CWC

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# CIS Tower, Manchester

## Energy & Carbon Statement
## P02

Date: 16/10/2025
Ref: 3559-CWC-XX-XX-RP-N-7015

Crookes Walker Consulting Limited is registered in England & Wales | 05011466 |
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# Revision Record

| Date | Reference | Revision | Prepared | Checked | Authorised |
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| | | | Obaid Rahman | Rob Wallis | David Walker |
| 16/10/2025 | 3559-CWC-XX-XX-RP-N-7015 | P02 | Obaid Rahman | Rob Wallis | David Walker |
| | | | Obaid Rahman | Rob Wallis | David Walker |
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# 1.0 Executive Summary

## 1.1 Energy & Carbon Proforma

### Energy and Carbon Proforma

Non-residential

Major development *(+1,000m²)*

*Version 1.0*

GMCA GREATER MANCHESTER COMBINED AUTHORITY

Project Name: 3292 CIS TOWER

Application ref:

Date: 29/08/2025

| | | *Ref. name* | CIS Tower | |
|---|---|---|---|---|
| | | *Area (m²GIA)* | 60,368 | |
| | | ***Target values*** | **Building 1** | **+** |
| Minimise energy demand | Space heating demand (kWh/m²GIA/yr) | ***≤ 15*** | 10.44 | |
| | Space cooling demand (kWh/m²GIA/yr) | ***≤ 15*** | 13.99 | |
| | Calculation methodology used to calculate space heating demand and confirmation that this covers all homes/blocks | *Predictive energy model* | | |

| | | | | |
|---|---|---|---|---|
| | Form factor per building | *≤ 2* | 0.44 | |
| | Average external wall U-value ($W/m^2K$) | *≤ 0.15* | 1.2 | |
| | Average window U-value ($W/m^2K$) | *≤ 1 (triple)* | 1.44 | |
| | Air permeability rate ($m^3/h/m^2$ @ 50 Pa) | *≤ 1* | 3 | |
| | | | | |
| Maximise energy efficiency | **BREEAM Ene 01 rating** | ***Excellent*** | Excellent | |
| | Energy use intensity ($kWh/m^2GIA/yr$) | - | 34.98 | |
| | Calculation methodology used to calculate energy use intensity and confirmation that this covers all homes/blocks | *Predictive energy model* | NCM predictive energy model | |
| | | | | |
| Use renewable energy | **PV footprint area (% of ground floor space)** | **-** | 6.2 | |
| | Annual renewable energy generation ($kWh/m^2$ building footprint/yr) | - | 12.6 | |
| | Renewable energy balance (%) | - | 1.02 | |
| | Total energy used (kWh/yr) | - | 38,565 | |
| | Total energy generated on-site (kWh/yr) | - | 42,754 | |
| | | | | |
| Use low carbon energy | **Fossil fuel free (yes/no)** | ***Yes*** | Yes | |
| | Heat source | *Electric* | Electric | |

| | | | | |
|---|---|---|---|---|
| | Low Carbon Heat Appraisal completed | *Yes* | Yes | |
| | Heat network suitability | - | Potential for future connection | |
| | Exemption requested | - | - | |
| | Efficiency of heating system (SCOP) | *≥ 3.5* | 3.25 | |
| | Carbon content of heat ($gCO_2$/kWh) | *≤ 100* | < 100 | |
| | | | | |
| Reduce overheating risk | **Has CIBSE TM52 been used to calculate overheating and does the building pass?** | ***Yes*** | Yes | |
| | What percentage of spaces are cooled? (% of GIA) | - | 68.2 | |
| | Has a CIBSE TM52 assessment been carried out using DSY2 and DSY3 weather files? Have any additional passive measures been included as a result? | *Yes* | PMV/PPD. | |
| | | | | |
| Minimise embodied carbon | **Upfront embodied carbon ($kgCO_2e/m^2GIA$)** | **-** | 530 | |
| | List top three materials with the highest upfront embodied carbon emissions ($kgCO_2e/m^2GIA$): Material 1 | - | External full height glazing systems | |
| | Material 2 | - | Space heating & hot water systems | |
| | Material 3 | | Ventilation ductwork & ancillaries | |
| | Lifecycle embodied carbon ($kgCO_2e/m^2GIA$) - *for large major developments only* | - | 1,000 | |
| | | | | |

| | | | | |
|---|---|---|---|---|
| Offsets | Offset contribution (£) | - | TBC | |

## 1.2 Project Overview

The CIS Tower is located on Miller Street in central Manchester. It is an existing 1960s Grade II building, formerly acting as a headquarters for The Co-Operative Insurance Society (CIS). It is read as part of a group, alongside the neighbouring Grade II listed New Century House and New Century Hall. This group, with other neighbouring listed buildings, collectively form the historic Co-operative estate. Devonshire (CIS Tower) Limited became custodians of The CIS Tower in 2017, purchasing the Grade II listed building from The Co-operative Group.

Having secured full planning and listed building consent in 2020 (MCC Planning Portal reference: 126118/FO/2020), the Covid pandemic halted progression and resulted in the permissions expiring.

The overarching brief objective has always been to secure the building's long-term future through a comprehensive refurbishment that will bring the building up to current office and environmental standards.

Therefore the 2025 brief seeks to revisit the 2020 proposals in a post pandemic environment and an updated market context. This includes delivering best in class office accommodation and amenity space, and a focus towards net zero carbon development.

As part of this updated brief context, a key shift in the strategy to improve the building performance and internal environment entails the proposal of a new facade in lieu of the previously proposed facade refurbishment.

The aim of providing workspace to meet updated market demands and environmental standards is to provide an attractive working environment within a unique heritage asset; attracting multiple tenants that will bring life to the building and the neighbourhood.

# 2.0 Building Fabric & Ventilation

## 2.1 Building Form & Heat Loss Envelope

The CIS Tower is an existing listed building and as a result, the orientation and form of the existing elements are fixed constraints that are derived by design decisions made by the original design team in response to the site at that time. For example, the podium element sits to the south of the site, due to sitting atop a war bunker that has structural loading constraints; with the tower addressing the inner ring road to the north of the site.

The new podium extension form subsequently follows the original plan form and has been developed with a stepping language to minimise the visual impact regarding town scaping; opposed to being a single extrusion for example. The stepped nature of the form increases the building surface area; however, this is countered through building regulations compliant performances throughout the wall and roof elements. These performances are considered within the overall performance assessments that support the planning submission.

The existing building facades represent a high-tech solution for the 1960s, which is now beyond its design life and degrading. Whilst high-tech for curtain walls of the time, the industry has subsequently developed and moved away from many of the design details that can be seen within the existing fabric. Several cold bridge elements exist and there is a lack of thermal breaks. Single glazing is also utilised throughout. The resulting fabric performances are therefore much lower than modern day regulations, with the existing façade having a U-value of circa 5.3W/$m^2$K.

A new building fabric, including roofs, roof lights and soffits is proposed. In terms of wall elements, this includes a replacement unitised façade to the existing tower and podium, with a U-value of circa 1.44W/$m^2$K. A new unitised façade is proposed to the extension.

Form factor:

The building has a gross internal area of 60,368m$^2$ and 26,784m$^2$ of exposed external surface area therefore its form factor is 0.44.

## 2.2 Elevation Design & Window Proportions

Due to the listed nature of the building, the design of the replacement façade to the existing podium and tower is in the spirit of replicating the original façade. This includes the window proportions. A typical floor is glazed on all four sides, with a floor-to-floor height of 3.73m in the tower and 3.96m in the podium. A cladding grid of 1.575m is applied in plan. A solid spandrel is utilised to cover the slab edge, which is 1.12m tall, resulting in windows that are circa 1.5m x 2.61-2.84m.

Within the proposals for the new podium extension, the elevation design and window proportions are strongly linked to and derived from the existing cladding grid. A similarly highly glazed façade which incorporates solid spandrels is proposed, to provide continuity with the language of the existing listed façade. Proposals with a higher proportion of solid wall to openings were discounted in the design process because of the required response to the listed nature of the building.

Minor alterations are proposed around the height of the Level 25 windows and at ground floor, however the focus of these also revolve around being sensitive interventions to a listed asset.

As a result of the above, there is a performance-based focus on the façade design, paired with the wider servicing strategies; to evaluate the overall scheme performance.

## 2.3 Heated & Unheated Spaces

The thermal envelope is given in plan and section in Appendix 1. There are some minor alterations from the planning drawings which are as a result of the design development of the scheme to give greater certainty to the overall energy and carbon performance of the building. These minor changes relate to the new podium core. The position of the new opening

through basement and podium slabs has changed (by circa. 500mm) from that shown on demolition information, but it will not change the amount of slab being removed. Other changes to layouts are predominantly rearranging partitions etc. to suit this change to the core, however these changes should not have any impact on the proposed alterations to the existing fabric.

Generally, heat is provided, through decarbonised means, throughout the building, with exception to the following zone types where no heat is provided:

1. Circulation spaces including corridors, stairs and lobbies.
2. Store/cupboards.
3. Plantrooms.
4. Archive rooms in the basement.
5. Mezzanine loading bay.

## 2.4 Fabric Specs & Air Tightness

| Specification | Unit/Element | Notes |
|---|---|---|
| Airtightness | 3 $m^3/m^2$.hr @ 50Pa | |
| Fabric | Ground floor 0.19 $W/m^2K$<br>New external wall 0.26 $W/m^2K$<br>New roof 0.18 $W/m^2K$ | Ground contact as EN-ISO 13370 |
| Glazing: | Main Entrance 1.6 $W/m^2K$<br>Tower & Podium 1.44 $W/m^2K$<br>Podium Extension 1.6 $W/m^2K$ | |

| | | |
|---|---|---|
| Doors | 1.6 W/m$^2$K | |
| Glazing g-value | Entrance/Retail 0.65<br>Elsewhere 0.4 | |

Table 1: Fabric Specification

As this is a non-residential application, the thermal bridging values are integrated within the u-value of the curtain walling system.

Where some of the U Values noted on the Architects planning drawings are classified as TBC, the thermal and energy modelling has used the latest updated values noted above to complete the modelling exercise and provide certainty for future design development of the Architectural drawings.

## 2.5 Ventilation System

The new sealed façades mean that ventilation is delivered exclusively through mechanical means.

Multiple dedicated air handling units serve different parts of the building. Each incorporates high efficiency heat recovery capability and variable speed drives to ensure output matches demand.

## 2.6 Space Heating Demand

The operational energy forecast (ref: 3292-CWC-XX-XX-X-0002 Rev04) based on CIBSE TM54, undertaken April 2025, gives the space heating demand as 9.56 kWh/m$^2$/year.

# 3.0 Maximise Energy Efficiency

## 3.1 Energy Usage Intensity

The energy use intensity for the proposed building is expected to be 61.59 kWh/m$^2$/yr (including offset of the energy generated by the new PV system) 62.26 kWh/m$^2$/yr (without the PV offset).

This is based on the analysis undertaken using approved software IES:VE v.2024.0.1.0 using the CIBSE TM54 method and described in document '3292-CWC-XX-XX-X-0002 Rev04'.

## 3.2 Energy Use of Equipment

The assumptions used to estimate unregulated energy loads have been derived from authoritative industry sources and expected operational usage.

Inputs were taken from CIBSE Guide A, BSRIA Rules of Thumb (2024) 'Mechanical Criteria', NABERS Design for Performance (DfP), and the current BCO (British Council of Offices) recommendations.

Operational profiles (including office occupancy, equipment usage, and lighting modulation) were based on NABERS DfP benchmarks.

Office equipment gains were informed by BCO recommendations.

Domestic hot water (DHW) consumption was taken from the BSRIA Rules of Thumb.

Lift energy was calculated using the NABERS DfP Guide.

Cooking and catering equipment assumptions were based on conservative allowances together with data from CIBSE Guide A.

Other equipment consumption for uncertain spaces (e.g. gym, F&B, and retail units) was based on generous allowances to represent a worst-case scenario.

For other specific operational profiles not covered by benchmarks, assumptions were made based on the anticipated building use once occupied.

This methodology ensures that all unregulated loads (appliances, catering equipment, plug loads, IT, lifts, and other specialist equipment) are realistically and conservatively represented in the energy calculations.

# 4.0 Renewable Energy Generation

## 4.1 Proposed Renewable Energy Generation

| Description | Solar PV |
|---|---|
| Orientation | Southwest |
| Tilt | 10° |
| Peak Output (kWp) | 46.73 |
| Panel (max output, type of inverter) | 450W (DC-AC) |
| PV area as per centage of ground floor area | 6.2% |
| Expected annual renewable energy generation | 42,754 kWh |

| | |
|---|---|
| Annual renewable energy generation per $m^2$ GIA | 0.71 $kWh/m^2_{GIA}$ |
| Annual renewable energy generation per $m^2$ building footprint | 12.6 $kWh/m^2_{FP}$ |
| Balance between total energy use & renewable energy generation | 1.02% |
| Shading constraints | Neighbouring buildings reduce yield by approx. 11.6% |
| Data Source | Meteonorm 8.2(i) |

Table 2: PV System Specification

The proposed layout of the PV system is:

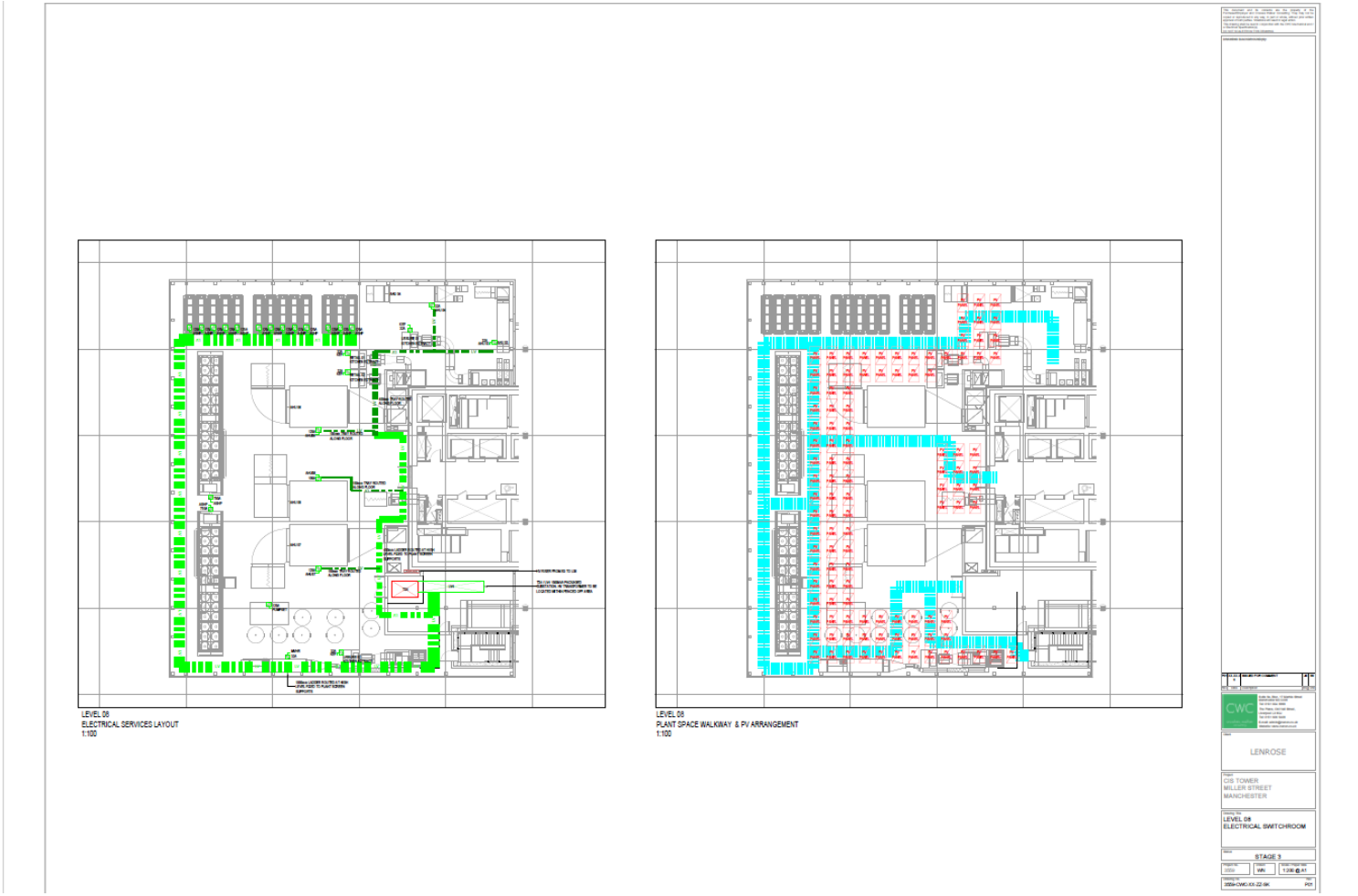



Figure 1: PV System Layout

The proposed system is based on a DAS SOLAR system, comprising 105 modules. The total system area amounts to 210m$^2$. Please note, the existing PV system is non-operational with no plans currently to recommission it.

## 4.2 Renewable Energy Balance

The total renewable energy generation amounts to 1.02% of the total anticipated energy use over a year.

# 5.0 Low Carbon Heating

## 5.1 Use of Fossil Fuels

No fossil fuels will be used on site therefore it may be taken as a fossil fuel free development.

## 5.2 Proposed Heating System

The site is within a low carbon heat network opportunity area (Case 3) however connecting to the network from the outset is not possible as the network is not currently available for the location.

Space heating is delivered through air source heat pumps thus ensuring the heating is of a lower carbon content than a low carbon heat network. For now, therefore, the lowest carbon content heating has been selected. Once the carbon content of the heat network reduces below that of the heat pumps, a feasibility study would need to be undertaken to assess the viability of connecting to the network.

Water heating is delivered through point-of-use electric heaters. Once again, under current conditions, this is a lower carbon content form of heating than the low carbon heat network thus an enhanced solution has been implemented.

The options considered for the heating system were:

1. ASHPs
2. GSHPs
3. CHP
4. Biomass

These options were assessed for their suitability to this application based on their ability to meet the demand, the practicalities around their integration into the building, and their ongoing ability to deliver low energy and low carbon heat.

The review found that air source heat pumps were the most viable solution and consequently this was selected as the proposed solution.

| Technology | Annual $CO_2$ Reduction (%) | Result | Capital Cost (£) | Result | Payback Period | Result | Recommendation |
|---|---|---|---|---|---|---|---|
| ASHP | 6.8 | High | 3,071,480 | High | 20.9 | High | High |
| GSHP | 2.5 | Low | 5,681,569 | High | 29 | High | Low |
| CHP | 13.6 | High | 3,787,713 | High | 11.4 | High | Low |
| Biomass | 5.1 | High | 4,261,177 | High | 127 | High | Low |

Table 3: Heating System Appraisal Summary

The appraisal resulted in the ASHPs being the standout option. They are the least costly of all options considered whilst delivering a 'high' reduction in carbon emissions and the second shortest payback period.

Ground source heat pumps were discounted due to their 'high' cost and payback period whilst CHP was discounted due to the building not having a big enough base load to ensure the CHP is viable.

Biomass was deemed unsuitable as its payback period is so high for this application that it rendered it not viable.

## 5.3 Proposed Cooling System

The existing building has sealed façades throughout, and the proposed building will have too. Consequently, mechanical cooling is required to ensure the occupied zones remain comfortable for the occupants.

The cooling system is air source heat pump based, located in the eighth-floor plant space. The system generates & distributes coolth throughout the building via chilled water distributed via a network of 4 pipes.

At the zone level, heat/coolth is delivered into the ceiling void to the rear of fan coil units, which also integrate fresh air from the ventilation plant to condition the volume of air to suit the requirement of that given zone.

High efficiency heat pumps will ensure that for every unit of energy used in the operation of the heat pump, over three units of heat energy and five units of coolth energy, are delivered to a zone thereby ensuring energy consumption is minimised.

# 6.0 Risk of Overheating

The building has a risk category of Category 2 (new builds and renovations).

