

Overheating Risk Assessment

Land North of Arundel Road, Fontwell

For Harlequin Developments

March 2026

ecolytik

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1 Executive Summary

This Overheating Report has been prepared by Ecolytik for the proposed development at Land North of Arundel Road in Fontwell, and within the jurisdiction of Arun District Council.

The proposed development comprises the erection of 64no. new homes with associated access, amenity and landscaping.

The methodology adopted is in line with Approved Document Part O of the Building Regulations (2021) and CIBSE Technical Memorandum 59 (2017) for the dwellings. To carry out the assessment, a 3D computer model of the proposed development was generated in line with the guidelines. London Gatwick Design Summer Year (DSY) weather files (DSY1/DSY2/DSY3) were used in the assessments for the 2020's period (high emissions, 50th percentile scenarios).

The technical analysis showed that the proposed development can comply with Part O (2021), provided the measures proposed within this report are fully incorporated and retained to construction.

Representative dwellings from various floor levels were evaluated in detail. A total of 76no. habitable rooms including open plan Kitchen/Living/Dining (KLD) spaces, separate kitchens and living rooms, bedrooms, across representative and worst-case plots on site were evaluated in detail.

In line with Part O methodology, assessments were carried out with windows being open (to determine whether passive measures have been maximised) and with windows closed during night-time due to noise associated with the location of the site next to the A27 as well as due to security constraints associated with ground floor habitable spaces.

1.1 Without useability constraints

When assuming that there are no noise or security constraints to limit the opening of windows during night-time, the proposed scheme was found to meet the overheating risk criteria for all habitable rooms (as per requirement O1(1) of Part O (2021), when solar control double-glazing with g-value of 0.4 and window opening areas as

shown in Appendix D of this report are factored into the design.

The design team have confirmed that implementing these measures are feasible for the scheme.

This modelling scenario demonstrates that passive measures such as solar control and natural ventilation will be maximised and the respective Building Regulations requirement can be met (iteration 1, Table 1 on the following page).

1.2 With useability constraints

1.2.1 Security

Plots 1-3, 12-46 are not considered to experience noise levels that exceed the Part O noise criteria for bedrooms at night-time.

However, due to security considerations, the ground floor windows to these plots cannot be modelled as open to a meaningful extent during night-time in line with the Part O methodology, which can increase overheating risk in dwellings.

To enable compliance with the overheating criteria when factoring in security constraints (requirement O1(2)), purge fans with ventilating capacity of at least 70 litres / second (l/s) should be installed in all ground floor bedrooms (where present) to these plots.

In addition, all ground floor habitable rooms should be fitted with windows that can be slightly opened to a free area of 0.1m² per room during nighttime, without compromising security. This could be achieved with security latches or other similar mechanisms.

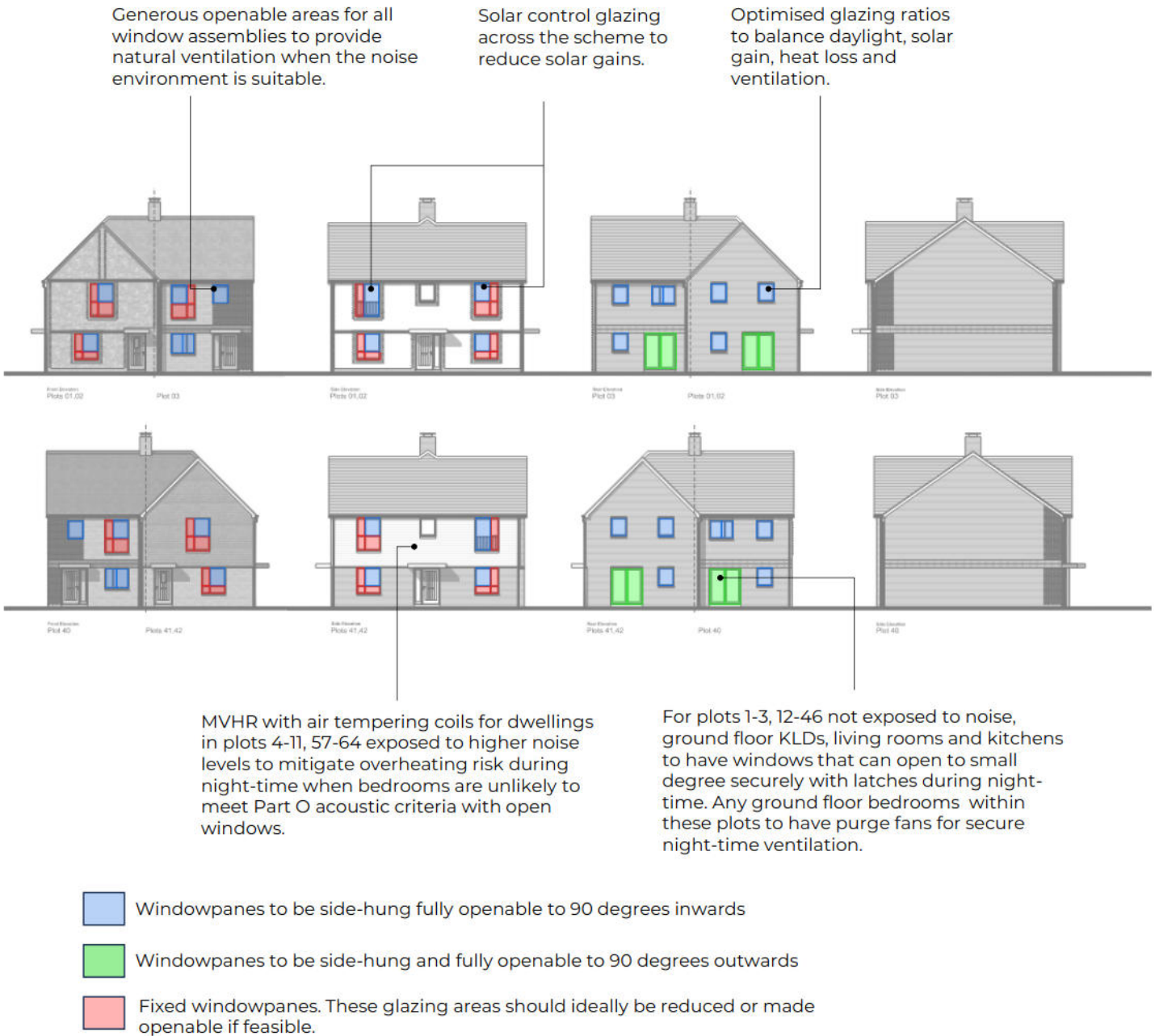


Figure 1. Overheating mitigation strategies for the scheme. The principles are illustrated for House Type 1, but the application of measures varies per plot as detailed in this report.

1.2.2 Noise

Noise Consultants Acoustics South East have identified that the plots closest to A27 (specifically 4-11, 47-64) are unlikely to meet Part O's noise criteria for bedrooms during night-time if the windows are opened for ventilation. Exposure to higher noise levels during daytime was also identified for these plots (see Appendix D for further details) which may prevent future residents from opening windows throughout the day.

For these reasons, these dwellings are proposed to have MVHR systems with integrated air tempering coils. Air tempering coils are not cooling systems per se and do not materially affect Part L calculations. They provide an element of trim cooling and can enable these dwellings to comply with requirement O1(2) (see iteration 3, Table 1).

The MVHR systems and associated ductwork should be capable of providing at least 20 l/s for KLDs and separate living rooms, at least 13 l/s for separate kitchens, and at least 20 l/s per bedroom.

1.2.3 Proposed strategy

The proposed scheme at Land North of Arundel Road will include the following design measures to mitigate overheating risks:

- High specification building fabric to limit unintended heat ingress through conduction or infiltration.
- Balanced and reasonable glazing ratios.
- Solar control glazing with g-value of 0.4 throughout the scheme.
- Generous openable areas for all dwellings (please refer to Appendix D for further details).
- Ground floor windows to habitable rooms with latches to enable secure night-time ventilation for plots 1-3, 12-46.
- Purge fans to ground floor bedrooms where present within plots 1-3, 12-46 to provide the flow rates identified in this report.
- MVHR with air tempering coils for dwellings closest to the A27 (plots 4-11 and 47-64) and exposed to higher levels of noise.

The above measures are illustrated in Figure 1 on the previous page and enable all dwellings to comply with Part O (2021), as shown in Table 1.

Detailed assessments in line with Part O methodology applicable at the time of construction should be carried out post-planning to confirm the final overheating risk mitigation strategy.

Table 1. Part O (2021) modelling results summary.

Iteration	Ventilation strategy	Room type	Applicable number of sample rooms	Sample rooms meeting criteria	% of rooms complying
1	Open windows 24/7	All habitable	76	76	100%
		Bedrooms	44	44	100%
2	Windows open during daytime; Purge fans *	All habitable	45	45	100%
		Bedrooms	27	27	100%
3	Windows open during daytime; MVHR**	All habitable	31	31	100%
		Bedrooms	17	17	100%

Notes:

All habitable rooms are assessed against overheating criteria during occupied hours (determined from CIBSE TM59). Bedrooms have additional night-time specific overheating criteria. Please see section 2.2 and Appendix C of the report for further details.

Iteration 1 is applicable to all dwellings across the site. Iteration 2 is relevant for dwellings not exposed to noise while iteration 3 is applicable for the sample dwellings next to the A27.

* Flow rates: ≥ 70 l/s per bedroom

** Flow rates: KLD, living rooms, bedrooms ≥ 20 l/s, kitchens ≥ 13 l/s, air tempering coil. Please refer to section 4.3 and of the report for further details on the air tempering coil.

2 Introduction

2.1 Site

The site is located to the north of Arundel Road, Fontwell, and falls within the Built-up Area Boundary of Fontwell. The site is allocated for residential use within the Walberton Neighbourhood Development Plan. The site is currently an open green field measuring 2.74 hectares of land bounded by mature trees and hedgerow.

The proposed development comprises the erection of 64no. new homes with associated access, amenity and landscaping.

The site location is presented in Figure 2.

2.2 Application of guidance

The analysis is based on the latest industry standards including the Building Regulations Part O (2021) and CIBSE Technical Memorandum 59 (2017).

2.2.1 Approved Document Part O

Approved Document Part O (published in 2021, hereafter referred to as ADO or Part O) sets out rigorous performance standards in relation to overheating risks for residential developments and applies additional considerations to CIBSE TM59 guidance. The overheating risk is evaluated for habitable spaces during occupied hours. These are determined from CIBSE TM59 guidance. Kitchen/ living/ dining (KLD) spaces are occupied during daytime, while bedrooms are assumed occupied on a 24-hour basis. The criteria applicable to both bedrooms and KLDs relate to the frequency of overheating during occupied hours and between May to September, when overheating is most likely to cause discomfort (this metric is hereafter referred to as 'occupied hours test' in the report).

There is an additional criterion for bedrooms where the frequency of overheating is assessed during night-time only, on an annual basis (hereafter referred to as 'night-time test').

The above metrics are applicable for dwellings which are predominantly naturally ventilated. For

predominantly mechanically ventilated dwellings (e.g. where windows have to be fixed or restricted due to noise, safety or security constraints), the applicable criterion for assessing overheating risk is a different frequency test, measuring the percentage of hours a certain temperature threshold is exceeded on an annual basis. For the Land North of Arundel Road, no windows are proposed to be fixed due to noise constraints although certain limitations to how often the windows could be opened have been considered in the assessment.

Whilst there are no criteria for the potential severity of overheating on any given day within Part O and TM59, the standards are challenging to meet and require robust mitigation strategies incorporated into the design from the earliest stages of projects.

CIBSE TM59 also includes a test to evaluate overheating risks within communal corridors where communal heating pipework is installed. This is also a frequency test and is evaluated across the entire year.

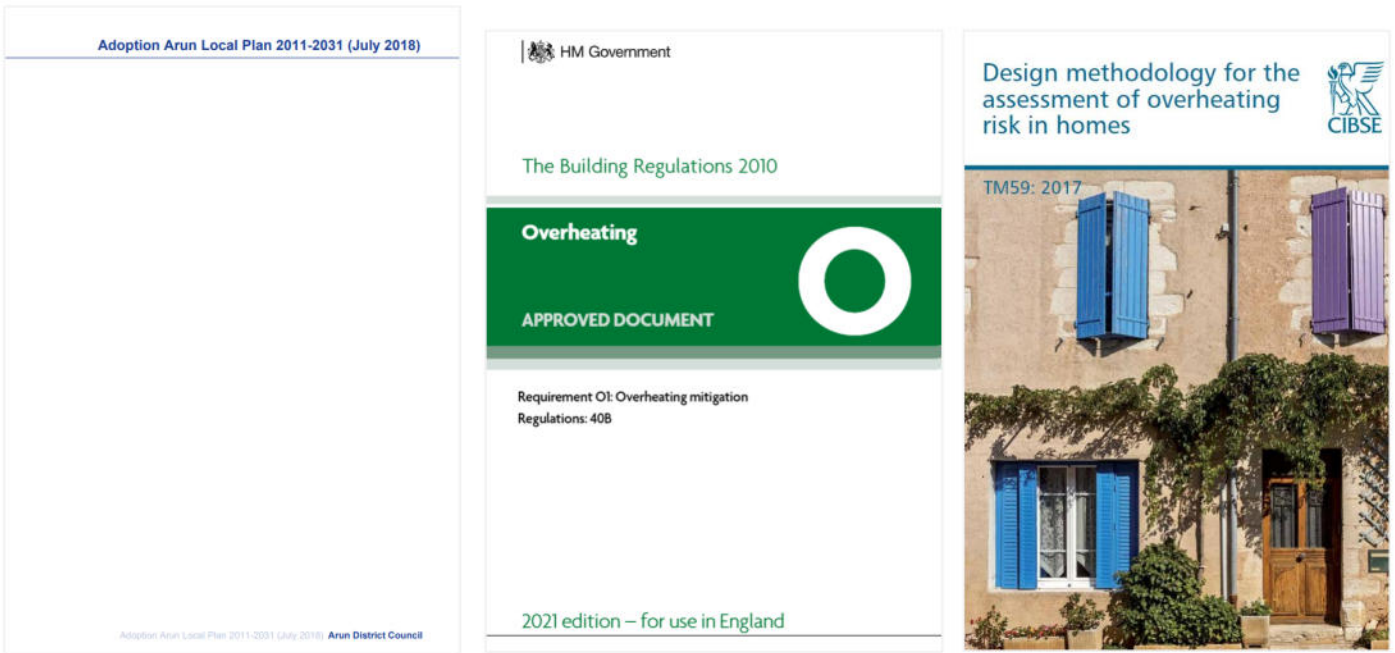
2.2.2 Arun District Council policies

Arun District Council's Local Plan (2018) refers to shading, cooling, ventilation, and solar gain in policy ECC SP1 Adapting to Climate Change as being some of the borough's key considerations for evaluating developments.

The report presents the technical analysis and results of the overheating risk assessment in line with Part O (2021) methodology for the proposed development at Land North of Arundel Road.



Figure 2. Approximate site location of the proposed development at Land North of Arundel Road (Source: Google Maps, accessed: February 2026).



3 Technical model

3.1 Sources of information

Architectural drawings have been used to create a 3D computer model of the proposed development. The full list of sources of information used in this assessment is as follows.

Drawings by ECE Architecture:

- 7428A-PL-02B Illustrative Layout
- 7428A-PL-20 Proposed Plans and Elevations - Apartment Block
- 7428 - PL-10 Proposed Plans and Elevations - HT01A and HT01B
- 7428 - PL-11 Proposed Plans and Elevations - HT01A and HT01B Semi
- 7428 - PL-12 Proposed Plans and Elevations - HT01, HT03 and HT01B
- 7428 - PL-13 Proposed Plans and Elevations - HT02A and HT04
- 7428 - PL-14 Proposed Plans and Elevations - HT02B Semi
- 7428 - PL-15 Proposed Plans and Elevations - HT03 Semi
- 7428 - PL-16 Proposed Plans and Elevations - HT05 Semi
- 7428 - PL-17 Proposed Plans and Elevations - HT05 Semi
- 7428 - PL-18 Proposed Plans and Elevations - HT07 Semi
- 7428 - PL-19 Proposed Plans and Elevations - HT06 Semi).

3.2 Scope of assessment

Figure 3 shows the technical 3D model developed for the analysis. Surrounding buildings were modelled in a simplified way as they are unlikely to influence the findings of the assessment.

