

CAM-WWL-2Z-ZZ-RP-N-000002 P04

## 1.0 Introduction

Wallace Whittle have been appointed by Graham Construction to conduct a Part O Overheating review for Cambridge PBSA, Manchester. The proposed development has two buildings, Phase 1 and Phase 2, with 22 - 28 storeys, with a total of 2302 bedrooms and amenity spaces across the buildings.

The purposed of this design note is to demonstrate Compliance against Part O for the proposed bedrooms (clusters and studios) and based on the two proposed ventilation options:

- Option 1: MVHR + purge ventilation (note that purge ventilation is only applicable to spaces with window opening restriction due to the acoustic requirement).
- Option 2: Continuous Mechanical Extract Ventilation.

The assessment has been conducted on a sample basis, with 289 rooms assessed from Phase 1 and 239 rooms assessed from Phase 2.

| Issue | Date     | By   | Checked |
|-------|----------|------|---------|
| P01   | 09.10.25 | AC   | GMcC    |
| P02   | 14.10.25 | GW   | GMcC    |
| P03   | 17.10.25 | GMcC | GMcC    |
| P04   | 27.10.25 | AC   | FTC     |

## 2.0 Introduction

### 2.1 Assessment Methodology

The assessment methodology is described below:

- A sample of full floorplates from the ground, 1<sup>st</sup>, 6<sup>th</sup>, 9<sup>th</sup> and 22<sup>nd</sup> floor for Phase 1, and ground, 1<sup>st</sup>, 4<sup>th</sup>, 9<sup>th</sup>, and 22<sup>nd</sup> floor for Phase 2 have been modelled to create a representative sample of all regularly occupied spaces across a lower, middle, and top floor.
- All regularly occupied spaces were zoned into separate rooms including clusters, studios and kitchens.
- Accurate thermal properties of all proposed building construction types have been included in the model.
- Standard CIBSE TM59 occupancy rates and internal gain profiles were applied to the model.
- Where applicable, openable windows were implemented.
- Mechanical ventilation was applied to match the ventilation strategy proposed.
- The most appropriate weather file was applied to all simulations.
- The thermal modelling assessment was carried out using hourly dynamic simulation.

A three-dimensional (3D) thermal model of the proposed building was developed using Integrated Environmental Solutions Virtual Environment (IES VE) Software (version 2025). Using the following modules to assess the potential overheating risk within all regularly occupied spaces of the development:

- ModelIT: to create the virtual model data, which is based on the proposed geometry and accounts for location and orientation.
- SunCast: to include the impact of the site orientation and relation to the solar impact on the development.
- MacroFlo: bulk air movement module which simulates natural ventilation provision.
- ApacheSim: dynamic thermal simulation module which combines the building thermo-physical characteristics to assess its thermal performance.
- VistaPro: results analysis.

| Issue | Date     | By   | Checked |
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| P03   | 17.10.25 | GMcC | GMcC    |
| P04   | 27.10.25 | AC   | FTC     |

## 2.2 Design Comfort Criteria

In April 2017, CIBSE launched TM59 'Design methodology for the assessment of overheating risk in homes. This specifically focuses on acceptable thermal comfort conditions for occupants during both daytime and night-time periods. The document outlines two criteria to assess overheating for homes, which are predominantly naturally ventilated and recommends the use of the CIBSE fixed temperature test for homes which are predominately mechanically ventilated. Compliance with Part O will be assessed in accordance with criteria for naturally ventilated homes.

### **TM59 4.2 Criterion (a) - Applied to all occupied Rooms (Natural Ventilation):**

The room temperature cannot exceed the maximum acceptable temperature by more than 1 K for more than 3% of occupied hours between May and September (inclusive). (CIBSE TM52 Criteria 1).

### **TM59 4.2 Criterion (b) - Applied to Bedrooms only (Natural Ventilation):**

The room temperature cannot exceed 26°C for more than 1% of the annual hours between 22:00 and 07:00.

(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').

### **TM59 4.2 Criteria Applied to all occupied Rooms for homes predominantly mechanically ventilated:**

For homes with restricted window openings, the CIBSE fixed temperature test must be followed, i.e. all occupied rooms should not exceed an operative temperature of 26 °C for more than 3% of the annual occupied annual hours (CIBSE Guide A (2015a)). Note that this criterion is not considered for the building.