The listed nature of the building has resulted in limited suitable passive measures. Despite this, the new façade has afforded the opportunity to integrate solar control glazing with a G-value no greater than 0.4. This enables the admission of desirable solar gains in the winter and omission of undesirable solar gains in the summer.

With sealed façades and the presence of cooling, the risk of overheating was assessed using the Predicted Mean Vote (PMV) and Percentage People Dissatisfied (PPD) metrics.

To demonstrate compliance, all PMV outcomes must land ±0.5 and PPD must be ≤10%.

The outcome of the assessment shows that the proposed building has an acceptable risk of overheating.

A summary of the outcome is given below, with the detailed results available for review in Appendix 4:

| Zone Type | PMV Result (-0.5 ≤ PMV ≤ +0.5) | PPD Result (PPD ≤ 10%) | Overall Result |
|---|---|---|---|
| Open Plan Offices | ✓ | ✓ | Pass |

Table 4: Overheating Risk Summary

# 7.0 Materials

A whole life carbon (WLC) exercise was carried out at RIBA Stage 2 to provide an indication of the WLC emissions of the development and potential measures that could reduce them further.

The result is given below and have been compared against the UK Net Zero Carbon Buildings (UKNZCBS) benchmarks for 2025 and 2026.

A full breakdown can be found in the RICS WLC Reporting spreadsheet. This meets the LETI 2020 target for office buildings.

| Framework | Upfront Carbon (A1-A5) (ex. Sequestration) | Life Cycle Embodied Carbon (A-C ex. B6-B7, inc. Sequestration) | Operational Energy and Water Use (B6-B7) | B-C embodied carbon emissions (ex. B6-B7 and sequestration) | Whole Life Carbon (A-C inc. B6-B7) |
|---|---|---|---|---|---|
| Proposed Scheme ($kgCO_2e/m^2$) | 530 | 1,000 | 260 | 510 | 1,300 |
| UKNZCBS 2025 Retrofit Target ($kgCO_2e/m^2$) | 600 | - | - | - | - |
| UKNZCBS 2026 Retrofit Target ($kgCO_2e/m^2$) | 575 | - | - | - | - |

Table 5: Whole Life Carbon Summary

Most of the existing structure is retained. A pre-demolition audit is to be carried out and the findings of which will inform potential areas for reuse. The key works taking place are:

- New podium extension
- Façade replacement
- Inclusion of new MEP systems

## 7.1 Design choices

In line with the submission guidance key design choices have been summarised below under structural, architectural and building services lean design.

### 7.1.1 Structural lean design

The proposed development will retain and when necessary, strengthen the existing structure, which will include the substructure.

### 7.1.2 Architectural lean design

A façade matrix study was carried out to ascertain the WLC emissions of each option, which include consideration of full retention, partial replacement and full replacement of the existing facade. As part of the study the scheme targeted 70% recycled content in the aluminium used for the curtain walling. The full replacement option proved to be the most favourable.

### 7.1.3 Building services lean design

The development considered five potential heating options: VRF, HVRF, air source 4-pipe, ambient water loop VRF and existing plant retention.

Considering multiple factors such as cost, flexibility, future risk and embodied carbon the design progressed with the air source 4 pipe system.

### 7.1.4 Limitations of Study

In cases where exact product matches are not provided by the database, the following steps, recommended by 'OneClick LCA' have been followed to ensure the most representative EPD for the specified product is used in the model:

- Option 1: Exact materials (search for the exact product from the manufacturer you are planning to choose).
- Option 2: Closest matches (if you cannot find the product from your manufacturer, try to search for other manufacturers typically used in your country).
- Option 3: Use generic data (if you cannot find a suitable product choose a generic one with similar qualities).

Furthermore, there are some items that do not exist in OneClick LCA's EPD library, or items for which provisional allowances have been attributed to the cost plan, but specifications have currently not been finalised. These items have been omitted from the scope of this assessment. In line with RICS guidance, it has been ensured that items excluded each account for less than 1 % of the total building element category cost.

The WLC assessment is an ongoing and iterative process that is refined and enhanced as project information becomes available through the design process. The data input into the WLC model will be added to, reviewed, and refined throughout the design process as designs become formalised and more specific materials/systems/component information becomes available.

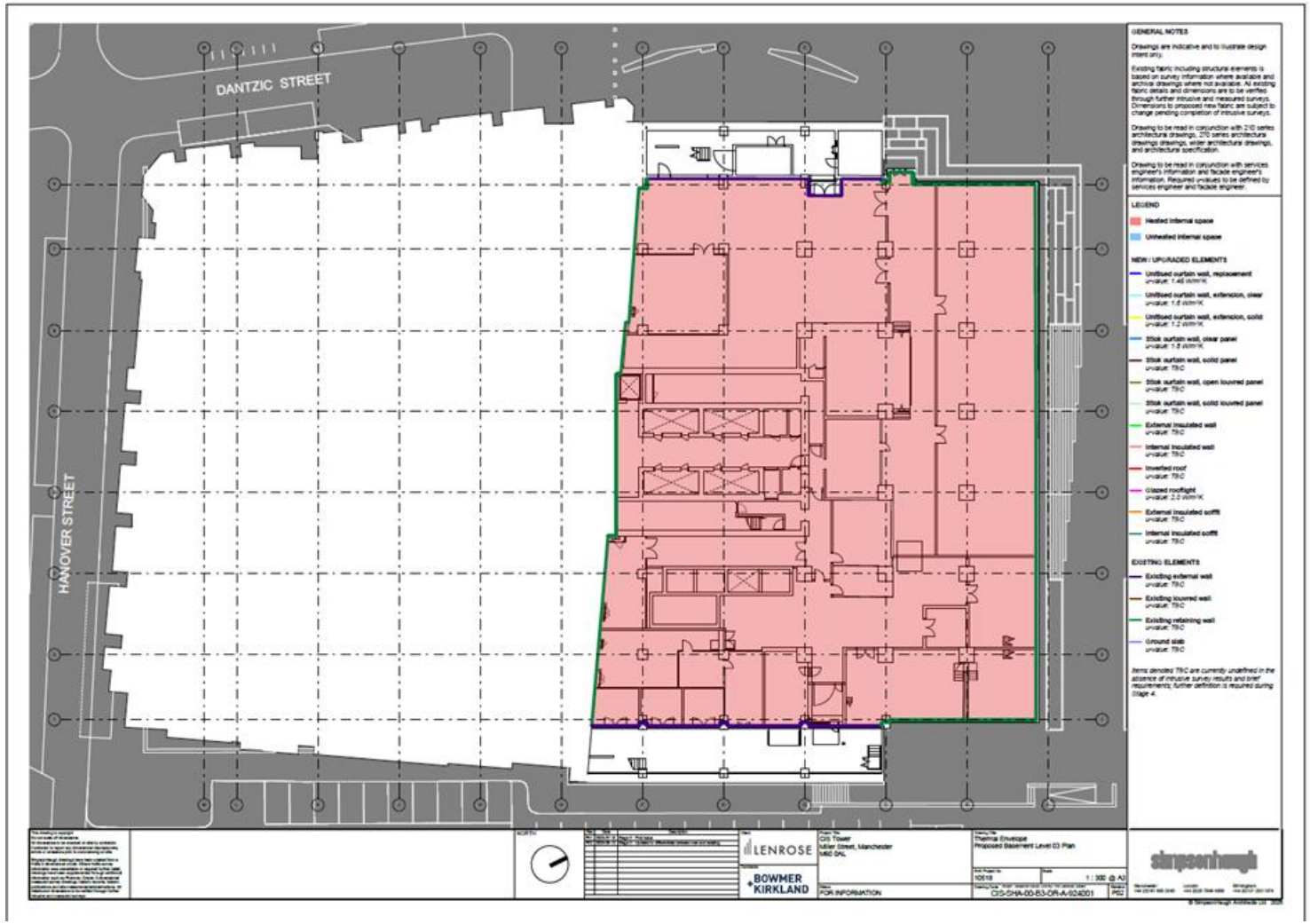
# 8.0 Offsetting

With the proposed PV system meeting just over 1% of the total energy requirement, for the building to be categorised as 'net zero compliant' the offset mechanism would need to balance against just short of 99% of the total energy needed by the building.

This would need to be reviewed by the Local Authority and the design team to assess the practicalities of offsetting such a large proportion of the energy demand.