A range of flats and houses were modelled in detail, taking into account different orientations, different levels of solar exposure, varying floor levels and dwelling typologies.

The thermal model includes the following key inputs summarised below.

- Building fabric as shown in Appendix B.
- The degree of window opening for the dwellings was determined from the

architects' drawings and following correspondence with the design team. This is presented in Appendix D.

It should be noted that air quality, noise and security constraints can limit the extent of window opening which could lead to greater overheating risks.

It has been assumed that Air Quality will not pose a constraint to the opening of windows at this stage.

Security is generally an issue for ground floor windows which has been considered in this assessment and report.

Safety is also a key consideration for upper floor windows across the scheme that do not lead to balconies. Such windows should be designed with a sill height (or guarding height) of 1.1m as per Part O guidance.

Bedroom windows to dwellings close to the A27 cannot be relied upon for night-time ventilation as confirmed by Acoustics South East.

For these reasons, three key assessments were carried out. One assumed no noise and security constraints to evaluate whether all passive measures have been maximised, in line with requirement O1(1) of Part O. Subsequently, analysis was carried out to identify the route to compliance when ground floor windows are opened to a limited extent for security reasons during night-time (as per requirement O1(2) of Part O). Lastly, simulations were carried out to determine the most appropriate solution for plots close to the A27 which are exposed to higher levels of noise both during night and daytime. The aim of this was to identify a backup overheating mitigation strategy for these dwellings (as per requirement O1(2) of Part O).

The overheating risk assessment was carried out at planning stage and presents an overall strategy on how overheating risks could be reduced and how Part O (2021) compliance could be achieved. It is recommended this assessment is updated as the design progresses to confirm compliance with overheating regulations at construction stage.

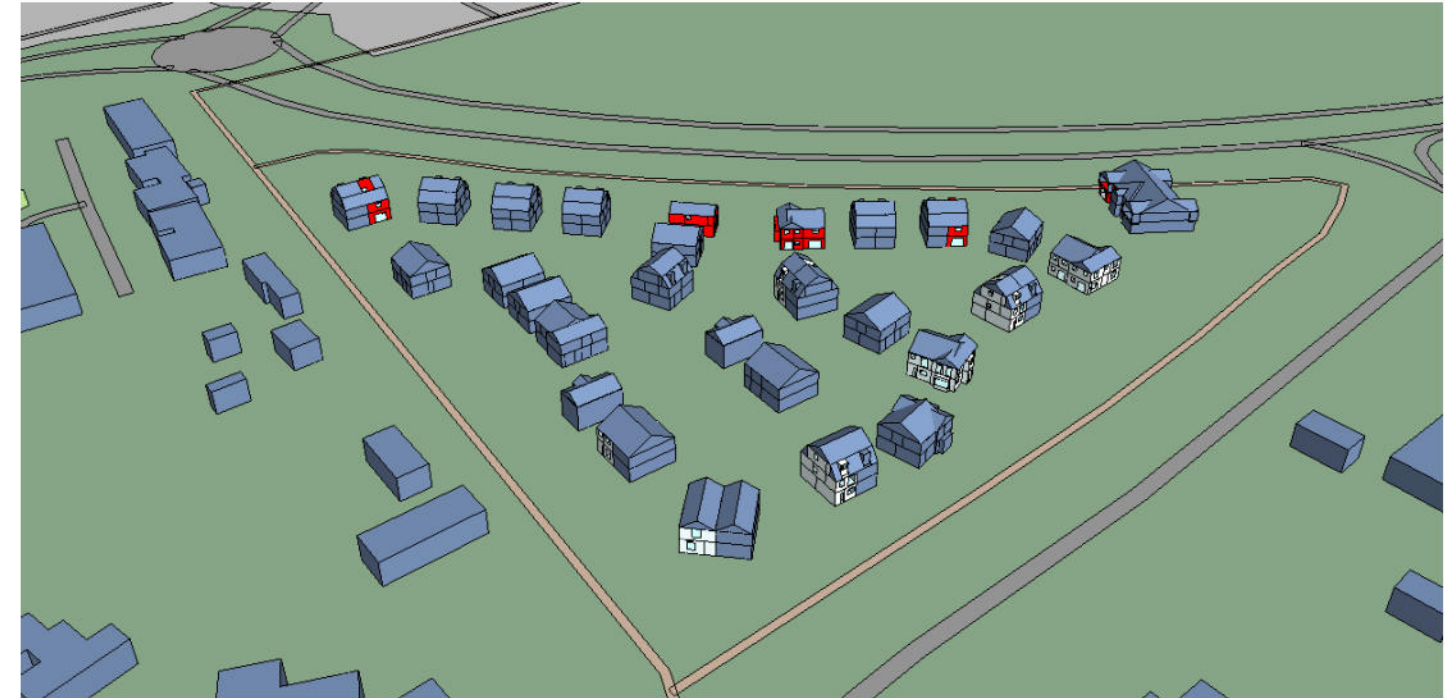
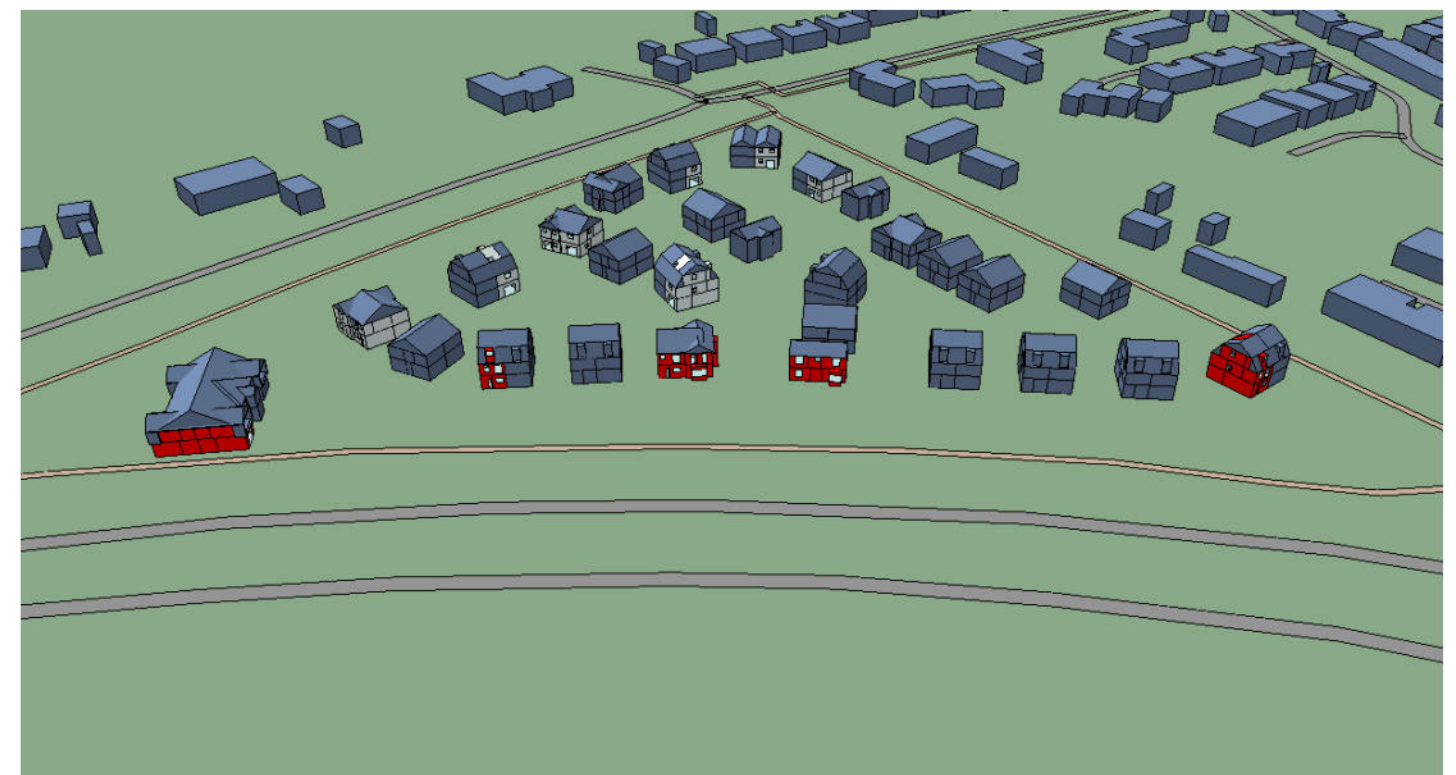


Figure 3. View from southwest (top) and northeast (bottom) of the 3D technical model used for the analysis. Sample dwellings modelled shown in white, sample dwellings exposed to noise shown in red, while remaining dwellings and surrounding properties shown in blue.

4 Analysis

4.1 Initial assessment

The designs developed by ECE Architecture already include features that help reduce overheating risks. Glazing ratios were designed to offer a reasonable balance between heat losses, ventilation, daylight and solar gains. Window assemblies generally indicated notable openable areas which enables adequate natural ventilation.

Dynamic thermal modelling was carried out to evaluate overheating risks, and guidance was provided to the design team prior to preparing this report on measures that should be considered and implemented into the design to enable compliance with Part O.

In principle, key overheating remediation techniques include reducing solar gains and increasing the ventilating capacity of windows. These were explored via dynamic thermal modelling and are discussed in more detail in the next section (4.3) of the report. Prior to presenting the results of the analysis, some background is provided on solar control techniques in subsection 4.2 below.

4.2 Solar control

It is not considered appropriate to incorporate more external shading measures to the scheme as this would interfere notably with architecture and would reduce internal daylight levels to the dwellings.

The specification of glazing, in particular the use of lower g-value glazing, was deemed to be the main remaining method of reducing solar gains.

There is often a balance to be made between admitting useful heat gain in winter and daylight against limiting solar gains through the specification of glazing.

Ideally, glazing is transparent to short-wave radiation and reflective to long wave radiation, allowing daylight to enter while resisting radiative heat transfer. The two properties of glazing that affect solar control are the g-value and the light transmission factor; low-e coatings can be applied to glass to achieve certain specifications.

Figure 4 illustrates the transmission of different, generic glazing types across the spectrum. Thermally efficient glazing is designed to transmit less of the far infrared radiation ($>1.5 \mu\text{m}$.) which is emitted by objects within rooms, thereby keeping the heat within buildings. Solar control glazing is designed to screen out the near infrared radiation which is emitted by the sun ($0.7\text{--}1.5 \mu\text{m}$.), thereby keeping the solar energy out of buildings. However, this entails a reduction in the transmission of the visible light of the spectrum.

It is therefore key to not reduce significantly the g-value of glazing in residential uses as it would affect the ingress of useful solar gain in winter and the level of daylight (among potential aesthetic implications on the appearance of glazing).

Several simulations were carried out with g-value of 0.5 and 0.45 (not included in this report) but it was not deemed possible to demonstrate compliance for this glazing specification. Therefore, the assessment results presented in the subsequent section of the report included glazing with a g-value of 0.4. Reducing this further is not deemed suitable as it compromises compliance with the Dwelling Fabric Energy Efficiency (DFEE) metric of Building Regulations Part L 2021.

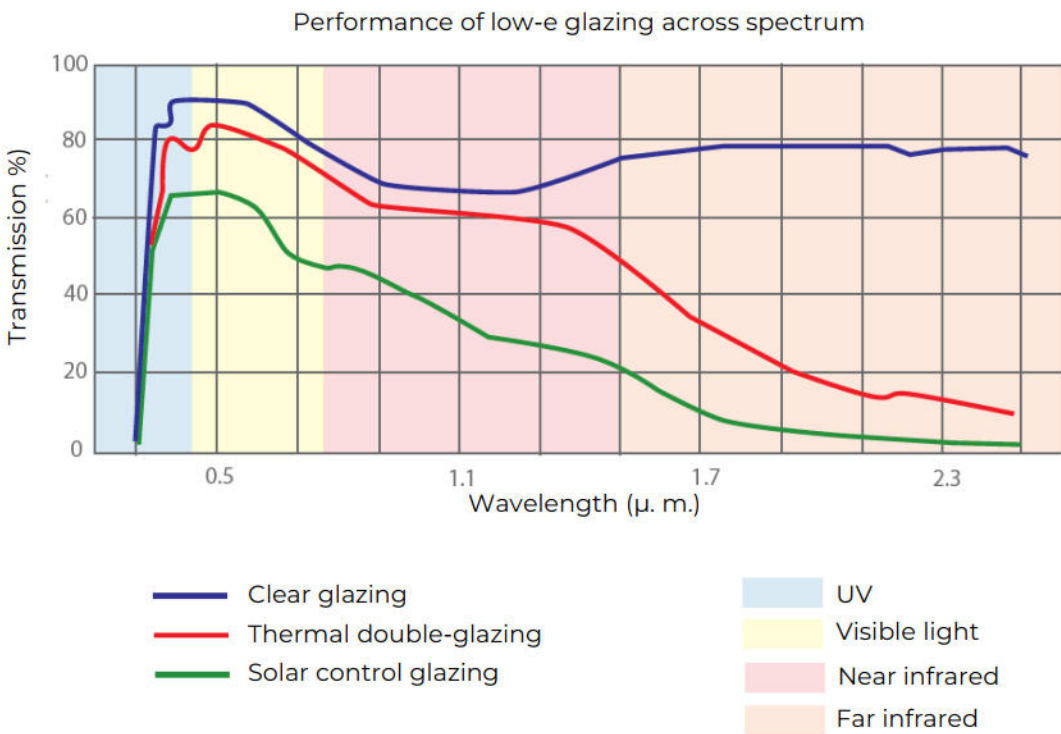


Figure 4. Indicative transmission of different glazing types across the spectrum.

4.3 Modelling iterations

4.3.1 Without useability constraints

If potential noise and security constraints were to be disregarded, all sample dwellings modelled were found to have adequate levels of passive ventilation via openable windows and reduced solar gains, demonstrating compliance with requirement O1(1) of Part O. This is reflected in Iteration 1, shown in Table 2 and Table 3.

Detailed numerical results for all rooms modelled are presented in Appendix A.

Overall, the proposed design with solar control double-glazing (g-value 0.4) and openable windows as per Appendix D demonstrates that passive overheating risk mitigation measures can be deemed to have been maximised at the scheme.

4.3.2 With useability constraints

4.3.2.1 Security

Plots 1-3, 12-46 are not considered to experience noise levels that exceed the Part O noise criteria for bedrooms at night-time.

For these plots, the modelling determined that the following additional measures should be incorporated into the design:

- Ground floor habitable rooms, including KLDs, living rooms and kitchens, should have windows which are capable of opening to small degree (0.1m² per room) via the use of secure latches (or similar mechanisms) to enable night time ventilation.
- All ground floor bedrooms should have purge fans installed and capable of delivering at least 70 l/s per bedroom during night-time.

With these measures in place, these dwellings are predicted to comply with requirement O1(2) of Part O.

The results summary is shown in Table 2 and Table 3 while detailed results are presented in Appendix A.

4.3.2.2 Noise

Plots 4-11 and 47-64 are exposed to higher levels of noise as confirmed by Acoustics South East consultants. Bedroom windows cannot be relied upon for night-time ventilation due to exceedances of the Part O noise criteria. The noise assessments also indicate that daytime noise levels could also be high which may limit the extent and frequency that future residents may operate windows.

Therefore, the application of MVHR systems was explored for these plots. The analysis indicated that standard MVHR systems with bypass and boost mode facilities would not enable the dwellings to comply with Part O. Therefore, the use of integrated air tempering coils to the MVHR systems was explored (iteration 3, Table 2).

Air tempering coils are considered the least energy intensive method of reducing overheating risks and their application has become common practice for developments with constraints to opening windows from elevated noise levels. This is not a full cooling system providing complete temperature control within the spaces but is only capable of providing an element of trim cooling.

The results showed that all relevant sample habitable rooms are predicted to comply with Part O criteria in this assessment scenario (Iteration 3, Table 3). Therefore, the use of MVHR with air tempering coils is recommended for plots exposed to noise to enable compliance with requirement O1(2) of Part O.

Table 2. Iterations carried out to identify how Part O compliance can be achieved for the sample dwellings modelled.

