50%.	4			
Glazing-to-facade >35%.	2				
Glazing-to-facade < 35% BUT glazing-to-floor > 10%.	1				
On rooflights (per rooflight scored under #11)	1x	0			
On highly glazed features e.g. conservatories (top & sides)	4	0			

scoring notes: scoring for shading on rooflights is conservative, as it's partial but applied to 12 risk points: potentially could increase the mitigation points a little

Infiltration, ventilation and effectiveness of openings

#15 What is the aspect of the dwellings? Dual aspect dwellings make effective ventilation easier and more likely.	Single aspect	6	0	
	Corner aspect, or dual aspect which is deep or with convoluted air path	3		
	Dual aspect	0		

#16 What are the infiltration, background and purge ventilation provisions? This assesses the contribution of infiltration and minimum purge and background ventilation to overheating risk - see guidance for details and illustrations. This should be assessed whether or not, for Building Regulations compliance, Part F requirements apply to the project. "High leak features" include fireplaces, suspended uninsulated timber floors, cat flap, unsealed letter box through door, no or poor sealing around doors and windows. ** IMPORTANT NOTE: where ventilation is assessed NOT to meet Part F provisions, action is recommended for air quality purposes, whether or not it is required by Building Regulations and regardless of this overheating risk assessment.	Purge requirements are not met, in at least 1 habitable room **	8	0	
	Purge requirements are met in all habitable rooms	0		
	Very leaky building e.g. at least 3 "high leak features" If test available: >12 m3/m2/hr at 50Pa	0		
	Average or very airtight building, but with suitable background ventilation provision (natural or mechanical), at least equivalent to Part F requirements.	0		
	Average airtightness, WITHOUT suitable background ventilation provision meeting Part F requirements **	1		
If test available: 5-10 m3/m2/hr at 50Pa	2			
Very airtight building, WITHOUT suitable background ventilation provision meeting Part F requirements. **	2			
This would apply to an exemplar retrofit e.g. Enerphit	2			
If test available: below 3m3/m2/hr at 50Pa	2			
Mechanical Ventilation with Heat Recovery and no / ineffective summer bypass	4			

#17 Do windows and openings support effective ventilation? Larger, effective and secure openings help dissipate heat - see guidance for details and illustrations. This is scored in a similar way as #16 by reference to Part F requirements for purge ventilation, whether or not they apply from a regulatory perspective. See guidance for details on schemes in northern England, Scotland and Northern Ireland, where potentially additional mitigation points may be scored for night-time ventilation.	Single aspect Corner aspect Dual aspect	= Part F purge provision	Part F purge + 50%	Part F purge + 100%	6	8	6			
								minimum required - see #16	5	7
									4	6

Energy Efficiency Characteristics

#18 Wall insulation	Un-insulated, or likely to be poor / partial	0	0	
	External Wall Insulation	0		
	Internal or Cavity Wall Insulation.	1		

#19 Roof and loft insulation Roofs can be a significant source of heat gains to top floor dwellings and rooms, and adding insulation can help reduce these. Coverings such as bitumen and lead can get very hot and exacerbate risk, particularly if the roof is poorly insulated.	Houses, bungalows, top floor flats: No or minimal (<50mm) insulation: 2 points PLUS 1 point if roof covering likely to get hot	2 or 3	2	
	Houses, bungalows, top floor flats: Some insulation (>100mm): 1 point PLUS 1 point if roof covering likely to get hot	1 or 2		
	Houses, bungalows, top floor flats: New build levels of insulation e.g. new loft roof, exemplar retrofit.	0		
	All flats except top floor flats	0		

#20 Windows This considers window U-value. Solar control properties of glazing are considered under #13 and #14.	Single glazed	0	2	
	Existing double glazed, or single + secondary	2		
	Similar to new build standards	3		

#21 Ground floor insulation Ground temperature is relatively constant throughout the year, and this can provide beneficial cooling in the summer, particularly in the case of suspended floors.	Houses, bungalows, ground floor flats: Un-insulated suspended floor, ventilated	2	2
	Houses, bungalows, ground floor flats: Un-insulated slab, or minimal insulation	1	
	Houses, bungalows, ground floor flats: Insulated slab, or insulated suspended floor. All upper floor flats.	0	

EARLY STAGE OVERHEATING TOOL - RETROFIT and existing homes

WORKED EXAMPLE: Office-to-resi conversion, block of flats, Northern England (Darlington)

Overview: Apartment block in northern England, small town. Single aspect apartments facing East or West, highly glazed with no external shading. While glazed areas are large, only the small top part opens. The urban location is assumed to create some restrictions to window openings at times, but not significant. The score assumes standard occupancy.

Pre-retrofit: opening windows are on restrictors (10cm)

Post-retrofit: without restricted openings, and with background mechanical ventilation.

GHA score: 54 points pre-retrofit, i.e. very "high" risk, and 37 points post-retrofit i.e. lower but still "high" risk

Comparison with modelling: CIBSE TM59 dynamic modelling was carried out to evaluate the impact of retrofit measures. It predicts a low risk of overheating i.e. very different from the GHA score. In the model, this is attributed to large benefits from night-time ventilation, with cool air from the northern England location. This is not accounted for in the GHA tool, as the benefits from ventilation are scored independently from location, however the guidance note under #17 advises that in Northern locations, these additional benefits may be looked into as part of scenario testing. However, with these high proportions of glazing, no shading, and single-aspect flats, it seems reasonable that the GHA tool should produce a high risk score. This is an example where, following the initial assessment with this simple tool, dynamic modelling would be useful to assess risk more accurately and identify possible mitigation measures.

Comparison with in-use feedback: in practice, the apartments were known to overheat pre-retrofit, matching the GHA tool assessment. Post-retrofit feedback is not known: it is not known whether improved ventilation on its own has resolved the issue, as predicted by TM59.



HIGH RISK 32 and over	MEDIUM RISK 22-31	LOW RISK 21 and below
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TOTAL SCORE	54	37
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Sum of contributing factors:	56	45	Sum of mitigating factors:	2	8
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KEY FACTORS INCREASING THE LIKELIHOOD OF OVERHEATING	SCORING SCALE	PRE-RETROFIT	POST-RETROFIT	KEY FACTORS REDUCING THE LIKELIHOOD OF OVERHEATING	SCORING SCALE	PRE-RETROFIT	POST-RETROFIT
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PAGE 1

Regional and local context

#1 Where is the scheme in the UK? <i>See guidance for map</i>	London and South East	8		
	Northern England, Scotland and Northern Ireland	0	0	
	Rest of England and Wales	4		
#2 Is the site likely to see an Urban Heat Island effect? <i>See guidance for details</i>	Central / "high heat risk" London	6		
	Outer / "lower heat risk" London, Birmingham, Manchester	4	2	
	Other cities, towns and dense sub-urban	2		

#3 Do the site surroundings feature significant blue/green infrastructure, or is it a coastal location? Proximity to green spaces and large water bodies has beneficial effects on local temperatures. As guidance, score 2 mitigation points for at least 50% of surroundings within a 100m radius to be blue/green, or a site in a coastal area.	Yes	2	0	0

Site characteristics

#4 Does the site have barriers to windows opening? - Noise / acoustic risks: see guidance for details - Poor air quality / smells e.g. near factory, car park or very busy road - Security risks / crime - Adjacent to heat rejection plant - Occupants unlikely to operate windows often enough to purge heat e.g. in weak physical condition, with reduced ability, or low sensitivity / awareness of need	Day time: significant barriers on all or the large majority of windows and openings	16		
	Day time: constraints on around half of the windows and openings	8	4	4
	Day time: some constraints, but not on the majority of windows and openings	4		
	Night time: significant barriers on all or the large majority of windows and openings	16		
	Night time: bedroom windows are likely to stay closed, but no constraints on most of the other windows / openings	8	4	4
	Night time: some constraints, but not on bedroom windows and not on the majority of windows and openings	4		

#5 Are immediate surrounding surfaces in majority pale in colour, or blue/green? Consider horizontal and vertical surfaces within 10m of the scheme.	Yes, the large majority of surfaces	2	0	0
	Yes, approximately half of the surfaces.	1		