# 9.0 Appendix 1 – Thermal Line Strategies

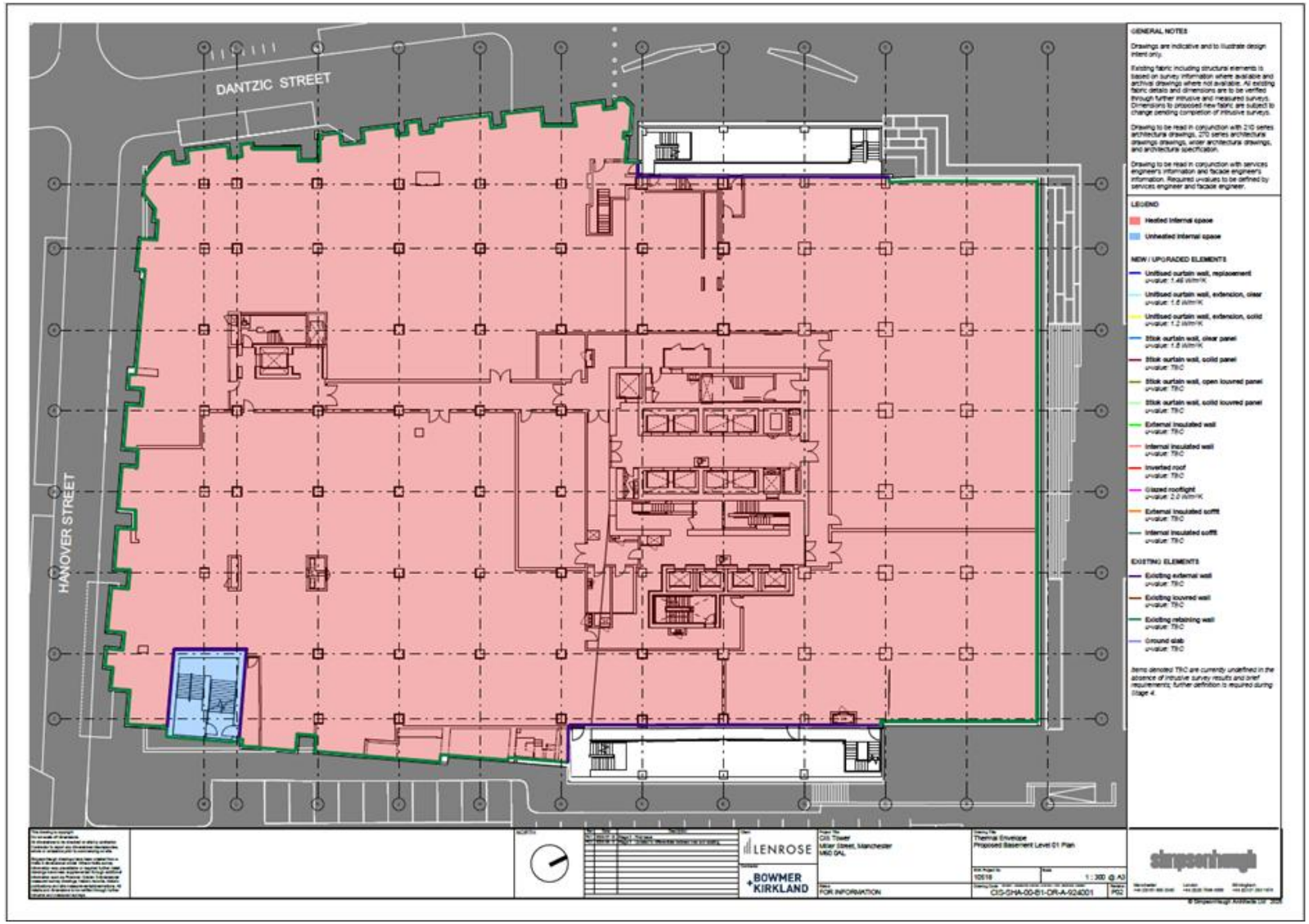
## 9.1 Basement 3



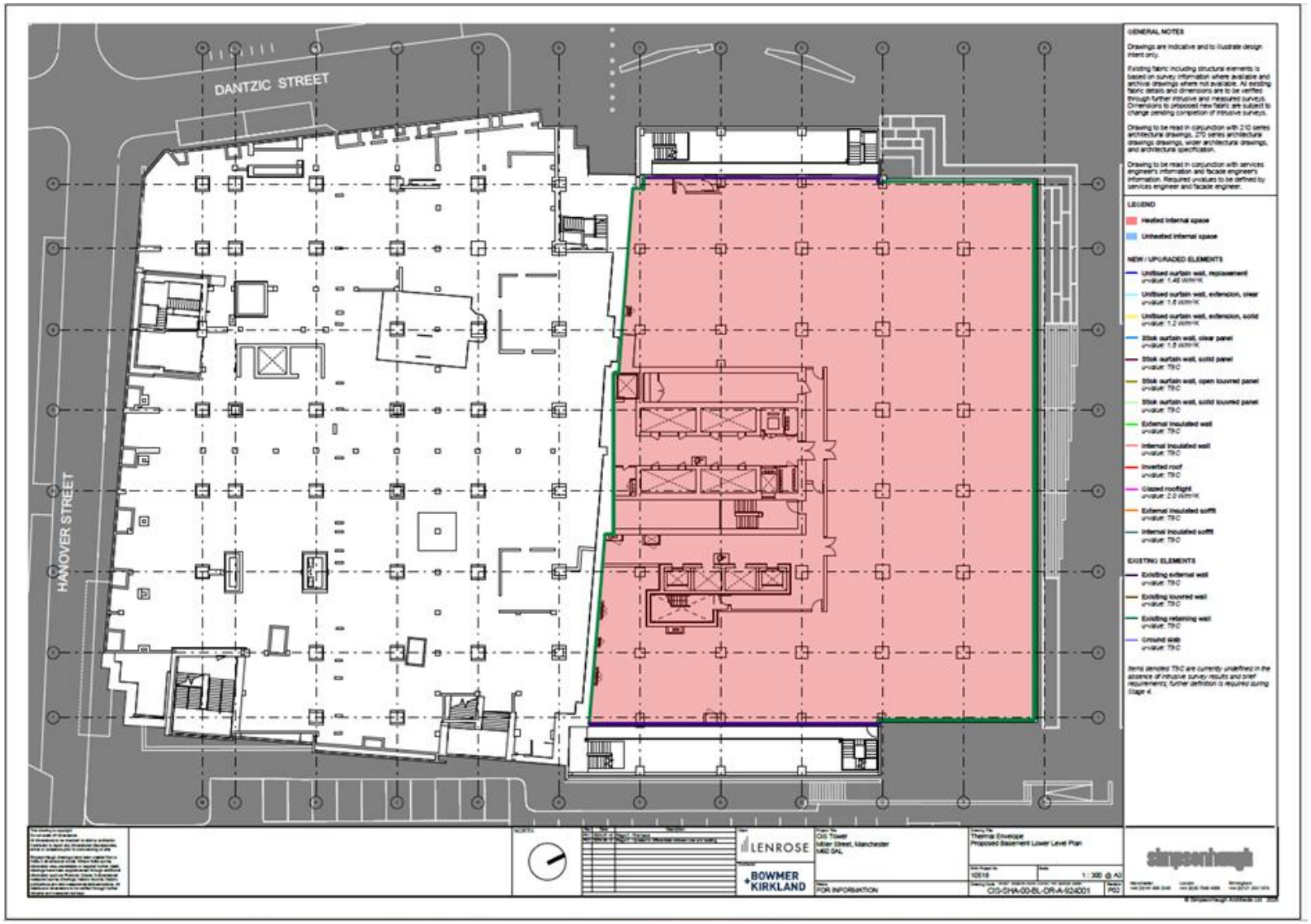
## 9.2 Basement 2



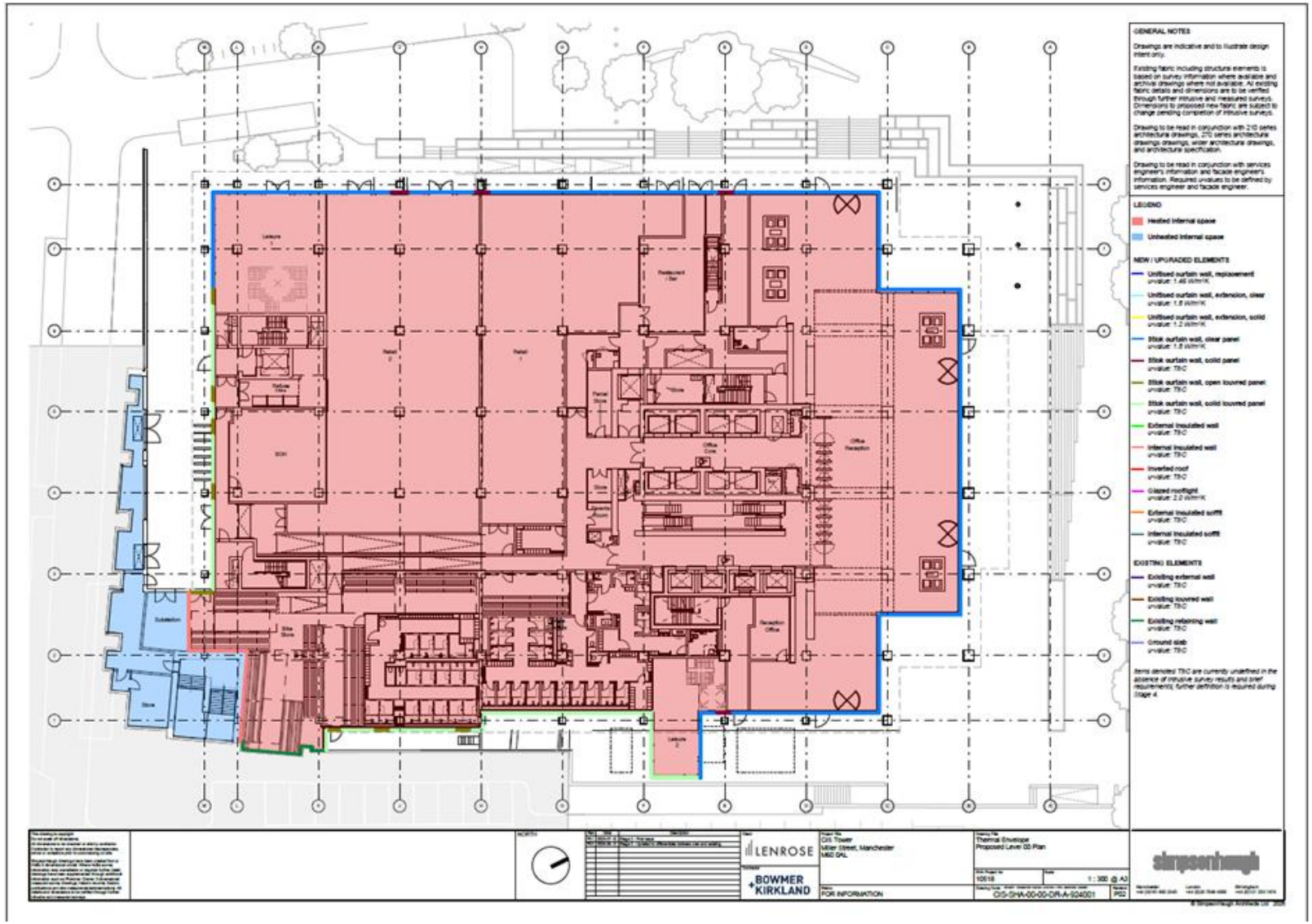
## 9.3 Basement 1



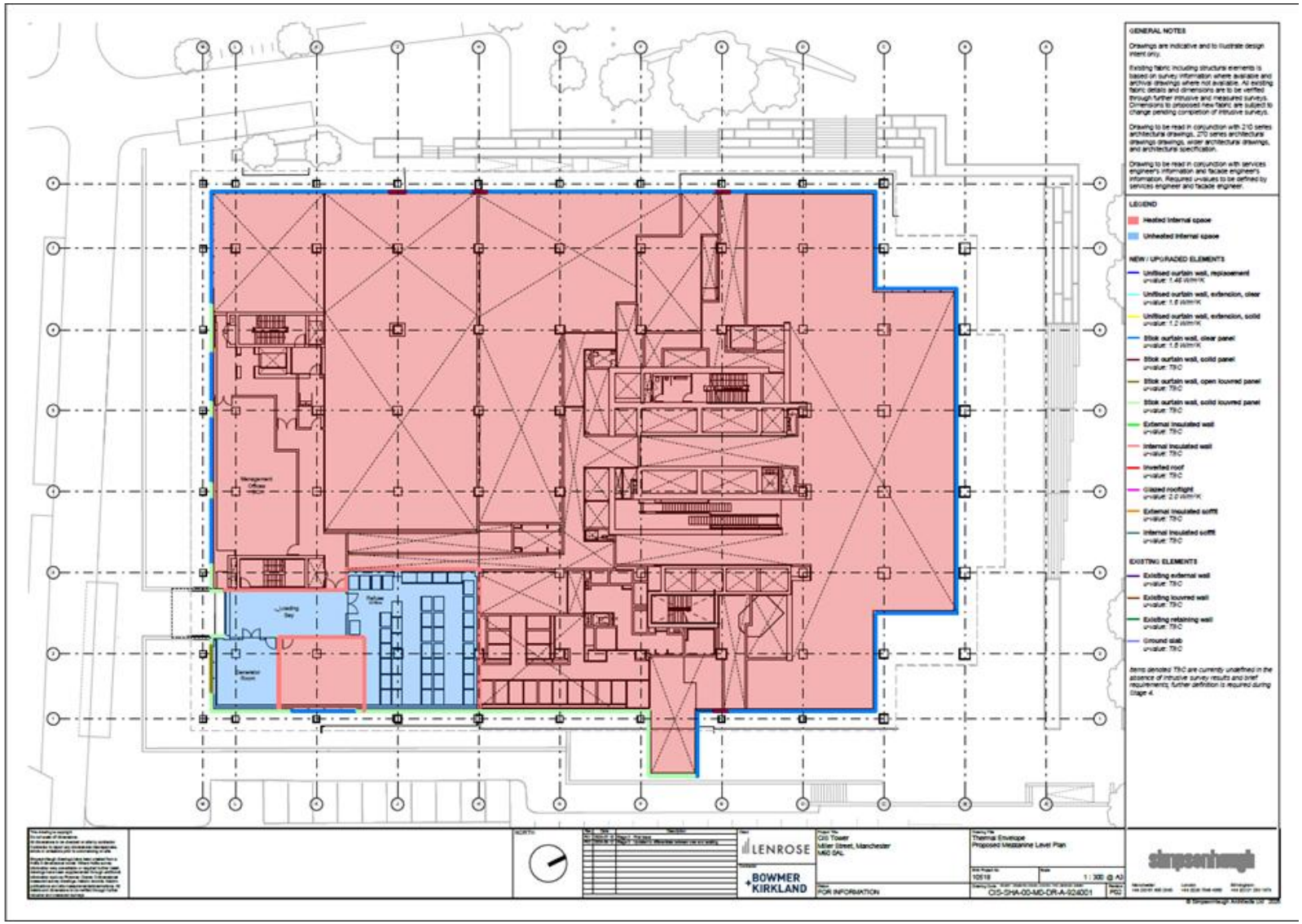
## 9.4 Basement 01 Lower



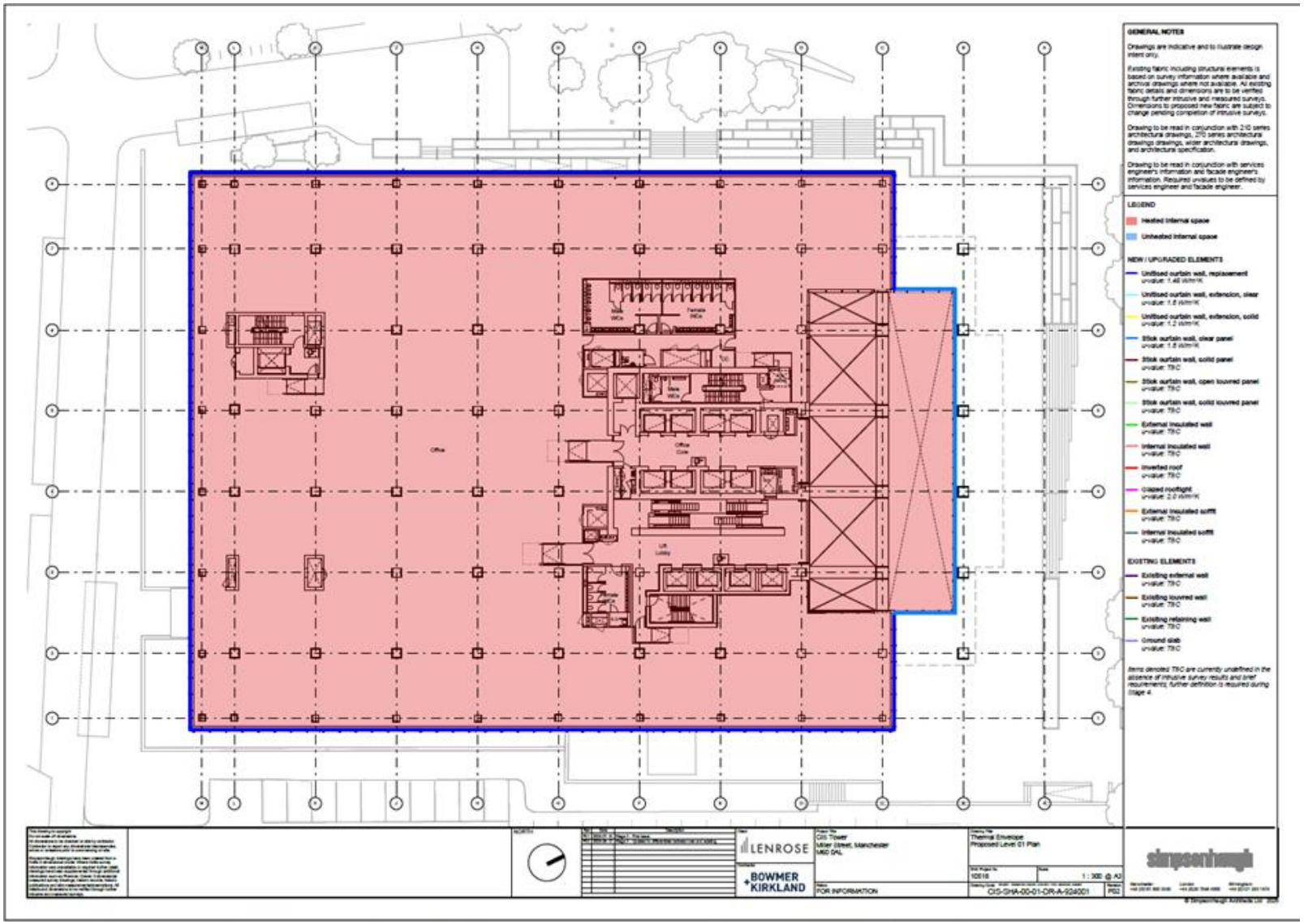
## 9.5 Floor 00


GENERAL NOTES
LEGEND
NEW / UPGRADED ELEMENTS
EXISTING ELEMENTS
LENROSE
BOWMER KIRKLAND
simpsonhaugh

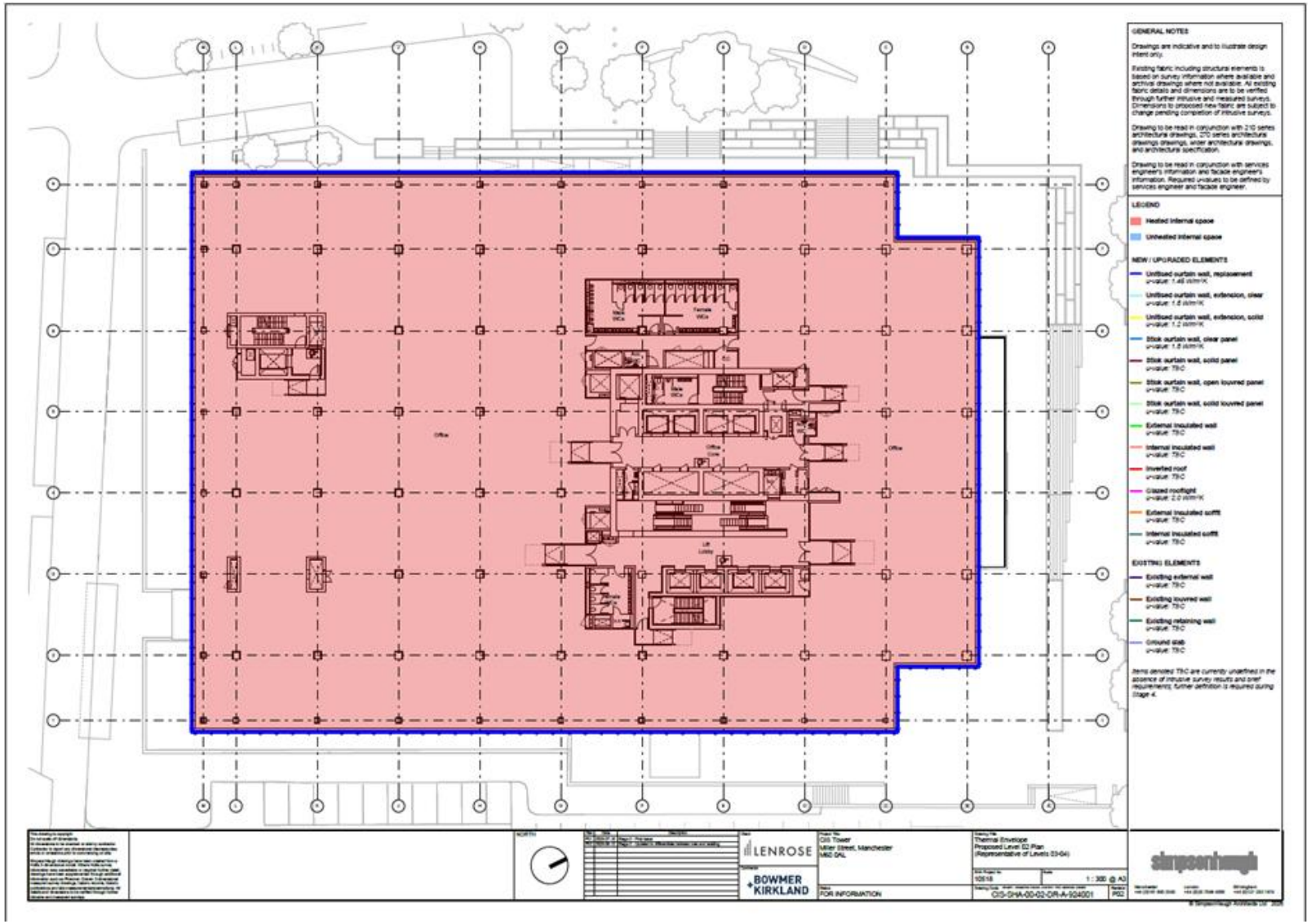
## 9.6 Mezzanine



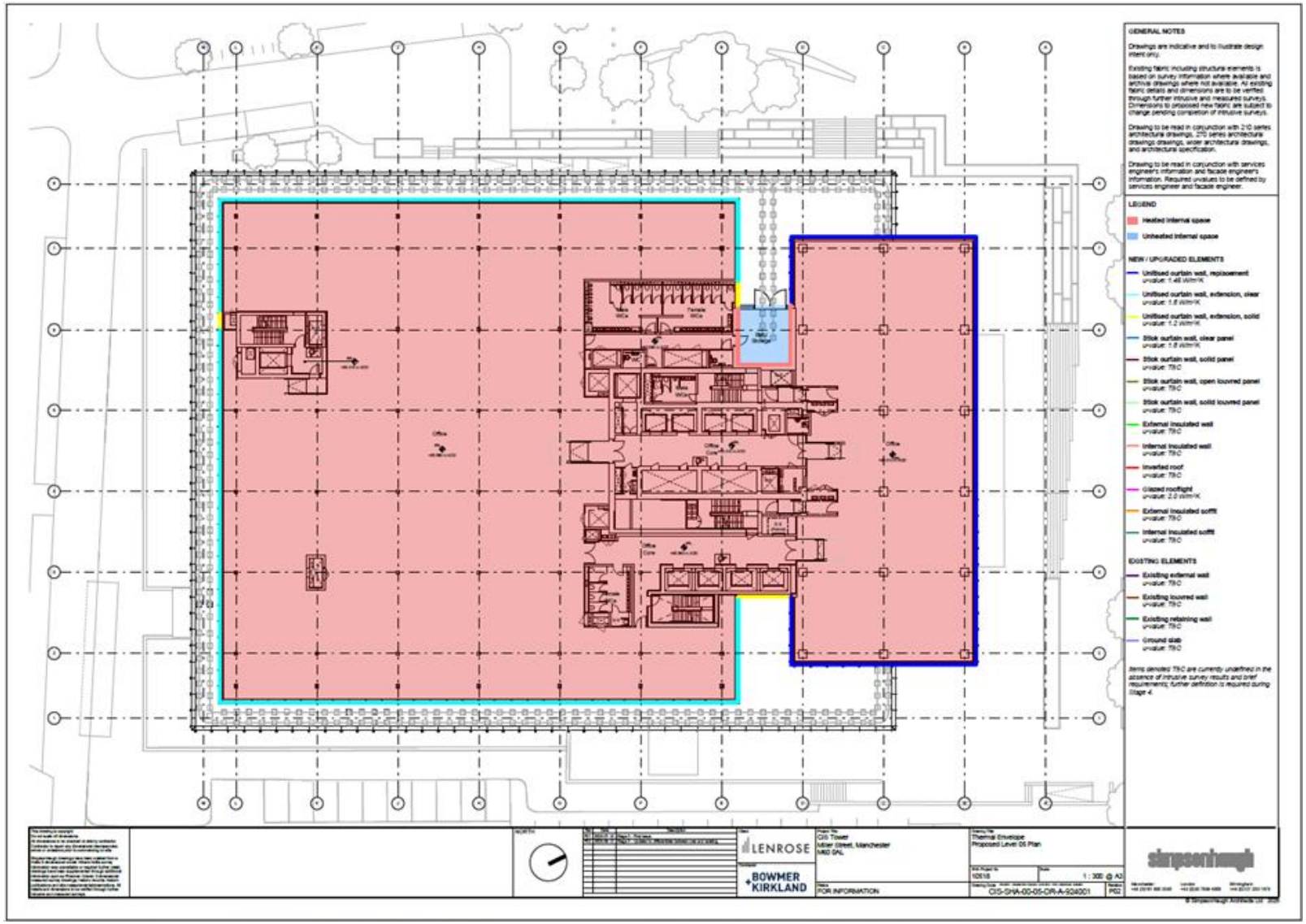
## 9.7 Floor 01


GENERAL NOTES
LEGEND
NEW / UPGRADED ELEMENTS
EXISTING ELEMENTS
LENROSE
BOWMER KIRKLAND
simpsonhaugh

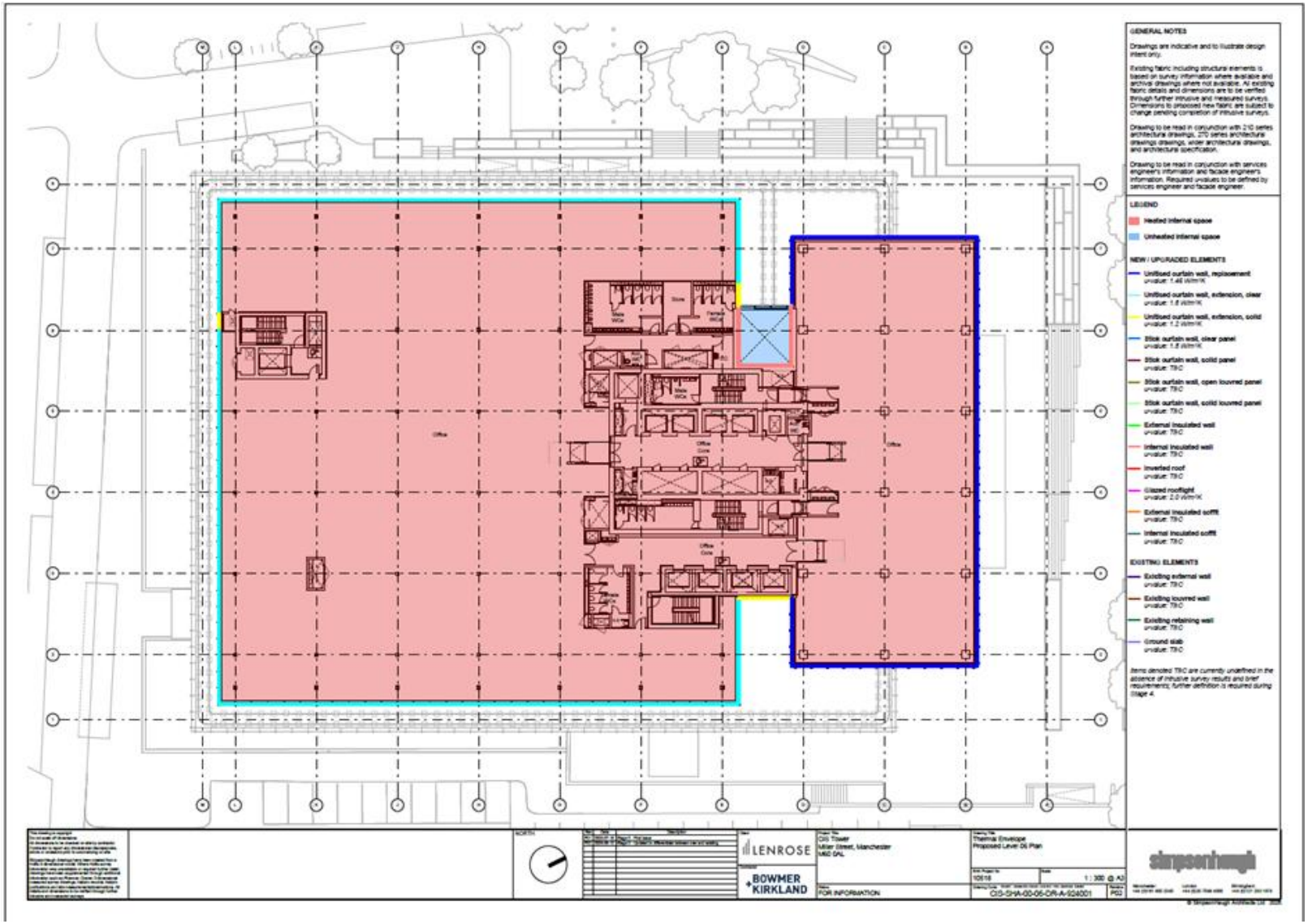
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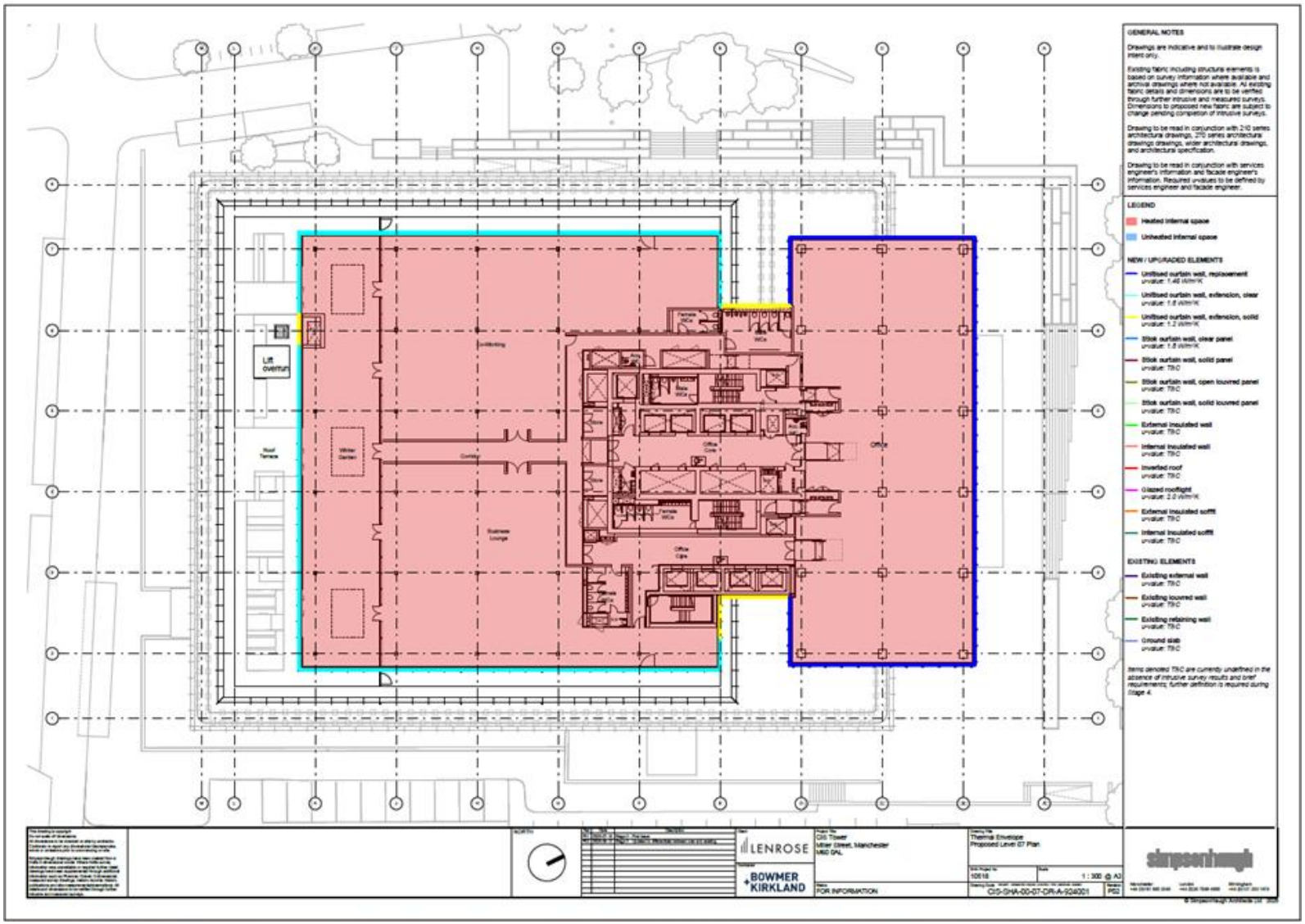
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Unheated internal space
NEW / UPGRADED ELEMENTS
EXISTING ELEMENTS
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BOWMER KIRKLAND
CIS Tower
Miller Street, Manchester
M60 0AL
Thermal Envelope
Proposed Level 05 Plan
FOR INFORMATION
CIS-SHA-00-05-DR-A-924001
simpsonhaugh