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| P03   | 17.10.25 | GMcC | GMcC    |
| P04   | 27.10.25 | AC   | FTC     |

## 2.2.1 Weather Data

As per CIBSE TM59 guidelines, developments should refer to the latest CIBSE Design Summer Year (DSY) weather files published in 2016 and be required to pass the DSY1 file most appropriate for the site location, as this represents a moderately warm summer. For this study, Manchester\_DSY1\_2020High50\_.epw was selected as the most representative for the location.

| Weather Scenario | Description                                                  | Notes                                                       |
|------------------|--------------------------------------------------------------|-------------------------------------------------------------|
| DSY1             | Moderately warm summer, with a return period of seven years. | Weather scenario used for compliance with Part O/CIBSE TM59 |

Table 2.2.1 - CIBSE DSY Weather Scenario

## 2.2.2 Internal Gains

In line with CIBSE TM59 standard thermal templates, the internal gains applied to the thermal model are summarised in the below table and were applied to thermal model.

| Unit / Room           | Occupancy                                                                                                                                                          | Equipment Load                                                                                                                                                           | Lighting                                                                                                               |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|
| Studio/Living kitchen | <ul style="list-style-type: none"> <li>8am - 11pm: 1 person at 100%</li> <li>11pm - 8am: 1 person at 70%</li> <li>Rate of gain: 75W Sensible/55W Latent</li> </ul> | <ul style="list-style-type: none"> <li>9am - 6pm: 110W</li> <li>6pm - 8pm: 450W</li> <li>8pm - 10pm: 200W</li> <li>10pm - 12pm: 110W</li> <li>12pm - 9am: 85W</li> </ul> | <ul style="list-style-type: none"> <li>6pm - 11pm: 2 W/m<sup>2</sup></li> <li>11pm - 6pm: 0 W/m<sup>2</sup></li> </ul> |
| Clusters              | <ul style="list-style-type: none"> <li>8am - 11pm: 1 person at 100%</li> <li>11pm - 8am: 1 person at 70%</li> <li>Rate of gain: 75W Sensible/55W Latent</li> </ul> | <ul style="list-style-type: none"> <li>8am - 11pm: 80W</li> <li>11pm - 8am: 10W</li> </ul>                                                                               |                                                                                                                        |
| Communal Corridors    | <ul style="list-style-type: none"> <li>Assumed to be zero</li> </ul>                                                                                               | <ul style="list-style-type: none"> <li>Assumed to be zero</li> </ul>                                                                                                     | <ul style="list-style-type: none"> <li>On continuously: 2 W/m<sup>2</sup></li> </ul>                                   |

Table 2.2.2 - Internal Gains Summary

| Issue | Date     | By   | Checked |
|-------|----------|------|---------|
| P01   | 09.10.25 | AC   | GMCC    |
| P02   | 14.10.25 | GW   | GMCC    |
| P03   | 17.10.25 | GMCC | GMCC    |
| P04   | 27.10.25 | AC   | FTC     |

### 2.2.3 Ventilation Strategy Information

The following table details the mixed mode ventilation assumptions that have been applied to the proposed development.

| Part O Compliance                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|---------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Ventilation Strategy                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Ventilation Features                                    | Descriptions (Flow Rates and Operational Profiles)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Infiltration                                            | Set at 0.25 ACH (CIBSE Guide A Table 4.24)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Openable windows                                        | <p>All Floors:</p> <ul style="list-style-type: none"> <li>All windows to be openable up to 90°. In line with Part K, perforated panels are proposed as a safety feature to enable the windows to open to such extent.</li> </ul> <p>Details of window opening mechanism is subject to detailed architectural design.</p>                                                                                                                                                                                                                                                              |
| Openable window (manual operation assumptions modelled) | <p>When rooms are occupied (daytime):</p> <ul style="list-style-type: none"> <li>Window can be opened when internal temperature exceeds 22°C.</li> <li>Windows can be fully opened (to the extent of their restriction) when the internal temperature exceeds 26°C.</li> <li>Windows can be closed when internal temperatures fall below 26°C.</li> <li>Windows closed when internal temperatures fall below 22°C.</li> </ul> <p>Night operation (23:00 - 07:00):</p> <ul style="list-style-type: none"> <li>Windows closed during the night due to noise constraints.</li> </ul>     |
| Ventilation Strategy                                    | <ul style="list-style-type: none"> <li>Option 1: A constant 13 l/s to Studios/Kitchens, 8 l/s to clusters and served at the same temperature as the external air from a MVHR. For areas with acoustic restrictions, 40l/s of purge ventilation will be activated from 11pm – 8am. Refer to Appendix A for location of purge ventilation.</li> <li>Option 2: Continuous mechanical extract ventilation of 40l/s applied to studios/kitchens and clusters. (Note that the windows are required to have trickle ventilation and may require further input by the acoustician)</li> </ul> |

