AVO Assessment Process

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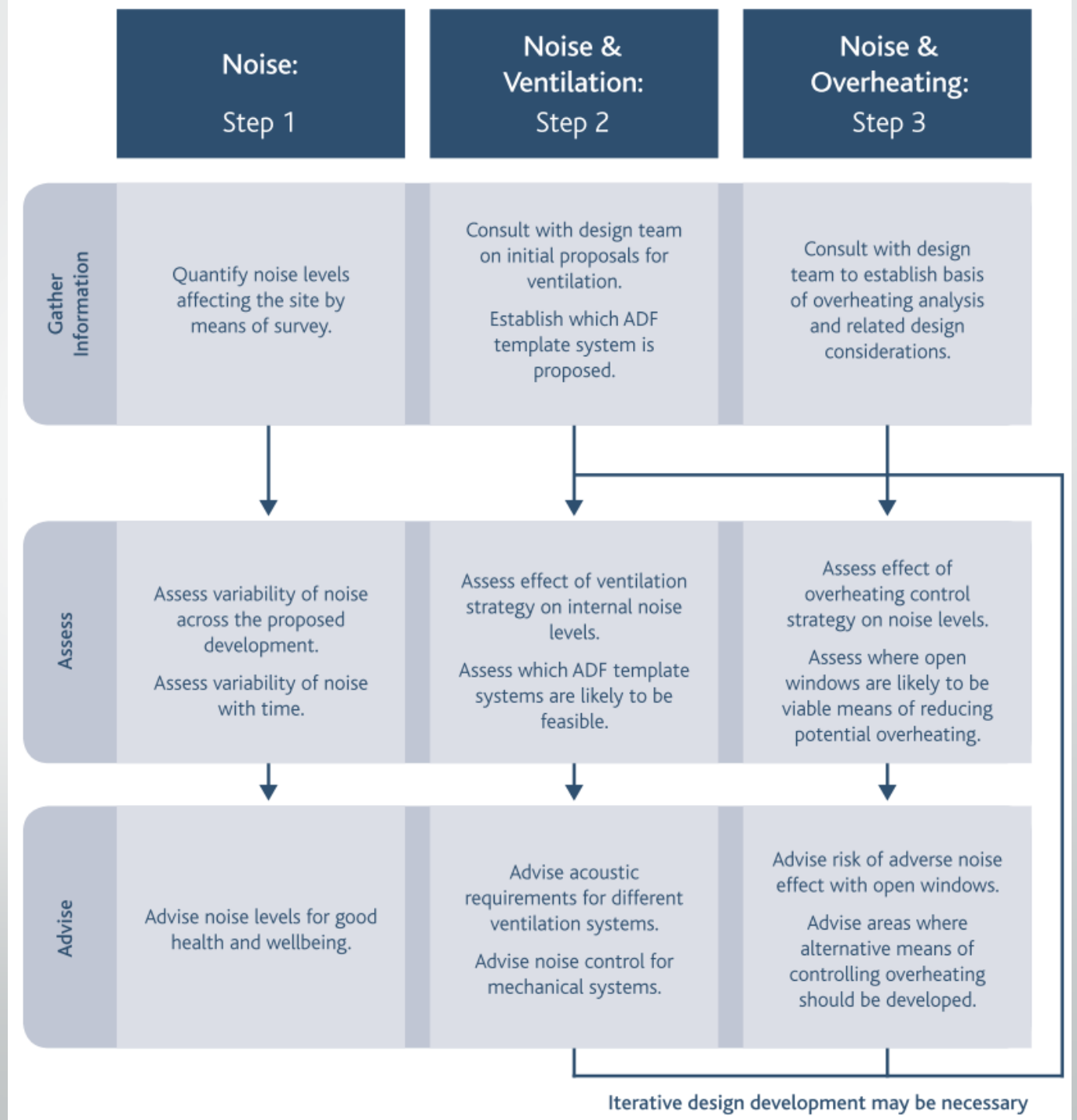
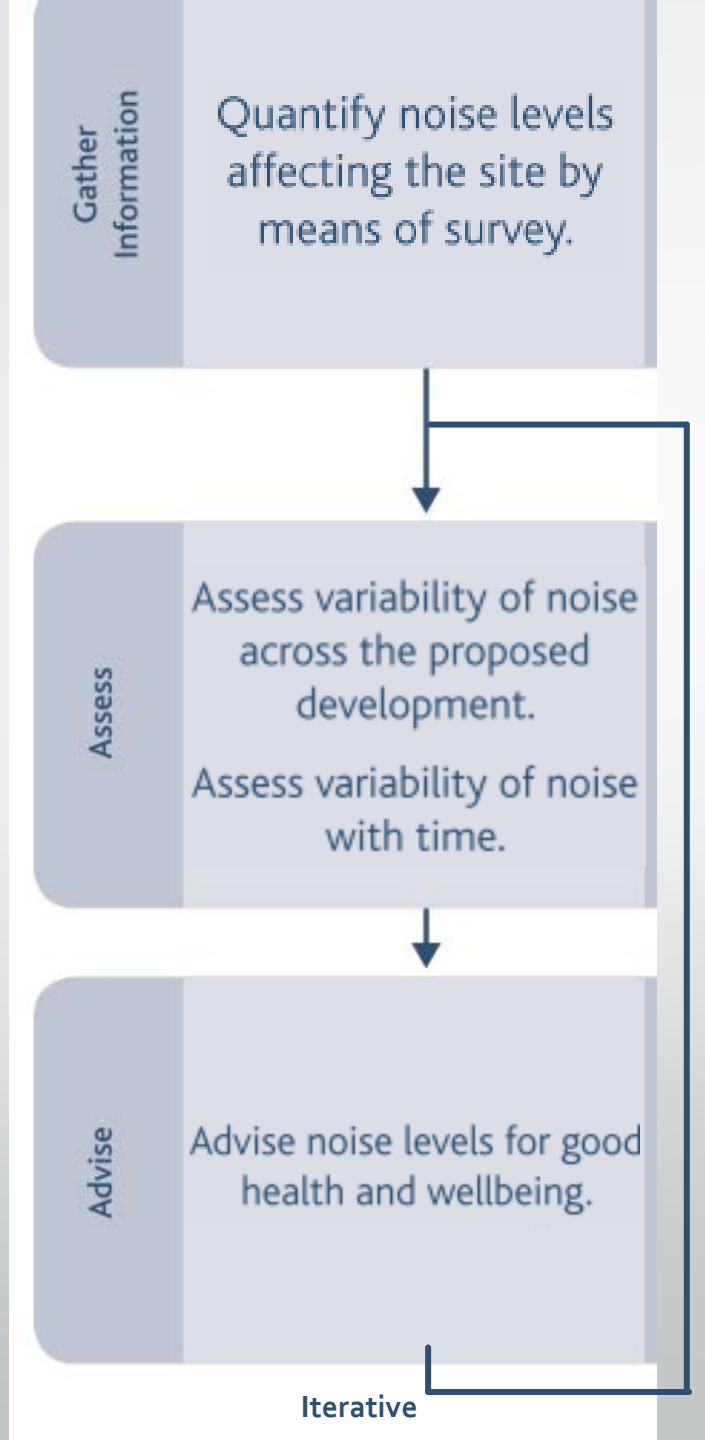
AVO Launch – 30th January 2020