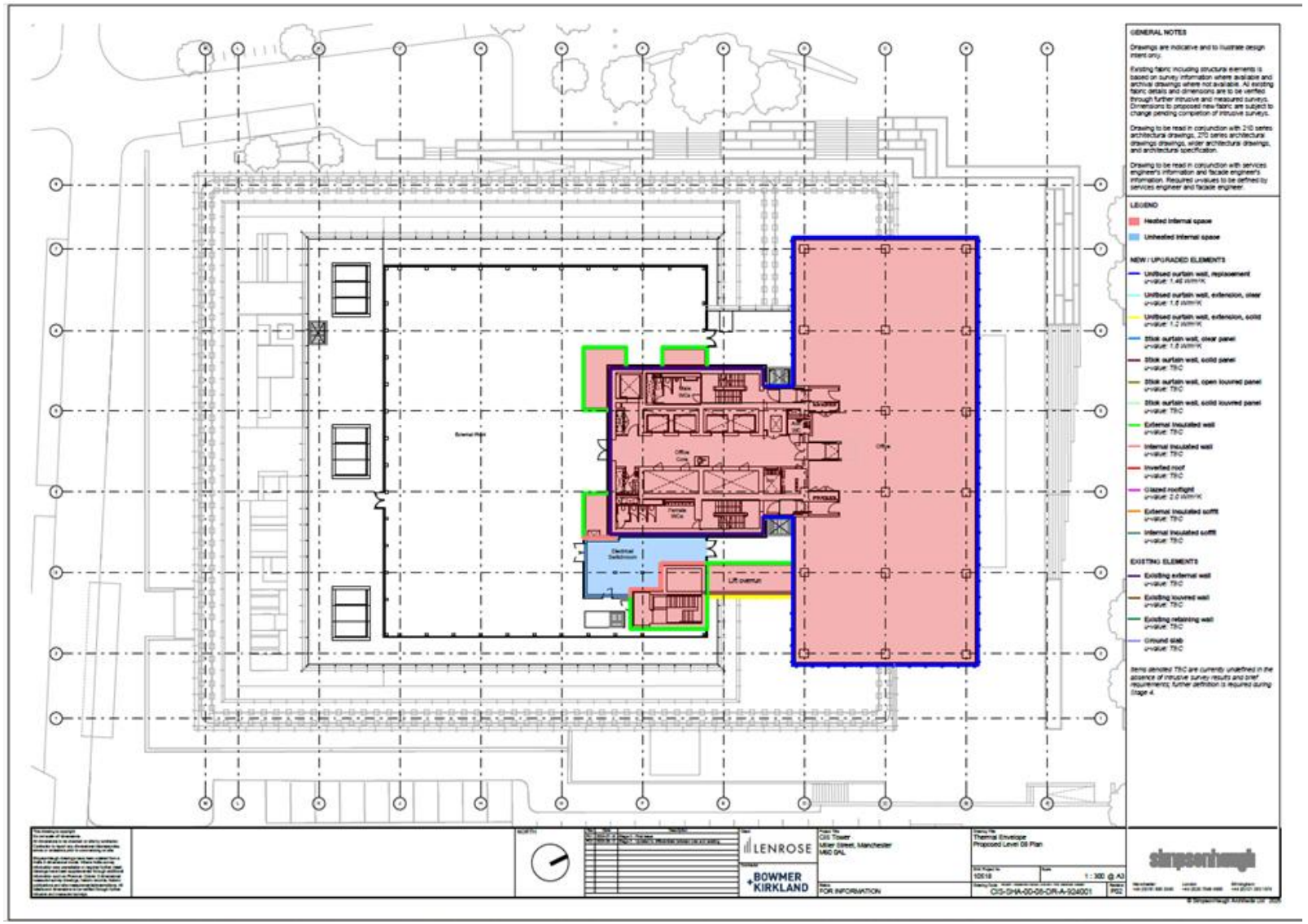
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BOWMER KIRKLAND
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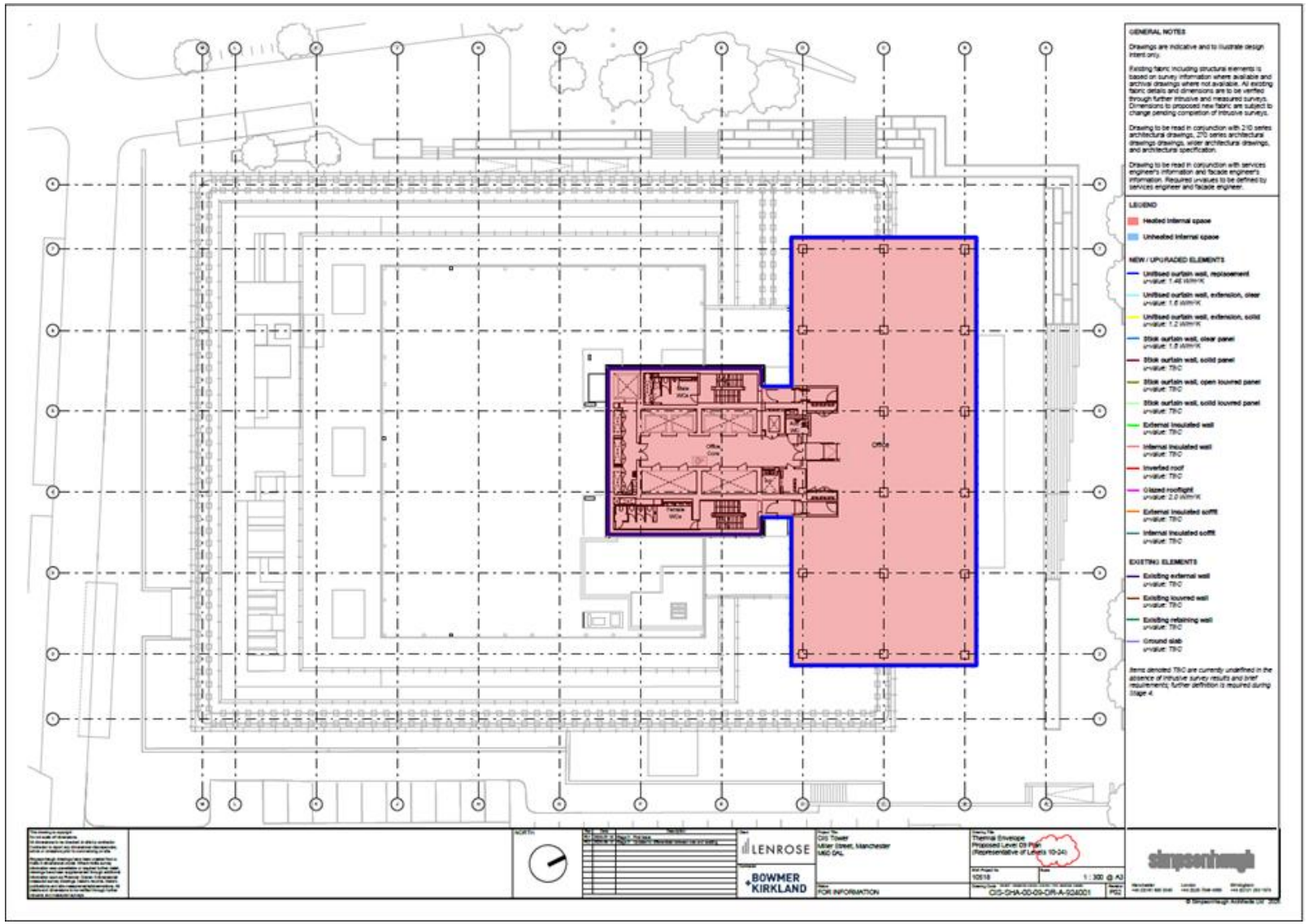
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Miller Street, Manchester
M60 0AL
Proposed Level 07 Plan
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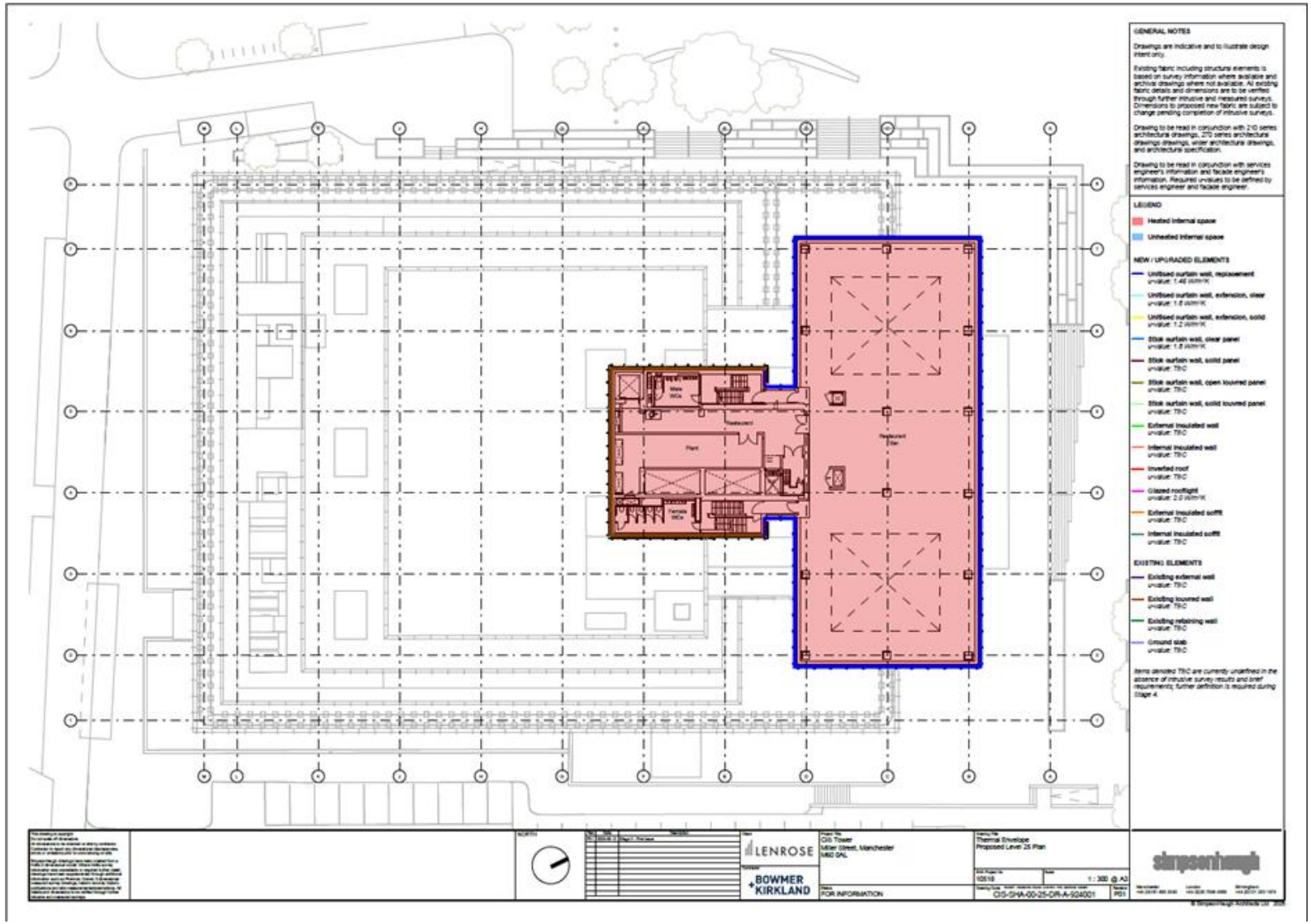
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simpsonhaugh

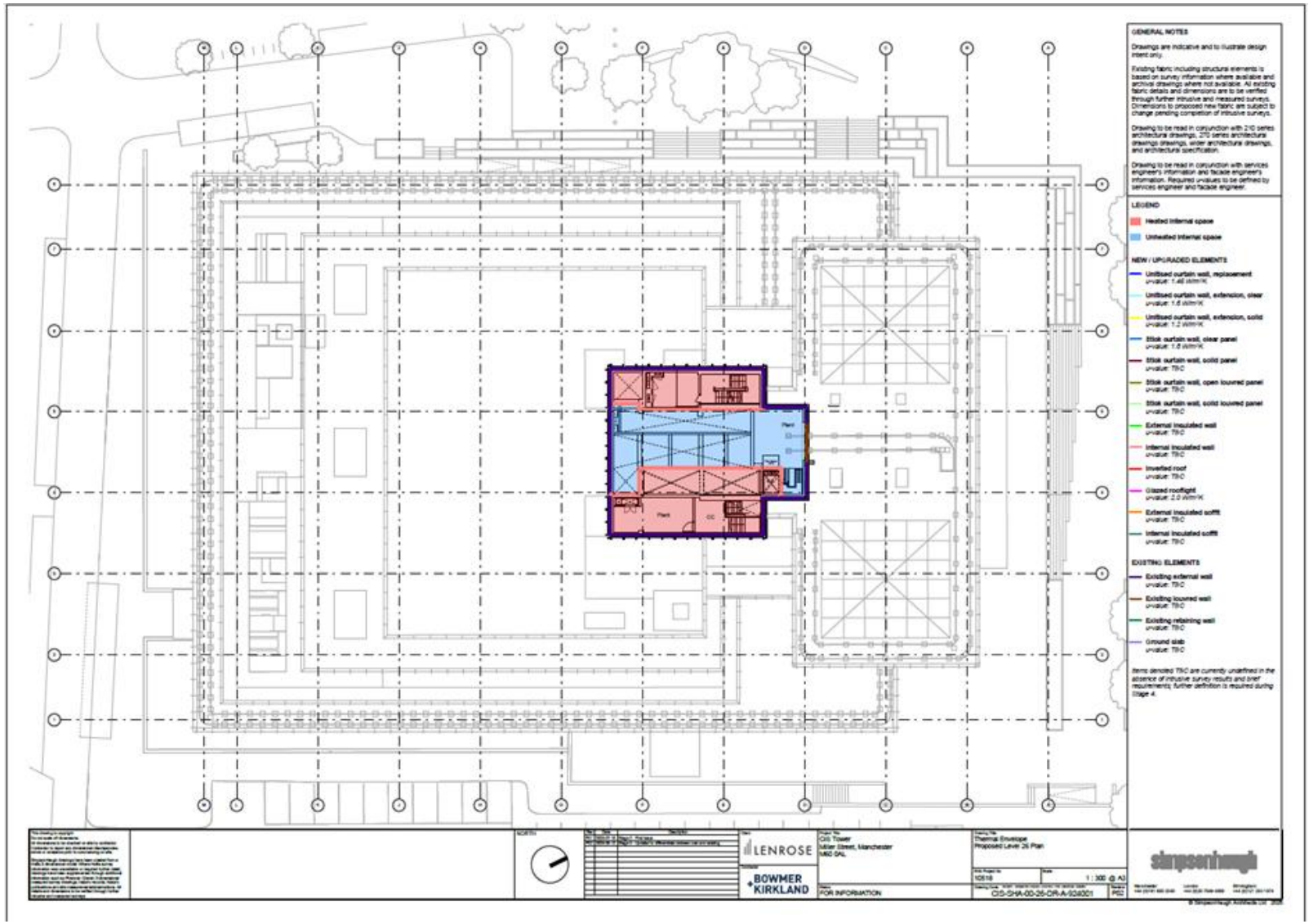
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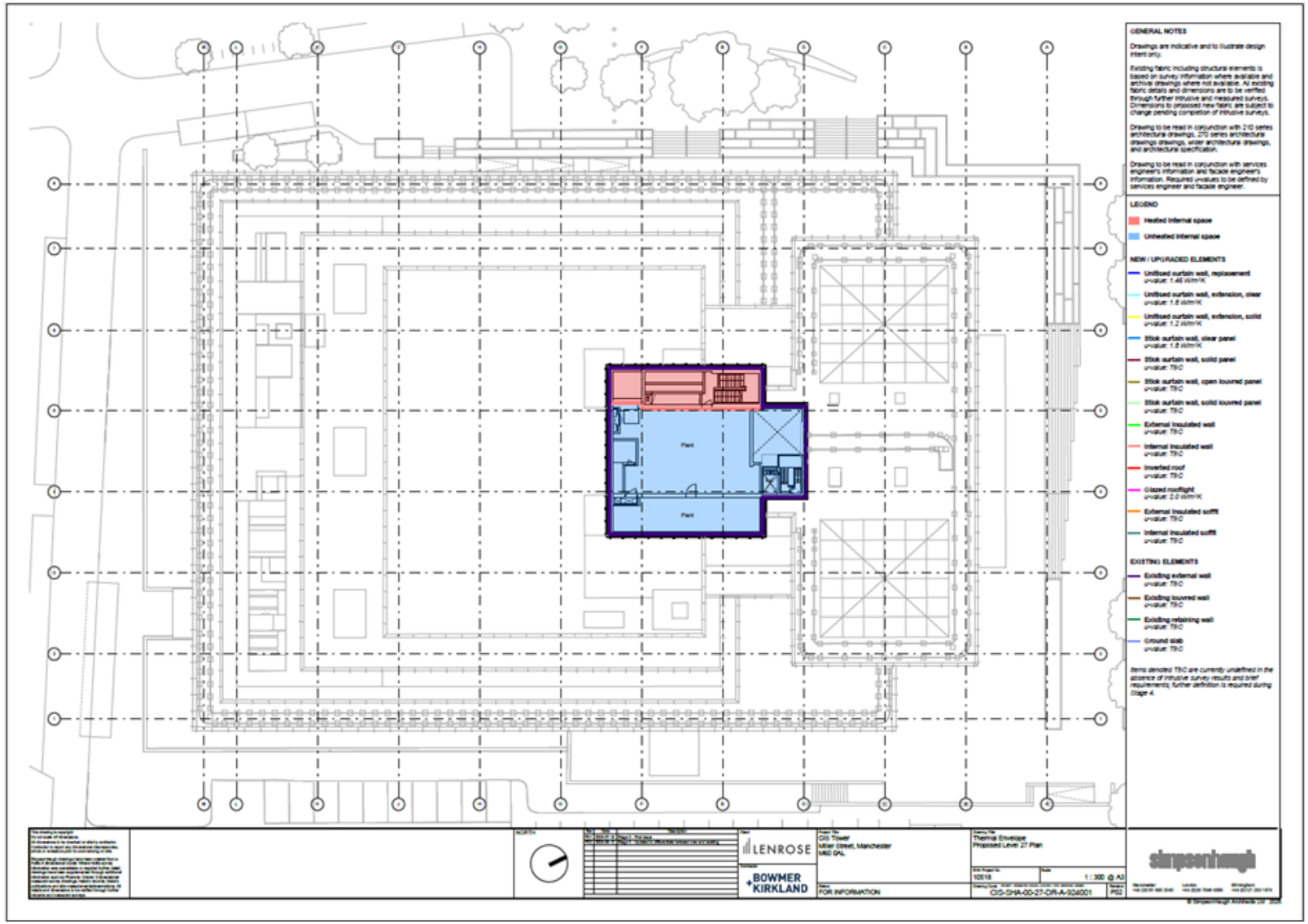
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BOWMER KIRKLAND
simpsonhaugh