Iteration	Description	Window openable area	MVHR or purge fans flow rate
1	No window useability constraints.	Openable panes of windows assumed to ventilate dwellings on 24/7 basis. See Appendix D for details.	n/a
2	Security constraints	Windows open during daytime only. Windows for ground floor KLD, living rooms and kitchens to have a small opening with secure latches. Ground floor bedrooms to have purge fans installed.	Purge fans for ground floor bedrooms providing ≥ 70 l/s per bedroom. Applicable to plots 1-3, 12,46.
3	Noise constraints factored into the assessment.	Windows open during daytime only.	KLD, Living rooms ≥ 20 l/s Bedrooms ≥ 20 l/s Kitchens ≥ 13 l/s Integrated air tempering coil to MVHR* Applicable to plots 4-11, 47-64. .

** The Supply Air Temperature (SAT) of the MVHR was modelled based on information provided from Nuaire which is considered representative of similar types of MVHR systems. The load and contribution from the air tempering coil is variable and dependent on the external (T_{ext}) and internal (T_{int}) temperature. This is approximated as follows in the modelling:
- If T_{int}≥22°C and T_{ext}<30°C, SAT=16°C
- If T_{int}≥22°C and T_{ext}≥30°C, SAT=T_{ext}-14°C
- If 18°C≤T_{int}<22°C and T_{ext}≥12°C and T_{int}>T_{ext}, SAT=T_{ext} (bypass)
- In all other instances, SAT=0.8 x T_{int} + 0.2 x T_{ext} (heat recovery)*

It should be noted that the proposed MVHR system has no control mechanism or button for future residents to enable active/ comfort cooling. The automated systems adjust their mode depending on internal and external temperatures to be in heat recovery, bypass, or air tempering mode.

Table 3. Part O modelling results summary.

Iteration	Ventilation strategy	Room type	Applicable number of sample rooms	Sample rooms meeting criteria	% of rooms complying
1	Open windows 24/7	All habitable	76	76	100%
		Bedrooms	44	44	100%
2	Windows open during daytime; Purge fans	All habitable	45	45	100%
		Bedrooms	27	27	100%
3	Windows open during daytime; MVHR	All habitable	31	31	100%
		Bedrooms	17	17	100%

Notes:

All habitable rooms are assessed against 'occupied hours' test. Bedrooms are also assessed against the 'night-time test'.

Iteration 1 is applicable to all dwellings across the site. Iteration 2 is relevant for dwellings not exposed to noise while iteration 3 is applicable for the sample dwellings next to the A27.

5 Proposed design

5.1 Summary of measures

The overheating risk mitigation strategy includes several measures as summarised below:

- High specification building fabric to prevent unintended heat ingress through conduction or infiltration.
- Generous openable areas for the dwellings as shown in the elevations for when the noise environment is suitable. Figure 5 shows House Types 4 and 7 with recommended design improvements to the opening of windows, while all elevation markups are provided in higher resolution in Appendix D.
- Solar control glazing with g-value of 0.4 for all glazing across the scheme.
- Ground floor windows to habitable rooms with latches to enable secure night-time ventilation for plots 1-3, 12-46.
- Purge fans to ground floor bedrooms where present within plots 1-3, 12-46 to provide the flow rates identified in this report.
- MVHR for plots 4-11 and 47-64 to provide 24-hour ventilation. The system will have boost mode and summer bypass facilities and will incorporate an air tempering coil. The system should provide as a minimum the flow rates identified in this report.

The preliminary analysis at planning stage indicates that with all these measures in place, the proposed residential development is predicted to comply with Part O (2021).

Detailed assessments in line with Part O methodology applicable at the time of construction should be carried out post-planning to confirm the final overheating risk mitigation strategy

5.2 Guidance to future residents

Future residents should be made aware of how to mitigate overheating and improve thermal comfort during heat waves. Below is a summary of recommendations that can be included in a home user guide.

- Residents should be advised on how to best operate windows for ventilation. Current guidance assumes windows would open when internal temperatures exceed 22°C but during heat waves windows should be opened more pre-emptively.
- Internal doors should remain open in conjunction with windows to facilitate cross ventilation as much as possible.
- On warm summer days and when the noise environment is suitable, homes can be ventilated during night-time by leaving the windows open and taking advantage of the lower external temperatures, where this can be done securely.
- Ground floor bedrooms not exposed to noise from the A27 should utilise the purge fans at night-time for secure ventilation.
- Where the noise environment is not suitable, the guidance should encourage the use of MVHR with its integrated air tempering coils to provide a more comfortable internal environment.
- Where blinds or internal curtains are installed, these should be light coloured to reflect solar radiation. Any internal shading devices should not notably interfere with the air flow through windows.
- Future residents should reduce the use of heat generating equipment as far as practicable during hot summer days.
- During heat waves, the use of fans could improve air circulation and thermal comfort.
- During hot summer days, residents should be encouraged to wear lighter, breathable and loose clothing and should be advised to hydrate regularly.



Figure 5. Proposed window opening for House Type 2a (top), 4 (middle) and 7 (bottom).

6 Conclusions

The proposed overheating risk mitigation strategy for Land North of Arundel Road maximised passive measures as far as practicable and was developed following CIBSE TM59 (2017) guidance and Building Regulations Part O (2021).

The proposed development has been designed to enable thermal comfort for future residents of the dwellings. Full mechanical cooling for residential units has been designed out. With the proposed measures retained to construction stage, the proposed development is anticipated to comply with Building Regulations Part O (2021).

Taking everything into account, the proposed development complies with Arun District Council policies.

Appendix A – Detailed results

This appendix provides the detailed numerical results of the overheating calculations for the sample dwellings modelled.

The criteria are as follows when dwellings are modelled as predominantly naturally ventilated (windows open for most of the day):

- **Test A: May-September ‘Occupied hours’ test:** % of occupied hours $\Delta T > 1^{\circ}\text{K}$ (<3%), for all habitable rooms.
- **Test B: Annual, ‘night-time’ test:** Annual night hours $T_{\text{op}} > 26^{\circ}\text{C}$ (<33 hours), for bedrooms only.

Table 4. Detailed Part O results with DSY1 weather file. Sample rooms exposed to noise from the A27 are highlighted in red. Results highlighted in green indicate compliance with Part O while any orange cells indicate non-compliance with Part O.

	Iteration 1 without window useability constraints		Iteration 2 with security constraints (windows closed at night; small opening via secure latch; purge fans to bedrooms)		Iteration 3 with noise constraints (windows closed at night; MVHR with air tempering coil)	
Room name	Test A	Test B	Test A	Test B	Test A	Test B
OF 1 Bedroom	0.6	8	0.6	12	N/A	N/A
OF 1 KLD 1B	1.7	N/A	2.3	N/A	N/A	N/A
OF 3 KD 3B	1.5	N/A	1.8	N/A	N/A	N/A
OF 3 Living 3B	1.2	N/A	1.5	N/A	N/A	N/A
OF 6 Kitchen 3B	1.3	N/A	N/A	N/A	0.9	N/A
OF 6 Living 3B	2.5	N/A	N/A	N/A	2.4	N/A
OF 10 Kitchen 2B	1	N/A	N/A	N/A	0.8	N/A
OF 10 Living 2B	2.1	N/A	N/A	N/A	2.2	N/A
OF 11 KD 3B	2.4	N/A	N/A	N/A	2.6	N/A
OF 11 Living 3B	1.4	N/A	N/A	N/A	1.3	N/A
OF 12 Kitchen 4B	1.3	N/A	1.7	N/A	N/A	N/A
OF 12 Living 4B	1.1	N/A	1.6	N/A	N/A	N/A
OF 16 Kitchen 2B	1.5	N/A	1.7	N/A	N/A	N/A
OF 16 Living 2B	1.1	N/A	1.5	N/A	N/A	N/A
OF 17 KD 3B	1.2	N/A	2	N/A	N/A	N/A
OF 17 Living 3B	2.8	N/A	2.8	N/A	N/A	N/A
OF 18 Kitchen 4B	1	N/A	1.4	N/A	N/A	N/A
OF 18 Living 4B	1	N/A	1.3	N/A	N/A	N/A
OF 23 Kitchen 3B	1.2	N/A	1.8	N/A	N/A	N/A
OF 23 Living 3B	1	N/A	1.5	N/A	N/A	N/A
OF 26 Bedroom	0.9	9	0.7	12	N/A	N/A
OF 26 KLD 1B	1.2	N/A	1.4	N/A	N/A	N/A
OF 29 KD 3B	1.1	N/A	1.6	N/A	N/A	N/A

	Iteration 1 without window useability constraints		Iteration 2 with security constraints (windows closed at night; small opening via secure latch; purge fans to bedrooms)		Iteration 3 with noise constraints (windows closed at night; MVHR with air tempering coil)	
Room name	Test A	Test B	Test A	Test B	Test A	Test B
0F 29 Living 3B	1.7	N/A	1.7	N/A	N/A	N/A
0F 47 Bedroom	0.5	11	N/A	N/A	0.5	20
0F 47 KLD 1B	1.4	N/A	N/A	N/A	1.5	N/A
0F 56 Kitchen 4B	1	N/A	N/A	N/A	0.7	N/A
0F 56 Living 4B	1.3	N/A	N/A	N/A	1.1	N/A
0F 58 Bedroom	0.4	9	N/A	N/A	0.2	7
0F 58 KLD 1B	1	N/A	N/A	N/A	1	N/A
0F 60 Bedroom	0.3	10	N/A	N/A	0.2	12
0F 60 KLD 1B	0.7	N/A	N/A	N/A	0.7	N/A
1F 2 Bedroom	0.7	5	0.6	4	N/A	N/A
1F 2 KLD 1B	1.1	N/A	1.1	N/A	N/A	N/A
1F 3 Bedroom 1	0.6	13	0.6	8	N/A	N/A
1F 3 Bedroom 2	0.7	14	0.6	8	N/A	N/A
1F 3 Bedroom 3 s	0.8	14	0.7	6	N/A	N/A
1F 6 Bedroom 2	0.5	13	N/A	N/A	0.2	16
1F 6 Bedroom 3	0.6	8	N/A	N/A	0.4	10
1F 10 Bedroom 1	0.5	8	N/A	N/A	0.4	9
1F 10 Bedroom 2	0.5	13	N/A	N/A	0.2	17
1F 11 Bedroom 1	1	7	N/A	N/A	0.8	14
1F 11 Bedroom 2	1.1	5	N/A	N/A	0.7	6
1F 11 Bedroom 3 s	0.7	9	N/A	N/A	0.5	3
1F 12 Bedroom 1	0.6	13	0.5	9	N/A	N/A
1F 12 Bedroom 3	1	10	0.8	6	N/A	N/A
1F 16 Bedroom 1	1	9	0.8	6	N/A	N/A
1F 16 Bedroom 2	0.6	12	0.6	8	N/A	N/A
1F 17 Bedroom 1	0.8	5	0.7	5	N/A	N/A
1F 17 Bedroom 2	1.5	6	1.2	6	N/A	N/A
1F 17 Bedroom 3 s	1.6	10	1.1	6	N/A	N/A
1F 18 Bedroom 1	0.5	12	0.5	8	N/A	N/A
1F 18 Bedroom 3	0.7	11	0.7	6	N/A	N/A
1F 23 Bedroom 2	0.5	13	0.5	8	N/A	N/A
1F 23 Bedroom 3	0.9	10	0.9	6	N/A	N/A
1F 27 Bedroom	0.9	6	0.7	6	N/A	N/A

	Iteration 1 without window useability constraints		Iteration 2 with security constraints (windows closed at night; small opening via secure latch; purge fans to bedrooms)		Iteration 3 with noise constraints (windows closed at night; MVHR with air tempering coil)	
Room name	Test A	Test B	Test A	Test B	Test A	Test B
1F 27 KLD 1B	1.2	N/A	1.2	N/A	N/A	N/A
1F 29 Bedroom 1	0.6	13	0.5	7	N/A	N/A
1F 29 Bedroom 2	0.6	23	0.6	10	N/A	N/A
1F 29 Bedroom 3 s	0.7	15	0.7	7	N/A	N/A
1F 48 Bedroom	0.5	7	N/A	N/A	0.5	21
1F 48 KLD 1B	1.1	N/A	N/A	N/A	1.2	N/A
1F 56 Bedroom 1	0.4	13	N/A	N/A	0.3	19
1F 56 Bedroom 3	0.5	8	N/A	N/A	0.3	9
1F 62 Bedroom	0.5	9	N/A	N/A	0.2	6
1F 62 KLD 1B	1	N/A	N/A	N/A	0.8	N/A
1F 64 Bedroom	0.4	11	N/A	N/A	0.2	7
1F 64 KLD 1B	0.6	N/A	N/A	N/A	0.6	N/A
2F 6 Bedroom 1	0.2	12	0.2	8	N/A	N/A
2F 12 Bedroom 2	0.5	14	0.4	8	N/A	N/A
2F 12 Bedroom 4 s	0.7	16	0.5	7	N/A	N/A
2F 18 Bedroom 2	0.5	13	0.5	8	N/A	N/A
2F 18 Bedroom 4 s	0.6	14	0.5	6	N/A	N/A
2F 23 Bedroom 1	0.3	13	0.3	8	N/A	N/A
2F 56 Bedroom 2	0.5	13	N/A	N/A	0.2	14
2F 56 Bedroom 4 s	0.6	14	N/A	N/A	0.1	4
OF 1 Bedroom	0.6	8	0.6	12	N/A	N/A
OF 1 KLD 1B	1.7	N/A	2.3	N/A	N/A	N/A

Table 5. Part O compliance results summary.

	Iteration 1		Iteration 2		Iteration 3	
	Test A	Test B	Test A	Test B	Test A	Test B
Rooms meeting criteria	76	44	45	27	31	17
Applicable number of rooms	76	44	45	27	31	17
% of rooms complying	100%	100%	100%	100%	100%	100%

Appendix B – Model inputs

The building has been modelled using dynamic thermal simulation software which is fully compliant with CIBSE Applications Manual AM11.

The tables in this appendix summarise the thermal model inputs for the calculations carried out.

The weather file used for most of the thermal modelling analysis is CIBSE TM49 London Gatwick DSY1 2020’s High50.epw.

Residential window opening profiles were based on paragraph 2.6 of Approved Document Part O (2021).

Table 6: Thermal model building fabric.

Element	Specification
External wall U-value	0.18 W / m².K
External wall thermal mass (software default)	76 kJ / m².K (very lightweight)
Floor U-value	0.10 W / m².K
Floor thermal mass (software default)	66 kJ / m².K (very lightweight)
Roof U-value	0.10 W / m².K
Roof thermal mass (software default)	8 kJ / m².K (very lightweight)
Glazing U-value	1.2 W / m².K
Glazing g-value	0.4
Air permeability	3m³ / m².h at 50 Pa for plots with MVHR; 3m³ / m².h at 50 Pa for all other plots

Table 7: TM59 Residential occupancy gains and profiles.

Space	Occupancy
1-bed KLD	1 person from 9am to 10pm; unoccupied for the rest of the day
2-bed kitchen	2 people at 25% gains from 9 am to 10 pm; room is unoccupied for the rest of the day
2-bed living room	2 people at 75% gains from 9 am to 10 pm; room is unoccupied for the rest of the day
3 bed kitchen	3 people at 25% gains from 9 am to 10 pm; room is unoccupied for the rest of the day
3 bed living room	3 people at 75% gains from 9 am to 10 pm; room is unoccupied for the rest of the day.
Single Bedroom	2 people at 70% gains from 11pm to 8am
	2 people at full gains from 8am to 9am and from 10pm to 11pm
	1 person at full gain in the bedroom from 9am to 10pm
Double Bedroom	2 people at 70% gains from 11pm to 8am
	2 people at full gains from 8am to 9am and from 10pm to 11pm
	1 person at full gain in the bedroom from 9am to 10pm

Table 8: TM59 Residential internal gains and profiles.

Space	Equipment and lighting
1-bed KLD	Peak load of 450 W from 6 pm to 8 pm
	200 W from 8 pm to 10 pm
	110 W from 9 am to 6 pm and from 10 pm to 12 pm Base load of 85 W for the rest of the day
2-bed kitchen	Peak load of 300 W from 6 pm to 8 pm Base load of 50 W for the rest of the day
2-bed living room	Peak load of 150 W from 6 pm to 10 pm 60 W from 9 am to 6 pm and from 10 pm to 12 pm Base load of 35 W for the rest of the day
3-bed kitchen	Peak load of 300 W from 6 pm to 8 pm base load of 50 W for the rest of the day
3-bed living room	Peak load of 150 W from 6 pm to 10 pm 60 W from 9 am to 6 pm and from 10 pm to 12 pm Base load of 35 W for the rest of the day
Single bedroom	Peak load of 80 W from 8am to 11pm. Base load of 10 W during sleeping hours
Double Bedroom	Peak load of 80 W from 8am to 11pm Base load of 10 W during the sleeping hours
Utility cupboard	78W heat gain from Heat Interface Unit standing gains and pipework within.
All rooms	Lighting 2 W / m² from 6pm to 11pm daily

Table 9. Thermal model details.