Overview

- Figure B-1
- Three key steps in the AVO assessment.



Step 1
Noise

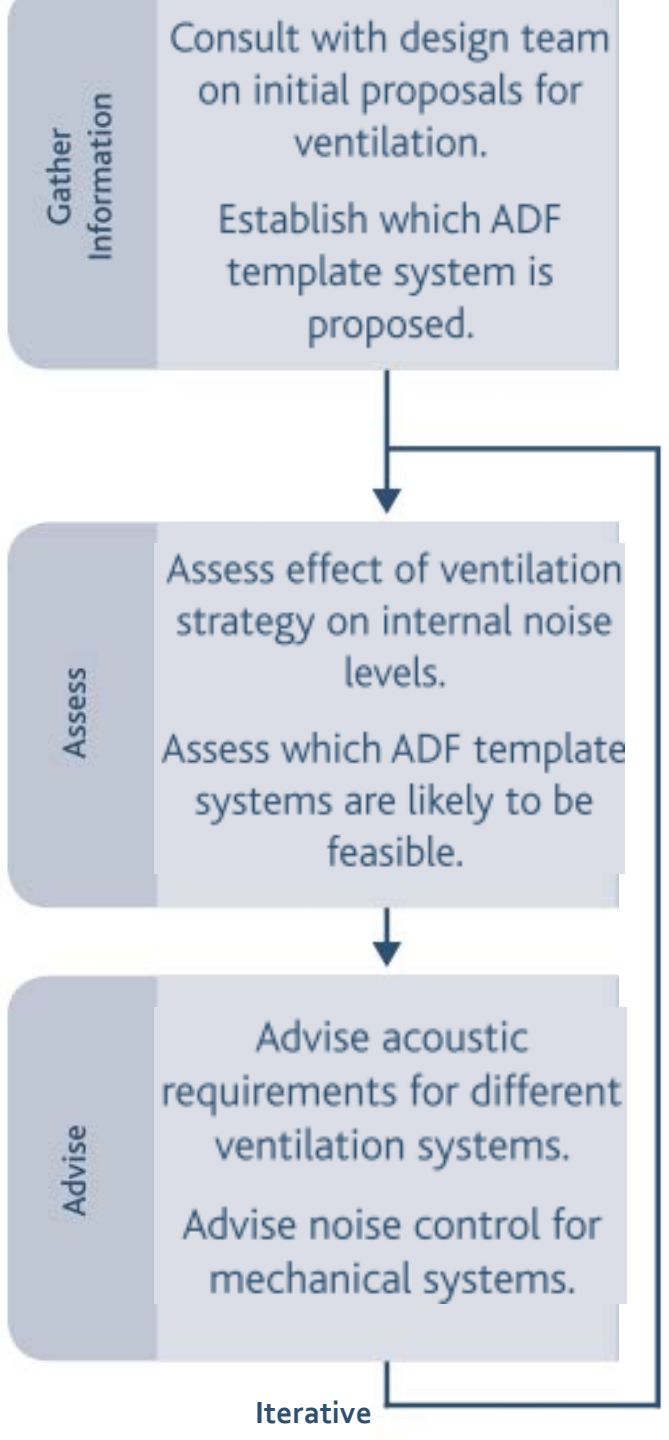


- Daytime LAeq,T
- Night-time LAeq,8hr
- Night-time LAFmax (choose appropriate design value)

- Noise-mapping exercise.
- Effect of proposed building arrangement on exposure of bedrooms and living rooms.

- Follow ProPG GAD process.
- Avoid, reduce, block, layout, façade.