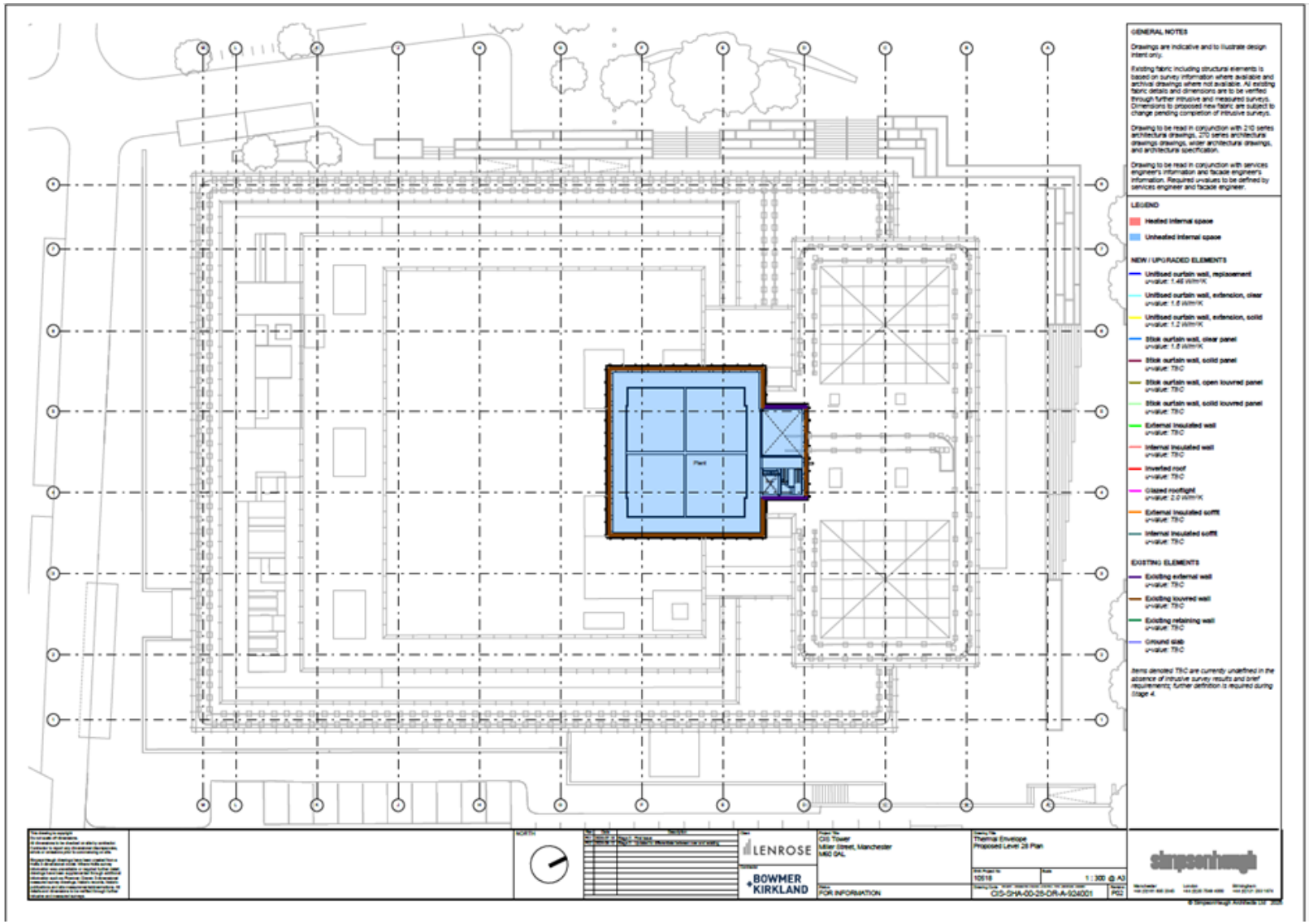
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simpsonhaugh

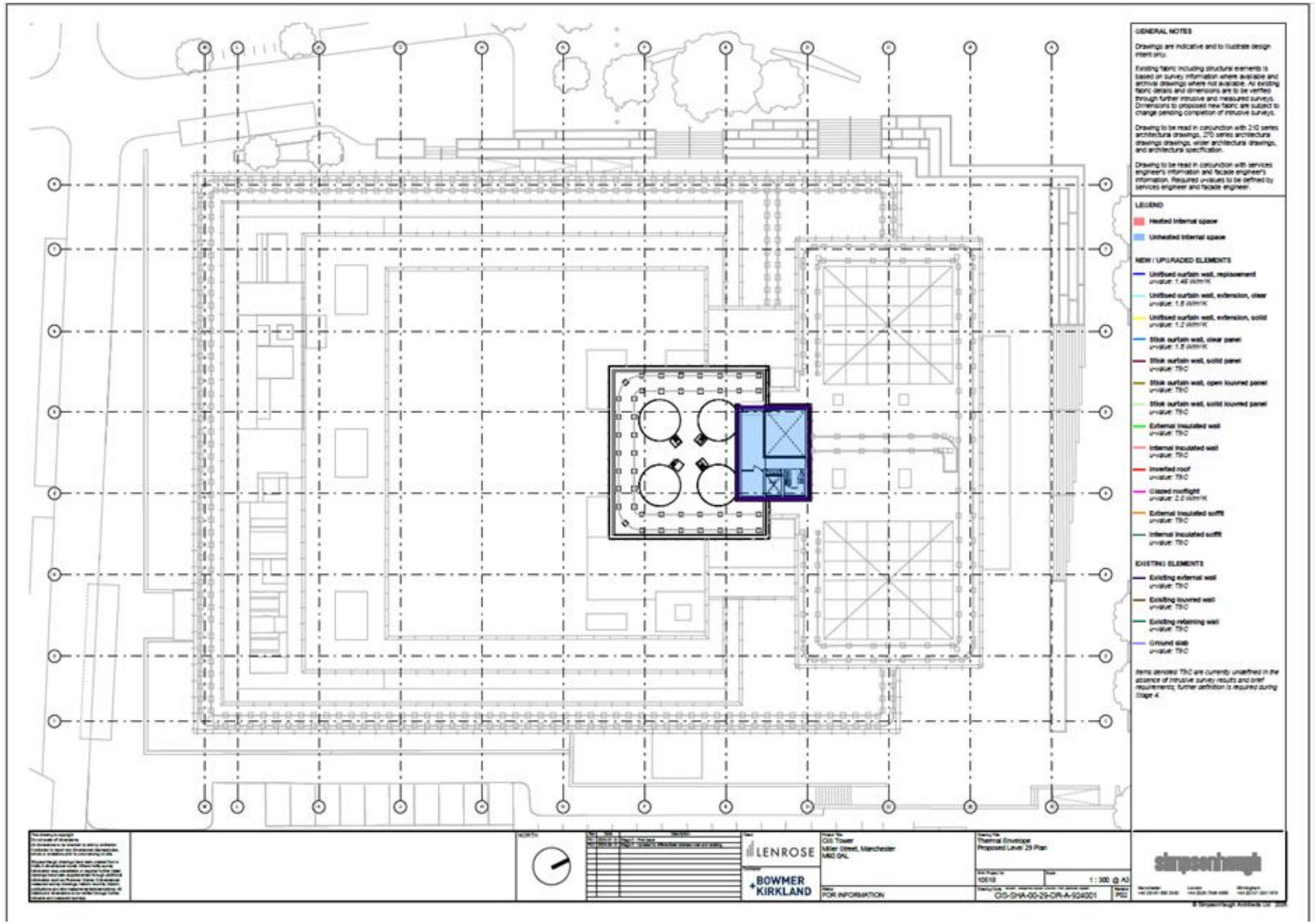
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simpsonhaugh

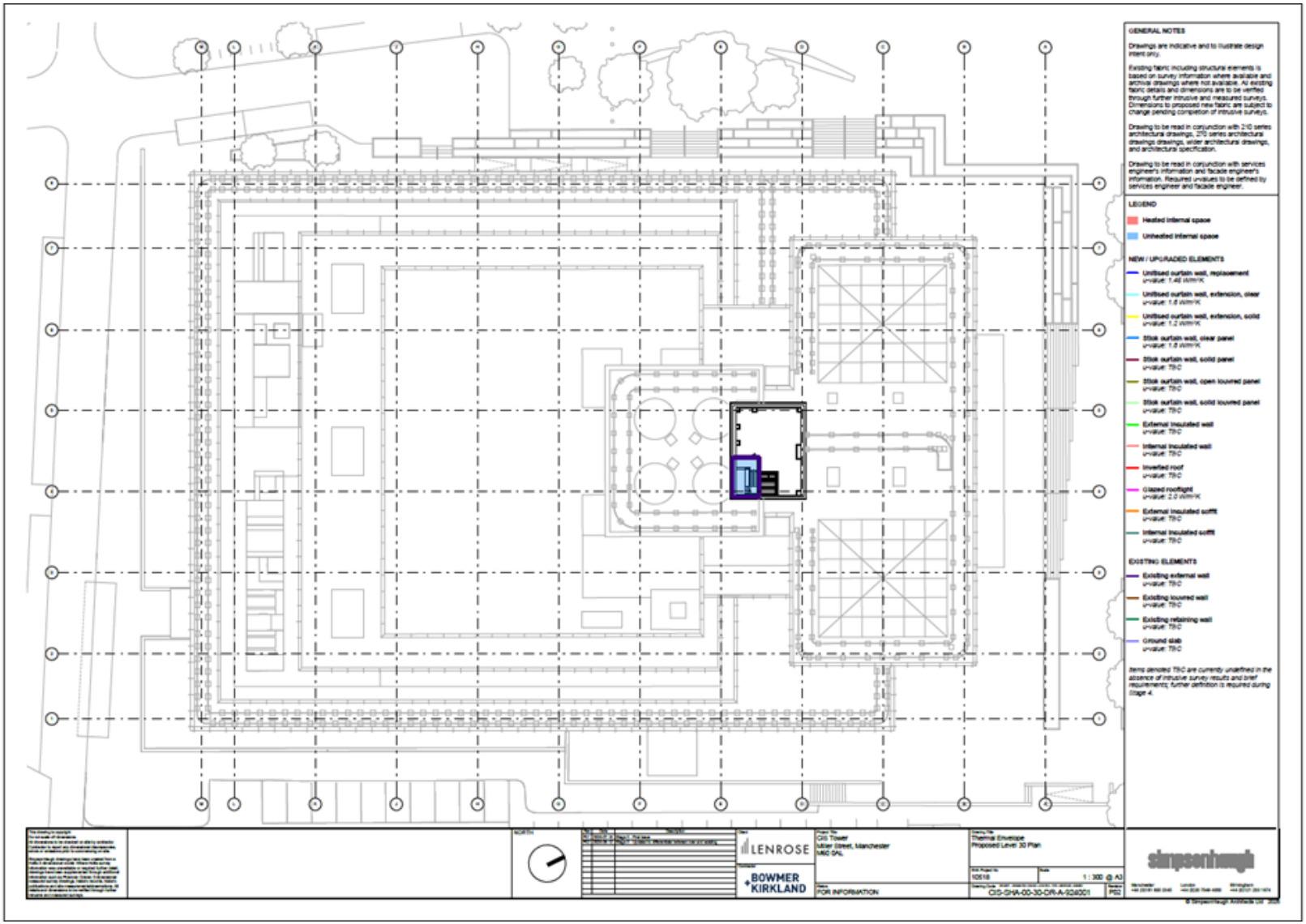
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Thermal Envelope
Proposed Level 28 Plan
FOR INFORMATION
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simpsonhaugh

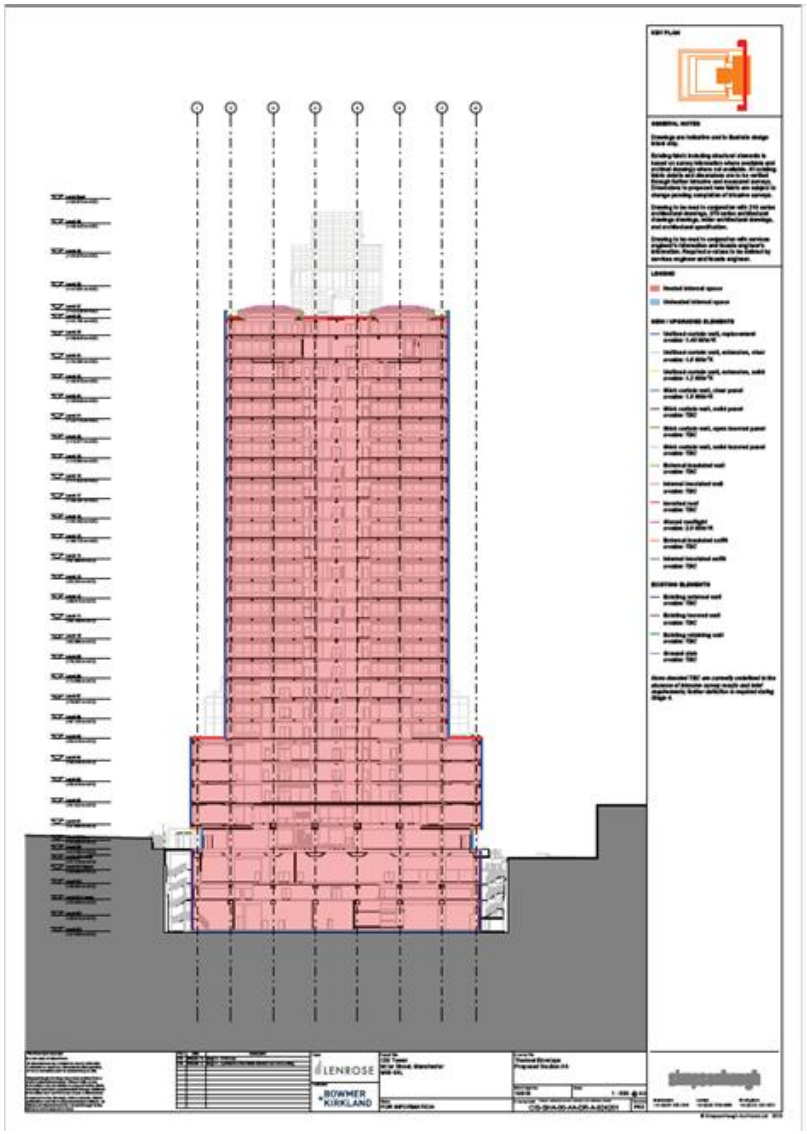
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Thermal Envelope
Proposed Level 29 Plan
FOR INFORMATION
CIS-SHA-00-29-DR-A-924001
1 : 300 @ A3
simpsonhaugh

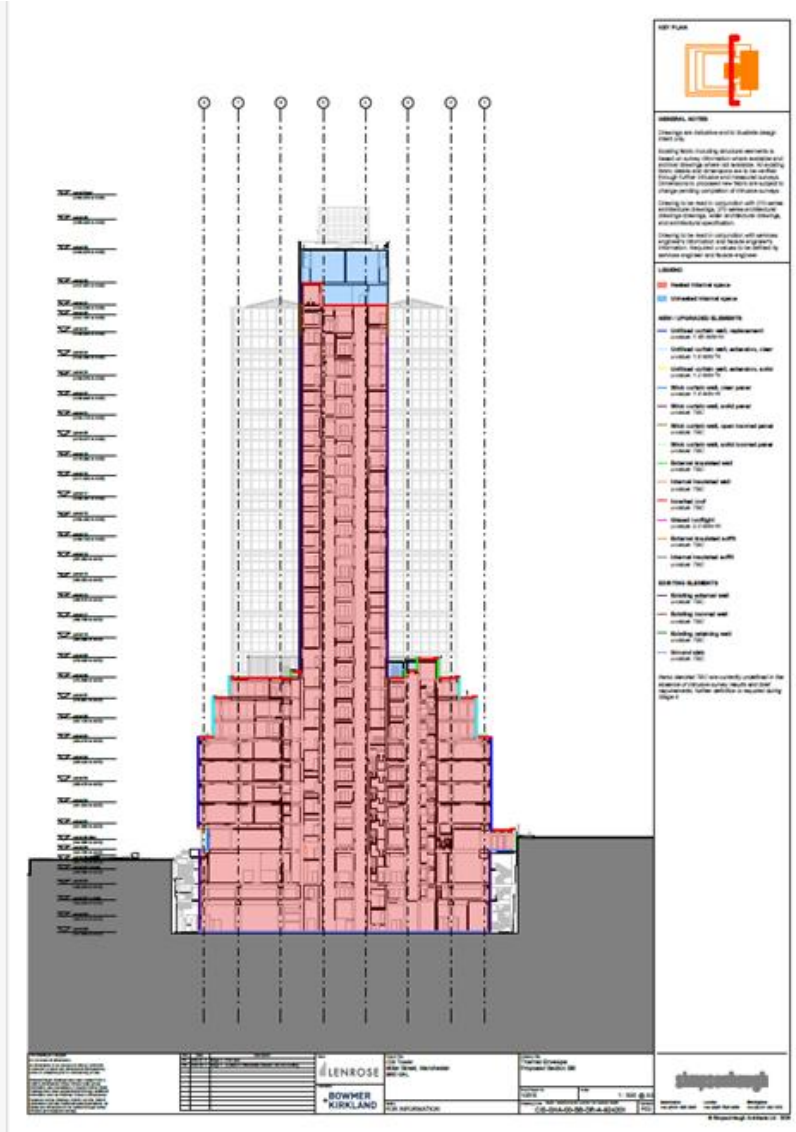
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NEW / UPGRADED ELEMENTS
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BOWMER KIRKLAND
simpsonhaugh