Software:	IES VE version 2025.1.0.0
TM59: summer elevated air speed:	0.1 m/s
TM59: occupant category:	Category II (normal)

Appendix C – CIBSE & Part O

CIBSE TM59 (2017)

CIBSE TM59 is a rigorous overheating risk performance standard for dwellings in the UK. It sets out the methodology and outlines details such as occupancy patterns, internal gains, weather files, window opening profiles etc that should be modelled.

Criteria for naturally ventilated dwellings

For living rooms, kitchens and bedrooms:

The number of hours during which the difference between operative and threshold comfort temperatures (ΔT) is greater than or equal to one degree (K), during the period of May to September inclusive, shall not be more than 3 per cent of occupied hours. (CIBSE TM52 Criterion 1: Hours of exceedance).

For bedrooms only: To evaluate comfort during the sleeping hours the operative temperature in the bedroom from 10 pm to 7 am shall not exceed 26°C for more than 1% of annual hours. (Note: 1% of the annual hours between 22:00 and 07:00 for bedrooms is 32 hours, so 33 or more hours above 26°C will be recorded as a fail).

For communal corridors

CIBSE TM59 states that whilst there is no mandatory target for communal corridors, if an operative temperature of 28°C is exceeded for more than 3% of annual hours, then this should be identified as a significant risk within the TM59 overheating report.

Criteria for mechanically ventilated dwellings

For living rooms, kitchens and bedrooms:

The internal temperature should not exceed 26°C for more than 3% of the occupied hours on an annual basis.

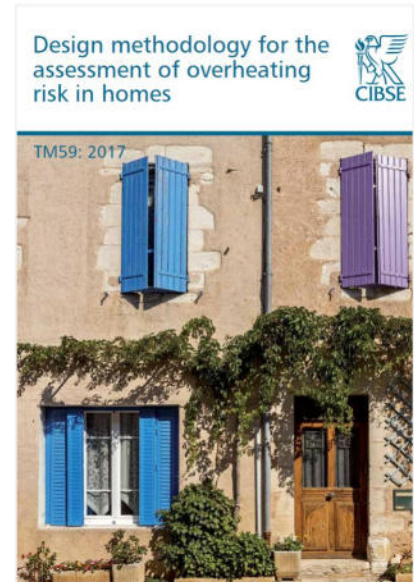
Technical definitions

The first criterion is evaluated in terms of the ΔT , which is the difference between the operative temperature T_{op} and the limiting maximum temperature T_{max} , $\Delta T = T_{op} - T_{max}$.

Operative temperature models the combined effect of convective and radiant heat transfer. It accounts for the combined of the temperature of the air, the temperature of the surfaces and air speed. To estimate T_{op} , dynamic thermal modelling is carried out to compute the predicted temperature distribution in the different thermal zones of the building.

T_{max} is the maximum acceptable temperature and is dependent on the outdoor running mean temperature and the building category with each associated acceptability range. The table details the suggested acceptability in terms of the temperature range of naturally ventilated buildings. For the assessment, we have used Category II limits.

Category	Explanation	Acceptable range (°C)
II	New build	±3



Building Regulations Part O (2021)

Part O builds on the guidance set out within CIBSE T59 and implements additional considerations. On window openings, ADO states:

“All of the following limits on CIBSE’s TM59, section 3.3, apply:

- a. When a room is occupied during the day (8am to 11pm), openings should be modelled to do all of the following.
 - i. Start to open when the internal temperature exceeds 22°C.
 - ii. Be fully open when the internal temperature exceeds 26°C.
 - iii. Start to close when the internal temperature falls below 26°C.
 - iv. Be fully closed when the internal temperature falls below 22°C.
- b. At night (11pm to 8am), openings should be modelled as fully open if both of the following apply.
 - i. The opening is on the first floor or above and not easily accessible.
 - ii. The internal temperature exceeds 23°C at 11pm.
- c. When a ground floor or easily accessible room is unoccupied, both of the following apply.
 - i. In the day, windows, patio doors and balcony doors should be modelled as open, if this can be done securely, following the guidance in paragraph 3.7 below.
 - ii. At night, windows, patio doors and balcony doors should be modelled as closed.”

Paragraph 3.7 explains:

“Open windows or doors can be made secure by using any of the following.

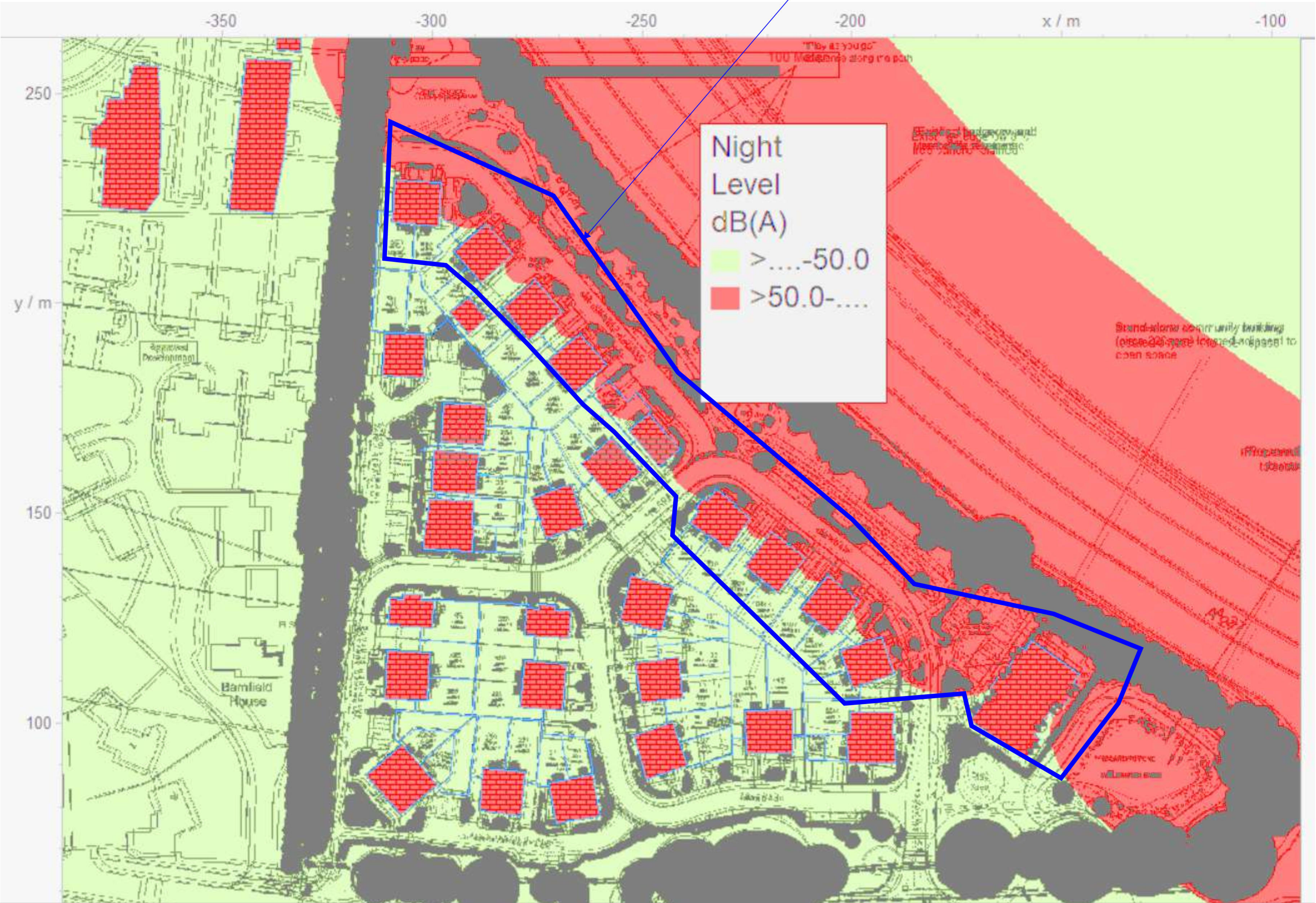
- a. Fixed or lockable louvred shutters.
- b. Fixed or lockable window grilles or railings.”

Part O does not support the use of internal blinds as part of the overheating mitigation strategy.

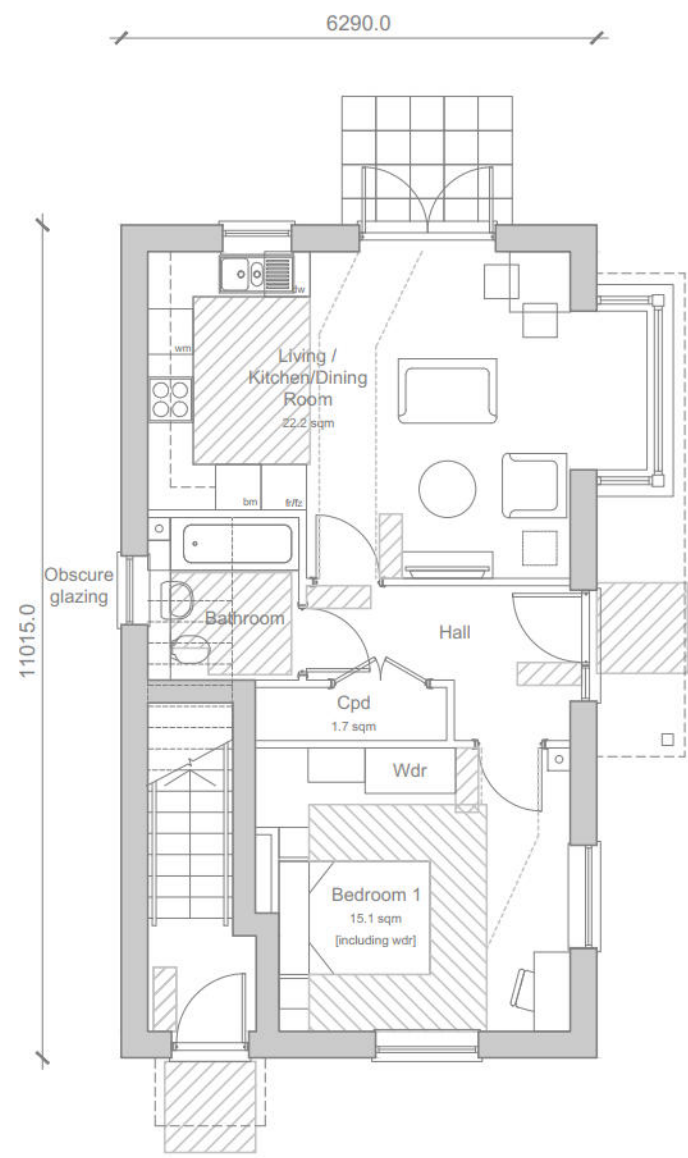


Appendix D – Overheating markups

Dwellings where windows cannot be relied upon for night-time ventilation due to noise constraints are proposed to have MVHR systems with integrated cooling coils. Please see notes 3 and 4 on the following page for further details.

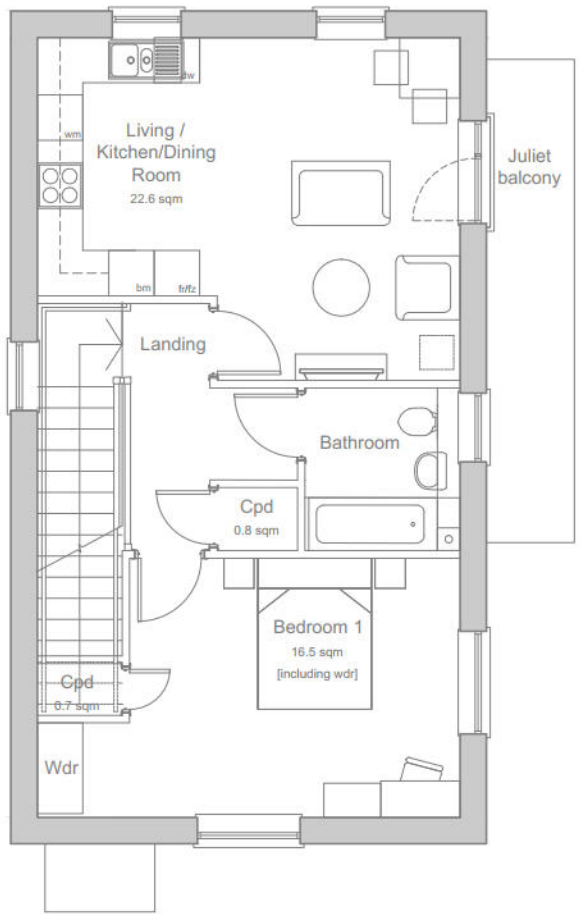


Building Regs – ADO- Overheating- Simplified Assessment. Red areas show greater than 50dB at night $L_{Aeq,8\text{ hour}}$



Ground Floor
HT01A
1-Bedroom 2-Person Maisonette
50.5 sqm / 543 sqft GIA (to finishes)
A minimum of 1.5 sqm storage provided in accordance with NDS requirements.

Plot 47



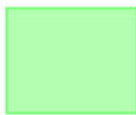
First Floor
HT01B
1-Bedroom 2-Person Maisonette
57.6 sqm / 620 sqft GIA (to finishes)
A minimum of 1.5 sqm storage provided in accordance with NDS requirements.

Plot 48

Legend



Window panes to be side-hung fully openable to 90 degrees inwards



Window panes to be side-hung and fully openable to 90 degrees outwards



Fixed window panes. These glazing areas should ideally be reduced or made openable if feasible.

Approved Document O (ADO) notes for overheating:

1) Please review transom or bottom of window heights for all window assemblies on upper floors where there is risk of falling. Part O (2021) guidance requires transoms to be at 1.1m above FFL to enable openable windowpanes above the transom to be fully openable. From our review of section drawings, the scheme is compliant but ECE please confirm.

2) All windows to have a g-value of 0.4.

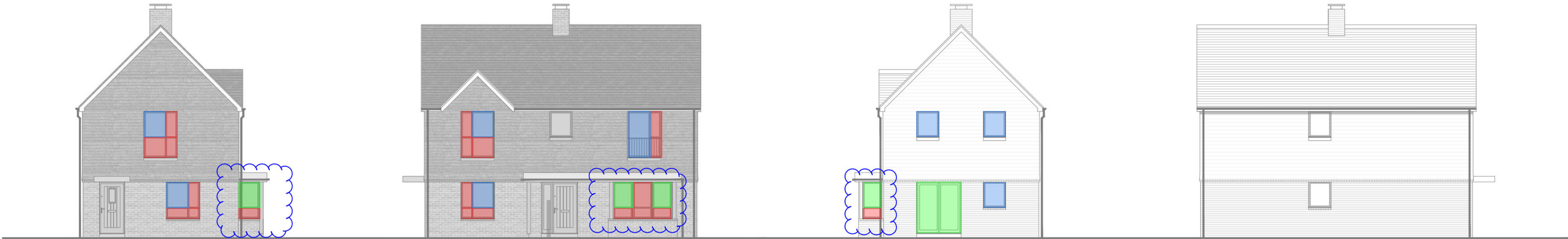
3) For plots where bedrooms do not deviate from ADO noise criteria:

Please ensure all Ground Floor (GF) Kitchen, Living, Dining (KLD) spaces can achieve a small opening (circa 0.1m² unobstructed free area per room) to provide night-time ventilation securely.

All GF bedrooms should be fitted with purge fans capable of delivering 70 litres /second of ventilation during night-time.

4) For plots facing A27 where ADO noise criteria cannot be met by bedrooms during night-time, the dwellings should have MVHR systems (with integrated air tempering coils) installed. MVHR should be capable of delivering 20 l/s per bedroom, 20 l/s per KLD, 20 l/s per Living room, and 13 l/s per Kitchen.

5) Current assessment based on ADO (2021) and CIBSE TM59 (2017). Final strategy to be confirmed based on ADO calculations to be carried out at detailed design and construction stages post-planning with the applicable guidance and regulations at the time of detailed design and construction stages.