#6 Are there existing tall trees or buildings that shade solar-exposed glazed areas? Really significant shading from trees and surroundings may be scored under #16, as external shading, but with caution e.g. deciduous trees in mid-season offer little protection.	Yes, to all or a majority of solar-exposed areas	2	0	0
	Yes, but only to some of the solar-exposed areas.	1		

Occupancy characteristics

#7 Are the homes occupied for long hours or over-occupied, or likely to be? <i>Single-room homes should in general be treated as one-bedroom dwellings, but users may wish to take a more cautious approach for very small homes, and score for "over-occupancy" if 2 people occupy them.</i>	Long occupancy hours with more than one adult: score 3 per adult, over the first adult <i>e.g. score 0 for 1 long occupancy adult, 3 for 2 long occupancy adults etc</i>	3x		
	High occupancy density i.e. more than 2 people per bedroom: score 3 per occupant over 2-per-bedroom total.	3x		

#8 Are the homes under-occupied, or likely to be? "Under occupancy" is taken here as less than 1 person per bedroom, based on total number of occupants and bedrooms - whether or not occupants share a bedroom, bedrooms are used as offices etc.	Low occupancy density: score 2 per occupant under the total number of bedrooms. <i>e.g. score 0 for 2 occupants in a 2-bed flat; 2 for 1 occupant in a 2-bed flat; 4 for 2 occupants in a 4-bed house</i>	2x	0	0

Scheme characteristics and dwelling design

#9 Are the dwellings flats, or another higher-risk typology? Flats and bungalows often combine risk factors such as dwelling size and heat gains from surrounding areas or the roof.	Flats	6		
	Bungalows	4		
	Mid-terrace, end terrace	1	6	6
	Detached or semi-detached house	0		

#10 Does the heating system create a risk of high internal heat gains? Community / district heating can create a risk due to hot pipework operating during the summer, especially if it runs across internal areas (e.g. corridors), leading to heat gains and higher temperatures in these areas and ultimately into adjacent dwellings. Individual heating systems can create a risk too, for example if they are poorly controlled, or if there is a hot water store with poor levels of insulation. The scoring should consider both space heating and DHW provision. <i>See guidance for more detail e.g. on electric heating systems.</i>	Communal / district heating: <u>Scoring route 1: not much information on the scheme / early design stage:</u> Score 7 for scheme details unknown or unlikely to be best practice OR Score 2 for best practice e.g. following CIBSE CP1 2020 "Best Practice", or ambient loop, and no store in apartments. <u>Scoring route 2: information on the scheme is available:</u> Score 2 if long corridors without overheating mitigation, 1 if corridors with effective overheating mitigation, 0 if very short/no internal corridors, or low temperature distribution PLUS Score 3 if poorly insulated store, 1 if well insulated store, and 0 if no store PLUS Score 1 if poorly insulated distribution (incl. HIU), 0 if insulated distribution (incl. HIU) PLUS Score 1 if poor controls, 0 if good controls.	up to 7	7	4
	Individual heating & hot water systems: Score 3 for poorly insulated store, 1 for well insulated store, and 0 for no store PLUS Score 1 for poorly insulated / long distribution, 0 for insulated / efficient distribution PLUS Score 1 for poor controls, 0 for good controls.	up to 5		

#11 Do dwellings have high exposed thermal mass AND a means for secure and quiet night ventilation? This should apply to at least the bedrooms and main living room. Score with caution, as it relies on occupants awareness and behaviour.	Yes	2	2	2

#12 Do floor to ceiling heights allow ceiling fans, now or in the future ? This should be scored if it covers at least the bedrooms and main living room. Score with caution, as fans rely on occupants awareness and behaviour.	>2.8m, and fans installed and likely to be used	4	0	0
	>2.8m, fans not installed	2		

PAGE 2	SCORING SCALE	PRE-RETROFIT	POST-RETROFIT
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SCORING SCALE	PRE-RETROFIT	POST-RETROFIT
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Solar heat gains and shading

#13 What is the estimated average glazing ratio for the dwellings? The scoring considers glazing on solar-exposed areas i.e. orientations facing east, south, west, and anything in between, as well as horizontal glazing and highly glazed features such as conservatories. Wherever possible it is also useful to consider the proportion of glazing to floor area. Additional risk points are recommended if the glazing offers particularly low solar protection, taken here for glazing g-values of 0.75 or above. This is likely only to apply to original clear single glazing. <i>See guidance for details and illustrations.</i>	Solar exposed glazing-to-facade >65%. If solar-exposed glazing areas are less than 18% of floor area, the number of points may be reduced, but should be at least 14 points.	24 (+4 if high g-value)	14	14
	Solar exposed glazing-to-facade >50%. If solar-exposed glazing areas are less than 14% of floor area, the number of points may be reduced, but should be at least 8 points.	14 (+2 if high g-value)		
	Solar exposed glazing-to-facade >35%.	8 (+1 if high g-value)		
	Solar exposed glazing-to-facade < 35%, BUT glazing-to-floor > 10%.	4		
	Horizontal glazing, rooflight: score 3 per rooflight (typical window size i.e. approx 1-2m ²). Large ones should be attributed more points, as if there were several.	3x	0	0

#14 Is there useful external shading or other protection from solar gains through glazing? This considers shading to solar exposed (east, south, west) glazing, and the scoring depends on glazing proportions, as per #13. Shading may include dedicated devices, balconies, facade articulation etc. See guidance on "full" and "part". While movable shading in general offers a number of benefits for occupants, it should be scored with caution as it relies on occupants awareness of the feature, and their behaviour. Solar control glass or solar film, and internal blinds, can also help reduce heat gains, but they potentially have a number of drawbacks such as affecting light transmittance or air flow (see guidance for details). They should therefore be used with caution where other options are limited, not as primary solar gains mitigation strategy. In addition, it is recommended NOT to take their mitigation point benefits if those of external shading are already accounted for.	External shading:	Full shade	Part shade		
	Glazing-to-facade >65%.	12	6		
	Glazing-to-facade >50%.	8	4		
	Glazing-to-facade >35%.	4	2	0	0
	Glazing-to-facade < 35% BUT glazing-to-floor > 10%.	2	1		
	On rooflights (per rooflight scored under #11)	2x	1x	0	0
	On highly glazed features e.g. conservatories (top & sides)	8	4	0	0
	Solar film / Low g-value (below 0.5) / Internal				
	Glazing-to-facade >65%.	6			
	Glazing-to-facade >50%.	4		0	0
Glazing-to-facade >35%.	2				
Glazing-to-facade < 35% BUT glazing-to-floor > 10%.	1				
On rooflights (per rooflight scored under #11)	1x		0	0	
On highly glazed features e.g. conservatories (top & sides)	4		0	0	

Infiltration, ventilation and effectiveness of openings

#15 What is the aspect of the dwellings?	Single aspect	6		
Dual aspect dwellings make effective ventilation easier and more likely.	Corner aspect, or dual aspect which is deep or with convoluted air path	3	6	6
	Dual aspect	0		

#16 What are the infiltration, background and purge ventilation provisions?	Purge requirements are not met, in at least 1 habitable room **	8	8	0
This assesses the contribution of infiltration and minimum purge and background ventilation to overheating risk - see guidance for details and illustrations. This should be assessed whether or not, for Building Regulations compliance, Part F requirements apply to the project.	Purge requirements are met in all habitable rooms	0		
"High leak features" include fireplaces, suspended uninsulated timber floors, cat flap, unsealed letter box through door, no or poor sealing around doors and windows.	Very leaky building e.g. at least 3 "high leak features" If test available: >12 m3/m2/hr at 50Pa	0		
** IMPORTANT NOTE: where ventilation is assessed NOT to meet Part F provisions, action is recommended for air quality purposes, whether or not it is required by Building Regulations and regardless of this overheating risk assessment.	Average or very airtight building, but with suitable background ventilation provision (natural or mechanical), at least equivalent to Part F requirements.	0		
	Average airtightness, WITHOUT suitable background ventilation provision meeting Part F requirements **	1	1	1
	If test available: 5-10 m3/m2/hr at 50Pa			
	Very airtight building, WITHOUT suitable background ventilation provision meeting Part F requirements. **			
	This would apply to an exemplar retrofit e.g. Enerphit	2		
	If test available: below 3m3/m2/hr at 50Pa			
	Mechanical Ventilation with Heat Recovery and no / ineffective summer bypass	4	0	0