Step 2
Noise and Ventilation

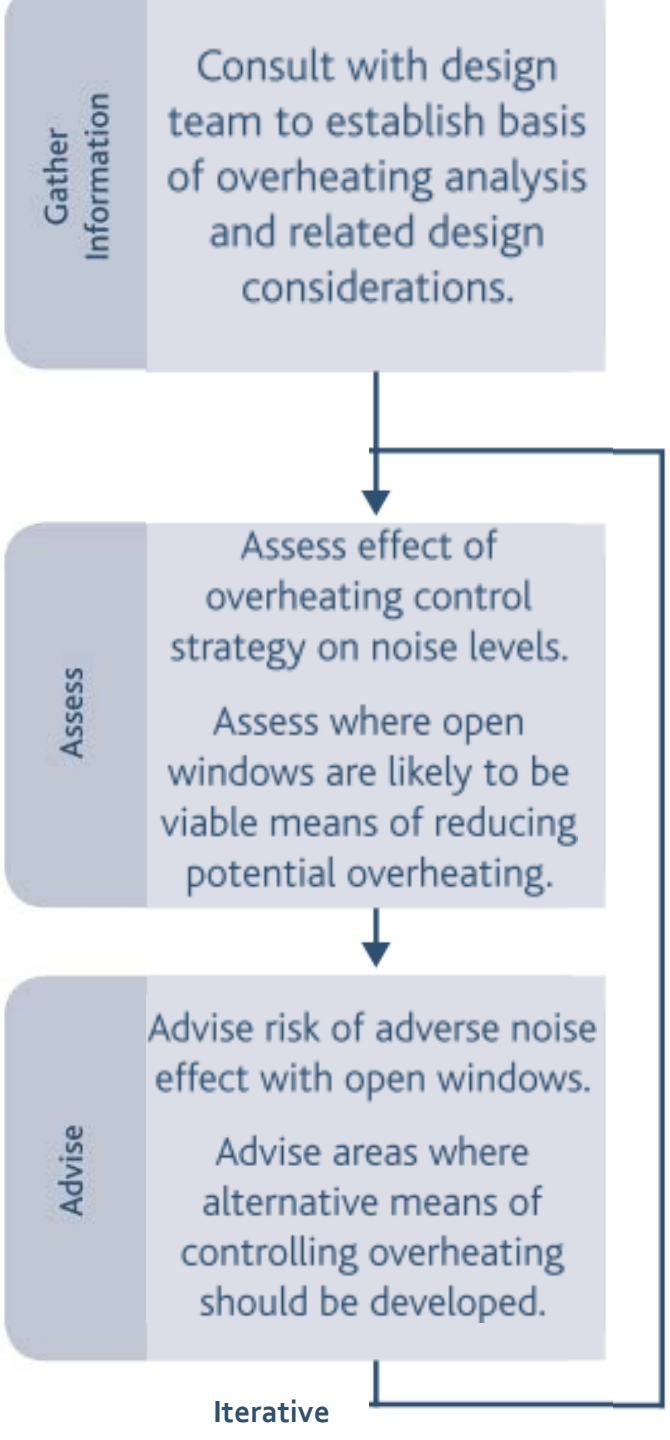


- What is the MEP engineer proposing to do? "Trickle" vents? MEV? MVHR?
- Set out the design targets we are looking to achieve (Tables 3-1 and 3-4)

- Which Part F ventilation systems would be appropriate based on the noise levels?
- Reference Table B-3
- Not the acousticians role to design ventilation system!

- Is enhanced sound insulation glazing required.
- If there are "trickle" vents, do they need to be acoustically rated?

Step 3
Noise and Overheating



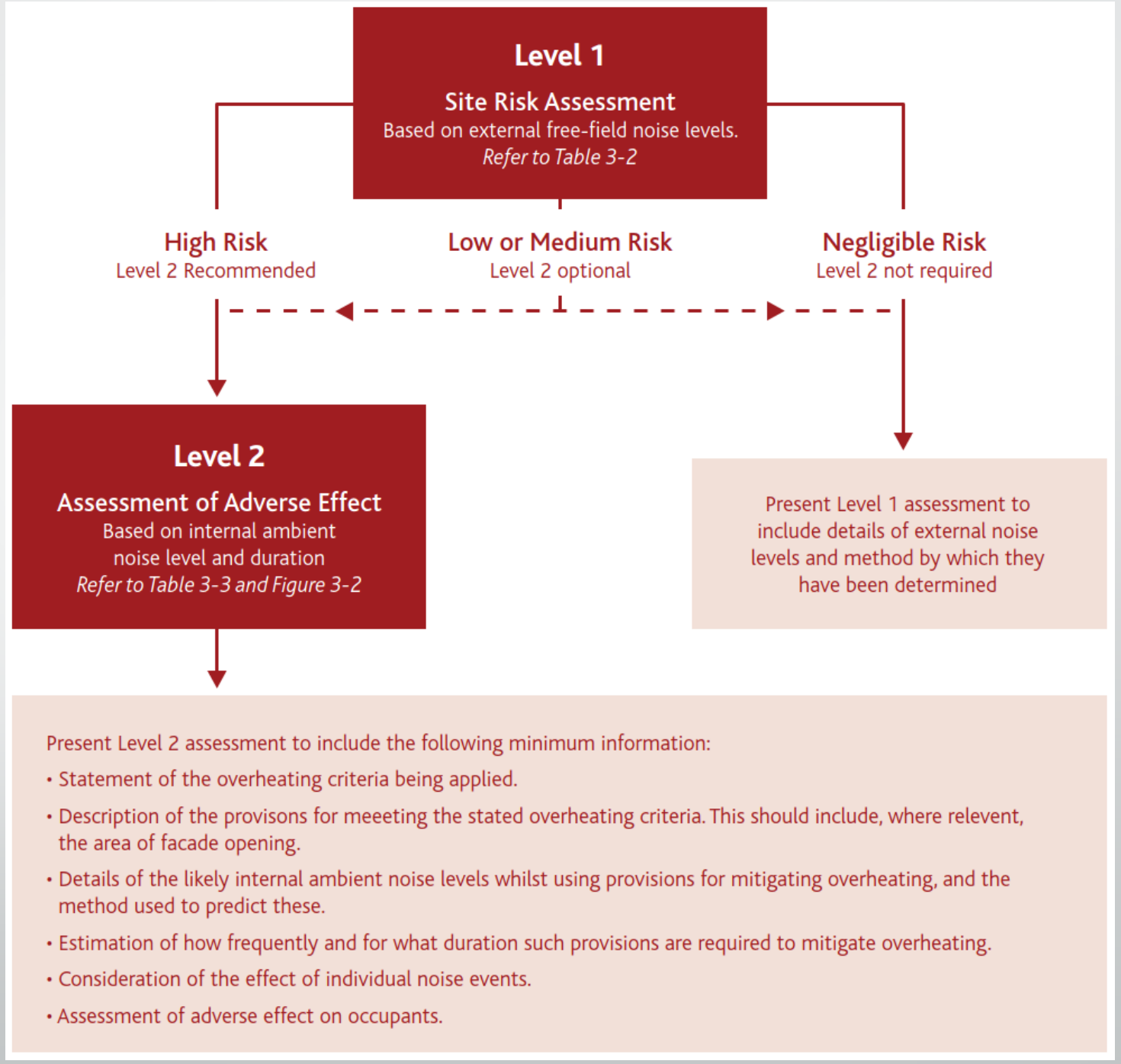
- Which overheating criterion – if any?
- What is the proposed cooling strategy. Refer to Table B-4 for common cooling strategies. *Default = opening windows*.
- What is the area of the façade opening? (Table A-2). *Default = 2% floor area*.

- If opening windows are the proposed cooling solution, use Figure 3-1 (i.e. Level 1 Assessment)
- Give an indication as to whether opening windows are a viable solution.

- Where opening windows are not likely to be appropriate, advise alternative solutions.
- Prioritise passive solutions where appropriate. Figure B-5.
- See Figure B-4 for mechanical solutions.
- Not the acousticians role to design cooling!