Table 2.2.3 - DSY1 Ventilation Strategy Description

| Issue | Date     | By   | Checked |
|-------|----------|------|---------|
| P01   | 09.10.25 | AC   | GMCC    |
| P02   | 14.10.25 | GW   | GMCC    |
| P03   | 17.10.25 | GMCC | GMCC    |
| P04   | 27.10.25 | AC   | FTC     |

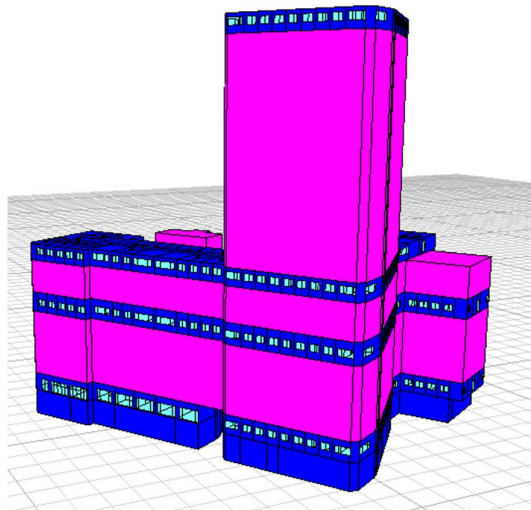
## 2.2.4 External Building Fabric Information

| Part O Compliance                                       |                                      |
|---------------------------------------------------------|--------------------------------------|
| Modelling Parameters                                    |                                      |
| Design Measures                                         | Overall U-value (W/m <sup>2</sup> K) |
| Ground Floor                                            | 0.09                                 |
| External Walls (including opaque curtain wall elements) | 0.15                                 |
| Roof                                                    | 0.12                                 |
| Glazing/Rooflights                                      | 0.8                                  |
| External Personnel Door                                 | 1.6                                  |
| Air Permeability                                        | 3                                    |

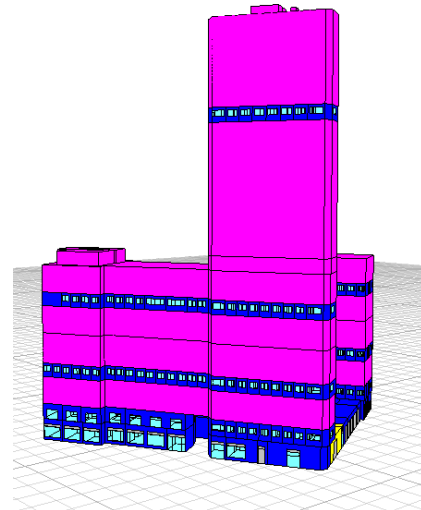
Table 2.2.4 - Construction U-values

## 2.2.5 Built Form

The below image details the spaces that have been modelled within IES to demonstrate Part O compliance.



Cambridge Phase 1



Cambridge Phase 2

Image 2.2.5 - IES Model Images

| Issue | Date     | By   | Checked |
|-------|----------|------|---------|
| P01   | 09.10.25 | AC   | GMCC    |
| P02   | 14.10.25 | GW   | GMCC    |
| P03   | 17.10.25 | GMCC | GMCC    |
| P04   | 27.10.25 | AC   | FTC     |

### 3.0 Assessment Results

The table below presents a summary of the dynamic thermal modelling results for the regularly occupied spaces in the proposed development. These spaces were assessed against TM59 4.2 Criterion (a) and TM59 4.2 Criterion (b) (as described in section 2.2 above) using the DSY1 weather file in accordance with TM59 and the TM59 Compliance form can be found in Appendix B.

| Part O Compliance                                        |                 |                            |
|----------------------------------------------------------|-----------------|----------------------------|
| Option 1: MVHR + Purge Ventilation<br>Assessment Results |                 |                            |
| Development Phase                                        | Spaces Assessed | Met Part O / TM59 Criteria |
| Phase 1                                                  | 289             | ✓                          |
| Phase 2                                                  | 239             | ✓                          |