#17 Do windows and openings support effective ventilation?		= Part F purge provision	Part F purge + 50%	Part F purge + 100%		
Larger, effective and secure openings help dissipate heat - see guidance for details and illustrations.						
This is scored in a similar way as #16 by reference to Part F requirements for purge ventilation, whether or not they apply from a regulatory perspective.	Single aspect		6	8		
See guidance for details on schemes in northern England, Scotland and Northern Ireland, where potentially additional mitigation points may be scored for night-time ventilation.	Corner aspect	minimum required - see #16	5	7	0	6
	Dual aspect		4	6		

Energy Efficiency Characteristics

#18 Wall insulation	Un-insulated, or likely to be poor / partial	0		
	External Wall Insulation	0	0	0
	Internal or Cavity Wall Insulation.	1		

#19 Roof and loft insulation	Houses, bungalows, top floor flats: No or minimal (<50mm) insulation: 2 points PLUS 1 point if roof covering likely to get hot	2 or 3		
Roofs can be a significant source of heat gains to top floor dwellings and rooms, and adding insulation can help reduce these.	Houses, bungalows, top floor flats: Some insulation (>100mm): 1 point PLUS 1 point if roof covering likely to get hot	1 or 2	2	2
Coverings such as bitumen and lead can get very hot and exacerbate risk, particularly if the roof is poorly insulated.	Houses, bungalows, top floor flats: New build levels of insulation e.g. new loft roof, exemplar retrofit.			
	All flats except top floor flats	0		

#21 Ground floor insulation	Ground temperature is relatively constant throughout the year, and this can provide beneficial cooling in the summer, particularly in the case of suspended floors.					
	Houses, bungalows, ground floor flats: Un-insulated suspended floor, ventilated		2			
	Houses, bungalows, ground floor flats: Un-insulated slab, or minimal insulation		1	0	0	
	Houses, bungalows, ground floor flats: Insulated slab, or insulated suspended floor. All upper floor flats.		0			

scoring note: scored here for "average" flat. This should be scored differently for ground floor flats

#20 Windows	Single glazed	0		
This considers window U-value. Solar control properties of glazing are considered under #13 and #14.	Existing double glazed, or single + secondary	2	2	2
	Similar to new build standards	3		

EARLY STAGE OVERHEATING TOOL - RETROFIT and existing homes

WORKED EXAMPLE: Existing flat in Paris, scored for Unknown and Known occupant

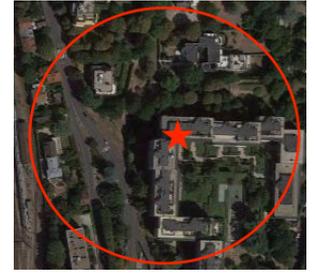
Overview: top floor 1960s flat, dual aspect North-South, but deep and with a convoluted air path not necessarily conducive to draughts. Highly glazed on South with large balcony. The building is within significant green/blue infrastructure and shaded to the West by another building. All rooms have windows with wide openings, but no trickle vents. All windows have shutters. 1 occupant for 2 bedrooms, at home all day.

Pre-retrofit: "standard score": scored conservatively, with unknown occupant.

Post-retrofit: scored to reflect known occupant behaviour: regular window opening for background & purge ventilation, use of light internal blinds which do not impede air flow, opening of windows & doors to create strong draughts.

GHA score: 32 points for as standard score, i.e. "high" risk and 27 points with known occupant i.e. "medium" risk
Comparison with modelling: n/a

Comparison with in-use feedback: in practice the flat performs well in the summer, likely thanks to the occupant who regularly opens windows to create draughts. It is also probably helped by the flat's position on top of a hill exposed to strong breezes from the North, which are very site specific and not accounted for in the tool. A number of questions have also been scored conservatively. Therefore, while the "medium" risk score with known occupant is higher than observed, it seems reasonable.



HIGH RISK 32 and over	MEDIUM RISK 22-31	LOW RISK 21 and below
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TOTAL SCORE	32	27
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Sum of contributing factors:	52	48	Sum of mitigating factors:	20	21
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KEY FACTORS INCREASING THE LIKELIHOOD OF OVERHEATING	SCORING SCALE	Unkno wn	Known Occ.	KEY FACTORS REDUCING THE LIKELIHOOD OF OVERHEATING	SCORING SCALE	Unkno wn	Known Occ.
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PAGE 1

Regional and local context

#1 Where is the scheme in the UK? <i>See guidance for map</i>	London and South East	8	11
	Northern England, Scotland and Northern Ireland	0	
	Rest of England and Wales	4	
<i>Scoring note: score adjusted to roughly reflect Paris location</i>			
#2 Is the site likely to see an Urban Heat Island effect? <i>See guidance for details</i>	Central / "high heat risk" London	6	4
	Outer / "lower heat risk" London, Birmingham, Manchester	4	
	Other cities, towns and dense sub-urban	2	

scoring note: in outer Paris, so scored for similar UHI as outer London

Site characteristics

#4 Does the site have barriers to windows opening? - Noise / acoustic risks: see guidance for details - Poor air quality / smells e.g. near factory, car park or very busy road - Security risks / crime - Adjacent to heat rejection plant - Occupants unlikely to operate windows often enough to purge heat e.g. in weak physical condition, with reduced ability, or low sensitivity / awareness of need	Day time: significant barriers on all or the large majority of windows and openings	16	0	0
	Day time: constraints on around half of the windows and openings	8		
	Day time: some constraints, but not on the majority of windows and openings	4		
	Night time: significant barriers on all or the large majority of windows and openings	16		
#5 Are immediate surrounding surfaces in majority pale in colour, or blue/green? Consider horizontal and vertical surfaces within 10m of the scheme.	Yes, the large majority of surfaces	2	2	2
	Yes, approximately half of the surfaces.	1		
	Other	0		

scoring note: the flat is on the top floor and at very low risk of intrusion at night, but this is cautious scoring which assumes windows with balcony access are closed at night. This also reflects actual observed occupant behaviour.

Occupancy characteristics

#7 Are the homes occupied for long hours or over-occupied, or likely to be? <i>Single-room homes should in general be treated as one-bedroom dwellings, but users may wish to take a more cautious approach for very small homes, and score for "over-occupancy" if 2 people occupy them.</i>	Long occupancy hours with more than one adult: score 3 per adult, over the first adult e.g. score 0 for 1 long occupancy adult, 3 for 2 long occupancy adults etc	3x	0	0
	High occupancy density i.e. more than 2 people per bedroom: score 3 per occupant over 2-per-bedroom total.	3x	0	0

#3 Do the site surroundings feature significant blue/green infrastructure, or is it a coastal location? Proximity to green spaces and large water bodies has beneficial effects on local temperatures. As guidance, score 2 mitigation points for at least 50% of surroundings within a 100m radius to be blue/green, or a site in a coastal area.	Yes	2	2	2
	Other	0		

scoring note: over 50% green / blue, checked on satellite view

#6 Are there existing tall trees or buildings that shade solar-exposed glazed areas? Really significant shading from trees and surroundings may be scored under #16, as external shading, but with caution e.g. deciduous trees in mid-season offer little protection.	Yes, to all or a majority of solar-exposed areas	2	1	1
	Yes, but only to some of the solar-exposed areas.	1		

scoring note: significant gardens & water features surrounding the building, pale stone & timber facade

scoring note: top floor flat, 11th floor, so no shading from trees, but shading from building to the west which affects at least half of the south-facing glazed areas.