Front Elevation
Plots 47, 48

Side Elevation

Rear Elevation

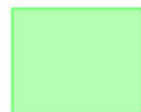
Side Elevation

Bay window assembly should have at least 4 upper panes as fully openable outwards, to 90 degrees.

Legend



Window panes to be side-hung fully openable to 90 degrees inwards



Window panes to be side-hung and fully openable to 90 degrees outwards



Fixed window panes. These glazing areas should ideally be reduced or made openable if feasible and subject to daylight consultant input.

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Drawing Title
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Job No	Drawing No	Rev
7428A	PL-10	-

Status
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Legend

- Window panes to be side-hung fully openable to 90 degrees inwards
- Window panes to be side-hung and fully openable to 90 degrees outwards
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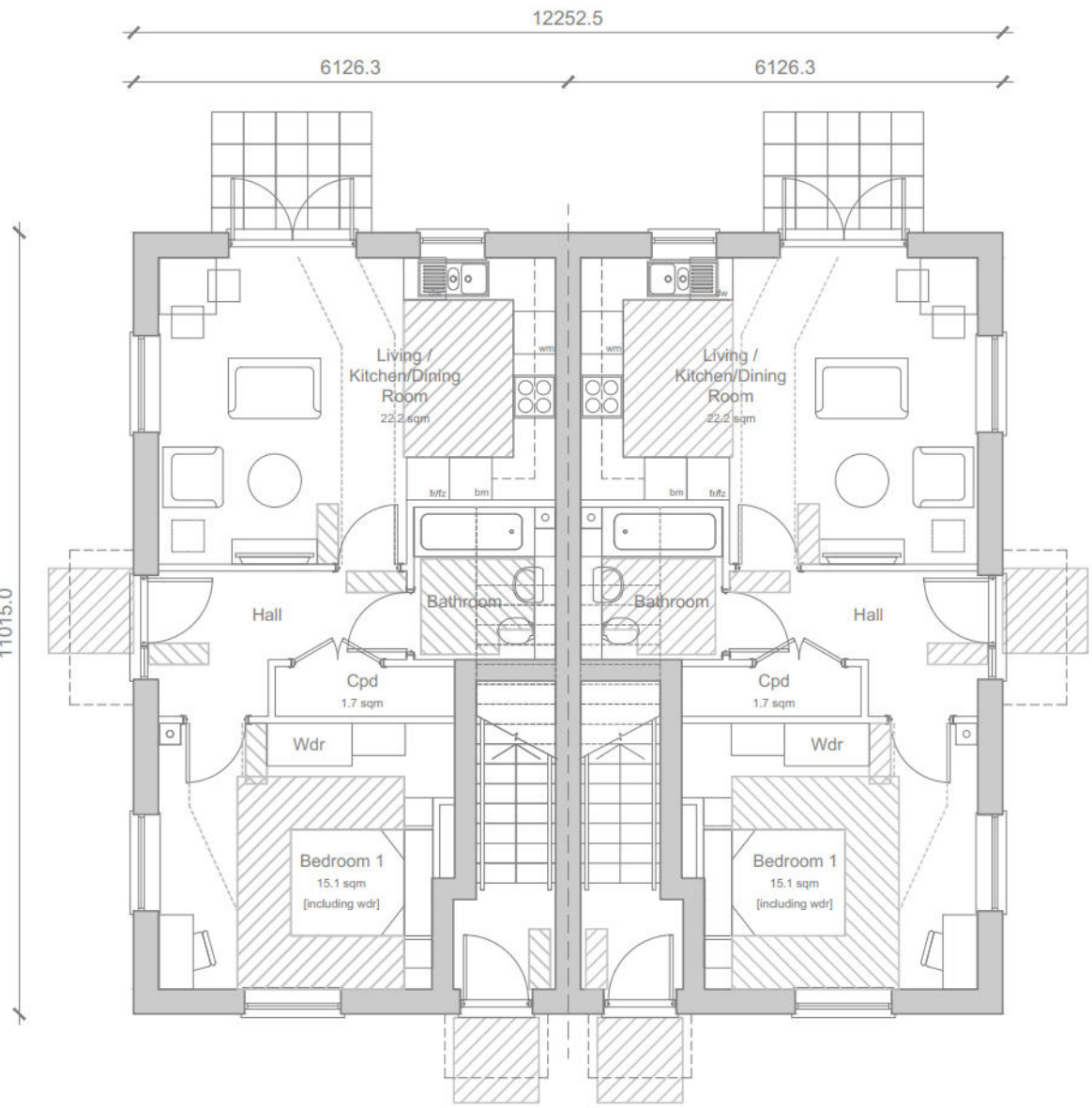
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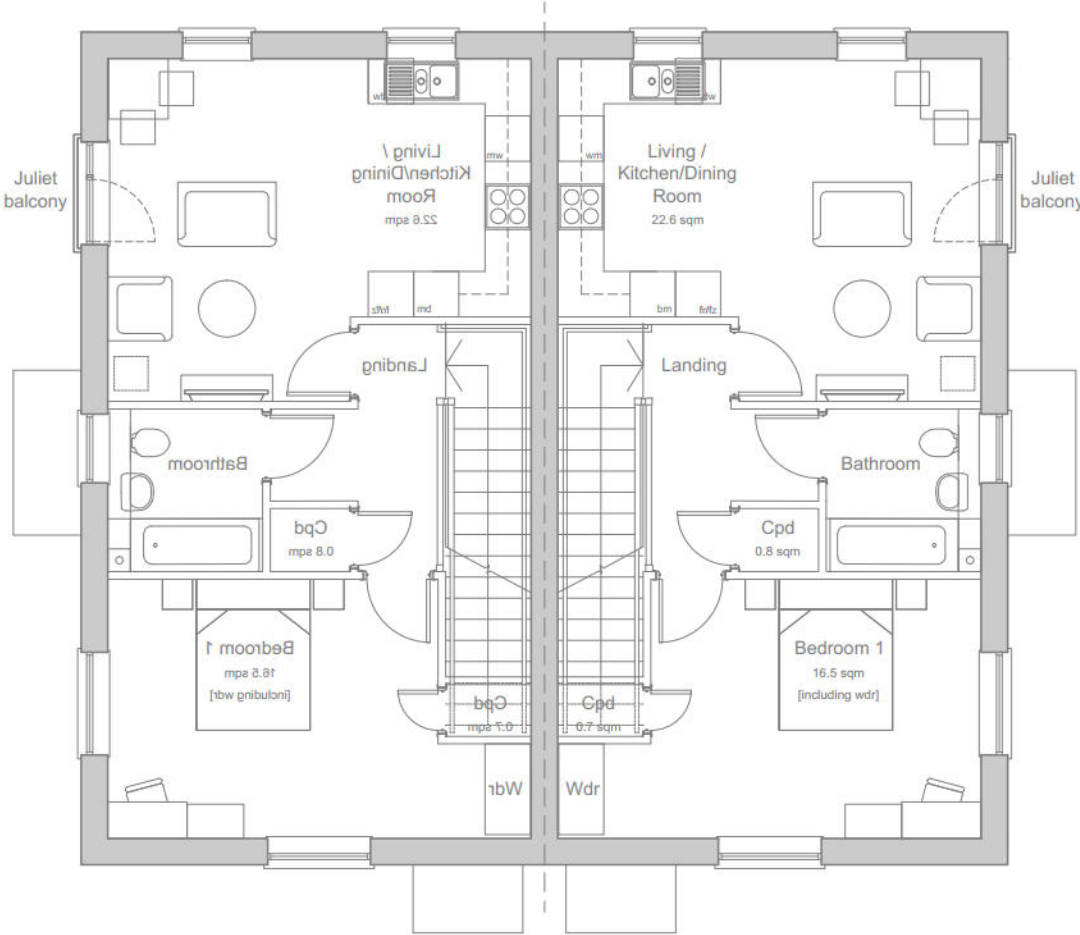
Ground Floor

HT01A
1-Bedroom 2-Person Maisonette
50.5 sqm / 543 sqft GIA (to finishes)
A minimum of 1.5 sqm storage provided in accordance with NDSS requirements.

Plot 26

HT01A
1-Bedroom 2-Person Maisonette
50.5 sqm / 543 sqft GIA (to finishes)
A minimum of 1.5 sqm storage provided in accordance with NDSS requirements.

Plot 24



First Floor

HT01B
1-Bedroom 2-Person Maisonette
57.6 sqm / 620 sqft GIA (to finishes)
A minimum of 1.5 sqm storage provided in accordance with NDSS requirements.

Plot 27

First Floor

HT01B
1-Bedroom 2-Person Maisonette
57.6 sqm / 620 sqft GIA (to finishes)
A minimum of 1.5 sqm storage provided in accordance with NDSS requirements.

Plot 25



Front Elevation

Plots 26, 27

Plots 24, 25



Side Elevation

Plots 24, 25



Rear Elevation

Plots 24, 25

Plot 26, 27



Side Elevation

Plots 26, 27

Legend

- Window panes to be side-hung fully openable to 90 degrees inwards
- Window panes to be side-hung and fully openable to 90 degrees outwards
- Fixed window panes. These glazing areas should ideally be reduced or made openable if feasible and subject to daylight consultant input.

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Job No 7428A
Drawing No PL-11
Rev -

Status
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Legend

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Legend

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Please redesign assembly to have two inward opening panes to 90 degrees angle.

Bay window assembly should have at least 4 upper panes as fully openable outwards, to 90 degrees.



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Job No 7428A	Drawing No PL-13	Rev -
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PRELIMINARY

CAD Plot date: 29/01/2026 - 16:43:21 7428-mast.dwg

Legend

- Window panes to be side-hung fully openable to 90 degrees inwards
- Window panes to be side-hung and fully openable to 90 degrees outwards
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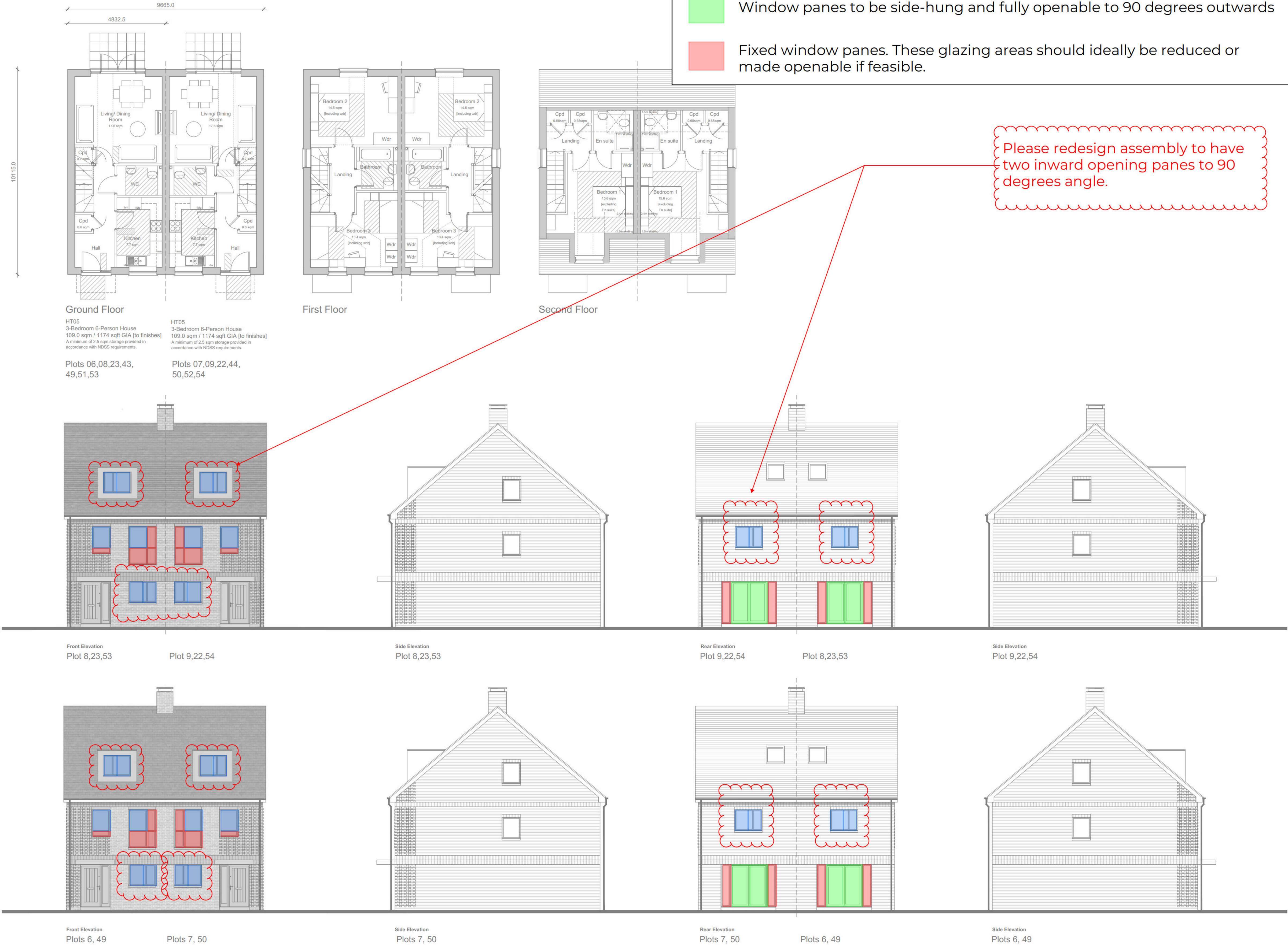
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29.01.26

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7428A

Drawing No
PL-16

Rev
-

Status
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Legend

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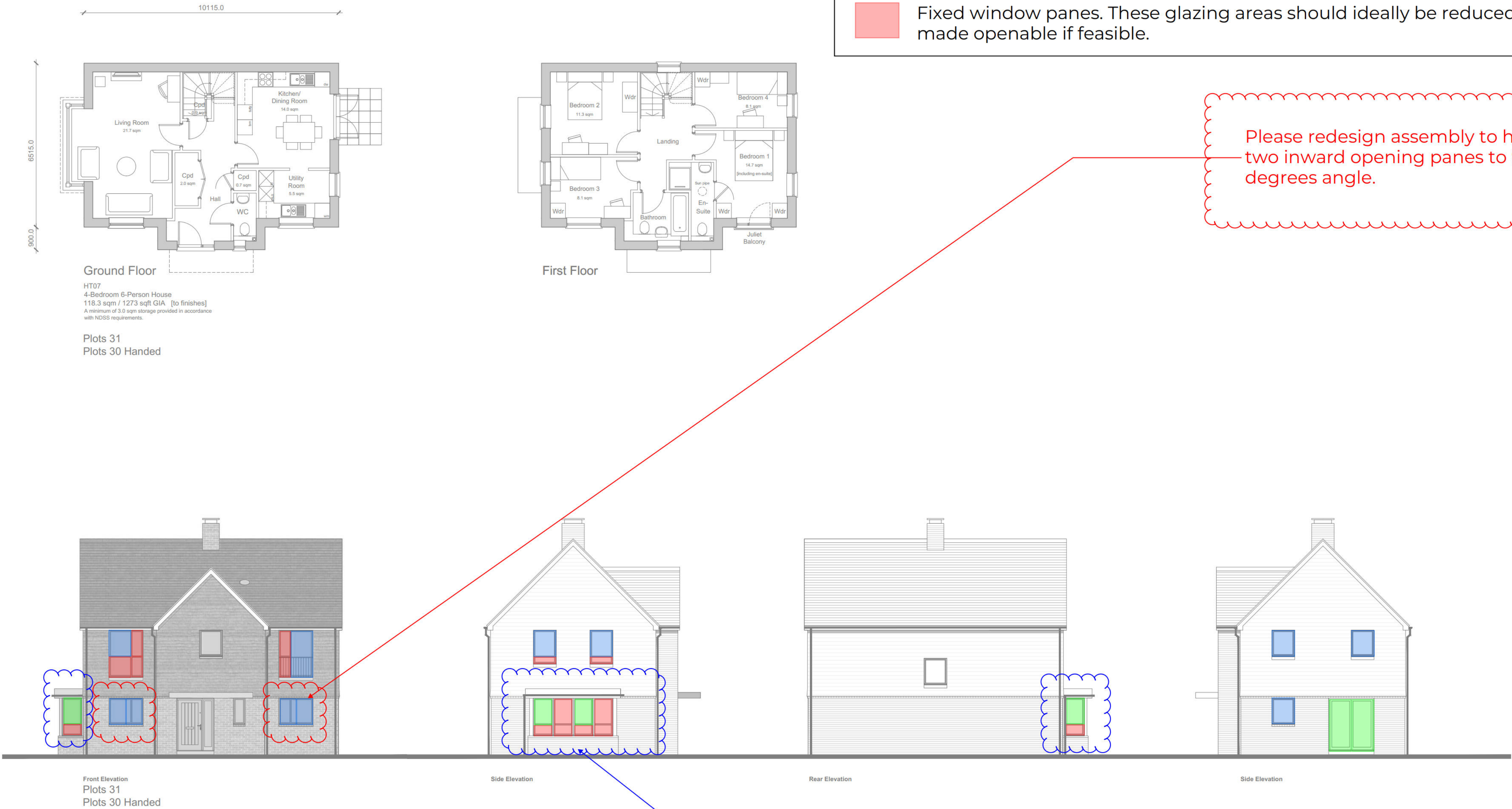
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5) Current assessment based on ADO (2021) and CIBSE TM59 (2017). Final strategy to be confirmed based on ADO calculations to be carried out at detailed design and construction stages post-planning with the applicable guidance and regulations at the time of detailed design and construction stages.