Table 3.0.1 - Option 1 Part O Compliance Results Summary

Note that purge ventilation is only applied to selected spaces inline with acoustician report, see Appendix A for details.

| Part O Compliance                                                         |                 |                            |
|---------------------------------------------------------------------------|-----------------|----------------------------|
| Option 2: Continuous Mechanical Extract Ventilation<br>Assessment Results |                 |                            |
| Development Phase                                                         | Spaces Assessed | Met Part O / TM59 Criteria |
| Phase 1                                                                   | 289             | ✓                          |
| Phase 2                                                                   | 239             | ✓                          |

Table 3.0.2 - Option 2 Part O Compliance Results Summary

The information in the above table presents that the ventilation proposals (Option 1 and 2) are compliant with TM59 and by extension Part O.

| Issue | Date     | By   | Checked |
|-------|----------|------|---------|
| P01   | 09.10.25 | AC   | GMcC    |
| P02   | 14.10.25 | GW   | GMcC    |
| P03   | 17.10.25 | GMcC | GMcC    |
| P04   | 27.10.25 | AC   | FTC     |

## 4.0 Conclusion and Recommendations

A Part O assessment has been conducted based on the amended Stage 3 information, as per the parameters outlined in Section 2 of this report. The results of the analysis indicate compliance with Part O.

In order to achieve the results outlined in this report, the following key design parameters should be noted:

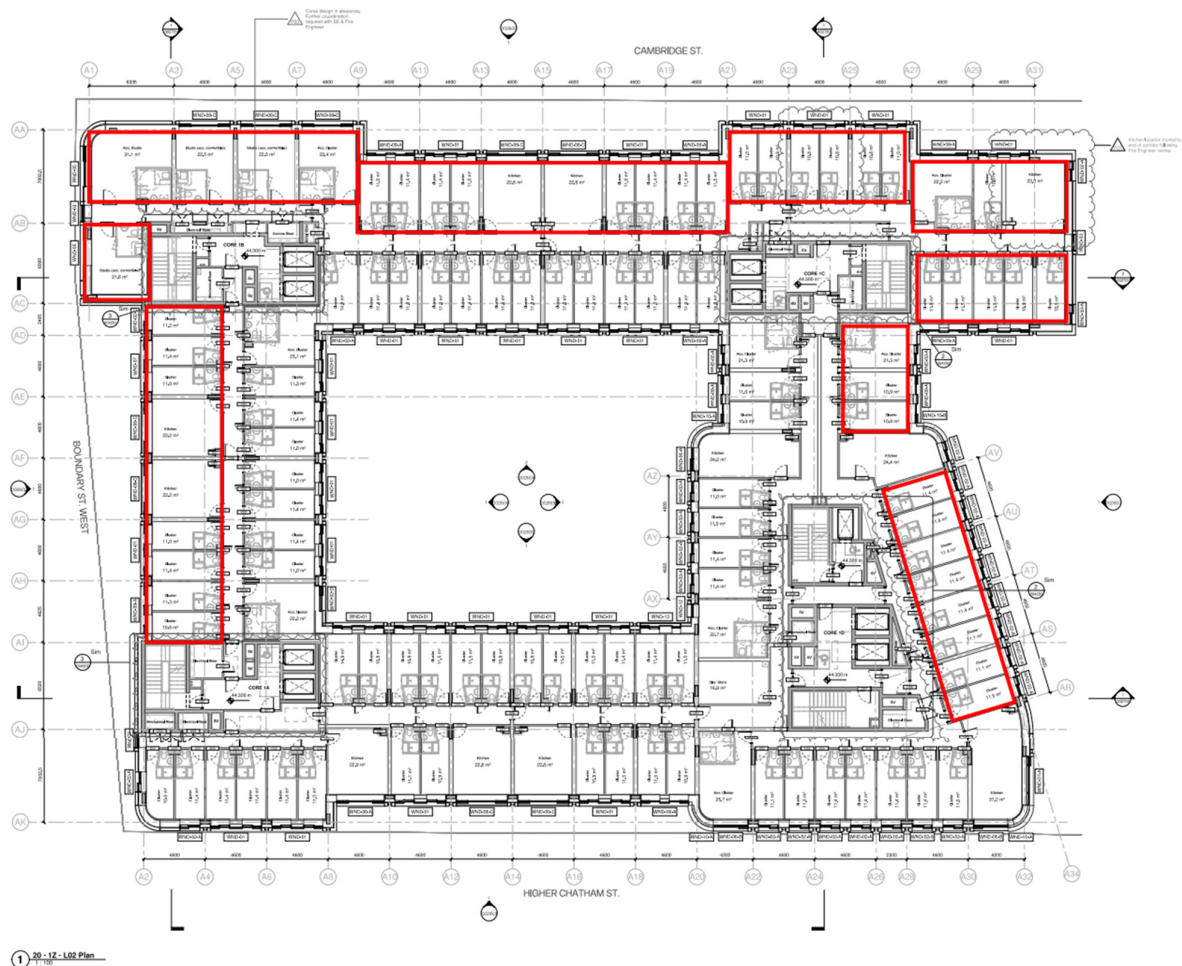
- The contractor and architect to confirm viability of the proposed fabric parameters that has been provided to Wallace Whittle.
- The architect shall ensure that the building fabric performance parameters is achieved and confirm the window opening mechanism at detail design.