#8 Are the homes under-occupied, or likely to be? "Under occupancy" is taken here as less than 1 person per bedroom, based on total number of occupants and bedrooms - whether or not occupants share a bedroom, flat; 4 for 2 occupants in a 4-bed bedrooms are used as offices etc.	Low occupancy density: score 2 per occupant under the total number of bedrooms. e.g. score 0 for 2 occupants in a 2-bed flat; 2 for 1 occupant in a 2-bed flat; 4 for 2 occupants in a 4-bed house	2x	0	2
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scoring note: 1 occupant, 2 bedrooms

Scheme characteristics and dwelling design

#9 Are the dwellings flats, or another higher-risk typology? Flats and bungalows often combine risk factors such as dwelling size and heat gains from surrounding areas or the roof.	Flats	6		
	Bungalows	4		
	Mid-terrace, end terrace	1	6	6
	Detached or semi-detached house	0		

#10 Does the heating system create a risk of high internal heat gains? Community / district heating can create a risk due to hot pipework operating during the summer, especially if it runs across internal areas (e.g. corridors), leading to heat gains and higher temperatures in these areas and ultimately into adjacent dwellings. Individual heating systems can create a risk too, for example if they are poorly controlled, or if there is a hot water store with poor levels of insulation. The scoring should consider both space heating and DHW provision. <i>See guidance for more detail e.g. on electric heating systems.</i>	Communal / district heating: <u>Scoring route 1: not much information on the scheme / early design stage:</u> Score 7 for scheme details unknown or unlikely to be best practice OR Score 2 for best practice e.g. following CIBSE CP1 2020 "Best Practice", or ambient loop, and no store in apartments. <u>Scoring route 2: information on the scheme is available:</u> Score 2 if long corridors without overheating mitigation, 1 if corridors with effective overheating mitigation, 0 if very short/no internal corridors, or low temperature distribution PLUS Score 3 if poorly insulated store, 1 if well insulated store, and 0 if no store PLUS Score 1 if poorly insulated distribution (incl. HIU), 0 if insulated distribution (incl. HIU) PLUS Score 1 if poor controls, 0 if good controls.	up to 7		
	Individual heating & hot water systems: Score 3 for poorly insulated store, 1 for well insulated store, and 0 for no store PLUS Score 1 for poorly insulated / long distribution, 0 for insulated / efficient distribution PLUS Score 1 for poor controls, 0 for good controls.	up to 5	2	2

scoring note: communal heating, limited control, no store in flat. Distribution unknown, unlikely to be well insulated. Very limited corridors: mostly vertical distribution. Unknown corridor ventilation, so could be scored more cautiously with an additional risk point, but in practice no overheating has been observed in the common areas so no risk point associated with it in the score.

PAGE 2

SCORING SCALE
Unkno wn Known Occ.

SCORING SCALE
Unkno wn Known Occ.

Solar heat gains and shading

#13 What is the solar-exposed glazing ratio for the dwellings? The scoring considers glazing on solar-exposed areas i.e. orientations facing east, south, west, and anything in between, as well as horizontal glazing and highly glazed features such as conservatories. Wherever possible it is also useful to consider the proportion of glazing to floor area. Additional risk points are recommended if the glazing offers particularly low solar protection, taken here for glazing g-values of 0.75 or above. This is likely only to apply to original clear single glazing. <i>See guidance for details and illustrations.</i>	Solar exposed glazing-to-facade >65%. If solar-exposed glazing areas are less than 18% of floor area, the number of points may be reduced, but should be at least 14 points. Solar exposed glazing-to-facade >50%. If solar-exposed glazing areas are less than 14% of floor area, the number of points may be reduced, but should be at least 8 points.	24 (+4 if high g-value)		
	Solar exposed glazing-to-facade >35%. Solar exposed glazing-to-facade < 35%, BUT glazing-to-floor > 10%.	14 (+2 if high g-value)	14	14
	Solar exposed glazing-to-facade < 35%, BUT glazing-to-floor > 10%.	8 (+1 if high g-value)		
	Horizontal glazing, rooflight: score 3 per rooflight (typical window size i.e. approx 1-2m ²). Large ones should be attributed more points, as if there were several.	4		

scoring note: quite highly glazed on south facade, just around 65%, but other facade is north, and it is a large flat: south glazing represents just 18% floor area; this is scored here "optimistically", not full 24 points

#11 Do dwellings have high exposed thermal mass AND a means for secure and quiet night ventilation? This should apply to at least the bedrooms and main living room. Score with caution, as it relies on occupants awareness and behaviour.	Yes	2	0	0
	No			

scoring note: this is scored cautiously, as ceilings and some walls are plastered, but several walls are exposed concrete and could possibly justify scoring for high thermal mass

#12 Do floor to ceiling heights allow ceiling fans, now or in the future? This should be scored if it covers at least the bedrooms and main living room. Score with caution, as fans rely on occupants awareness and behaviour.	>2.8m, and fans installed and likely to be used	4	0	0
	>2.8m, fans not installed	2		

#14 Is there useful external shading or other protection from solar gains through glazing? This considers shading to solar exposed (east, south, west) glazing, and the scoring depends on glazing proportions, as per #13. Shading may include dedicated devices, balconies, facade articulation etc. See guidance on "full" and "part". While movable shading in general offers a number of benefits for occupants, it should be scored with caution as it relies on occupants awareness of the feature, and their behaviour. Solar control glass or solar film, and internal blinds, can also help reduce heat gains, but they potentially have a number of drawbacks such as affecting light transmittance or air flow (see guidance for details). They should therefore be used with caution where other options are limited, not as primary solar gains mitigation strategy. In addition, it is recommended NOT to take their mitigation point benefits if those of external shading are already accounted for.	External shading:	Full shade	Part shade		
	Glazing-to-facade >65%.	12	6		
	Glazing-to-facade >50%.	8	4	8	8
	Glazing-to-facade >35%.	4	2		
	Glazing-to-facade < 35% BUT glazing-to-floor > 10%.	2	1		
	On rooflights (per rooflight scored under #11)	2x	1x		
	On highly glazed features e.g. conservatories (top & sides)	8	4		
	Solar film / Low g-value (below 0.5) / Internal blinds:				
	Glazing-to-facade >65%.	6			
	Glazing-to-facade >50%.	4			

scoring note: deep balconies + external movable shutters on all solar-exposed areas. There is also extensive shading from the West, from the adjacent building. Also internal light curtains, but not scored since points are already taken for external shading.

Infiltration, ventilation and effectiveness of openings

#15 What is the aspect of the dwellings? Dual aspect dwellings make effective ventilation easier and more likely.	Single aspect	6		
	Corner aspect, or dual aspect which is deep or with convoluted air path	3	3	0
	Dual aspect	0		

scoring note: the flat is dual aspect with deep and with a convoluted air path, so the Unknown Occupancy scoring assumes 3, conservatively. The scoring for Known Occupancy is as a dual aspect, as in practice the occupant actively manages air flow and strong cross-ventilation has been observed on a regular basis.

#16 What are the infiltration, background and purge ventilation provisions? This assesses the contribution of infiltration and minimum purge and background ventilation to overheating risk - see guidance for details and illustrations. This should be assessed whether or not, for Building Regulations compliance, Part F requirements apply to the project. "High leak features" include fireplaces, suspended uninsulated timber floors, cat flap, unsealed letter box through door, no or poor sealing around doors and windows. ** IMPORTANT NOTE: where ventilation is assessed NOT to meet Part F provisions, action is recommended for air quality purposes, whether or not it is required by Building Regulations and regardless of this overheating risk assessment.	Purge requirements are not met, in at least 1 habitable room **	8	0	0
	Purge requirements are met in all habitable rooms	0		
	Very leaky building e.g. at least 3 "high leak features" If test available: >12 m3/m2/hr at 50Pa	0		
	Average or very airtight building, but with suitable background ventilation provision (natural or mechanical), at least equivalent to Part F requirements.	0		
	Average airtightness, WITHOUT suitable background ventilation provision meeting Part F requirements **	1	1	0
	Very airtight building, WITHOUT suitable background ventilation provision meeting Part F requirements. ** This would apply to an exemplar retrofit e.g. Enerphit If test available: below 3m3/m2/hr at 50Pa	2		
Mechanical Ventilation with Heat Recovery and no / ineffective summer bypass	4	0	0	

scoring note: the flat is naturally ventilated. Built in the 1960s, assumed of average airtightness. Windows do not have trickle vents, so this is scored accordingly in the Unknown Occupancy case, but in the Known Occupancy case no risk points are scored as the occupant is known to regularly ventilate every room.