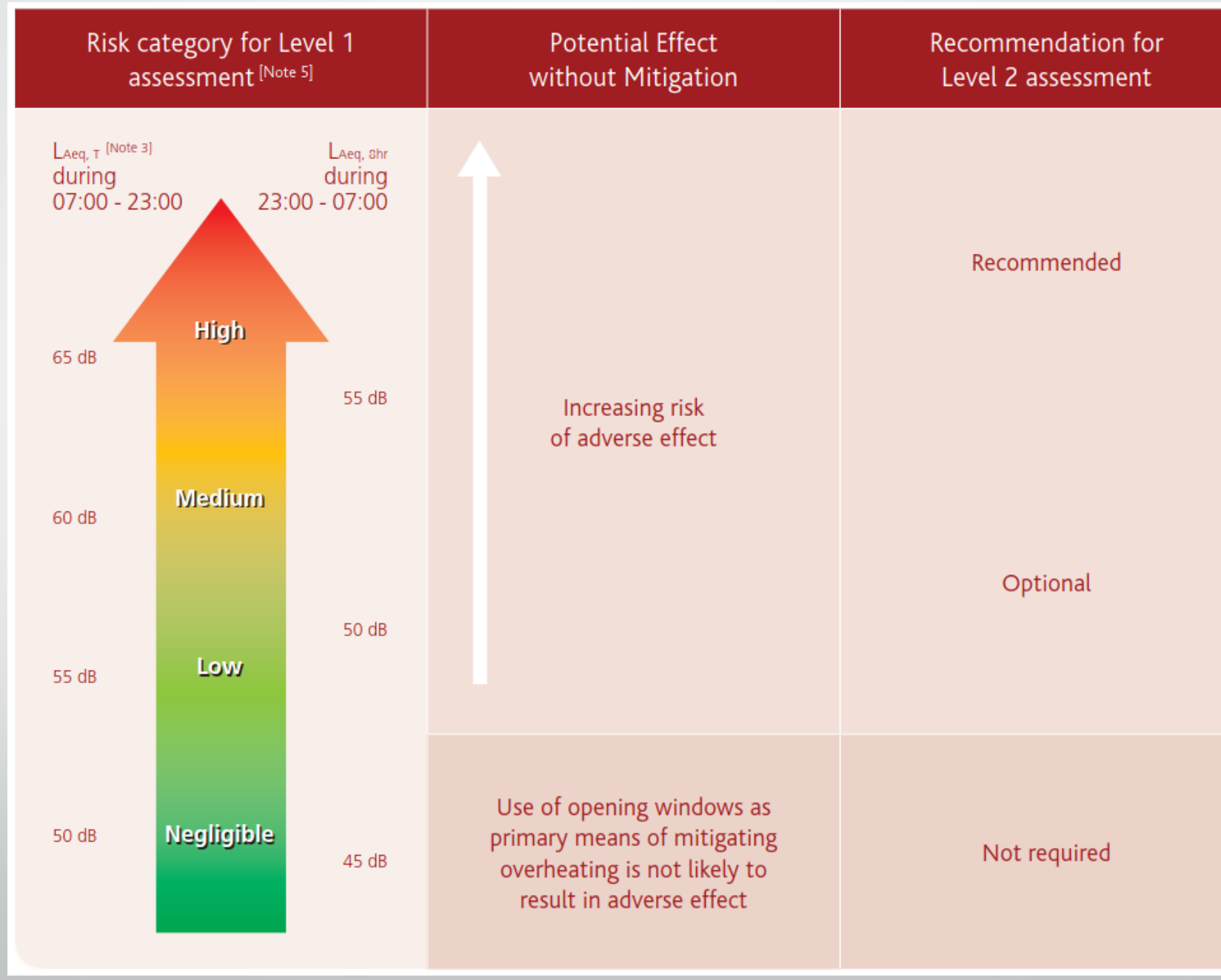
Step 3
Noise and Overheating

- Figure 3-1.
- Two level assessment procedure.
- Assessment detail proportionate to the risk.



Step 3
Noise and Overheating

- Level 1 Assessment
- External level
- Where 78dB L_{AFmax} is normally exceeded: Level 2 is recommended.



Step 3
Noise and Overheating

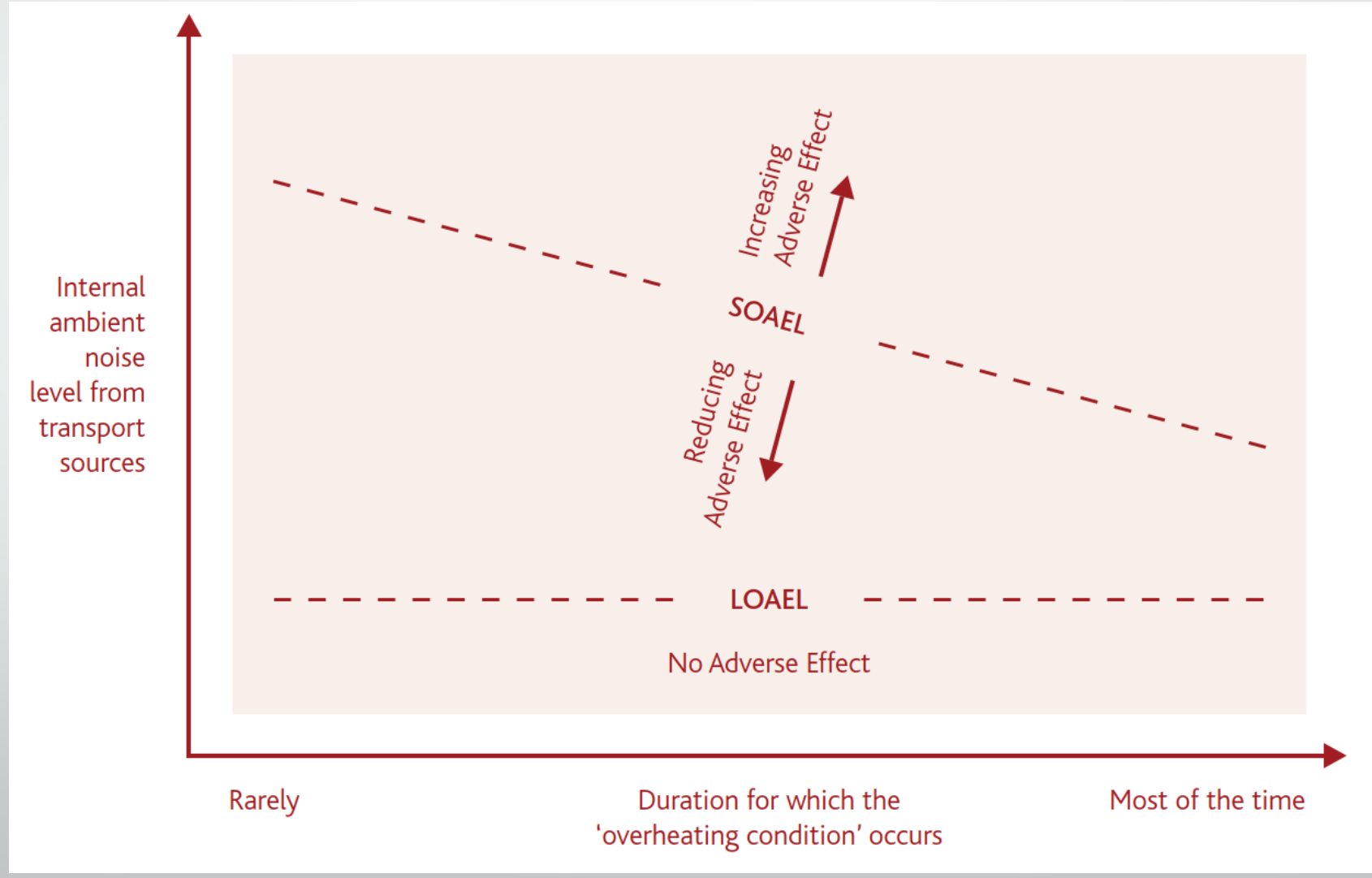
- Level 2 Assessment
- Internal level
- Doesn't assume an open window (13dB).
- Assess based on actual solution.