*Please note that results and recommendations are based on the assumptions described in this report. If any of the inputs change, results are likely to change, and recommendations might no longer be appropriate.*

| Issue | Date     | By   | Checked |
|-------|----------|------|---------|
| P01   | 09.10.25 | AC   | GMcC    |
| P02   | 14.10.25 | GW   | GMcC    |
| P03   | 17.10.25 | GMcC | GMcC    |
| P04   | 27.10.25 | AC   | FTC     |

Appendix - A Purge Fans Location

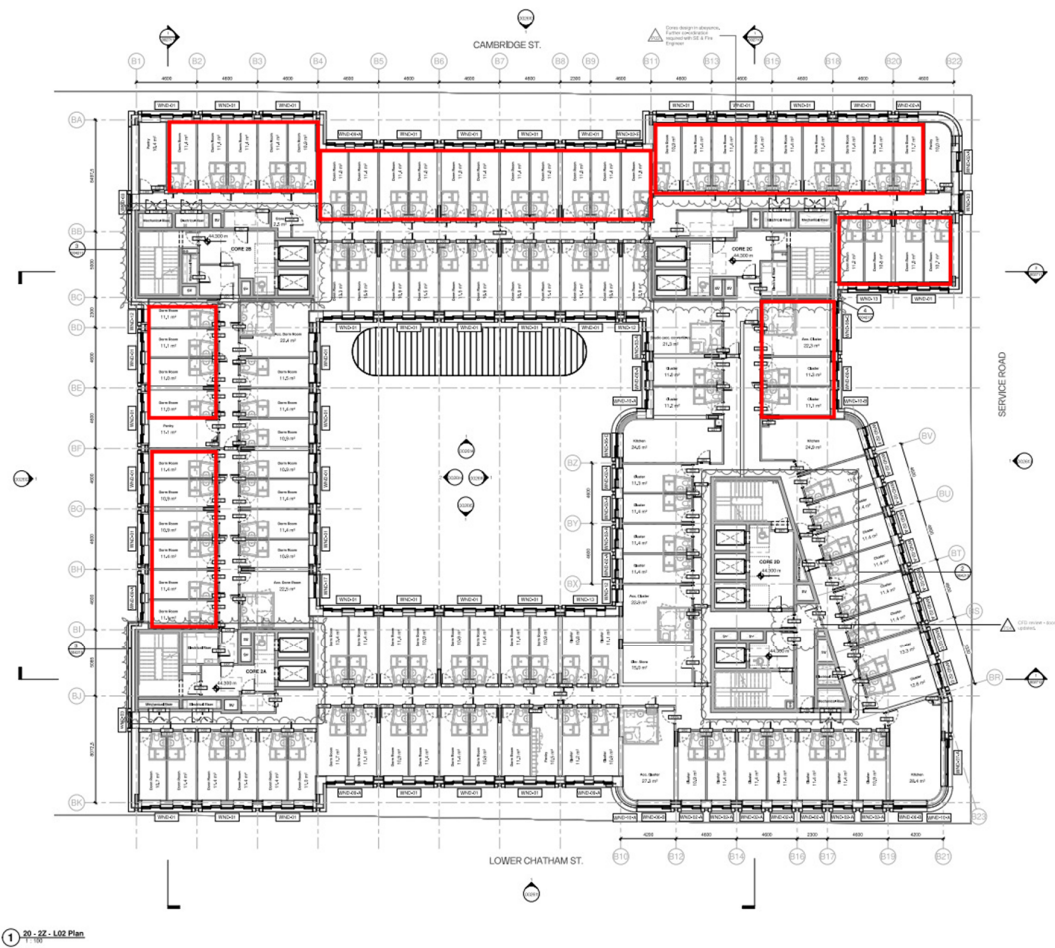
Phase 1 - Option 1 Purge Fan Location



As per the acoustician report, restrictions on windows opening have been applied to the thermal comfort model for level 02 – 06 studios/clusters. There is a total of **245 purges fans** required for Phase 1.

| Issue | Date     | By   | Checked |
|-------|----------|------|---------|
| P01   | 09.10.25 | AC   | GMcC    |
| P02   | 14.10.25 | GW   | GMcC    |
| P03   | 17.10.25 | GMcC | GMcC    |
| P04   | 27.10.25 | AC   | FTC     |

Phase 2 - Option 1 Purge Fan Location



As per the acoustician report, restrictions on windows opening have been applied to the thermal comfort model for level 02 – 06 studios/clusters. There is a total of **210 purges fans** required for Phase 2.

| Issue | Date     | By   | Checked |
|-------|----------|------|---------|
| P01   | 09.10.25 | AC   | GMcC    |
| P02   | 14.10.25 | GW   | GMcC    |
| P03   | 17.10.25 | GMcC | GMcC    |
| P04   | 27.10.25 | AC   | FTC     |

## Appendix B - TM59 Form

### Phase 1 - Option 1 TM59 Compliance Form

Compliance Forms



Page 1 of 65

#### Building details

|                                                     |                           |
|-----------------------------------------------------|---------------------------|
| Project name:                                       | Date: 27-10-2025 15:23:42 |
| Location: Manchester Ap, United Kingdom             |                           |
| Address:                                            |                           |
| Building use:                                       |                           |
| Are there any security, noise, or pollution issues: |                           |

#### Designer's details

|                          |
|--------------------------|
| Designer's name:         |
| Designer's organisation: |
| Designer's address:      |

#### Dynamic thermal model

|                                                                                                                  |     |