Energy Efficiency Characteristics

#18 Wall insulation	Un-insulated, or likely to be poor / partial	0		
	External Wall Insulation	0	1	1
	Internal or Cavity Wall Insulation.	1		

#19 Roof and loft insulation Roofs can be a significant source of heat gains to top floor dwellings and rooms, and adding insulation can help reduce these. Coverings such as bitumen and lead can get very hot and exacerbate risk, particularly if the roof is poorly insulated.	Houses, bungalows, top floor flats: No or minimal (<50mm) insulation: 2 points PLUS 1 point if roof covering likely to get hot	2 or 3		
	Houses, bungalows, top floor flats: Some insulation (>100mm): 1 point PLUS 1 point if roof covering likely to get hot	1 or 2	3	3
	Houses, bungalows, top floor flats: New build levels of insulation e.g. new loft roof, exemplar retrofit.	0		
	All flats except top floor flats			

scoring note: this is a top floor flat. A large part of the roof is dark covered (as seen from Google); insulation levels are unknown - could be better standard as recently repaired, but scored here conservatively

#20 Windows This considers window U-value. Solar control properties of glazing are considered under #13 and #14.	Single glazed	0		
	Existing double glazed, or single + secondary	2	3	3
	Similar to new build standards	3		

scoring note: the occupant recently had all windows replaced to new built standards

#17 Do windows and openings support effective ventilation? Larger, effective and secure openings help dissipate heat - see guidance for details and illustrations. This is scored in a similar way as #16 by reference to Part F requirements for purge ventilation, whether or not they apply from a regulatory perspective. See guidance for details on schemes in northern England, Scotland and Northern Ireland, where potentially additional mitigation points may be scored for night-time ventilation.		= Part F purge provision	Part F purge + 50%	Part F purge + 100%		
	Single aspect		6	8		
	Corner aspect	minimum required - see #16	5	7	7	6
	Dual aspect		4	6		

scoring note: change from Unknown to Known Occupancy scores, to reflect scoring under #15

#21 Ground floor insulation Ground temperature is relatively constant throughout the year, and this can provide beneficial cooling in the summer, particularly in the case of suspended floors.	Houses, bungalows, ground floor flats: Un-insulated suspended floor, ventilated	2		
	Houses, bungalows, ground floor flats: Un-insulated slab, or minimal insulation	1	0	0
	Houses, bungalows, ground floor flats: Insulated slab, or insulated suspended floor. All upper floor flats.	0		

scoring note: top floor flat, so scored 0 regardless of GF insulation

EARLY STAGE OVERHEATING TOOL - RETROFIT and existing homes

WORKED EXAMPLE: Existing flat in Paris, with enclosed glazed balcony

Overview: upper floor 1960s flat, corner aspect, South East to South West, with highly glazed living room and reasonable glazing proportions in the other rooms. All rooms have windows with wide openings and large "trickle" vents which are a significant leak feature. All windows have external shutters, which are used by the occupant with windows left open for air flow. The living room has a large balcony enclosed by frosted & tinted glazing (added by previous owners, not the original design); while some of the vertical panes on this balcony open, the top and sides are fixed (see pic). The flat has 2 bedrooms and is occupied by one adult.

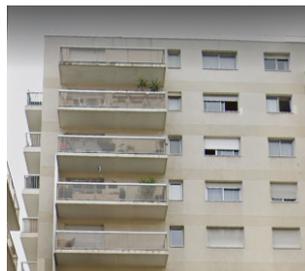
Pre-retrofit: with glazing enclosure on balcony i.e. as currently experienced

Post-retrofit: without glazing enclosure on balcony (speculative retrofit measure)

GHA score: 34 points as existing i.e. "high" risk. 22 points without enclosed balcony i.e. a low "medium" risk

Comparison with modelling: n/a

Comparison with in-use feedback: in practice the living room becomes very hot in the summer, so this matches the GHA assessment. This is probably largely due to the glazed semi-enclosed balcony: the air temperature easily reaches the 30s mid-morning, creating a hot zone surrounding the room; the semi-enclosure also impedes air flow into the flat. The tool suggests that the overheating issue would be resolved if the glazing enclosure was omitted (as per original design of the apartment block).



HIGH RISK 32 and over	MEDIUM RISK 22-31	LOW RISK 21 and below
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TOTAL SCORE	34	22
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Sum of contributing factors:	52	38	Sum of mitigating factors:	18	16
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KEY FACTORS INCREASING THE LIKELIHOOD OF OVERHEATING	SCORING SCALE	Existing	Without enclosed balcony	KEY FACTORS REDUCING THE LIKELIHOOD OF OVERHEATING	SCORING SCALE	Existing	Without enclosed balcony
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PAGE 1

Regional and local context

#1 Where is the scheme in the UK? <i>See guidance for map</i>	London and South East	8	11
	Northern England, Scotland and Northern Ireland	0	
	Rest of England and Wales	4	
	Scoring note: score adjusted to roughly reflect Paris location		

#2 Is the site likely to see an Urban Heat Island effect? <i>See guidance for details</i>	Central / "high heat risk" London	6	6
	Outer / "lower heat risk" London, Birmingham, Manchester	4	
	Other cities, towns and dense sub-urban	2	

scoring note: in inner Paris, so scored for similar UHI as inner London

Site characteristics

#4 Does the site have barriers to windows opening? - Noise / acoustic risks: see guidance for details - Poor air quality / smells e.g. near factory, car park or very busy road - Security risks / crime - Adjacent to heat rejection plant - Occupants unlikely to operate windows often enough to purge heat e.g. in weak physical condition, with reduced ability, or low sensitivity / awareness of need	Day time: significant barriers on all or the large majority of windows and openings	16	0	0
	Day time: constraints on around half of the windows and openings	8		
	Day time: some constraints, but not on the majority of windows and openings	4		
	Scoring note: the flat is on high level floor and at very low risk of intrusion at night; quiet site.			
#5 Are immediate surrounding surfaces in majority pale in colour, or blue/green? Consider horizontal and vertical surfaces within 10m of the scheme.	Yes, the large majority of surfaces	2	1	1
	Yes, approximately half of the surfaces.	1		
	Scoring note: pale stone facade; some gardens surrounding the building, but not extensive			
#6 Are there existing tall trees or buildings that shade solar-exposed glazed areas? Really significant shading from trees and surroundings may be scored under #16, as external shading, but with caution e.g. deciduous trees in mid-season offer little protection.	Yes, to all or a majority of solar-exposed areas	2	0	0
	Yes, but only to some of the solar-exposed areas.	1		
	Scoring note: scored cautiously, as in fact not far from over 50% green / blue			
#7 Are the homes occupied for long hours or over-occupied, or likely to be? <i>Single-room homes should in general be treated as one-bedroom dwellings, but users may wish to take a more cautious approach for very small homes, and score for "over-occupancy" if 2 people occupy them.</i>	Long occupancy hours with more than one adult: score 3 per adult, over the first adult e.g. score 0 for 1 long occupancy adult, 3 for 2 long occupancy adults etc	3x	0	0
	High occupancy density i.e. more than 2 people per bedroom: score 3 per occupant over 2-per-bedroom total.	3x	0	0

Occupancy characteristics

#8 Are the homes under-occupied, or likely to be? "Under occupancy" is taken here as less than 1 person per bedroom, based on total number of occupants and bedrooms - whether or not occupants share a bedroom, flat; 4 for 2 occupants in a 4-bed bedrooms are used as offices etc.	Low occupancy density: score 2 per occupant under the total number of bedrooms. e.g. score 0 for 2 occupants in a 2-bed flat; 2 for 1 occupant in a 2-bed flat; 4 for 2 occupants in a 4-bed house	2x	2	2
	Scoring note: 1 occupant, 2 bedrooms			

Scheme characteristics and dwelling design

#9 Are the dwellings flats, or another higher-risk typology? Flats and bungalows often combine risk factors such as dwelling size and heat gains from surrounding areas or the roof.	Flats	6		
	Bungalows	4		
	Mid-terrace, end terrace	1	6	6
	Detached or semi-detached house	0		

#10 Does the heating system create a risk of high internal heat gains? Community / district heating can create a risk due to hot pipework operating during the summer, especially if it runs across internal areas (e.g. corridors), leading to heat gains and higher temperatures in these areas and ultimately into adjacent dwellings. Individual heating systems can create a risk too, for example if they are poorly controlled, or if there is a hot water store with poor levels of insulation. The scoring should consider both space heating and DHW provision. <i>See guidance for more detail e.g. on electric heating systems.</i>	Communal / district heating: <u>Scoring route 1: not much information on the scheme / early design stage:</u> Score 7 for scheme details unknown or unlikely to be best practice OR Score 2 for best practice e.g. following CIBSE CP1 2020 "Best Practice", or ambient loop, and no store in apartments. <u>Scoring route 2: information on the scheme is available:</u> Score 2 if long corridors without overheating mitigation, 1 if corridors with effective overheating mitigation, 0 if very short/no internal corridors, or low temperature distribution PLUS Score 3 if poorly insulated store, 1 if well insulated store, and 0 if no store PLUS Score 1 if poorly insulated distribution (incl. HIU), 0 if insulated distribution (incl. HIU) PLUS Score 1 if poor controls, 0 if good controls.	up to 7	0	0
	Individual heating & hot water systems: Score 3 for poorly insulated store, 1 for well insulated store, and 0 for no store PLUS Score 1 for poorly insulated / long distribution, 0 for insulated / efficient distribution PLUS Score 1 for poor controls, 0 for good controls.	up to 5		

scoring note: instantaneous electric heating, good control, no store.