Please redesign assembly to have two inward opening panes to 90 degrees angle.

Bay window assembly should have at least 4 upper panes as fully openable outwards, to 90 degrees.



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Harlequin Developments

Job Title
Land North of Arundel Road, Fontwell

Drawing Title
Floor Plans and Elevations - HT07

Scale
1:100 @ A1 / 1:200 @ A3

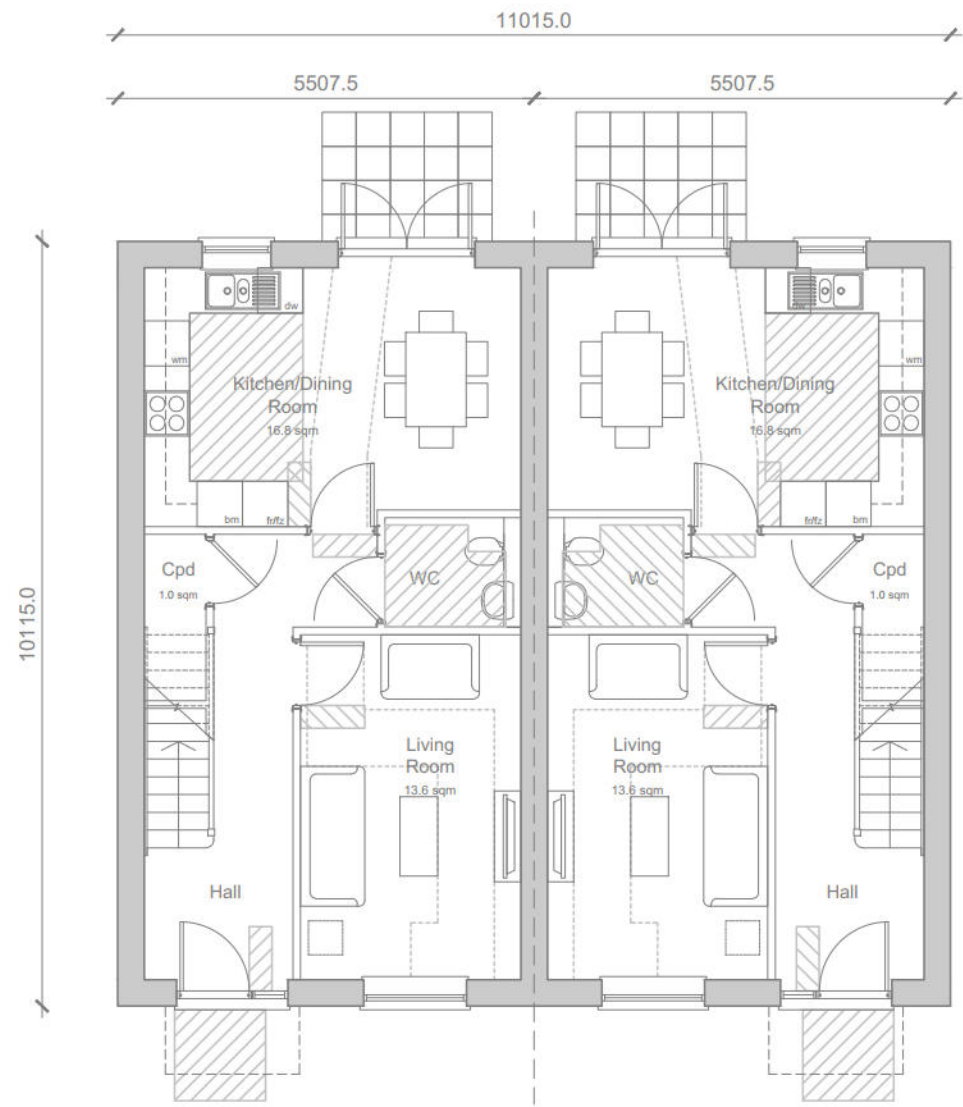


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Checked KE
Date 29.01.26

Job No 7428A
Drawing No PL-18
Rev -

Status
PRELIMINARY

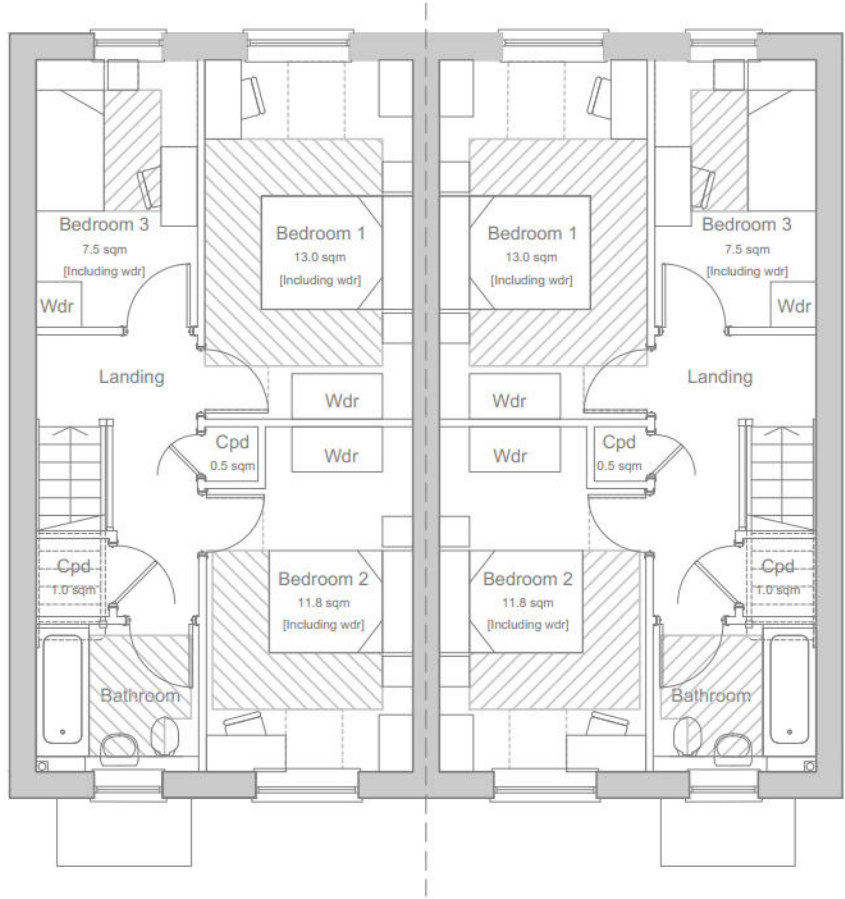
CAD Plot date: 29/01/2026 - 16:49:21 7428-mast.dwg



Ground Floor

HT03
3-Bedroom 5-Person House
95 sqm / 1023 sqft GIA [to finishes]
A minimum of 2.5 sqm storage provided in accordance with NDSG requirements.

Plots 29,33



First Floor

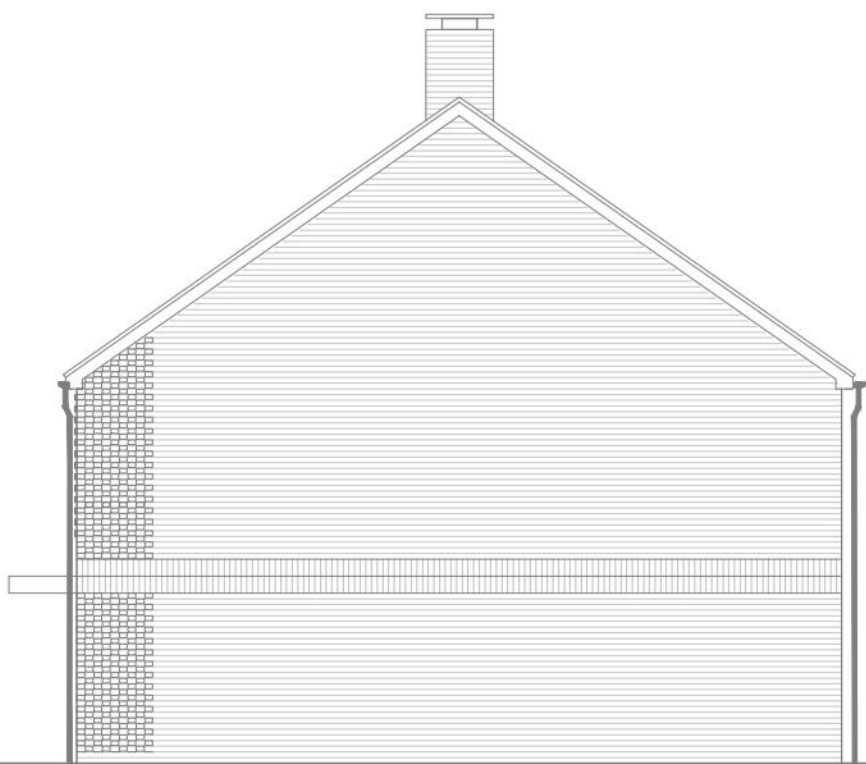
HT03
3-Bedroom 5-Person House
95 sqm / 1023 sqft GIA [to finishes]
A minimum of 2.5 sqm storage provided in accordance with NDSG requirements.

Plots 28,32

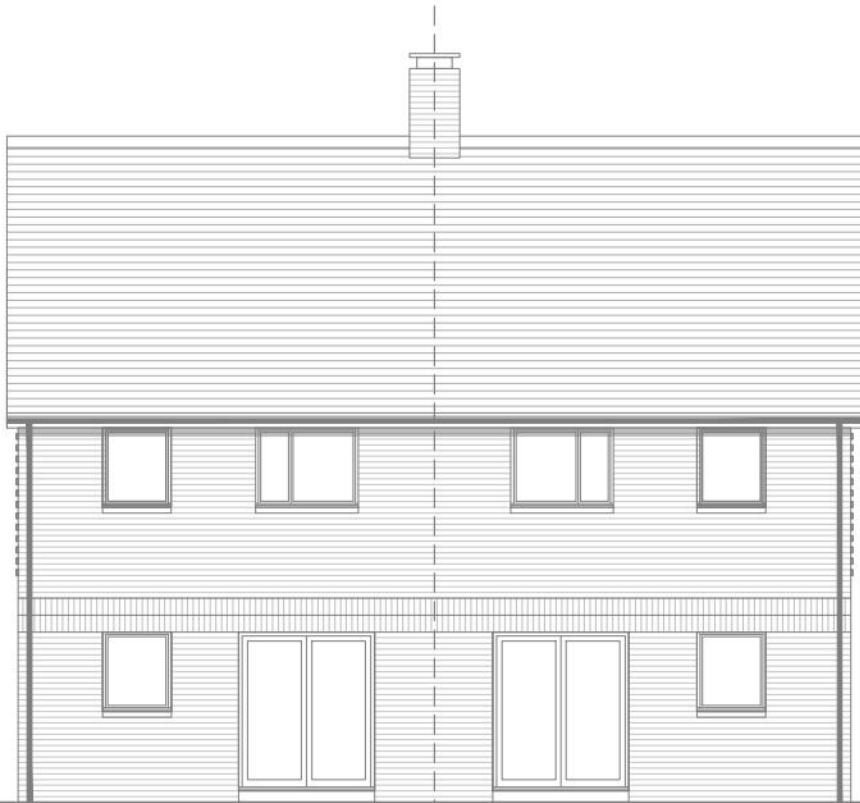
Please refer to previous pages for guidance on how to design the window assemblies of this typology.



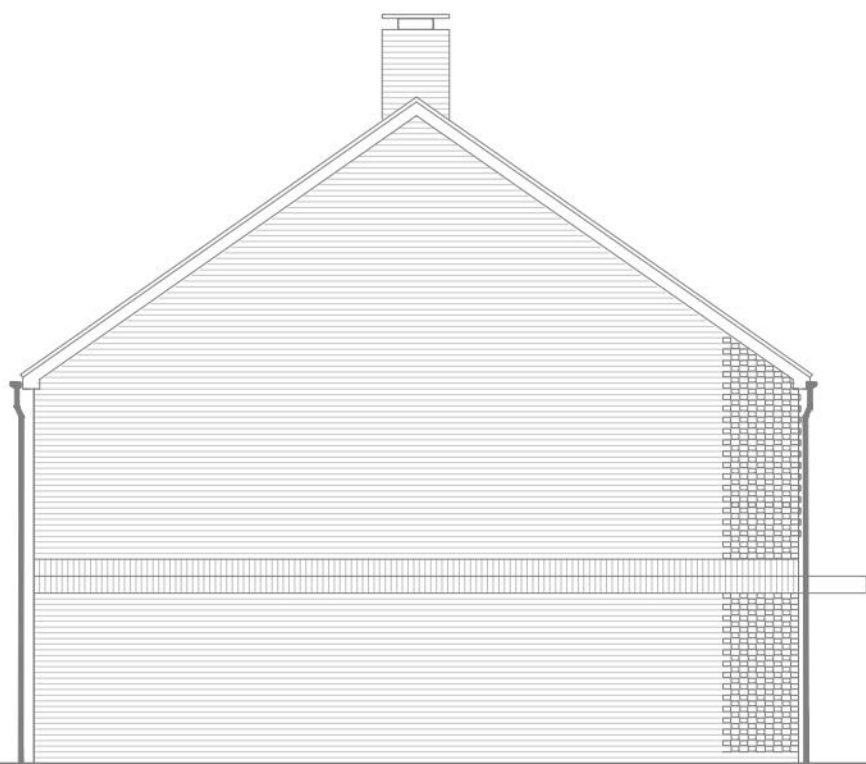
Front Elevation
Plot 29,33



Side Elevation
Plot 28,32



Rear Elevation
Plot 28,32



Side Elevation
Plot 29,33

Rev	Date	Revision Details	Dr	Ch
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Job Title
Land North of Arundel Road, Fontwell