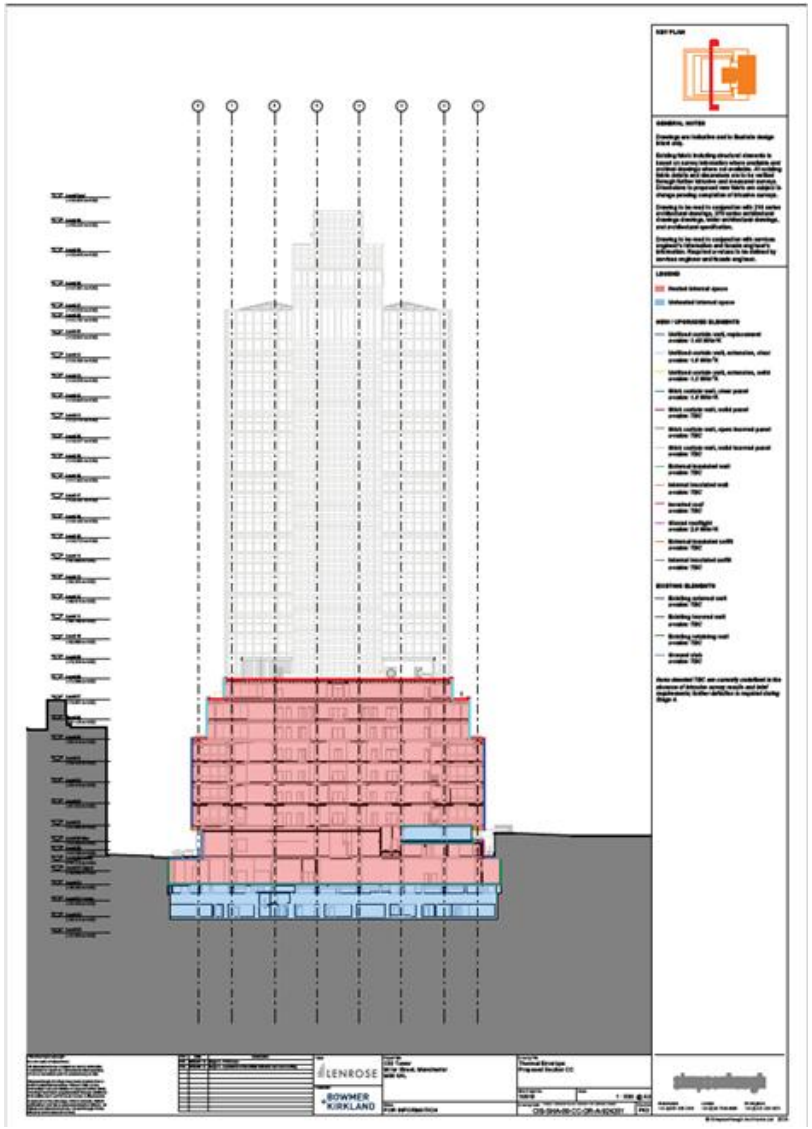
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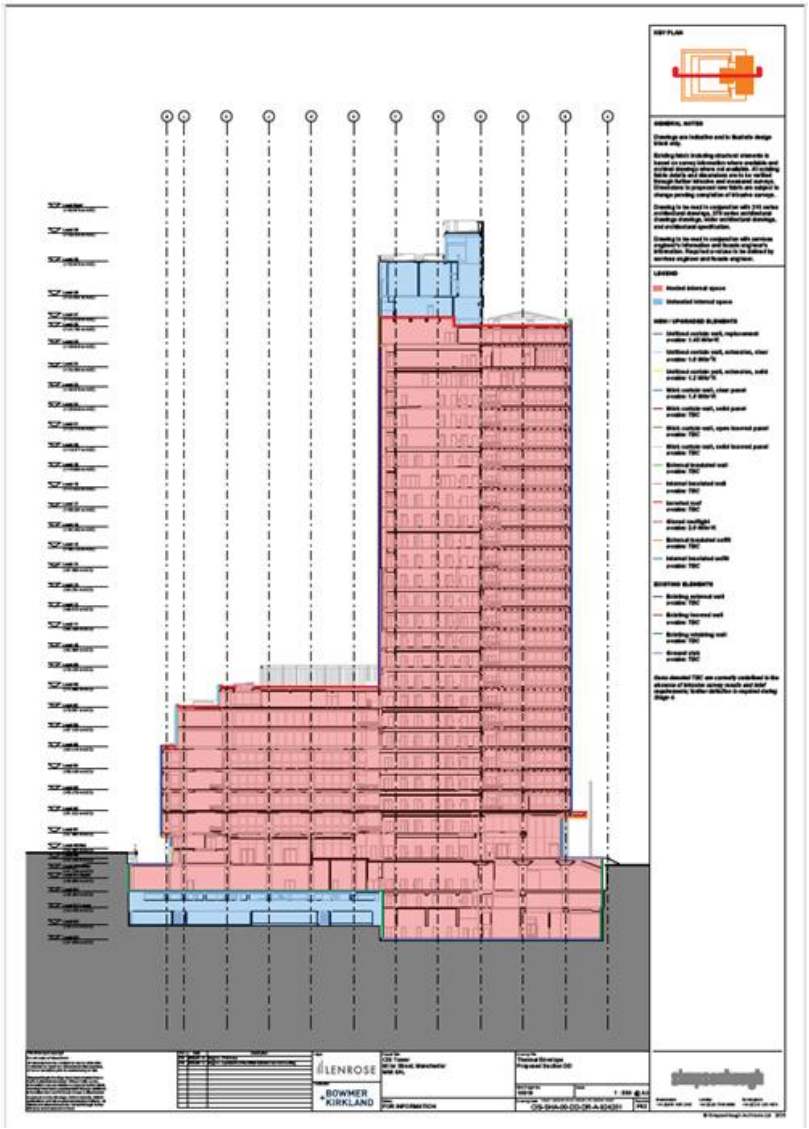
## 9.21 Section BB



## 9.22 Section CC



## 9.23 Section DD



# 10.0 Appendix 2: Low Carbon Heat Appraisal

## 10.1 ASHPs & 4-pipe FCUs

1. Two separate supply/return pairs of pipes take heat/coolth from the ASHPs:
    a. One pair carries chilled water to deliver cooling.
    b. The other pair carries hot water to deliver heating.
2. Fan coil unit contains two heat exchanger coils:
    a. One coil is connected to the chilled water circuit.
    b. The other coil is connected to the hot water circuit.
3. Airflow is driven by a fan:
    a. Room air is drawn into the unit, passes across the appropriate coil (heating or cooling), and is blown back into the space.
    b. Independent control of heating and cooling
4. Each zone or room can call for heating or cooling as needed, regardless of other zones.
    a. Control valves on each coil regulate the flow of hot or chilled water depending on demand.
    b. Flexibility and comfort
5. Allows simultaneous heating in one part of a building and cooling in another.
6. Efficiency of central plant
    a. Chilled water is from a high efficiency heat pump.
7. Occupants or automatic controls select heating or cooling mode locally, sending a signal to the control valve(s) to open the appropriate coil.

Considerations:

- ASHP technology are energy-efficient because they move heat rather than generating it. They can provide up to four units of heat for every unit of electricity used.

- They are versatile by being able to deliver heating and cooling.

- Reduce greenhouse gas emissions.

- Outdoor units can be noisy.

- Installation costs vary on factors such as size, property type, complexity of installation and labour rates. Typical commercial installations may cost:

- Small – medium systems (<30kW): up to £20,000.
- Large systems (30-100kW+): £20,000 - £50,000+

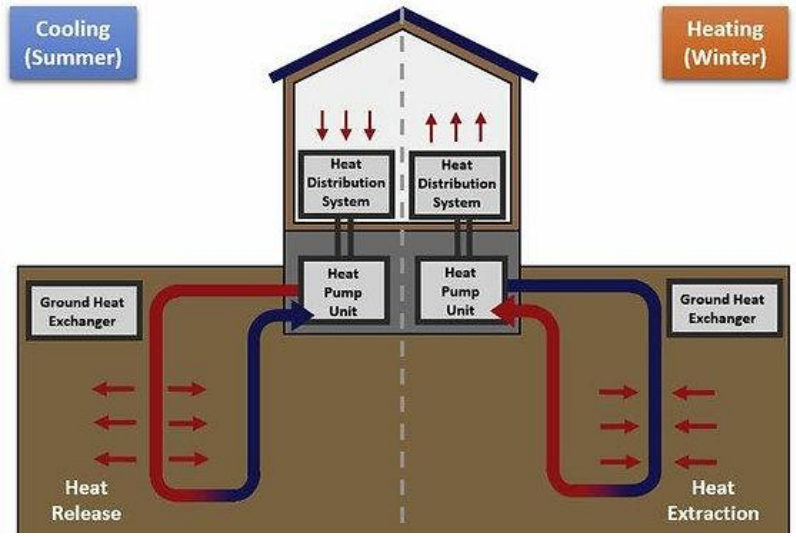
- Typical payback period for the installation of ASHP technology is low and can be anywhere between 5 and 10 years. Larger systems may have a longer payback period however the savings with such systems would be greater.

- ASHP technology has a low level of maintenance requirements.

ASHPs are suitable for this application and ought to be incorporated into the servicing strategy.

## 10.2 Ground Source Heat Pumps (GSHP)

GSHP systems, also known as geothermal heat pumps, use the heat stored in the ground to provide heating and cooling. They function on the following basis:




1. The system comprises a loop of pipes, usually made of high-density polyethylene buried underground. The fluid in the pipes (usually a mixture of water and anti-freeze) transfers the heat from/to the ground.

2. The ground loop can be horizontal – where pipes are buried in shallow trenches (between 1.5m and 3m) over a larger area of land. Alternatively, the ground loop can be vertical where the pipes are laid vertically in boreholes up to 150m deep. These are suitable for buildings with limited land area and/or higher energy needs.

3. In winter, the fluid takes the heat from the ground to the heat exchanger where it is concentrated (using the refrigeration cycle as described above) to provide space and/or water heating. In summer, this can be reversed to move heat from the building to the ground.

4. Once heat is transferred to the indoor environment, it is distributed using conventional heating methods, such as radiators, underfloor heating or air ducts.

Considerations:

- GSHP are highly efficient as the ground temperature remains constant unlike ASHP that rely on external air temperature. Thus, less energy is used to transfer heat providing greater energy savings.

- Reduces greenhouse gas emissions.

- GSHP generally make no noise when in operation.

- GSHP require a large external area for installation.

- Installation cost can be high due to the drilling / trenching required for the ground loop. Typical costs can be:

- Small to medium commercial applications (<30kW): £20,000 - £35,000.
- Large commercial applications (30kW – 100kW+): £35,000 - £80,000+.

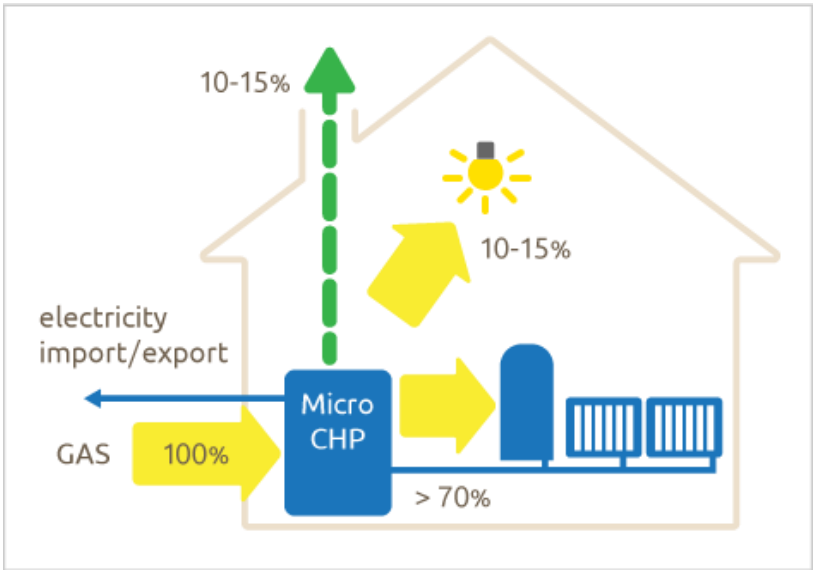
- Typical payback periods for the installation of a GSHP system can be:
- Small to medium commercial applications (<30kW): 10-12 years.
- Large commercial applications (30kW-100kW+): 12-15 years.

- GSHP technology has low maintenance requirements.

The installation of GSHPs to serve the building is not deemed viable as the costs, location and the fixed nature of the site render their inclusion prohibitive.

## 10.3 Combined Heat & Power (CHP)

CHP, or cogeneration, is a system that simultaneously generates both electricity and useful heat from a single energy source:




1. Fuel (natural gas, biomass or waste materials) is fed into a prime mover (gas/steam turbine, or internal combustion engine) to generate electricity.

2. The heat generated from the production of electricity is captured and used for space and/or water heating. In traditional power generation systems, this heat is typically wasted.

3. The electricity can be used on-site to power the building, or processes within it, or it may be exported to the grid.

4. The heat is then recovered and used for other purposes such as space heating, hot water production or industrial heating.

Considerations:

- A base load (the consistent and continuous demand for heat and electricity) is required for the system to be effective and economical.

- The recovery of waste heat that would normally be lost allows the system to achieve much higher overall efficiency, making it a more sustainable and cost-effective solution.

- The electricity generated can be exported to the grid for additional income thereby reducing the payback period.

- CHP systems can generate low noise levels when in operation.

- Fuel type chosen must be readily available throughout the year and be cost-effective for the site.

- Installation costs can be high:

- Small systems (Micro CHP): up to £20,000.
- Medium to large systems: up to £500,000.

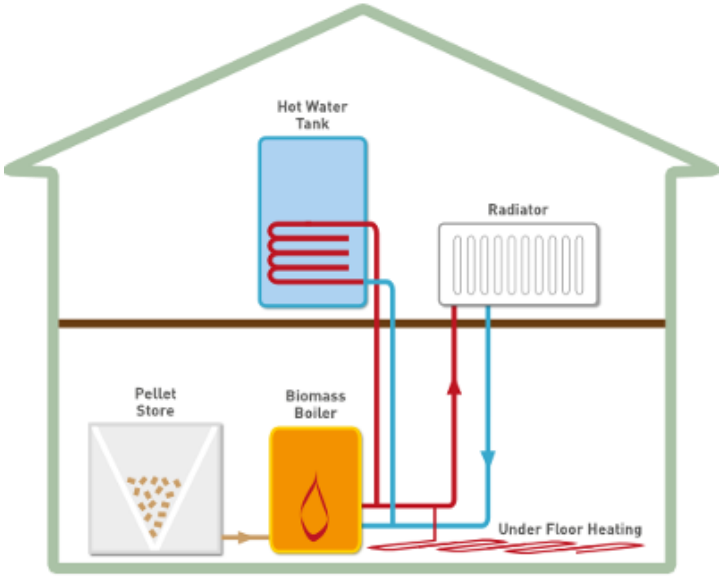
- Payback periods for the installation of CHP can be typically between 3 and 10 years.

- Size and location of CHP may be subject to local regulations regarding air quality, emissions and noise levels.

The use of the building is not expected to generate a sufficient base load to enable the use of CHP viable. This has therefore been discounted in this instance.

## 10.4 Biomass Heating

Biomass heating uses organic materials such as wood, agricultural residues, or other plant-based materials to generate heat for buildings, industrial processes or power generation:




1. Biomass is burned in a biomass boiler or stove, the combustion process generates heat, which is used to heat space and/or water.
2. The heated water can be circulated through radiators, underfloor heating or stored in hot water tanks for the use in buildings.
3. The heat from combustion is used to generate steam or hot water for heating purposes.
4. After combustion, there is ash residue, which must be cleaned and disposed of regularly. The amount of ash depends on the type of biomass used.

Considerations:

- Biomass is a renewable source, plants and trees can be regrown, and waste biomass is continuously produced.
- Storage requirement for biomass fuel can be significant.
- The carbon dioxide released during the combustion of biomass is roughly equal to the amount absorbed by the plants during their growth, making it a carbon-neutral source of energy.

- Using biomass reduces the reliance on fossil fuels.
- Typica initial costs for a biomass heating system is around £50,000 to £200,000+.
- Typical payback period for a biomass heating system generally between 5 to 10 years.
- Biomass heating systems can have a high level of maintenance requirements.

The existing site does not have sufficient space to allow the storage of biomass fuel therefore it is not deemed suitable.

# 11.0 Appendix 3: Overheating Report

CWC

crookes walker
consulting





# CIS Tower

## Manchester

BREEAM Hea04 Thermal Comfort Analysis

Date: 14/08/2025
Ref: 3559-CWC-XX-XX-RP-M-7005

Crookes Walker Consulting Limited is registered in England & Wales | 05011466 |
Registered Office: One Express | 1 George Leigh Street | Manchester | M4 5DL

# Revision Record

| Date | Reference | Revision | Prepared | Checked | Authorised |
|---|---|---|---|---|---|
| 14/08/2025 | 3559-CWC-XX-XX-RP-M-7005 | 01 | Nazhan Nizam | Obaid Rahman | David Walker |
| | | | NN | OR | DW |
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# 1.0 Executive summary

This report outlines the parameters that have been assigned to the thermal model for CIS Tower, located in Manchester city centre, to determine performance against the requirements of BREEAM Hea04 Health & Wellbeing – Thermal Comfort.

With the parameters set out in this report, CIS Tower achieves compliance with *CIBSE Technical Memorandum 52: The limits of thermal comfort: avoiding overheating in European buildings*.

The report explains the analysis that has been undertaken for the building. Details such as internal heat gains, and fabric details are outlined herein. The parameters for compliance include:

- Fabrics as per Table 2.
- Ventilation strategy as per Section 4.2.
- Internal heat gains as per Appendix B.

If the design deviates from the strategy described within this report, then this assessment will need to be re-run to ensure the servicing strategies minimise the risk of overheating.

Table 1 below shows the CIBSE TM52 criteria for air-conditioned zones. To achieve compliance, occupied zones need to comply with both the Predicted Mean Vote (PMV) and Percentage People Dissatisfied (PPD) criteria.

| Location | PMV Result<br>−0.5 ≤ PMV ≤ +0.5 | PPD Result<br>PPD ≤ 10% | Overall Result |
|---|---|---|---|
| Office zones | ✓ | ✓ | Pass |

Table 1. CIBSE TM52 PMV/PPD Criteria

Full results are shown in Appendix C.

# 2.0 Introduction

Crookes Walker Consulting (CWC) have undertaken an overheating assessment in-line with the 'Chartered Institute of Building Services Engineers' (CIBSE) guidance document, *Technical Memorandum 52: The limits of thermal comfort: avoiding overheating in European buildings ("CIBSE TM52").*

Under CIBSE TM52, non-air-conditioned zones are assessed against three criteria, requiring compliance with at least two. However, as the assessed zone is air-conditioned, it will be evaluated using the Predicted Mean Vote (PMV) and Percentage People Dissatisfied PMV/PPD criteria instead.