Internal ambient noise level [Note 2]			Examples of Outcomes [Note 5]	
$L_{Aeq,T}$ [Note 3] during 07:00 – 23:00 [Note 6]	$L_{Aeq,8h}$ during 23:00 – 07:00	Individual noise events during 23:00 – 07:00 [Note 4]		
> 50 dB	> 42 dB	Normally exceeds 65 dB $L_{AF,max}$	Noise causes a material change in behaviour e.g. having to keep windows closed most of the time	Avoiding certain activities during periods of intrusion. Having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.
			Increasing likelihood of impact on reliable speech communication during the day or sleep disturbance at night	At higher noise levels, more significant behavioural change is expected and may only be considered suitable if occurring for limited periods. As noise levels increase, small behaviour changes are expected e.g. turning up the volume on the television; speaking a little more loudly; having to close windows for certain activities, for example ones which require a high level of concentration. Potential for some reported sleep disturbance. Affects the acoustic environment inside the dwelling such that there is a perceived change in quality of life. At lower noise levels, limited behavioural change is expected unless conditions are prevalent for most of the time. [Note 8]
≤ 35 dB	≤ 30 dB	Do not normally exceed $L_{AF,max}$ 45 dB more than 10 times a night	Noise can be heard, but does not cause any change in behaviour	Noise can be heard, but does not cause any change in behaviour, attitude, or other physiological response[Note 9]. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.

Step 3
Noise and Overheating

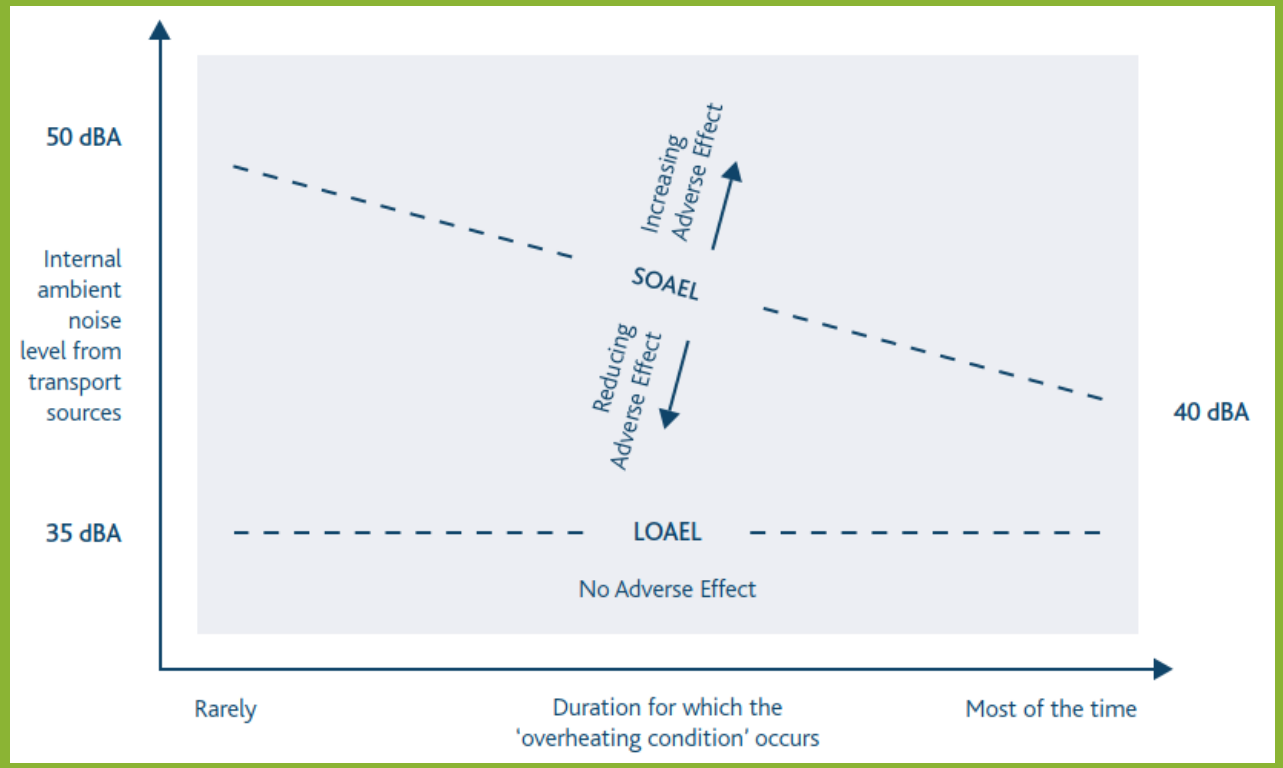
- "Duration"
- Figure 3-2 "AVO Diagram"
- Qualitative
- How do you scale axes?