#11 Do dwellings have high exposed thermal mass AND a means for secure and quiet night ventilation? This should apply to at least the bedrooms and main living room. Score with caution, as it relies on occupants awareness and behaviour.	Yes	2	2	2

scoring note: some concrete walls + stone floors, observed to significantly cool at night, and to remain cool for long periods in the daytime

#12 Do floor to ceiling heights allow ceiling fans, now or in the future? This should be scored if it covers at least the bedrooms and main living room. Score with caution, as fans rely on occupants awareness and behaviour.	>2.8m, and fans installed and likely to be used	4	0	0
	>2.8m, fans not installed	2		

PAGE 2

SCORING SCALE

Unkno wn	Known Occ.
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SCORING SCALE

Unkno wn	Known Occ.
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Solar heat gains and shading

#13 What is the solar-exposed glazing ratio for the dwellings? The scoring considers glazing on solar-exposed areas i.e. orientations facing east, south, west, and anything in between, as well as horizontal glazing and highly glazed features such as conservatories. Wherever possible it is also useful to consider the proportion of glazing to floor area. Additional risk points are recommended if the glazing offers particularly low solar protection, taken here for glazing g-values of 0.75 or above. This is likely only to apply to original clear single glazing. <i>See guidance for details and illustrations.</i>	Solar exposed glazing-to-facade >65%. If solar-exposed glazing areas are less than 18% of floor area, the number of points may be reduced, but should be at least 14 points. Solar exposed glazing-to-facade >50%. If solar-exposed glazing areas are less than 14% of floor area, the number of points may be reduced, but should be at least 8 points.	24 (+4 if high g-value)		
	Solar exposed glazing-to-facade >35%. SUN BUT glazing-to-floor > 10%.	14 (+2 if high g-value)	8	8
	Solar exposed glazing-to-facade >35%. SUN BUT glazing-to-floor > 10%.	8 (+1 if high g-value)		
	Solar exposed glazing-to-facade < 35%, BUT glazing-to-floor > 10%.	4		
	Horizontal glazing, rooflight: score 3 per rooflight (typical window size i.e. approx 1-2m ²). Large ones should be attributed more points, as if there were several.	3x		

scoring note: corner flat with south-east to south-west elevations, around 50% of facade is glazed, but not high in relation to floor area. The original balcony on one of the elevations has been fully enclosed in glazing. Post-retrofit score looks at what would have happened if this glazed enclosure was removed, reverting to original open air balcony

#14 Is there useful external shading or other protection from solar gains through glazing? This considers shading to solar exposed (east, south, west) glazing, and the scoring depends on glazing proportions, as per #13. Shading may include dedicated devices, balconies, facade articulation etc. See guidance on "full" and "part". While movable shading in general offers a number of benefits for occupants, it should be scored with caution as it relies on occupants awareness of the feature, and their behaviour. Solar control glass or solar film, and internal blinds, can also help reduce heat gains, but they potentially have a number of drawbacks such as affecting light transmittance or air flow (see guidance for details). They should therefore be used with caution where other options are limited, not as primary solar gains mitigation strategy. In addition, it is recommended NOT to take their mitigation point benefits if those of external shading are already accounted for.	External shading:	Full shade	Part shade		
	Glazing-to-facade >65%.	12	6		
	Glazing-to-facade >50%.	8	4		
	Glazing-to-facade >35%.	4	2	4	4
	Glazing-to-facade < 35% BUT glazing-to-floor > 10%.	2	1		
	On rooflights (per rooflight scored under #11)	2x	1x		
	On highly glazed features e.g. conservatories (top & sides)	8	4	0	0
	Solar film / Low g-value (below 0.5) / Internal shading:				
	Glazing-to-facade >65%.	6			
	Glazing-to-facade >50%.	4			
	Glazing-to-facade >35%.	2			
	Glazing-to-facade < 35% BUT glazing-to-floor > 10%.	1			

scoring note: there is some shading on some of the glazed areas, through balconies above, and there are external rolling blinds on all glazed areas. The glazing enclosing the balcony is fritted. The occupant also has light internal curtains but this is not accounted for since the benefits of external shading are already accounted for.

Infiltration, ventilation and effectiveness of openings

#15 What is the aspect of the dwellings? Dual aspect dwellings make effective ventilation easier and more likely.	Single aspect	6		
	Corner aspect, or dual aspect which is deep or with convoluted air path	3	3	3
	Dual aspect	0		

scoring note: corner flat

#16 What are the infiltration, background and purge ventilation provisions? This assesses the contribution of infiltration and minimum purge and background ventilation to overheating risk - see guidance for details and illustrations. This should be assessed whether or not, for Building Regulations compliance, Part F requirements apply to the project. "High leak features" include fireplaces, suspended uninsulated timber floors, cat flap, unsealed letter box through door, no or poor sealing around doors and windows. ** IMPORTANT NOTE: where ventilation is assessed NOT to meet Part F provisions, action is recommended for air quality purposes, whether or not it is required by Building Regulations and regardless of this overheating risk assessment.	Purge requirements are not met, in at least 1 habitable room **	8	0	0
	Purge requirements are met in all habitable rooms	0		
	Very leaky building e.g. at least 3 "high leak features" If test available: >12 m3/m2/hr at 50Pa	0		
	Average or very airtight building, but with suitable background ventilation provision (natural or mechanical), at least equivalent to Part F requirements.	0		
	Average airtightness, WITHOUT suitable background ventilation provision meeting Part F requirements **	1	1	1
	If test available: 5-10 m3/m2/hr at 50Pa Very airtight building, WITHOUT suitable background ventilation provision meeting Part F requirements. ** This would apply to an exemplar retrofit e.g. Enerphit If test available: below 3m3/m2/hr at 50Pa Mechanical Ventilation with Heat Recovery and no / ineffective summer bypass	2		
	4			

scoring note: the flat is naturally ventilated. Built in the 1960s, assumed of average airtightness. Windows do not have trickle vents.

Energy Efficiency Characteristics

#18 Wall insulation	Un-insulated, or likely to be poor / partial	0		
	External Wall Insulation	0	1	1
	Internal or Cavity Wall Insulation.	1		

#19 Roof and loft insulation Roofs can be a significant source of heat gains to top floor dwellings and rooms, and adding insulation can help reduce these. Coverings such as bitumen and lead can get very hot and exacerbate risk, particularly if the roof is poorly insulated.	Houses, bungalows, top floor flats: No or minimal (<50mm) insulation: 2 points PLUS 1 point if roof covering likely to get hot	2 or 3		
	Houses, bungalows, top floor flats: Some insulation (>100mm): 1 point PLUS 1 point if roof covering likely to get hot	1 or 2	0	0
	Houses, bungalows, top floor flats: New build levels of insulation e.g. new loft roof, exemplar retrofit. All flats except top floor flats	0		

scoring note: upper floor flat, not top

#20 Windows This considers window U-value. Solar control properties of glazing are considered under #13 and #14.	Single glazed	0		
	Existing double glazed, or single + secondary	2	2	2
	Similar to new build standards	3		

#17 Do windows and openings support effective ventilation? Larger, effective and secure openings help dissipate heat - see guidance for details and illustrations. This is scored in a similar way as #16 by reference to Part F requirements for purge ventilation, whether or not they apply from a regulatory perspective. See guidance for details on schemes in northern England, Scotland and Northern Ireland, where potentially additional mitigation points may be scored for night-time ventilation.		= Part F purge provision	Part F purge + 50%	Part F purge + 100%		
	Single aspect		6	8		
	Corner aspect	minimum required - see #16	5	7		
	Dual aspect		4	6		

scoring note: pre-retrofit: while openings are very generous, the enclosed balcony affects air flow; this is taken here as a reduction in effective area. Removing the enclosure would result in increased mitigation points.