## 2.1 Weather data

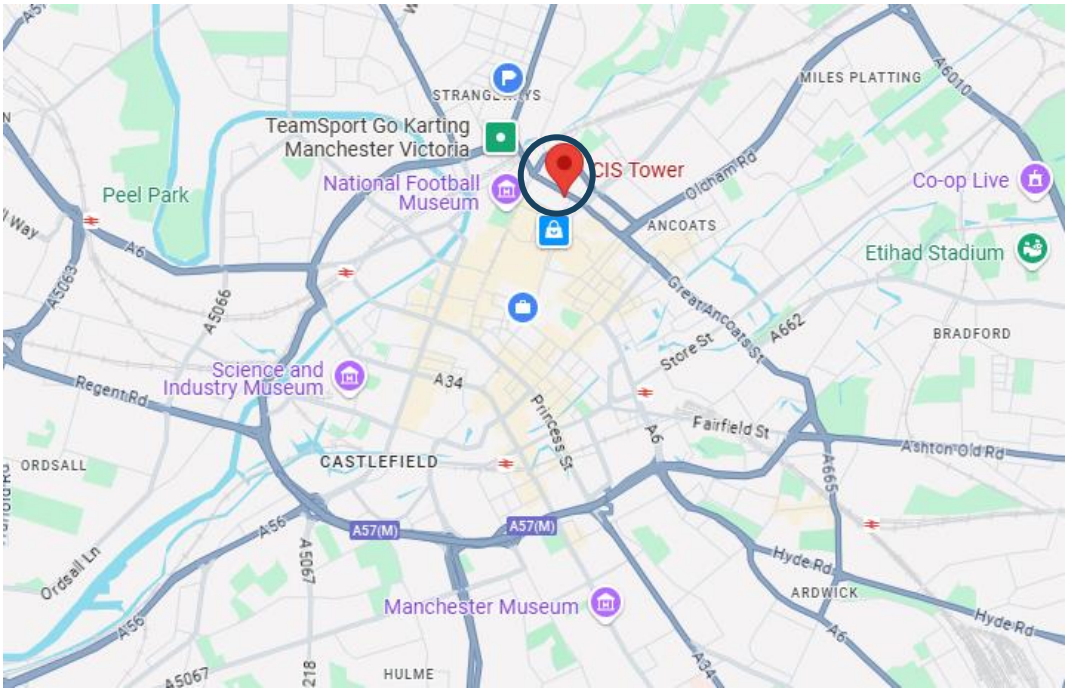



Figure 1. Site location

The site is located in Manchester city centre, hence, the Manchester DSY1 2020 high emissions scenario 50$^{th}$ percentile weather data has been used for the calculations.

The Manchester DSY1 2020 high emissions scenario 50th percentile air temperature profile is shown in Appendix A.

CWC were not commissioned to evaluate the proposed scheme against any future weather files.

## 2.2 Thermal Model

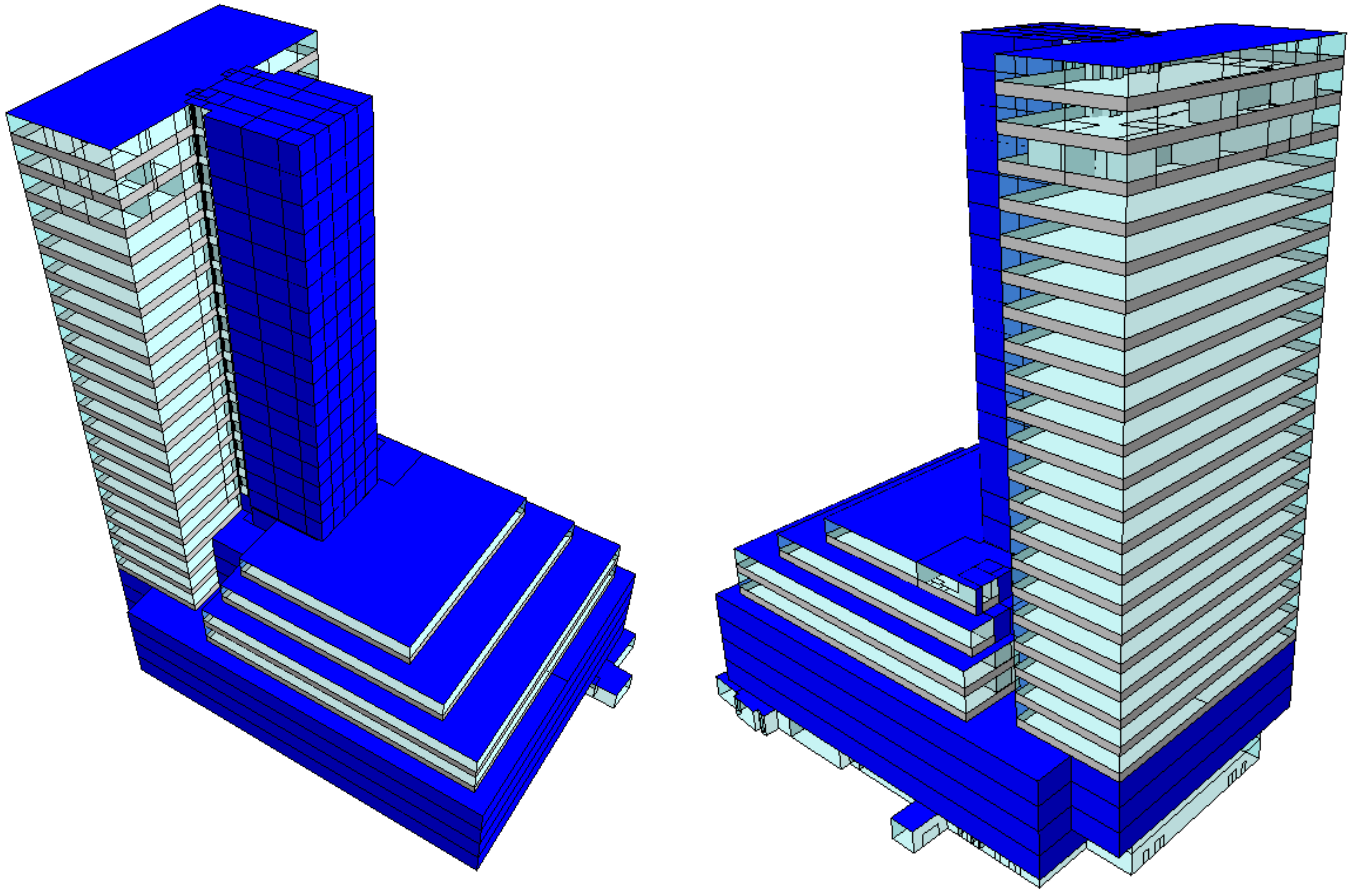


Figure 2. Thermal model in IES-VE software

## 2.3 Modelling disclaimer

The building has been modelled with accredited software package IES:VE version 2025.0.0.0, which is a dynamic simulation software, compliant with CIBSE AM11 Building Performance Modelling.

The analysis was undertaken by an Energy Specialist; an individual who has acquired substantial expertise or a recognised qualification for undertaking assessments, designs, and installations of Low and Zero Carbon solutions in the commercial buildings sector and is not professionally connected to a single Low and Zero Carbon technology or manufacturer.

It should be noted that the data generated by this work is obtained using computer simulations. These simulations are the best means of predicting the performance of the building at this stage. Full certainty can only be achieved by measuring the performance of the building and associated systems after a period of use.
Whilst the simulations have been undertaken in good faith using reasonable skill and care, Crookes Walker Consulting Limited can take no responsibility for differences between the computer simulations and the actual performance of the completed building due to the inherent complexity and variability of the physics in a building and its environment.

# 3.0 Assessment methodology

## 3.1 CIBSE TM52

CIBSE TM52 is a standardised approach to assess the risk of overheating in non-domestic buildings. It is based on the adaptive thermal comfort method where the comfort temperature in free running buildings is related to the outdoor temperature.

For zones that are mechanically cooled, the Predicted Mean Vote (PMV) and Percentage People Dissatisfied (PPD) approach is used. The PMV combines the influence of air temperature, mean radiant temperature, air movement and humidity with that of clothing and activity levels into one value on a thermal sensation scale, as shown in Figure 3.

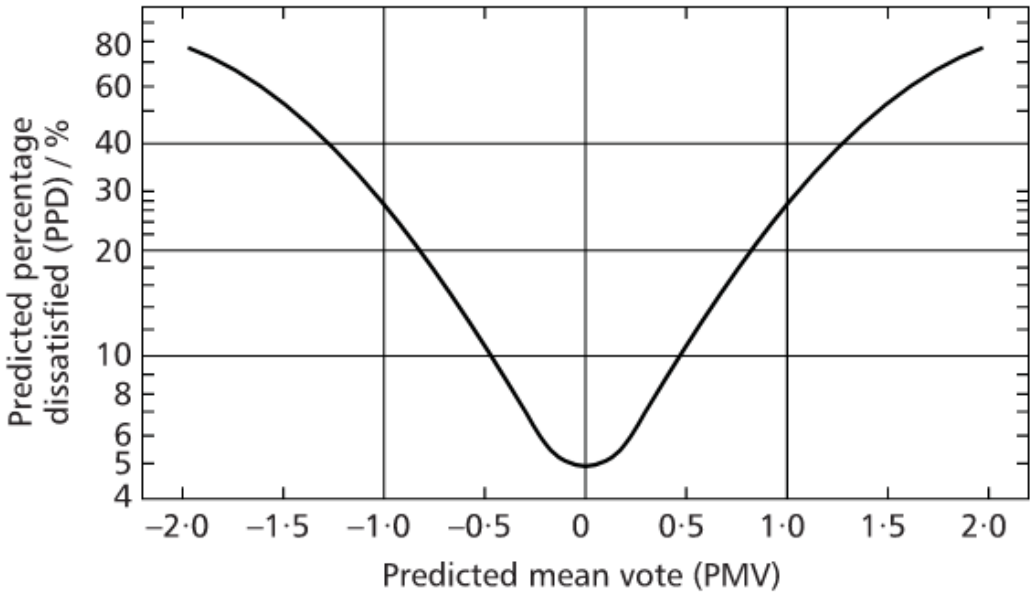



Figure 3. CIBSE PMV / PPD Requirements

Figure 3 outlines the guidelines for maintaining a comfortable indoor environment in mechanically cooled buildings. The aim is to keep the PMV index near zero. If the PMV exceeds 0.5 (equivalent to a 10% likelihood of dissatisfaction), the zone is

considered overheated. If the PMV exceeds -0.5, the zone is conditioned as too cold during the winter season.

The PMV / PPD methodology includes four categories, shown in Figure 4 below. CIS Tower is assessed under Category 2 for normal expectations in new buildings and renovations, with PMV limits between -0.5 and 0.5, and the PPD limited to less than 10%.

| Category | Explanation | Suggested acceptable range / K | Suggested acceptable PMV limits |
|---|---|---|---|
| I | High level of expectation (only used for spaces occupied by very sensitive and fragile persons) | ± 2 K | ± 0.2 |
| II | Normal expectation (for new buildings and renovations) | ± 3 K | ± 0.5 |
| III | A moderate expectation (used for existing buildings) | ± 4 K | ± 0.7 |
| IV | Values outside the criteria for the above categories (only acceptable for a limited periods) | > 4 K | > 0.7 |

Figure 4. CIBSE PMV / PPD Categories

All assumptions and mitigations made within this report must form part of the construction contract, or the model will need to be re-simulated to prove compliance. Inclusion of pipework insulation, blinds and openable windows etc must not be ignored.

# 4.0 Input Parameters.

## 4.1 Fabric Parameters

Table 2 below confirms the building fabric and glazing properties applied to the thermal model.

| Fabric Element | u-value (W/m$^2$K) |
|---|---|
| Curtain Wall (Replacement) | 1.45 \| 0.40 g-value \| LT 0.70 |
| Curtain Wall (Extension) | 1.60 \| 0.40 g-value \| 0.70 |
| Exposed Floor | 0.45 |
| Roof (Existing) | 1.42 |
| Roof (Proposed Extension) | 0.18 |
| Roof Light | 1.44 \| 0.90 g-value \| LT 0.90 |
| Air Permeability | 4 m$^3$/h.m$^2$ @ 50Pa |

Table 2. Fabric Parameters

## 4.2 Mechanical Ventilation

Energy-efficient HVAC equipment, including Air Source Heat Pumps (ASHP), provides effective heating and cooling to mitigate overheating risks.

| HVAC System: Offices | |
|---|---|
| Heating/Cooling Type | VRF from Air Source Heat Pump |
| Heat Generator Seasonal Efficiency | 3.30 |
| Cooling Seasonal Efficiency | 5.51 |
| Ventilation Type | Balanced Supply & Extract (Central AHU) |
| SFP | 1.80 |
| Heat Recovery Efficiency | 75% |

| HVAC System: Offices | |
|---|---|
| Automatic monitoring and targeting | Yes |
| Set Points | Office & Reception Summer 24°C \| Winter 21°C |

Table 3. HVAC System

## 4.3 Internal Heat Gains

Specific internal heat gains have been included for each zone, and are stated in Appendix B. Assumed values have been taken from CIBSE Guide A.

# 5.0 Results

This report outlines the parameters that have been assigned to the thermal model for CIS Tower, located in Manchester city centre, to analyse potential overheating risks.

With the parameters set out in this report, CIS Tower achieves compliance with *CIBSE Technical Memorandum 52: The limits of thermal comfort: avoiding overheating in European buildings*.

The report explains the analysis that has been undertaken for the building. Details such as internal heat gains, and fabric details are outlined herein. The parameters for compliance include:

- Fabrics as per Table 2.
- Ventilation strategy as per Section 4.2.
- Internal heat gains as per Appendix B.

If the design deviates from the strategy described within this report, then this assessment will need to be re-run to ensure the servicing strategies prevent overheating.

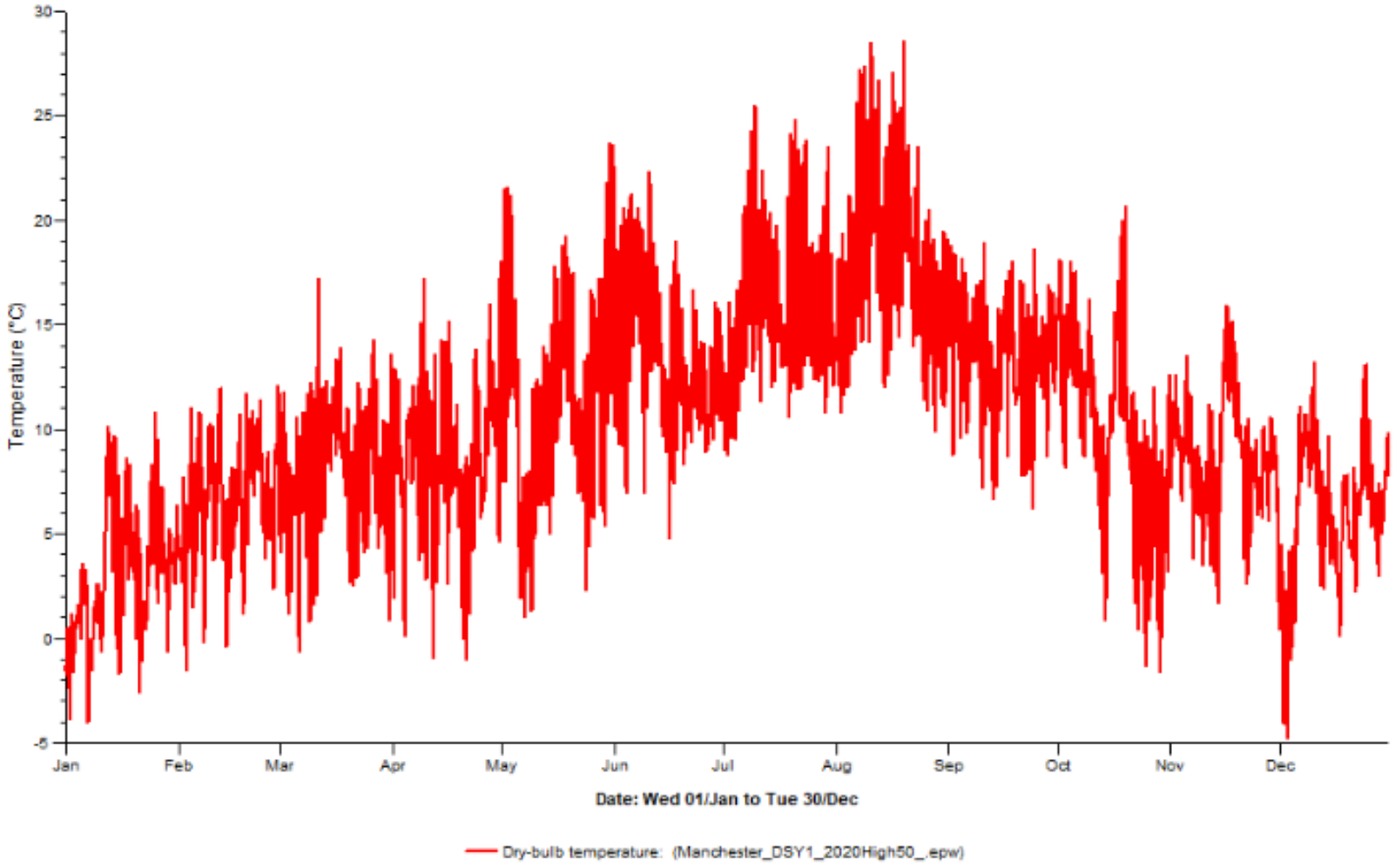
Table 4 below shows the CIBSE TM52 criteria for air-conditioned zones. To achieve compliance, occupied zones need to comply with both the Predicted Mean Vote (PMV) and Percentage People Dissatisfied (PPD) criteria.

| Location | PMV Result<br>−0.5 ≤ PMV ≤ +0.5 | PPD Result<br>PPD ≤ 10% | Overall Result |
|---|---|---|---|
| **Open Office Space** | ✓ | ✓ | Pass |

Table 4. CIBSE TM52 PMV/PPD Criteria

Full results are shown in Appendix C.

# 6.0 Appendix A – Annual Weather Data



# 7.0 Appendix B Full Internal Heat Gain Inputs

| Space Name | Occupancy ($m^2$/person) | Personnel Gains W/person Sensible / Latent | Lighting Gains $W/m^2$ | General Gains $W/m^2$ |
|---|---|---|---|---|
| 00 Reception Offices | 8 | 90 / 50 | 2.55 | 7.50 |
| 01 Office (Open) Podium | 8 | 90 / 50 | 2.55 | 7.50 |
| 02 Office (Open) Podium | 8 | 90 / 50 | 2.55 | 7.50 |
| 03 Office (Open) Podium | 8 | 90 / 50 | 2.55 | 7.50 |
| 04 Office (Open) Podium | 8 | 90 / 50 | 2.55 | 7.50 |
| 05 Office (Open) Podium | 8 | 90 / 50 | 2.55 | 7.50 |
| 05 Office Tower (Open) | 10 | 90 / 50 | 2.55 | 3.00 |
| 06 Office (Open) Podium | 8 | 90 / 50 | 2.55 | 11.25 |
| 06 Office Tower (Open) | 10 | 90 / 50 | 2.55 | 3.00 |
| 07 Office (Open) Podium | 8 | 90 / 50 | 2.55 | 11.25 |
| 07 Office Tower (Open) | 10 | 90 / 50 | 2.55 | 6.00 |
| 08 Office Tower (Open) | 10 | 90 / 50 | 2.55 | 3.00 |
| 09 Office Tower (Open) | 10 | 90 / 50 | 2.55 | 3.00 |
| 10 Office Tower (Open) | 10 | 90 / 50 | 2.55 | 3.00 |
| 11 Office Tower (Open) | 10 | 90 / 50 | 2.55 | 3.00 |
| 12 Office Tower (Open) | 10 | 90 / 50 | 2.55 | 3.00 |
| 13 Office Tower (Open) | 10 | 90 / 50 | 2.55 | 3.00 |
| 14 Office Tower (Open) | 10 | 90 / 50 | 2.55 | 3.00 |
| 15 Office Tower (Open) | 10 | 90 / 50 | 2.55 | 3.00 |
| 16 Office Tower (Open) | 10 | 90 / 50 | 2.55 | 3.00 |
| 17 Office Tower (Open) | 10 | 90 / 50 | 2.55 | 3.00 |

| Space Name | Occupancy ($m^2$/person) | Personnel Gains W/person Sensible / Latent | Lighting Gains $W/m^2$ | General Gains $W/m^2$ |
|---|---|---|---|---|
| 18 Office Tower (Open) | 10 | 90 / 50 | 2.55 | 3.00 |
| 19 Office Tower (Open) | 10 | 90 / 50 | 2.55 | 3.00 |
| 20 Office Tower (Open) | 10 | 90 / 50 | 2.55 | 3.00 |
| 21 Office Tower (Open) | 10 | 90 / 50 | 2.55 | 3.00 |
| 22 Office Tower (Open) | 10 | 90 / 50 | 2.55 | 3.00 |
| 23 Office (Office) 1 | 10 | 90 / 50 | 2.55 | 3.00 |
| 23 Office (Office) 2 | 10 | 90 / 50 | 2.55 | 9.00 |
| 23 Office (Office) 3 | 10 | 90 / 50 | 2.55 | 7.50 |
| 23 Office (Office) 4 | 10 | 90 / 50 | 2.55 | 6.00 |
| 23 Office (Office) 5 | 10 | 90 / 50 | 2.55 | 6.00 |
| 23 Office (Office) 6 | 10 | 90 / 50 | 2.55 | 4.50 |
| 23 Office (Office) 7 | 10 | 90 / 50 | 2.55 | 3.00 |
| 23 Office (Office) 8 | 10 | 90 / 50 | 2.55 | 9.00 |
| 23 Office (Office) 9 | 10 | 90 / 50 | 2.55 | 7.50 |
| 23 Office (Office) 10 | 10 | 90 / 50 | 2.55 | 6.00 |
| 23 Office (Office) 11 | 10 | 90 / 50 | 2.55 | 6.00 |
| 23 Office (Office) 12 | 10 | 90 / 50 | 2.55 | 4.50 |
| 23 Office (Office) 13 | 10 | 90 / 50 | 2.55 | 3.00 |
| 24 Office (Office) 1 | 8 | 90 / 50 | 2.55 | 7.50 |
| 24 Office (Office) 2 | 8 | 90 / 50 | 2.55 | 7.50 |
| 24 Office (Office) 3 | 8 | 90 / 50 | 2.55 | 7.50 |
| 24 Office (Office) 4 | 8 | 90 / 50 | 2.55 | 7.50 |
| MZ Dockmasters Office | 8 | 90 / 50 | 2.55 | 7.50 |
| MZ Managers Offices | 8 | 90 / 50 | 2.55 | 7.50 |