The potential for adverse effect will also depend on how frequently and for what duration the overheating condition occurs. Refer to Figure 3-2.

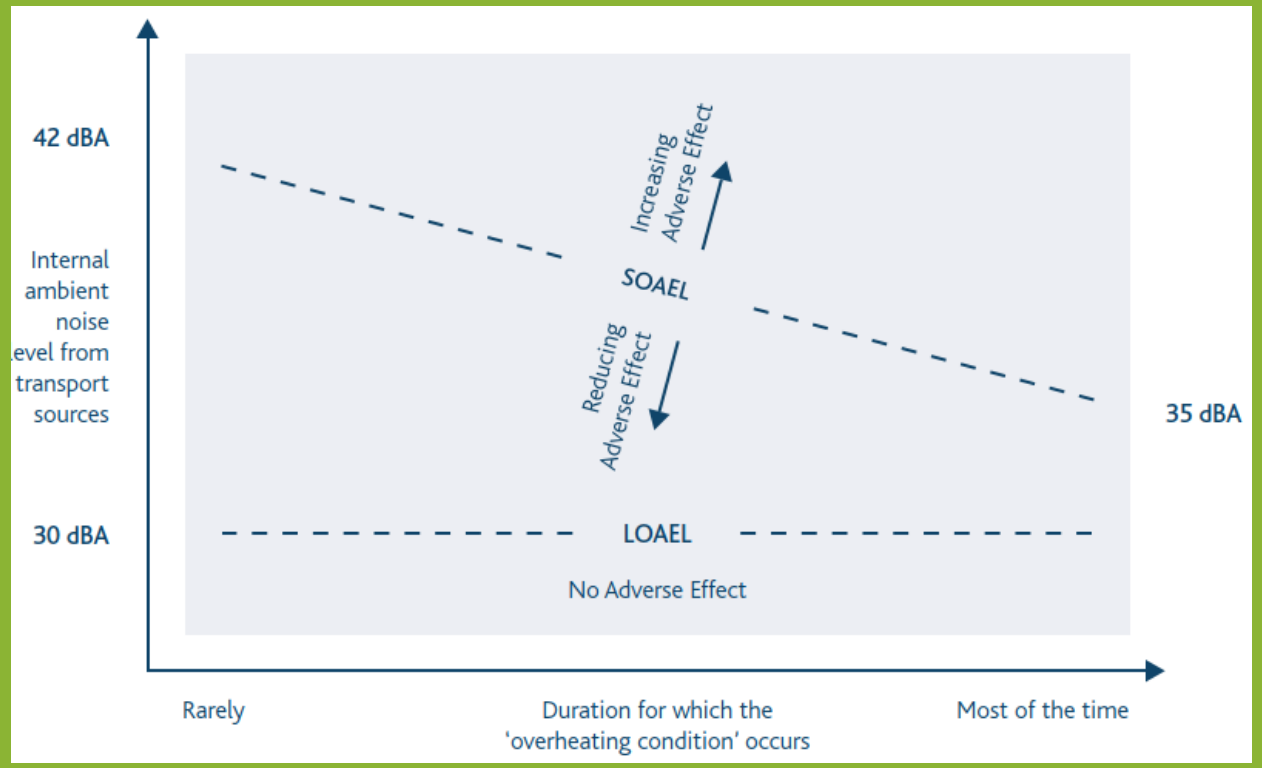


Step 3
Noise and Overheating

- Refer to Table 3-3 to scale vertical axis.
- e.g. Figures B-2 & B-3



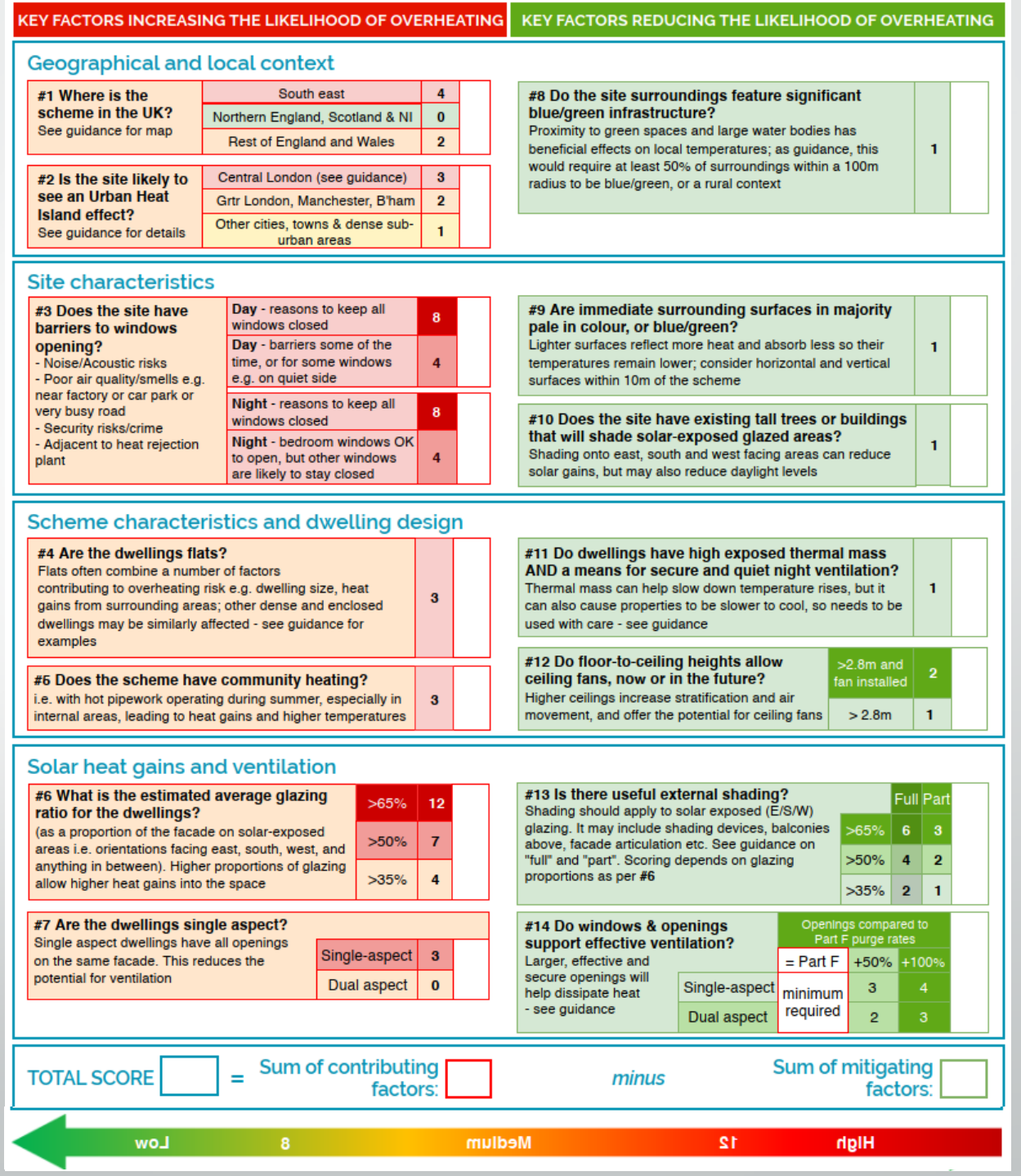
Daytime



Night

Step 3
Noise and Overheating

- May not get much information about duration.
- What can you expect?
- Good Homes Alliance Tool.



KEY FACTORS INCREASING THE LIKELIHOOD OF OVERHEATING | KEY FACTORS REDUCING THE LIKELIHOOD OF OVERHEATING

Geographical and local context

#1 Where is the scheme in the UK? See guidance for map	South east	4
	Northern England, Scotland & NI	0
	Rest of England and Wales	2
#2 Is the site likely to see an Urban Heat Island effect? See guidance for details	Central London (see guidance)	3
	Grtr London, Manchester, B'ham	2
	Other cities, towns & dense sub-urban areas	1

#8 Do the site surroundings feature significant blue/green infrastructure? Proximity to green spaces and large water bodies has beneficial effects on local temperatures; as guidance, this would require at least 50% of surroundings within a 100m radius to be blue/green, or a rural context — 1

Site characteristics

#3 Does the site have barriers to windows opening? - Noise/Acoustic risks - Poor air quality/smells e.g. near factory or car park or very busy road - Security risks/crime - Adjacent to heat rejection plant	**Day** - reasons to keep all windows closed	8
	Day - barriers some of the time, or for some windows e.g. on quiet side	4
	Night - reasons to keep all windows closed	8
	Night - bedroom windows OK to open, but other windows are likely to stay closed	4

#9 Are immediate surrounding surfaces in majority pale in colour, or blue/green? Lighter surfaces reflect more heat and absorb less so their temperatures remain lower; consider horizontal and vertical surfaces within 10m of the scheme — 1