#21 Ground floor insulation Ground temperature is relatively constant throughout the year, and this can provide beneficial cooling in the summer, particularly in the case of suspended floors.	Houses, bungalows, ground floor flats: Un-insulated suspended floor, ventilated		2		
	Houses, bungalows, ground floor flats: Un-insulated slab, or minimal insulation		1	0	0
	Houses, bungalows, ground floor flats: Insulated slab, or insulated suspended floor. All upper floor flats.		0		

scoring note: upper floor flat

EARLY STAGE OVERHEATING TOOL - RETROFIT (and existing homes)

WORKED EXAMPLE: Deep retrofit, 1950s block of flats, Great Yarmouth

Overview: 1950s block of flats, dual aspect E & W. The site is within a built up area, but in a coastal location. Deep retrofit project. Reasonable proportions of glazing, no external shading. Scored for standard occupancy.

Pre-retrofit: double glazing, assumed some cavity insulation, individual heating system with no store and no insulation on distribution; assumed no change in controls pre & post, assumed poor

Post-retrofit: deep retrofit, Enerphit

GHA score: 16 pre retrofit and 15 post retrofit, i.e. both "low" risk and without any significant change through the retrofit.

Comparison with modelling: PHPP (assuming only small night-time restrictions to window openings i.e. 0.5 ach daytime and 0.1 ach nighttime): 0% overheating

Comparison with in-use feedback: feedback received informally: there does not seem to be an issue with overheating; this would match the GHA assessment.



HIGH RISK 32 and over	MEDIUM RISK 22-31	LOW RISK 21 and below
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TOTAL SCORE	16	15
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Sum of contributing factors:	25	25	Sum of mitigating factors:	9	10
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KEY FACTORS INCREASING THE LIKELIHOOD OF OVERHEATING	SCORING SCALE	PRE-RETROFIT	POST-RETROFIT	KEY FACTORS REDUCING THE LIKELIHOOD OF OVERHEATING	SCORING SCALE	PRE-RETROFIT	POST-RETROFIT
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PAGE 1

Regional and local context

#1 Where is the scheme in the UK? <i>See guidance for map</i>	London and South East	8	4
	Northern England, Scotland and Northern Ireland	0	
	Rest of England and Wales	4	
#2 Is the site likely to see an Urban Heat Island effect? <i>See guidance for details</i>	Central / "high heat risk" London	6	2
	Outer / "lower heat risk" London, Birmingham, Manchester	4	
	Other cities, towns and dense sub-urban	2	

#3 Do the site surroundings feature significant blue/green infrastructure, or is it a coastal location? Proximity to green spaces and large water bodies has beneficial effects on local temperatures. As guidance, score 2 mitigation points for at least 50% of surroundings within a 100m radius to be blue/green, or a site in a coastal area.	Yes	2	2	2
	No	0	0	0

scoring note: coastal location

Site characteristics

#4 Does the site have barriers to windows opening? - Noise / acoustic risks: see guidance for details - Poor air quality / smells e.g. near factory, car park or very busy road - Security risks / crime - Adjacent to heat rejection plant - Occupants unlikely to operate windows often enough to purge heat e.g. in weak physical condition, with reduced ability, or low sensitivity / awareness of need	Day time: significant barriers on all or the large majority of windows and openings	16	0	0
	Day time: constraints on around half of the windows and openings	8		
	Day time: some constraints, but not on the majority of windows and openings	4		
	Night time: significant barriers on all or the large majority of windows and openings	16		
	Night time: bedroom windows are likely to stay closed, but no constraints on most of the other windows / openings	8	4	3
	Night time: some constraints, but not on bedroom windows and not on the majority of windows and openings	4		

#5 Are immediate surrounding surfaces in majority pale in colour, or blue/green? Consider horizontal and vertical surfaces within 10m of the scheme.	Yes, the large majority of surfaces	2	1	2
	Yes, approximately half of the surfaces.	1		

scoring note: pre-retrofit mostly brick walls, post-retrofit mostly light render; front and back lawn pre- and post-retrofit

#6 Are there existing tall trees or buildings that shade solar-exposed glazed areas? Really significant shading from trees and surroundings may be scored under #16, as external shading, but with caution e.g. deciduous trees in mid-season offer little protection.	Yes, to all or a majority of solar-exposed areas	2	0	0
	Yes, but only to some of the solar-exposed areas.	1		

scoring note: this is scored as average for the block, as no significant shading applies to the majority of apartments. The benefits from shading, if present, could be accounted for when scoring for specific apartments.

Occupancy characteristics

#7 Are the homes occupied for long hours or over-occupied, or likely to be? <i>Single-room homes should in general be treated as one-bedroom dwellings, but users may wish to take a more cautious approach for very small homes, and score for "over-occupancy" if 2 people occupy them.</i>	Long occupancy hours with more than one adult: score 3 per adult, over the first adult e.g. score 0 for 1 long occupancy adult, 3 for 2 long occupancy adults etc	3x	0	0
	High occupancy density i.e. more than 2 people per bedroom: score 3 per occupant over 2-per-bedroom total.	3x	0	0

scoring note: scored as "average" occupancy, as not known, but could be scored differently for individual flats where occupancy is known. As social housing, long occupancy hours and high occupancy densities are likely, so this is "optimistic" scoring and higher risk scores should be considered to inform a resilient strategy

#8 Are the homes under-occupied, or likely to be? "Under occupancy" is taken here as less than 1 person per bedroom, based on total number of occupants and bedrooms - whether or not occupants share a bedroom, bedrooms are used as offices etc.	Low occupancy density: score 2 per occupant under the total number of bedrooms. e.g. score 0 for 2 occupants in a 2-bed flat; 2 for 1 occupant in a 2-bed house	2x	0	0

scoring note: scored as "average" occupancy, as not known, but could be scored differently for individual flats where occupancy is known. However, as social housing, under-occupancy may be unlikely and should not be relied upon for a resilient strategy

Scheme characteristics and dwelling design

#9 Are the dwellings flats, or another higher-risk typology? Flats and bungalows often combine risk factors such as dwelling size and heat gains from surrounding areas or the roof.	Flats	6		
	Bungalows	4		
	Mid-terrace, end terrace	1	6	6
	Detached or semi-detached house	0		

#10 Does the heating system create a risk of high internal heat gains? Community / district heating can create a risk due to hot pipework operating during the summer, especially if it runs across internal areas (e.g. corridors), leading to heat gains and higher temperatures in these areas and ultimately into adjacent dwellings. Individual heating systems can create a risk too, for example if they are poorly controlled, or if there is a hot water store with poor levels of insulation. The scoring should consider both space heating and DHW provision. <i>See guidance for more detail e.g. on electric heating systems.</i>	Communal / district heating: <u>Scoring route 1: not much information on the scheme / early design stage:</u> Score 7 for scheme details unknown or unlikely to be best practice OR Score 2 for best practice e.g. following CIBSE CP1 2020 "Best Practice", or ambient loop, and no store in apartments. <u>Scoring route 2: information on the scheme is available:</u> Score 2 if long corridors without overheating mitigation, 1 if corridors with effective overheating mitigation, 0 if very short/no internal corridors, or low temperature distribution PLUS Score 3 if poorly insulated store, 1 if well insulated store, and 0 if no store PLUS Score 1 if poorly insulated distribution (incl. HIU), 0 if insulated distribution (incl. HIU) PLUS Score 1 if poor controls, 0 if good controls.	up to 7		
	Individual heating & hot water systems: Score 3 for poorly insulated store, 1 for well insulated store, and 0 for no store PLUS Score 1 for poorly insulated / long distribution, 0 for insulated / efficient distribution PLUS Score 1 for poor controls, 0 for good controls.	up to 5	2	2

scoring note: cautious scoring assuming no change pre and post as very limited intervention inside the flats: individual heating system with no store, no insulation on distribution, poor controls