|------------------------------------------------------------------------------------------------------------------|-----|
| Software: IESVE version 2025.0.0.0                                                                               |     |
| Weather file: Manchester_DSY1_2020High50_epw                                                                     |     |
| Results file: Phase1_TM59_Baseline.apr                                                                           |     |
| Number of rooms analysed: 289                                                                                    |     |
| TM59: summer elevated air speed: 0.1                                                                             |     |
| TM59: occupant category: Category II (normal)                                                                    |     |
| Overheating mitigation strategy:                                                                                 |     |
| Has the building construction proposal been modelled accurately?                                                 | YES |
| Have the analysed rooms passed the assessment for Approved Doc O Dynamic Thermal Modelling Method (CIBSE TM 59)? | YES |
| Designer's signature:                                                                                            |     |

| Issue | Date     | By   | Checked |
|-------|----------|------|---------|
| P01   | 09.10.25 | AC   | GMCC    |
| P02   | 14.10.25 | GW   | GMCC    |
| P03   | 17.10.25 | GMCC | GMCC    |
| P04   | 27.10.25 | AC   | FTC     |

Phase 2 - Option 2 TM59 Compliance Form

Compliance Forms



Page 1 of 54

Building details

|                                                     |                           |
|-----------------------------------------------------|---------------------------|
| Project name:                                       | Date: 27-10-2025 15:21:23 |
| Location: Manchester Ap, United Kingdom             |                           |
| Address:                                            |                           |
| Building use:                                       |                           |
| Are there any security, noise, or pollution issues: |                           |

Designer's details

|                          |
|--------------------------|
| Designer's name:         |
| Designer's organisation: |
| Designer's address:      |