#10 Does the site have existing tall trees or buildings that will shade solar-exposed glazed areas? Shading onto east, south and west facing areas can reduce solar gains, but may also reduce daylight levels — 1

Scheme characteristics and dwelling design

#4 Are the dwellings flats? Flats often combine a number of factors contributing to overheating risk e.g. dwelling size, heat gains from surrounding areas; other dense and enclosed dwellings may be similarly affected - see guidance for examples — 3

#5 Does the scheme have community heating? i.e. with hot pipework operating during summer, especially in internal areas, leading to heat gains and higher temperatures — 3

#11 Do dwellings have high exposed thermal mass AND a means for secure and quiet night ventilation? Thermal mass can help slow down temperature rises, but it can also cause properties to be slower to cool, so needs to be used with care - see guidance — 1

#12 Do floor-to-ceiling heights allow ceiling fans, now or in the future? Higher ceilings increase stratification and air movement, and offer the potential for ceiling fans	>2.8m and fan installed	2
	> 2.8m	1

Solar heat gains and ventilation

#6 What is the estimated average glazing ratio for the dwellings? (as a proportion of the facade on solar-exposed areas i.e. orientations facing east, south, west, and anything in between). Higher proportions of glazing allow higher heat gains into the space	>65%	12
	>50%	7
	>35%	4

#7 Are the dwellings single aspect? Single aspect dwellings have all openings on the same facade. This reduces the potential for ventilation

Single-aspect	3
Dual aspect	0

#13 Is there useful external shading? Shading should apply to solar exposed (E/S/W) glazing. It may include shading devices, balconies above, facade articulation etc. See guidance on "full" and "part". Scoring depends on glazing proportions as per #6