#11 Do dwellings have high exposed thermal mass AND a means for secure and quiet night ventilation? This should apply to at least the bedrooms and main living room. Score with caution, as it relies on occupants awareness and behaviour.	Yes	2	2	2

#12 Do floor to ceiling heights allow ceiling fans, now or in the future ? This should be scored if it covers at least the bedrooms and main living room. Score with caution, as fans rely on occupants awareness and behaviour.	>2.8m, and fans installed and likely to be used	4	0	0
	>2.8m, fans not installed	2		

SCORING SCALE PRE-RETRO FIT POST-RETROFIT

SCORING SCALE PRE-RETROFIT POST-RETROFIT

Solar heat gains and shading

#13 What is the solar-exposed glazing ratio for the dwellings? The scoring considers glazing on solar-exposed areas i.e. orientations facing east, south, west, and anything in between, as well as horizontal glazing and highly glazed features such as conservatories. Wherever possible it is also useful to consider the proportion of glazing to floor area. Additional risk points are recommended if the glazing offers particularly low solar protection, taken here for glazing g-values of 0.75 or above. This is likely only to apply to original clear single glazing. <i>See guidance for details and illustrations.</i>	Solar exposed glazing-to-facade >65%. If solar-exposed glazing areas are less than 18% of floor area, the number of points may be reduced, but should be at least 14 points. Solar exposed glazing-to-facade >50%. If solar-exposed glazing areas are less than 14% of floor area, the number of points may be reduced, but should be at least 8 points.	24 (+4 if high g-value) 14 (+2 if high g-value) 8 (+1 if high g-value)	4	4
	Solar exposed glazing-to-facade >35%. Solar exposed glazing-to-facade < 35%, BUT glazing-to-floor > 10%.	4		
	Horizontal glazing, rooflight: score 3 per rooflight (typical window size i.e. approx 1-2m ²). Large ones should be attributed more points, as if there were several.	3x		
	Highly glazed feature e.g. conservatory, enclosed glazed balcony	14 (+2 if high g-value)		

#14 Is there useful external shading or other protection from solar gains through glazing? This considers shading to solar exposed (east, south, west) glazing, and the scoring depends on glazing proportions, as per #13. Shading may include dedicated devices, balconies, facade articulation etc. See guidance on "full" and "part". While movable shading in general offers a number of benefits for occupants, it should be scored with caution as it relies on occupants awareness of the feature, and their behaviour. Solar control glass or solar film, and internal blinds, can also help reduce heat gains, but they potentially have a number of drawbacks such as affecting light transmittance or air flow (see guidance for details). They should therefore be used with caution where other options are limited, not as primary solar gains mitigation strategy. In addition, it is recommended NOT to take their mitigation point benefits if those of external shading are already accounted for.	External shading:	Full shade	Part shade		
	Glazing-to-facade >65%.	12	6		
	Glazing-to-facade >50%.	8	4	0	0
	Glazing-to-facade >35%.	4	2		
	Glazing-to-facade < 35% BUT glazing-to-floor > 10%.	2	1		
	On rooflights (per rooflight scored under #11)	2x	1x		
	On highly glazed features e.g. conservatories (top & sides)	8	4		
	Solar film / Low g-value (below 0.5) / Internal				
	Glazing-to-facade >65%.	6		0	0
	Glazing-to-facade >50%.	4			
Glazing-to-facade >35%.	2				
Glazing-to-facade < 35% BUT glazing-to-floor > 10%.	1				
On rooflights (per rooflight scored under #11)	1x				
On highly glazed features e.g. conservatories (top & sides)	4				

no shading except on limited glazed area, from balcony above, but narrow and horizontal on E/W elevation so limited effect: therefore, not taken any mitigation point. This is cautious scoring for average flat, as individually the residents may have installed internal blinds, which is not accounted for here.

Infiltration, ventilation and effectiveness of openings

#15 What is the aspect of the dwellings? Dual aspect dwellings make effective ventilation easier and more likely.	Single aspect	6		
	Corner aspect, or dual aspect which is deep or with convoluted air path	3	0	0
	Dual aspect	0		

#16 What are the infiltration, background and purge ventilation provisions? This assesses the contribution of infiltration and minimum purge and background ventilation to overheating risk - see guidance for details and illustrations. This should be assessed whether or not, for Building Regulations compliance, Part F requirements apply to the project. "High leak features" include fireplaces, suspended uninsulated timber floors, cat flap, unsealed letter box through door, no or poor sealing around doors and windows. ** IMPORTANT NOTE: where ventilation is assessed NOT to meet Part F provisions, action is recommended for air quality purposes, whether or not it is required by Building Regulations and regardless of this overheating risk assessment.	Purge requirements are not met, in at least 1 habitable room **	8		
	Purge requirements are met in all habitable rooms	0	0	0
	Very leaky building e.g. at least 3 "high leak features" If test available: >12 m3/m2/hr at 50Pa	0		
	Average or very airtight building, but with suitable background ventilation provision (natural or mechanical), at least equivalent to Part F requirements.	0		
	Average airtightness, WITHOUT suitable background ventilation provision meeting Part F requirements ** If test available: 5-10 m3/m2/hr at 50Pa	1	0	0
	Very airtight building, WITHOUT suitable background ventilation provision meeting Part F requirements. ** This would apply to an exemplar retrofit e.g. Enerphit If test available: below 3m3/m2/hr at 50Pa	2		
Mechanical Ventilation with Heat Recovery and no / ineffective summer bypass	4			

scoring note: improvement in airtightness post-retrofit to "exemplar", from "average" pre-retrofit, but no risk point as suitable background ventilation provision

Energy Efficiency Characteristics

#18 Wall insulation	Un-insulated, or likely to be poor / partial	0		
	External Wall Insulation	0	1	1
	Internal or Cavity Wall Insulation.	1		

#19 Roof and loft insulation Roofs can be a significant source of heat gains to top floor dwellings and rooms, and adding insulation can help reduce these. Coverings such as bitumen and lead can get very hot and exacerbate risk, particularly if the roof is poorly insulated.	Houses, bungalows, top floor flats: No or minimal (<50mm) insulation: 2 points PLUS 1 point if roof covering likely to get hot	2 or 3		
	Houses, bungalows, top floor flats: Some insulation (>100mm): 1 point PLUS 1 point if roof covering likely to get hot	1 or 2	0	0
	Houses, bungalows, top floor flats: New build levels of insulation e.g. new loft roof, exemplar retrofit. All flats except top floor flats	0		

#20 Windows This considers window U-value. Solar control properties of glazing are considered under #13 and #14.	Single glazed	0		
	Existing double glazed, or single + secondary	2	2	3
	Similar to new build standards	3		

#17 Do windows and openings support effective ventilation? Larger, effective and secure openings help dissipate heat - see guidance for details and illustrations. This is scored in a similar way as #16 by reference to Part F requirements for purge ventilation, whether or not they apply from a regulatory perspective. See guidance for details on schemes in northern England, Scotland and Northern Ireland, where potentially additional mitigation points may be scored for night-time ventilation.							
	Single aspect						
	Corner aspect						
	Dual aspect						

= Part F purge provision + 50% + Part F purge + 100%

minimum required - see #16

6	8		
5	7	4	4
4	6		

scoring notes: windows are generous and open wide; not measured so scored conservatively as 50% over Part F, but may well be above

#21 Ground floor insulation Ground temperature is relatively constant throughout the year, and this can provide beneficial cooling in the summer, particularly in the case of suspended floors.	Houses, bungalows, ground floor flats: Un-insulated suspended floor, ventilated	2		
	Houses, bungalows, ground floor flats: Un-insulated slab, or minimal insulation	1	0	0
	Houses, bungalows, ground floor flats: Insulated slab, or insulated suspended floor. All upper floor flats.	0		

scoring note: scored here for "average" flat. This should be scored differently for ground floor flats