Dynamic thermal model

|                                                                                                                  |     |
|------------------------------------------------------------------------------------------------------------------|-----|
| Software: IESVE version 2025.0.0.0                                                                               |     |
| Weather file: Manchester_DSY1_2020High50_.epw                                                                    |     |
| Results file: Phase 2_TM59_Baseline.aps                                                                          |     |
| Number of rooms analysed: 239                                                                                    |     |
| TM59: summer elevated air speed: 0.1                                                                             |     |
| TM59: occupant category: Category II (normal)                                                                    |     |
| Overheating mitigation strategy:                                                                                 |     |
| Has the building construction proposal been modelled accurately?                                                 | YES |
| Have the analysed rooms passed the assessment for Approved Doc O Dynamic Thermal Modelling Method (CIBSE TM 59)? | YES |
| Designer's signature:                                                                                            |     |

| Issue | Date     | By   | Checked |
|-------|----------|------|---------|
| P01   | 09.10.25 | AC   | GMcC    |
| P02   | 14.10.25 | GW   | GMcC    |
| P03   | 17.10.25 | GMcC | GMcC    |
| P04   | 27.10.25 | AC   | FTC     |

Phase 1 - Option 2 (Continuous Mechanical Extract Ventilation) TM59 Compliance Form

Compliance Forms



Page 1 of 67

**Building details**

|                                                     |                           |
|-----------------------------------------------------|---------------------------|
| Project name:                                       | Date: 27-10-2025 12:32:04 |
| Location: Manchester Ap, United Kingdom             |                           |
| Address:                                            |                           |
| Building use:                                       |                           |
| Are there any security, noise, or pollution issues: |                           |

**Designer's details**

|                          |
|--------------------------|
| Designer's name:         |
| Designer's organisation: |
| Designer's address:      |

**Dynamic thermal model**

|                                                                                                                  |     |
|------------------------------------------------------------------------------------------------------------------|-----|
| Software: IESVE version 2025.0.0.0                                                                               |     |
| Weather file: Manchester_DSY1_2020High50_.epw                                                                    |     |
| Results file: Phase1_TM59_ExtractOnly.apr                                                                        |     |
| Number of rooms analysed: 289                                                                                    |     |
| TM59: summer elevated air speed: 0.1                                                                             |     |
| TM59: occupant category: Category II (normal)                                                                    |     |
| Overheating mitigation strategy:                                                                                 |     |
| Has the building construction proposal been modelled accurately?                                                 | YES |
| Have the analysed rooms passed the assessment for Approved Doc O Dynamic Thermal Modelling Method (CIBSE TM 59)? | YES |
| Designer's signature:                                                                                            |     |

| Issue | Date     | By   | Checked |
|-------|----------|------|---------|
| P01   | 09.10.25 | AC   | GMCC    |
| P02   | 14.10.25 | GW   | GMCC    |
| P03   | 17.10.25 | GMCC | GMCC    |
| P04   | 27.10.25 | AC   | FTC     |

Phase 2 - Option 2 (Continuous Mechanical Extract Ventilation) TM59 Compliance Form

Compliance Forms

IES

INTEGRATED ENVIRONMENTAL SOLUTIONS

Page 1 of 54

Building details

|                                                     |                           |
|-----------------------------------------------------|---------------------------|
| Project name:                                       | Date: 27-10-2025 12:54:38 |
| Location: Manchester Ap, United Kingdom             |                           |
| Address:                                            |                           |
| Building use:                                       |                           |
| Are there any security, noise, or pollution issues: |                           |

Designer's details

|                          |
|--------------------------|
| Designer's name:         |
| Designer's organisation: |
| Designer's address:      |

Dynamic thermal model

|                                                                                                                  |     |
|------------------------------------------------------------------------------------------------------------------|-----|
| Software: IESVE version 2025.0.0.0                                                                               |     |
| Weather file: Manchester_DSY1_2020High50_.epw                                                                    |     |
| Results file: Phase 2_TM59_Extractonly.apr                                                                       |     |
| Number of rooms analysed: 239                                                                                    |     |
| TM59: summer elevated air speed: 0.1                                                                             |     |
| TM59: occupant category: Category II (normal)                                                                    |     |
| Overheating mitigation strategy:                                                                                 |     |
| Has the building construction proposal been modelled accurately?                                                 | YES |
| Have the analysed rooms passed the assessment for Approved Doc O Dynamic Thermal Modelling Method (CIBSE TM 59)? | YES |
| Designer's signature:                                                                                            |     |

| Issue | Date     | By   | Checked |
|-------|----------|------|---------|
| P01   | 09.10.25 | AC   | GMCC    |
| P02   | 14.10.25 | GW   | GMCC    |
| P03   | 17.10.25 | GMCC | GMCC    |
| P04   | 27.10.25 | AC   | FTC     |