Drawing Title
Floor Plans and Elevations - HT03 Semi

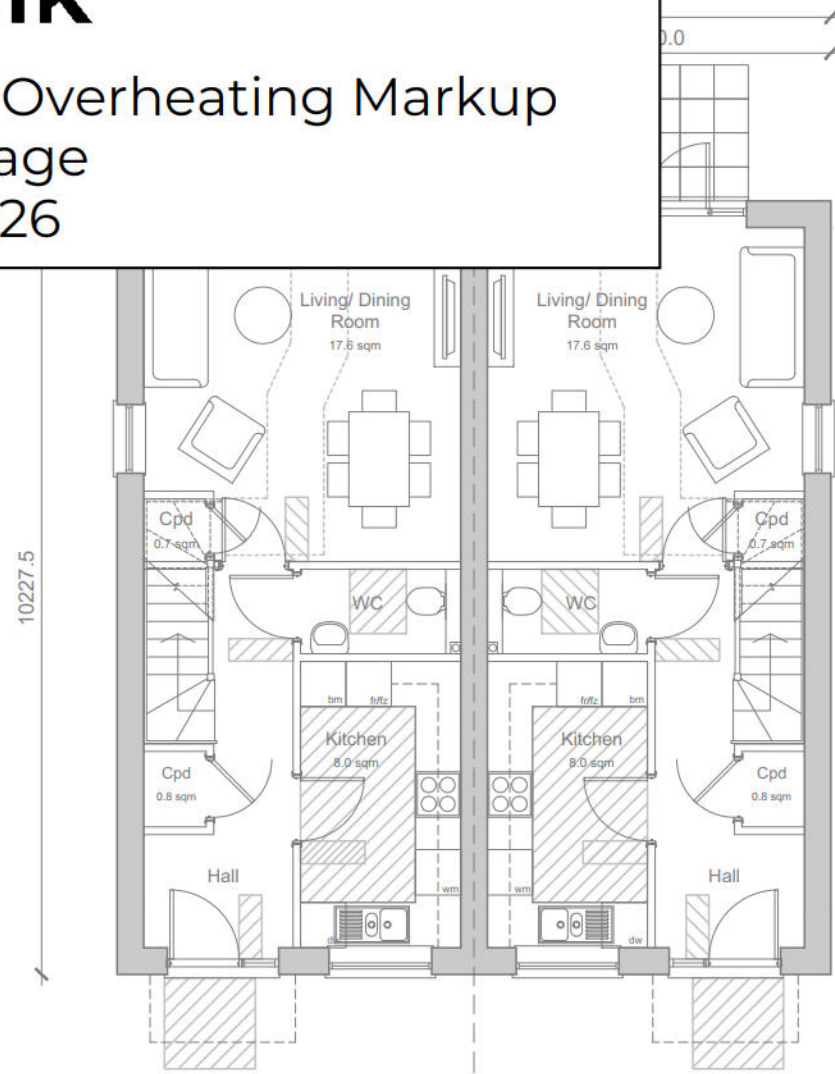
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Drawn CV/KP
Checked KE
Date 29.01.26

Job No 7428A
Drawing No PL-15
Rev -

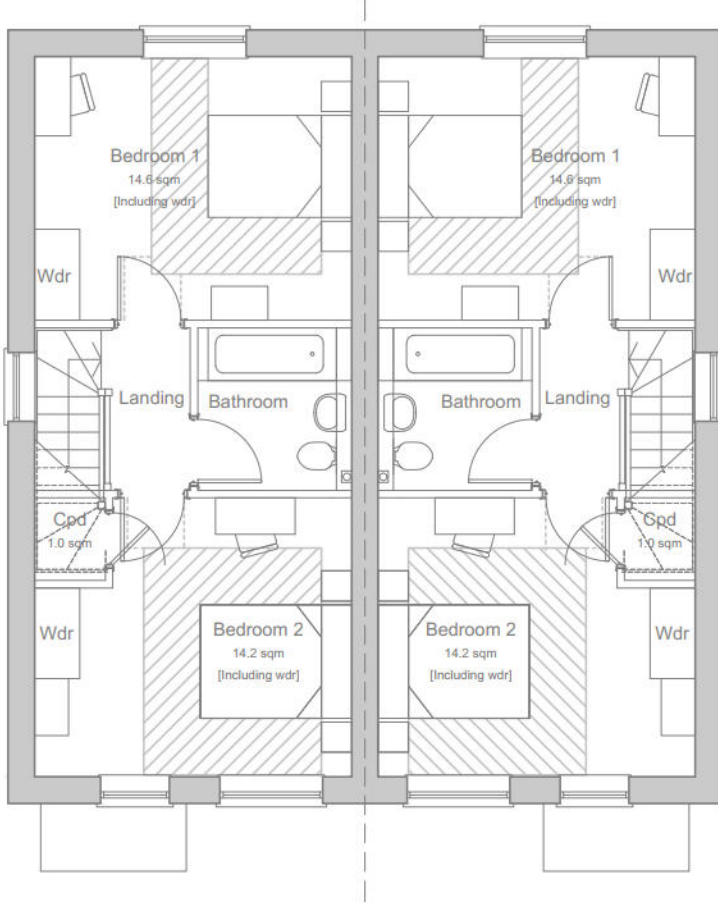
Status
PRELIMINARY



Ground Floor

HT02B
2-Bedroom 4-Person House
79.9 sqm / 860 sqft GIA (to finishes)
A minimum of 2.0 sqm storage provided in accordance with NDSS requirements.

Plots 04,14,34,36,38,45



First Floor

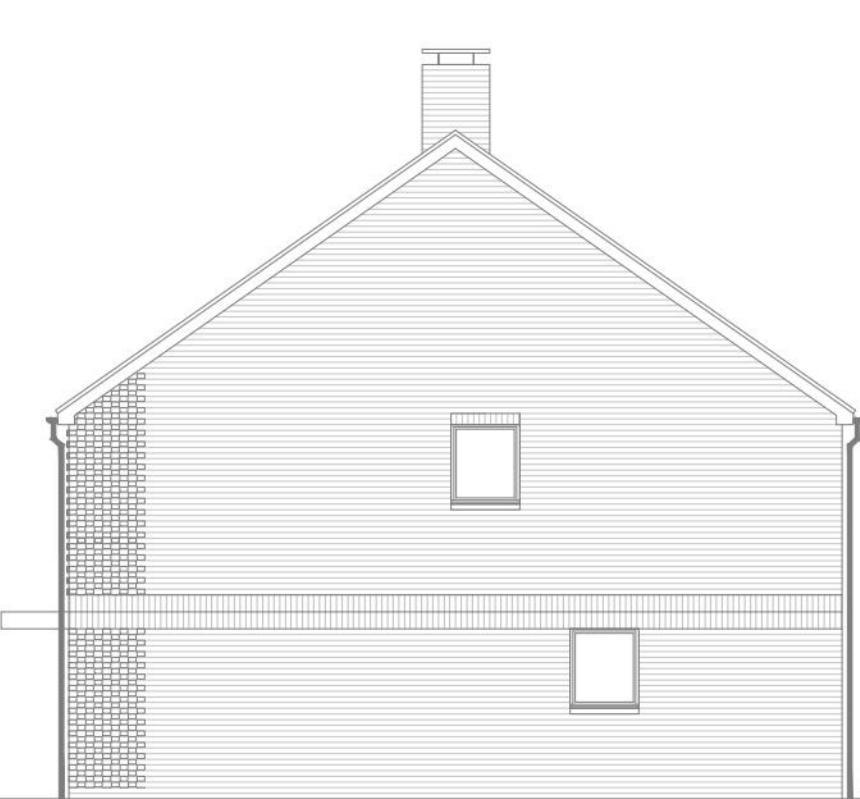
HT02B
2-Bedroom 4-Person House
79.9 sqm / 860 sqft GIA (to finishes)
A minimum of 2.0 sqm storage provided in accordance with NDSS requirements.

Plots 05,15,35,37,39,46

Please refer to previous pages for guidance on how to design the window assemblies of this typology.