	Full	Part
>65%	6	3
>50%	4	2
>35%	2	1

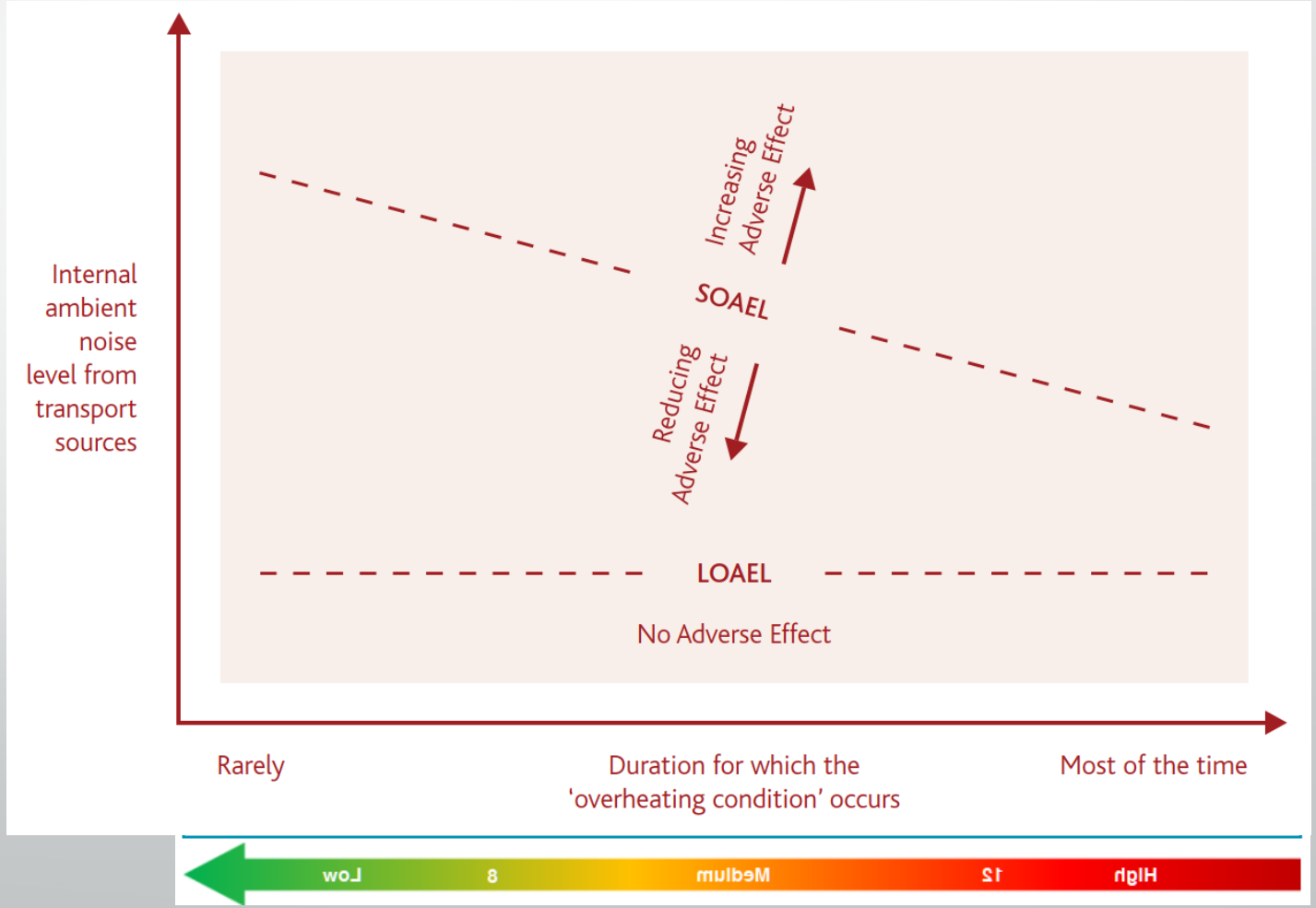
#14 Do windows & openings support effective ventilation? Larger, effective and secure openings will help dissipate heat - see guidance

	Openings compared to Part F purge rates		
	= Part F minimum required	+50%	+100%
Single-aspect		3	4
Dual aspect		2	3

TOTAL SCORE = Sum of contributing factors: *minus* Sum of mitigating factors:

Low | 8 | Medium | 12 | High

Step 3
Noise and Overheating



Step 3
Noise and Overheating

Calculate internal levels & plot on AVO diagram.

If internal noise levels are too high → Reduce overheating risk

Consider passive cooling solution (Table B-5)

Consider mechanical cooling solution (Table B-4)

Step 3
Noise and Overheating

- Passive cooling solutions.
- Table B-5

Design option	Description and references	Approximate Level Difference (external free field level – internal reverberant level)	Improvement relative to a window providing a similar amount of ventilation
Standard opening windows	Window(s) open sufficiently to provide a ventilation free-area equivalent to 2% of the floor area. [42]	13 dB	0 dB
Open windows with sound attenuating balconies	Window(s) as above. Balconies may have a solid balustrade or be enclosed to a further degree (maintaining an open area for ventilation). Absorption may be provided to the balcony soffit or potentially to other surfaces. [49, 50, 51]	17 – 23 dB	4 – 10 dB
Attenuated or plenum windows	Dual windows (spaced by around 200mm) with staggered openings and absorptive linings to the cavity reveals. Various other configurations also possible in principle. [52, 53]	17 – 24 dB	4 – 11 dB
Attenuated vents/ louvres	Ventilation openings with integral means of attenuating sound. Typically this may be acoustic louvres or acoustically lined ducts/plena. [54, 55]	17 – 29 dB	4 – 16 dB
Attenuated windows or vents/ louvres with sound attenuating balconies	Combined use of balconies to provide screening and acoustically attenuated windows or vents. Refer to above for description of each element.	21 – 39 dB	8 – 26 dB

Step 3
Noise and Overheating

- Mechanical cooling solutions.
- Table B-4
- System noise important. (Table 3-5)

Means of cooling	Description	External noise ingress considerations	Mechanical system noise considerations
Mechanical ventilative cooling	Using fans to introduce external air to a space to provide a cooling effect. Due to the airflow required, this type of system often involves significantly increased plant and duct size requirements.	These are likely to be sufficient to attenuate external noise ingress via the ducts. If intake and/or exhaust ducts penetrate the facade locally, the effect on sound insulation should be reviewed.	Air-flow rates will be significantly higher than those required for ADF whole dwelling ventilation. Fan noise will therefore be higher and duct-borne, breakout and structure-borne paths must be appropriately considered. Airflow (regenerated) noise will also need to be considered at grilles.
Comfort cooling	Using a mechanical system to cool the air within a space to achieve a user-defined setpoint. This type of system will require some form of mechanical device to cool the air, such as a fan coil unit (FCU).	No air-path to outside. Consider noise ingress through other facade elements.	Indoor units (fan-coils, cassettes etc.) include a fan and require significant air-flow rates to convey cooling to the room. Both the fan and the airflow are sources of noise and must be appropriately addressed. Outdoor units (which reject heat to the atmosphere) also generate noise and this may have an impact on nearby external amenity spaces or result in break-in to nearby dwellings.
Tempered fresh air system	These systems add a small amount of cooling to the whole dwelling ventilation supply system (e.g. to the MVHR). This provides a reduced temperature fresh air supply which can provide some cooling to a space. However, this may not be able to control overheating in isolation. Unlike comfort cooling, these systems are not designed to achieve specific temperature in a space.	No additional air-path to outside. Consider noise ingress through other facade elements.	Addition of cooling may affect noise generated by MVHR (or other ventilation supply system).

Step 3
Noise and Ventilation

- Information to be Provided at Planning (Table B-6)

Planning stage	Noise implications for overheating strategy
Outline application	Level 1 assessment of risk in accordance with Figure 3-1, for different aspects of the proposed development as appropriate. Feasibility of potential overheating strategies with the noise levels measured and with any potential mitigation. Reference can be made to Tables B-4 or B-5.
	Suggest a schedule of testing is developed for a proportion of dwellings.
Detailed application	Calculations demonstrating that the internal noise levels from external sources are consistent with the guideline levels in Table 3-3, with justification where there are exceedances. Specifications for noise levels from mechanical cooling systems.
	Consider a schedule of testing, particularly for any mechanical systems.

Thank you for listening