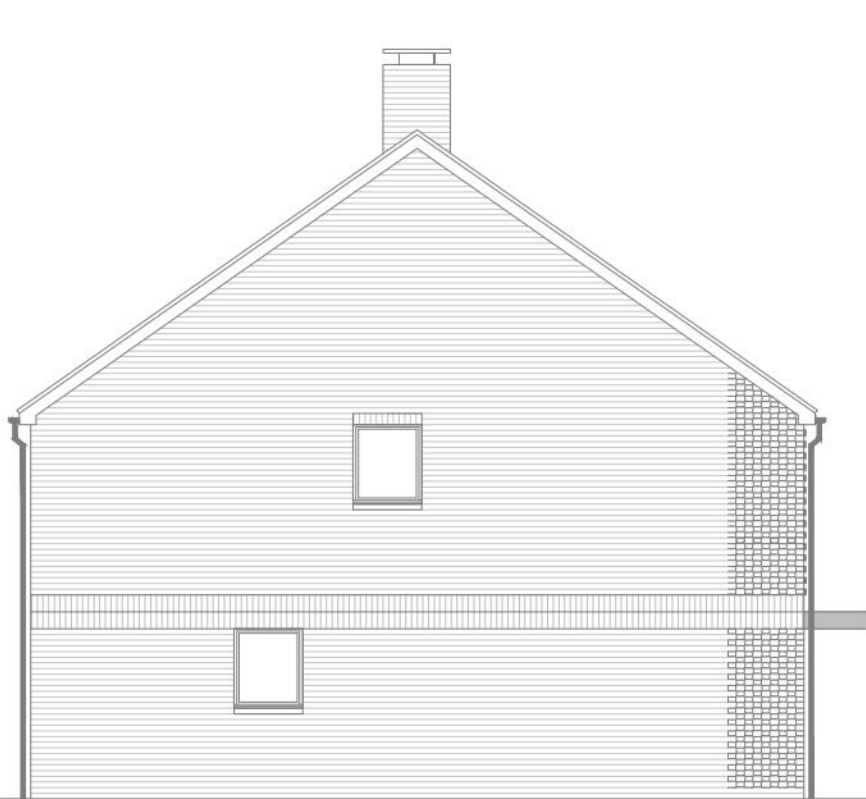
Front Elevation
Plots 04,14,36



Side Elevation
Plots 05,15,37



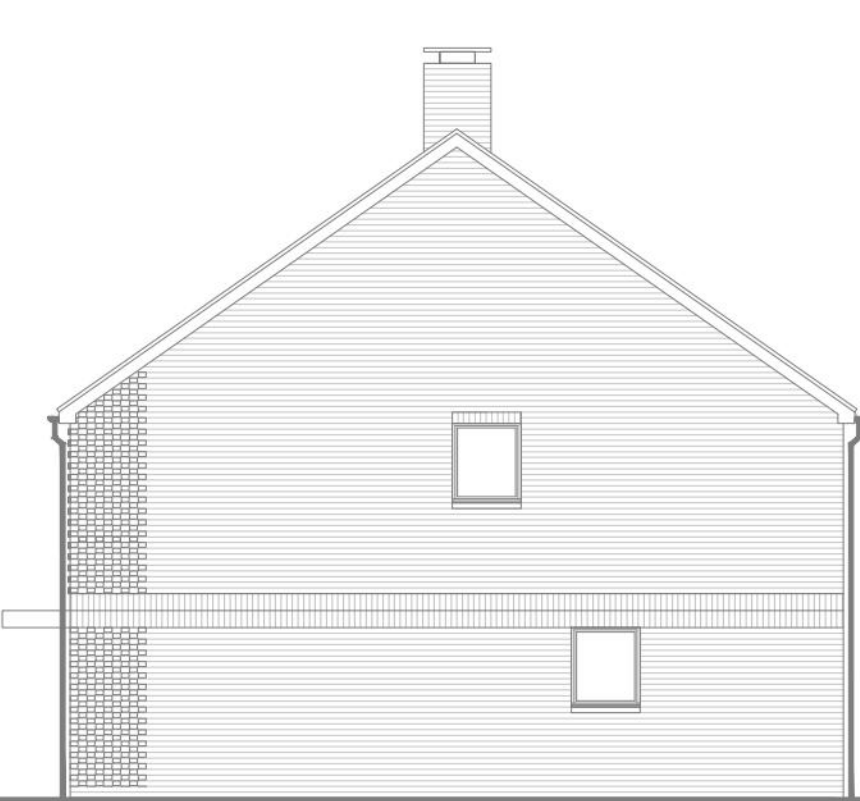
Rear Elevation
Plots 05,15,37



Side Elevation
Plots 04,14,36



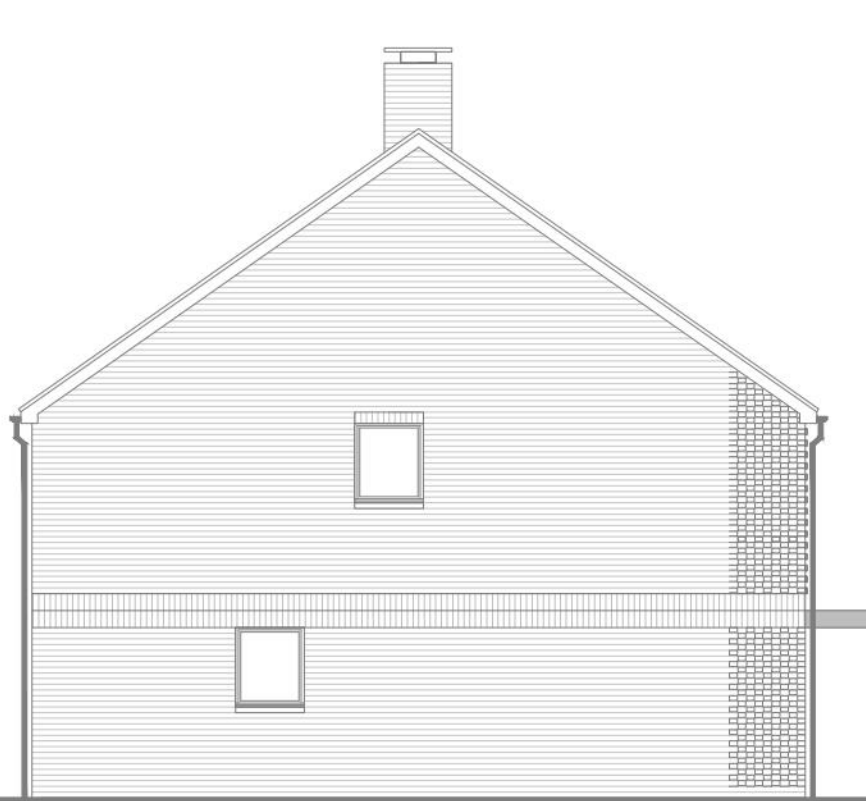
Front Elevation
Plots 38,45



Side Elevation
Plots 39,46



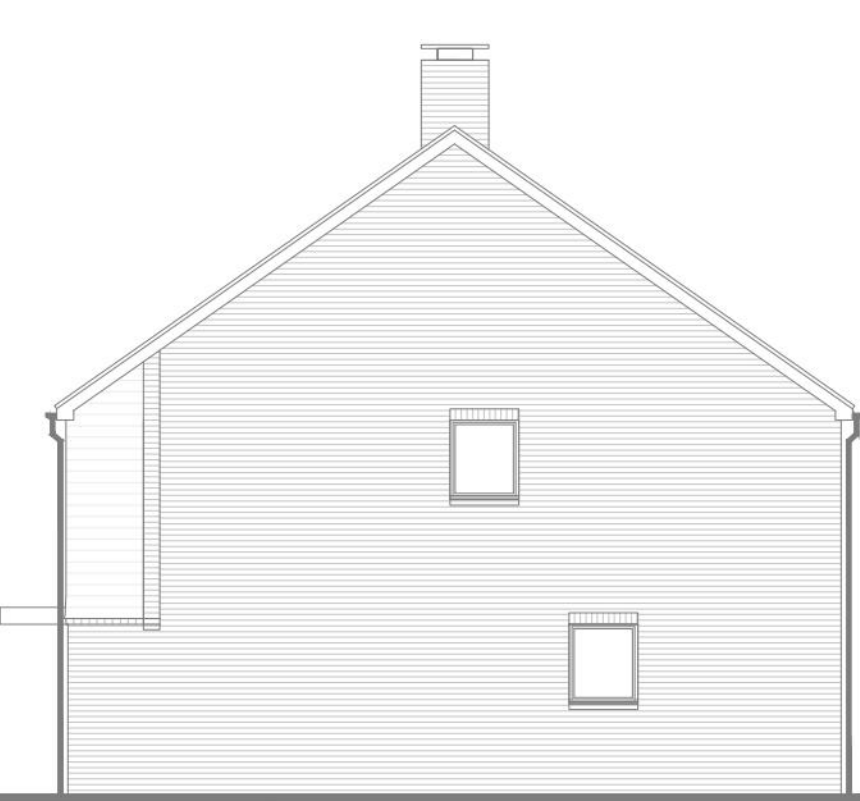
Rear Elevation
Plots 39,46



Side Elevation
Plots 38,45



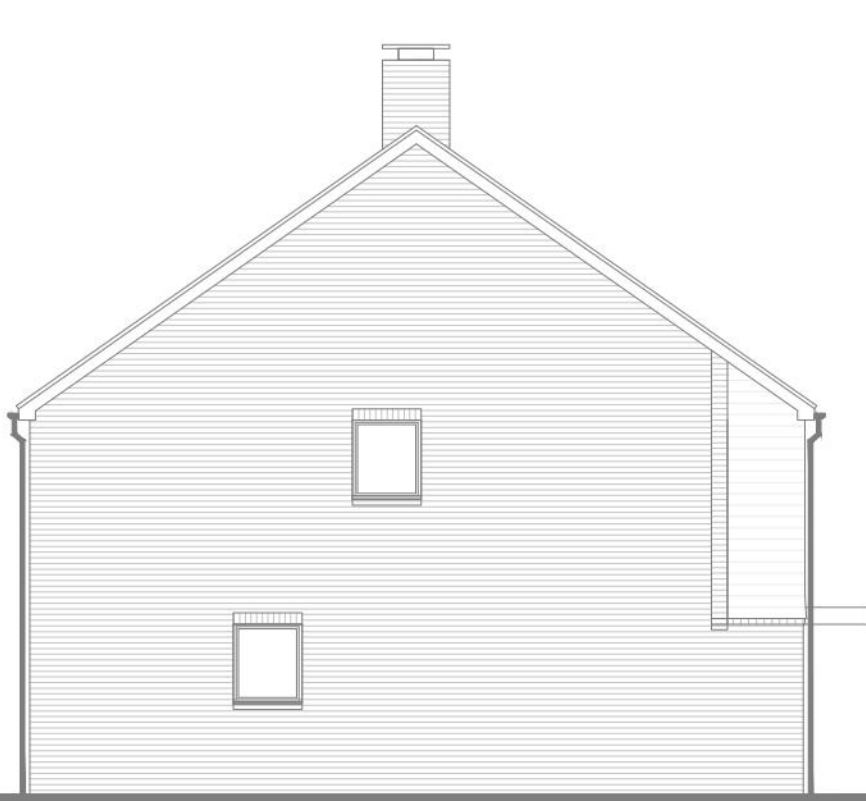
Front Elevation
Plot 34



Side Elevation
Plot 35



Rear Elevation
Plot 35



Side Elevation
Plot 34

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Harlequin Developments

Job Title
Land North of Arundel Road, Fontwell

Drawing Title
Floor Plans and Elevations -HT02B Semi

Scale
1:100 @ A1 / 1:200 @ A3

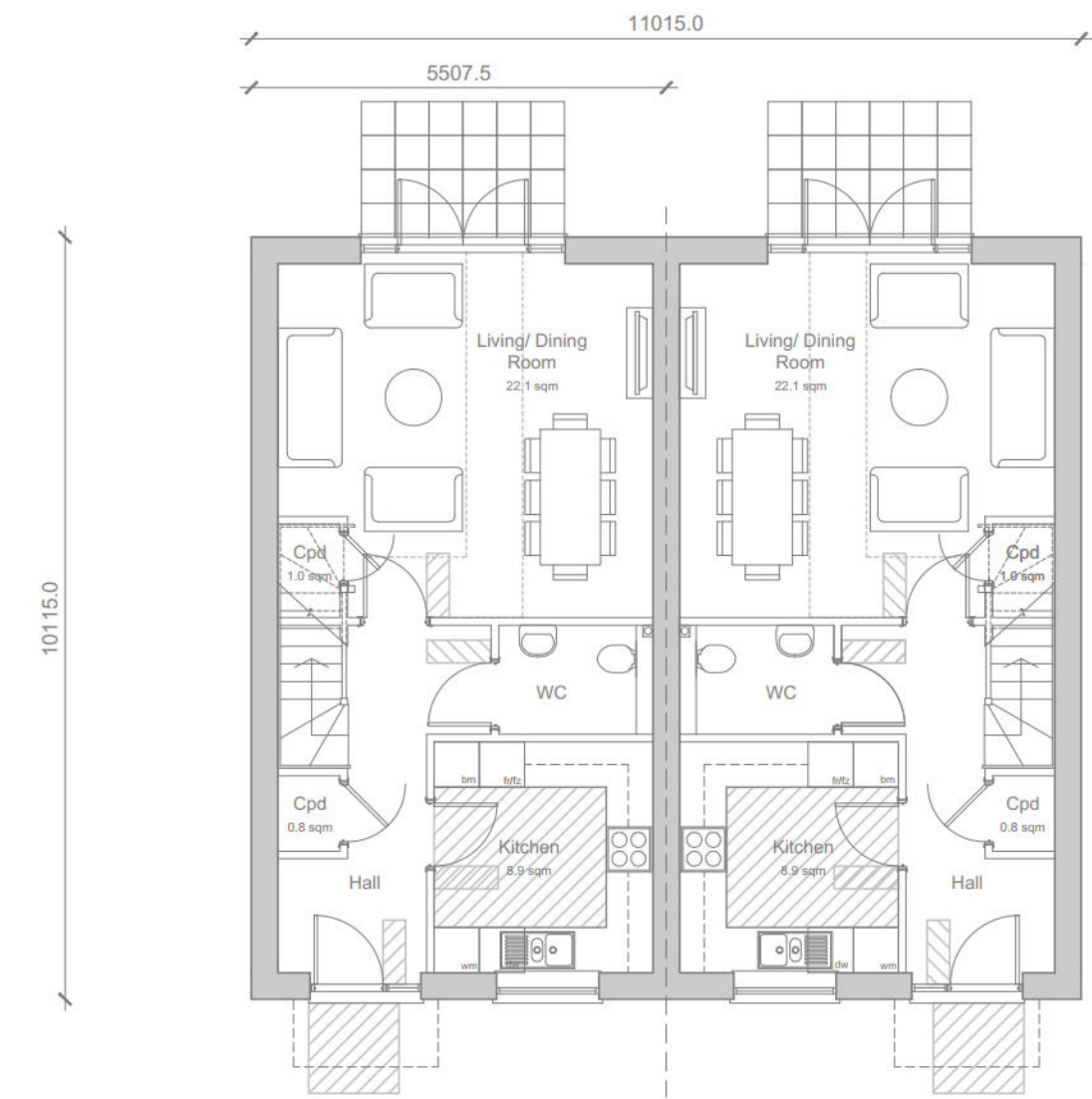
metres 2 4 6 8 10

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Job No 7428A Drawing No PL-14 Rev -

Status
PRELIMINARY

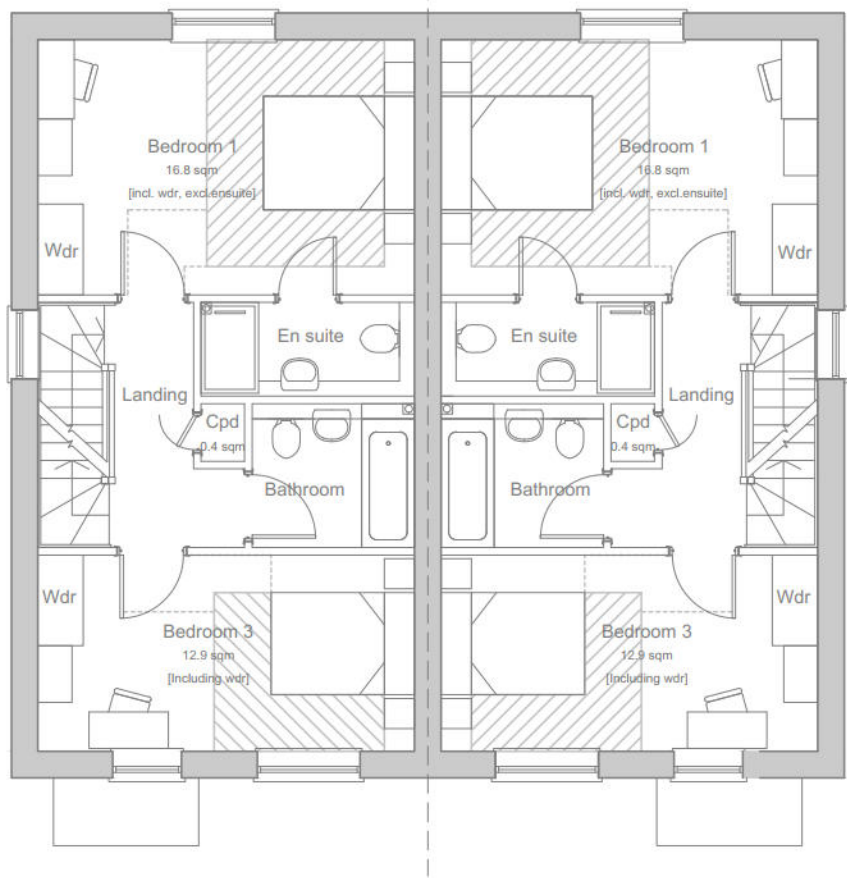
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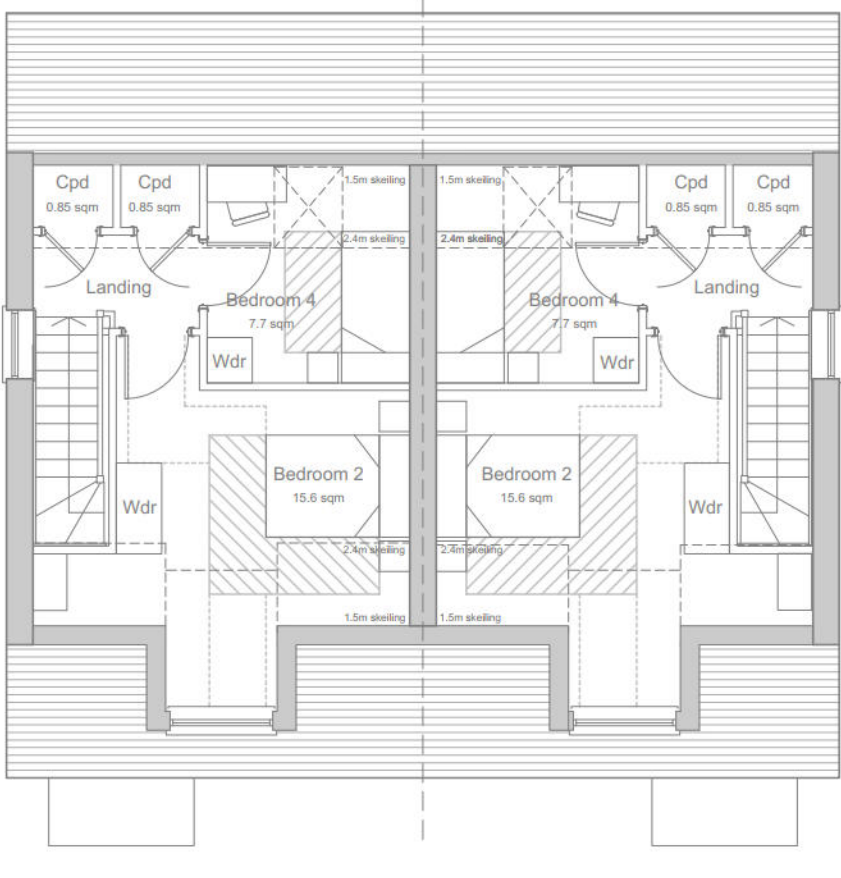
Ground Floor

HT06
4-Bedroom 7-Person House
125.8 sqm / 1354 sqft GIA
[to finishes]
A minimum of 3.0 sqm storage provided in accordance with NDIS requirements.
Plots 12,18,55

HT06
4-Bedroom 7-Person House
125.8 sqm / 1354 sqft GIA
[to finishes]
A minimum of 3.0 sqm storage provided in accordance with NDIS requirements.
Plots 13,19,56



First Floor



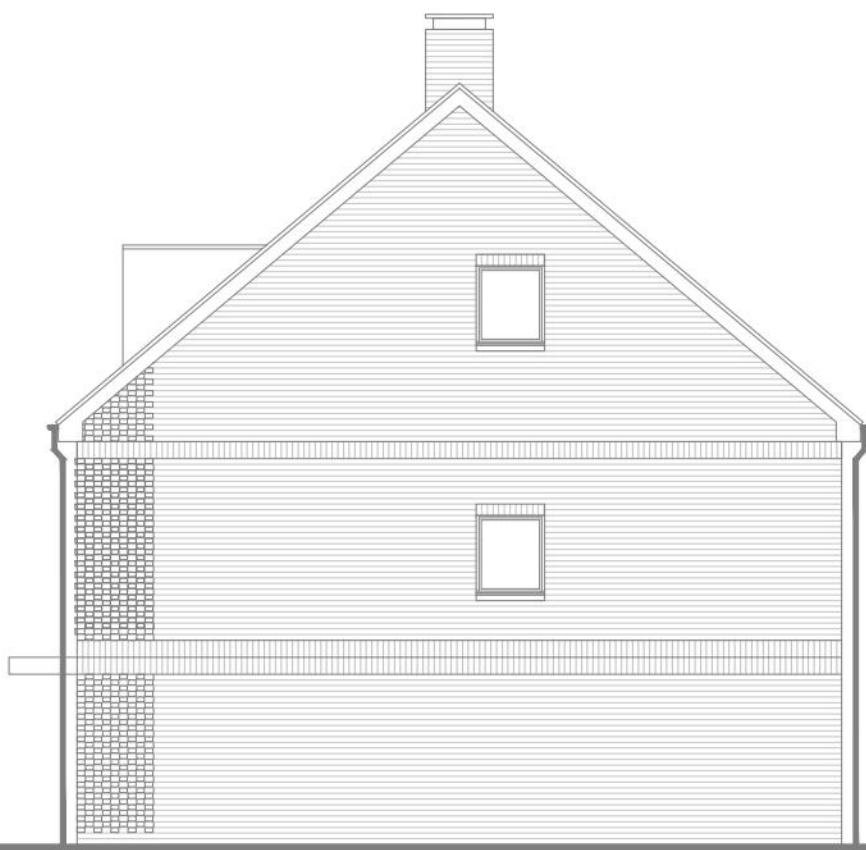
Second Floor

Please refer to previous pages for guidance on how to design the window assemblies of this typology.



Front Elevation
Plots 12,18,55

Plots 13,19,56

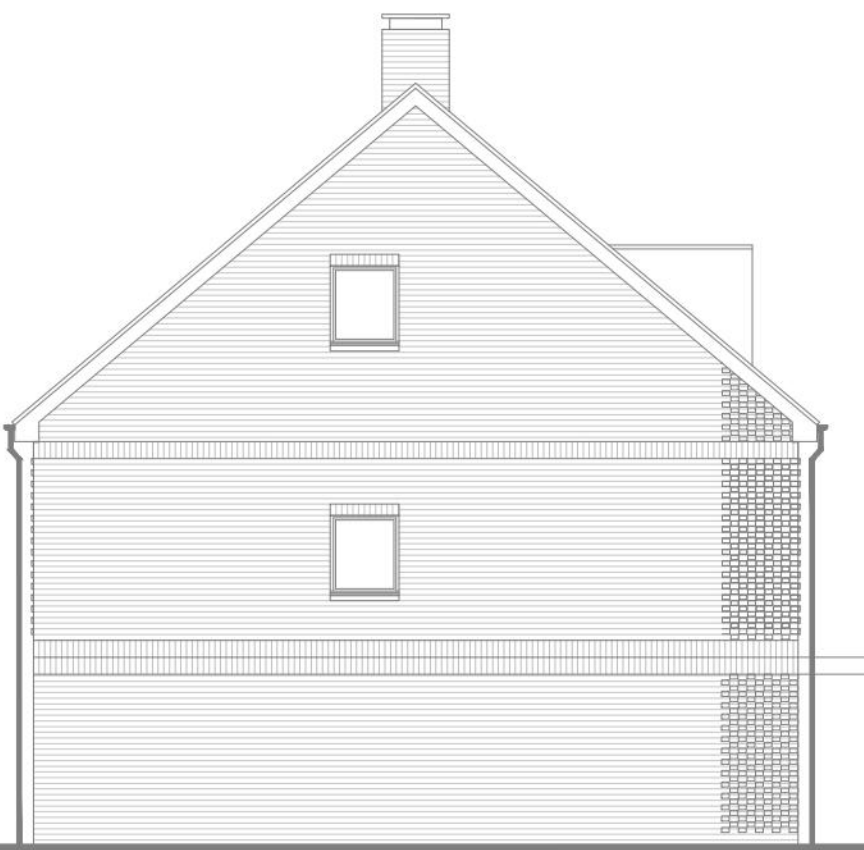


Side Elevation
Plots 13,19,56



Rear Elevation
Plots 13,19,56

Plots 12,18,55



Side Elevation
Plots 12,18,55

Rev	Date	Revision Details	Dr	Ch
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Job Title
Land North of Arundel Road, Fontwell

Drawing Title
Floor Plans and Elevations - HT06 Semi

Scale
1:100 @ A1 / 1:200 @ A3



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Job No 7428A	Drawing No PL-19	Rev -
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