# 8.0 Appendix C Full Results

| Location | Predicted Mean Vote (PMV) Result | | | | | | |
|---|---|---|---|---|---|---|---|
| | <= -0.50 | >-0.50 to <=-0.30 | >-0.30 to <=-0.10 | >-0.10 to <=0.10 | >0.10 to <=0.30 | >0.30 to <=0.50 | > 0.50 |
| **00 Reception Offices** | 0.00 | 0.00 | 5.00 | 5.00 | 1.00 | 0.00 | 0.00 |
| **01 Office (Open) Podium** | 0.00 | 2.00 | 4.00 | 4.00 | 1.00 | 0.00 | 0.00 |
| **02 Office (Open) Podium** | 0.00 | 2.00 | 3.00 | 6.00 | 0.00 | 0.00 | 0.00 |
| **03 Office (Open) Podium** | 0.00 | 2.00 | 3.00 | 5.00 | 1.00 | 0.00 | 0.00 |
| 04 Office (Open) Podium | 0.00 | 3.00 | 2.00 | 5.00 | 1.00 | 0.00 | 0.00 |
| 05 Office (Open) Podium | 0.00 | 2.00 | 2.00 | 6.00 | 1.00 | 0.00 | 0.00 |
| 05 Office Tower (Open) | 0.00 | 4.00 | 6.00 | 1.00 | 0.00 | 0.00 | 0.00 |
| 06 Office (Open) Podium | 0.00 | 2.00 | 2.00 | 6.00 | 1.00 | 0.00 | 0.00 |
| 06 Office Tower (Open) | 0.00 | 8.00 | 3.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 07 Office (Open) Podium | 0.00 | 4.00 | 2.00 | 1.00 | 3.00 | 0.00 | 0.00 |
| 07 Office Tower (Open) | 0.00 | 7.00 | 4.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 08 Office Tower (Open) | 0.00 | 5.00 | 6.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 09 Office Tower (Open) | 0.00 | 5.00 | 3.00 | 2.00 | 1.00 | 0.00 | 0.00 |
| 10 Office Tower (Open) | 0.00 | 5.00 | 2.00 | 3.00 | 1.00 | 0.00 | 0.00 |
| 11 Office Tower (Open) | 0.00 | 5.00 | 2.00 | 3.00 | 1.00 | 0.00 | 0.00 |
| 12 Office Tower (Open) | 0.00 | 5.00 | 2.00 | 3.00 | 1.00 | 0.00 | 0.00 |
| 13 Office Tower (Open) | 0.00 | 5.00 | 2.00 | 3.00 | 1.00 | 0.00 | 0.00 |
| 14 Office Tower (Open) | 0.00 | 5.00 | 2.00 | 3.00 | 1.00 | 0.00 | 0.00 |
| 15 Office Tower (Open) | 0.00 | 5.00 | 2.00 | 3.00 | 1.00 | 0.00 | 0.00 |
| 16 Office Tower (Open) | 0.00 | 5.00 | 2.00 | 3.00 | 1.00 | 0.00 | 0.00 |
| 17 Office Tower (Open) | 0.00 | 5.00 | 2.00 | 3.00 | 1.00 | 0.00 | 0.00 |
| 18 Office Tower (Open) | 0.00 | 5.00 | 2.00 | 3.00 | 1.00 | 0.00 | 0.00 |

| Location | Predicted Mean Vote (PMV) Result | | | | | | |
|---|---|---|---|---|---|---|---|
| | <= -0.50 | >-0.50 to <=-0.30 | >-0.30 to <=-0.10 | >-0.10 to <=0.10 | >0.10 to <=0.30 | >0.30 to <=0.50 | > 0.50 |
| 19 Office Tower (Open) | 0.00 | 5.00 | 2.00 | 3.00 | 1.00 | 0.00 | 0.00 |
| 20 Office Tower (Open) | 0.00 | 5.00 | 2.00 | 3.00 | 1.00 | 0.00 | 0.00 |
| 21 Office Tower (Open) | 0.00 | 5.00 | 2.00 | 3.00 | 1.00 | 0.00 | 0.00 |
| 22 Office Tower (Open) | 0.00 | 5.00 | 2.00 | 3.00 | 1.00 | 0.00 | 0.00 |
| 23 Office (Office) 1 | 0.00 | 4.00 | 5.00 | 1.00 | 1.00 | 0.00 | 0.00 |
| 23 Office (Office) 2 | 0.00 | 4.00 | 2.00 | 0.00 | 4.00 | 0.00 | 0.00 |
| 23 Office (Office) 3 | 0.00 | 4.00 | 4.00 | 1.00 | 2.00 | 0.00 | 0.00 |
| 23 Office (Office) 4 | 0.00 | 6.00 | 5.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 23 Office (Office) 5 | 0.00 | 3.00 | 6.00 | 2.00 | 0.00 | 0.00 | 0.00 |
| 23 Office (Office) 6 | 0.00 | 3.00 | 6.00 | 2.00 | 0.00 | 0.00 | 0.00 |
| 23 Office (Office) 7 | 0.00 | 0.00 | 3.00 | 3.00 | 5.00 | 0.00 | 0.00 |
| 23 Office (Office) 8 | 0.00 | 3.00 | 3.00 | 3.00 | 2.00 | 0.00 | 0.00 |
| 23 Office (Office) 9 | 0.00 | 0.00 | 2.00 | 4.00 | 5.00 | 0.00 | 0.00 |
| 23 Office (Office) 10 | 0.00 | 3.00 | 5.00 | 3.00 | 0.00 | 0.00 | 0.00 |
| 23 Office (Office) 11 | 0.00 | 5.00 | 3.00 | 3.00 | 0.00 | 0.00 | 0.00 |
| 23 Office (Office) 12 | 0.00 | 5.00 | 0.00 | 3.00 | 3.00 | 0.00 | 0.00 |
| 23 Office (Office) 13 | 0.00 | 3.00 | 3.00 | 0.00 | 3.00 | 2.00 | 0.00 |
| 24 Office (Office) 1 | 0.00 | 1.00 | 2.00 | 6.00 | 2.00 | 0.00 | 0.00 |
| 24 Office (Office) 2 | 0.00 | 3.00 | 5.00 | 3.00 | 0.00 | 0.00 | 0.00 |
| 24 Office (Office) 3 | 0.00 | 2.00 | 4.00 | 5.00 | 0.00 | 0.00 | 0.00 |
| 24 Office (Office) 4 | 0.00 | 3.00 | 6.00 | 0.00 | 2.00 | 0.00 | 0.00 |
| MZ Dockmasters Office | 0.00 | 6.00 | 5.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| MZ Managers Offices | 0.00 | 3.00 | 5.00 | 3.00 | 0.00 | 0.00 | 0.00 |

| Location | Percentage People Dissatisfied (PPD) Result | | | | | | |
|---|---|---|---|---|---|---|---|
| | <= -10.00 | >-10.00 to <=-6.00 | >-6.00 to <=-2.00 | >-2.00 to <=2.00 | >2.00 to <=6.00 | >6.00 to <=10.00 | > 10.00 |
| **00 Reception Offices** | 0.00 | 0.00 | 0.00 | 0.00 | 10.00 | 1.00 | 0.00 |
| **01 Office (Open) Podium** | 0.00 | 0.00 | 0.00 | 0.00 | 7.00 | 4.00 | 0.00 |
| **02 Office (Open) Podium** | 0.00 | 0.00 | 0.00 | 0.00 | 8.00 | 3.00 | 0.00 |
| **03 Office (Open) Podium** | 0.00 | 0.00 | 0.00 | 0.00 | 8.00 | 3.00 | 0.00 |
| 04 Office (Open) Podium | 0.00 | 0.00 | 0.00 | 0.00 | 7.00 | 4.00 | 0.00 |
| 05 Office (Open) Podium | 0.00 | 0.00 | 0.00 | 0.00 | 8.00 | 3.00 | 0.00 |
| 05 Office Tower (Open) | 0.00 | 0.00 | 0.00 | 0.00 | 2.00 | 9.00 | 0.00 |
| 06 Office (Open) Podium | 0.00 | 0.00 | 0.00 | 0.00 | 8.00 | 3.00 | 0.00 |
| 06 Office Tower (Open) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 11.00 | 0.00 |
| 07 Office (Open) Podium | 0.00 | 0.00 | 0.00 | 0.00 | 6.00 | 4.00 | 0.00 |
| 07 Office Tower (Open) | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 10.00 | 0.00 |
| 08 Office Tower (Open) | 0.00 | 0.00 | 0.00 | 0.00 | 3.00 | 7.00 | 0.00 |
| 09 Office Tower (Open) | 0.00 | 0.00 | 0.00 | 0.00 | 5.00 | 5.00 | 0.00 |
| 10 Office Tower (Open) | 0.00 | 0.00 | 0.00 | 0.00 | 5.00 | 5.00 | 0.00 |
| 11 Office Tower (Open) | 0.00 | 0.00 | 0.00 | 0.00 | 5.00 | 5.00 | 0.00 |
| 12 Office Tower (Open) | 0.00 | 0.00 | 0.00 | 0.00 | 5.00 | 5.00 | 0.00 |
| 13 Office Tower (Open) | 0.00 | 0.00 | 0.00 | 0.00 | 5.00 | 5.00 | 0.00 |
| 14 Office Tower (Open) | 0.00 | 0.00 | 0.00 | 0.00 | 5.00 | 5.00 | 0.00 |
| 15 Office Tower (Open) | 0.00 | 0.00 | 0.00 | 0.00 | 5.00 | 5.00 | 0.00 |
| 16 Office Tower (Open) | 0.00 | 0.00 | 0.00 | 0.00 | 5.00 | 5.00 | 0.00 |
| 17 Office Tower (Open) | 0.00 | 0.00 | 0.00 | 0.00 | 5.00 | 5.00 | 0.00 |
| 18 Office Tower (Open) | 0.00 | 0.00 | 0.00 | 0.00 | 5.00 | 5.00 | 0.00 |
| 19 Office Tower (Open) | 0.00 | 0.00 | 0.00 | 0.00 | 5.00 | 5.00 | 0.00 |
| 20 Office Tower (Open) | 0.00 | 0.00 | 0.00 | 0.00 | 5.00 | 5.00 | 0.00 |
| 21 Office Tower (Open) | 0.00 | 0.00 | 0.00 | 0.00 | 5.00 | 6.00 | 0.00 |

| Location | Percentage People Dissatisfied (PPD) Result | | | | | | |
|---|---|---|---|---|---|---|---|
| | <= -10.00 | >-10.00 to <=-6.00 | >-6.00 to <=-2.00 | >-2.00 to <=2.00 | >2.00 to <=6.00 | >6.00 to <=10.00 | > 10.00 |
| 22 Office Tower (Open) | 0.00 | 0.00 | 0.00 | 0.00 | 5.00 | 6.00 | 0.00 |
| 23 Office (Office) 1 | 0.00 | 0.00 | 0.00 | 0.00 | 4.00 | 7.00 | 0.00 |
| 23 Office (Office) 2 | 0.00 | 0.00 | 0.00 | 0.00 | 4.00 | 6.00 | 0.00 |
| 23 Office (Office) 3 | 0.00 | 0.00 | 0.00 | 0.00 | 4.00 | 7.00 | 0.00 |
| 23 Office (Office) 4 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 11.00 | 0.00 |
| 23 Office (Office) 5 | 0.00 | 0.00 | 0.00 | 0.00 | 5.00 | 6.00 | 0.00 |
| 23 Office (Office) 6 | 0.00 | 0.00 | 0.00 | 0.00 | 5.00 | 6.00 | 0.00 |
| 23 Office (Office) 7 | 0.00 | 0.00 | 0.00 | 0.00 | 7.00 | 4.00 | 0.00 |
| 23 Office (Office) 8 | 0.00 | 0.00 | 0.00 | 0.00 | 8.00 | 3.00 | 0.00 |
| 23 Office (Office) 9 | 0.00 | 0.00 | 0.00 | 0.00 | 9.00 | 2.00 | 0.00 |
| 23 Office (Office) 10 | 0.00 | 0.00 | 0.00 | 0.00 | 6.00 | 5.00 | 0.00 |
| 23 Office (Office) 11 | 0.00 | 0.00 | 0.00 | 0.00 | 5.00 | 5.00 | 0.00 |
| 23 Office (Office) 12 | 0.00 | 0.00 | 0.00 | 0.00 | 4.00 | 6.00 | 0.00 |
| 23 Office (Office) 13 | 0.00 | 0.00 | 0.00 | 0.00 | 3.00 | 8.00 | 0.00 |
| 24 Office (Office) 1 | 0.00 | 0.00 | 0.00 | 0.00 | 9.00 | 2.00 | 0.00 |
| 24 Office (Office) 2 | 0.00 | 0.00 | 0.00 | 0.00 | 6.00 | 5.00 | 0.00 |
| 24 Office (Office) 3 | 0.00 | 0.00 | 0.00 | 0.00 | 7.00 | 4.00 | 0.00 |
| 24 Office (Office) 4 | 0.00 | 0.00 | 0.00 | 0.00 | 4.00 | 7.00 | 0.00 |
| MZ Dockmasters Office | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 11.00 | 0.00 |
| MZ Managers Offices | 0.00 | 0.00 | 0.00 | 0.00 | 6.00 | 5.00 | 0.00 |

# 12.0 Appendix 4: Whole Life Carbon Analysis

# CIS Tower, Manchester

## Stage 2 Whole Life-Cycle Carbon Assessment

Miller Street, Manchester M60 0GB

Devonshire (CIS Tower) Ltd



| | |
|---|---|
| Client | Devonshire (CIS Tower) Ltd |
| Revision | Issue 2.3 |
| Date of issue | 28th April 2025 |
| Produced by | Natasha Sidhu |
| Checked and authorised by | Mat Lown |



**Figure 1:** Identification photograph – Manchester

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| 5.0 | Carbon Reduction Opportunities | 17 |
| 6.0 | Conclusion | 19 |

# 1.0 Executive summary

## 1.1 General

Devonshire (CIS Tower) Ltd, hereinafter referred to as “Devonshire Ltd, has commissioned Tuffin Ferraby Taylor (TFT) Ltd., hereinafter referred to as “TFT” to undertake a Whole Life-Cycle Carbon Assessment (WLCA) for the redevelopment of CIS Tower. The proposal seeks to maintain the heritage of the building. It retains the entrance hall extension and three storey podium, as well as integrating a level 24-25 restaurant and bar.

This assessment is undertaken at RIBA Stage 2 and provides an indication of the WLC emissions of the development and potential measures that could reduce them further. The following results summarise the WLC emissions for the design stage. The results are assuming a decarbonised scenario and include a top up factor based on the RICS guidance. As seen below, the upfront embodied carbon emissions (A1-A5, excluding sequestration) are equal to 530 $kgCO_2e/m^2$ (GIA). This falls below the UKNZBCS 2026 target of 575 $kgCO_2e/m^2$ for office retrofit. The life cycle embodied carbon emissions (A-C excluding B6-B7 operational carbon and including sequestration) are equal to 1000 $kgCO_2e/m^2$ (GIA).

**Table 1:** CIS Tower Carbon Emissions Summary (60 Year Reference Study Period)

| | Upfront Carbon (A1-A5) (excluding Sequestration) | Life Cycle Embodied Carbon (A-C excluding B6-B7, including Sequestration) | Operational Energy and Water Use (B6-B7) | B-C embodied carbon emissions (excluding B6-B7 and sequestration) | Whole Life Carbon (A-C including B6-B7) |
|---|---|---|---|---|---|
| **Proposed Scheme ($kgCO_2e/m^2$)** | 530 | 1,000 | 260 | 510 | 1,300 |
| **UKNZCBS 2025 Retrofit Target ($kgCO_2e/m^2$)** | 600 | - | - | - | - |
| **UKNZCBS 2026 Retrofit Target ($kgCO_2e/m^2$)** | 575 | - | - | - | - |

## 1.2 Carbon Reduction Opportunities

Section 5 of this report summarises the embodied carbon reduction opportunities for further investigation. In the technical design stage, the selection of MEP components should consider durability, cost and a carbon perspective.

The scheme would also benefit from purchasing products as a service. This would encourage the reuse of existing components and reduce the B1-B5 emissions. Where possible materials should be sourced locally, to reduce transport emissions.

# 2.0 Introduction

## 2.1 Background

Devonshire (CIS Tower) Ltd, hereinafter referred to as “Devonshire Ltd”, have commissioned Tuffin Ferraby Taylor (TFT) Ltd., hereinafter referred to as “TFT” to undertake a Whole Life-Cycle Carbon Assessment (WLCA) of CIS Tower.

Prior to the commencement of the works, Devonshire Ltd wanted to understand the embodied and whole life carbon performance of the proposed design and reduce the embodied carbon impact. To address this, a WLC assessment is being undertaken by TFT. It should also be noted that an investigation into different façade options took place which was key to understanding the embodied carbon implications of the different design iterations. Full details can be found in the façade matrix. As part of the study the scheme targeted 70% recycled content in the aluminium used for the curtain walling. This report summarises the findings of the WLC assessment for RIBA Stage 2.

A Life Cycle Assessment (LCA), which is the method for analysing Whole Life Cycle impacts, can report several environmental indicators including but not limited to:

- Global Warming Potential (GWP)
- Acidification Potential (AP)
- Eutrophication Potential (EP)
- Ozone Depletion Potential (ODP)
- Life Cycle Costs (LCC)

For the purposes of establishing a whole life carbon baseline and for aligning against carbon intensity benchmarks, this report focuses on the GWP environmental indicator.

The report is for the benefit of the client only; Tuffin Ferraby Taylor (TFT) Ltd cannot accept any liability to any third party for the whole or any part of its contents. Our appointment specifically excludes the provisions set out in the contracts (Rights of Third Parties) Act 1999.

TFT is a trading name of Tuffin Ferraby Taylor (TFT) Ltd, a limited company registered in England and Wales. Registration number: 14869285. Registered office: 18 Holborn, London EC1N 2LE.

## 2.2 Proposed development

The proposal is for the redevelopment of CIS Tower; the existing and proposed views from Dantzic Street can be seen below.




**Figure 2:** Existing Site



**Figure 3:** Proposed Scheme

## 2.3 Scope of the assessment

TFT has undertaken a WLC assessment to determine the impacts of construction materials across the whole lifecycle of the proposed development. The assessment was commissioned based on the embodied carbon specifications and the specifications for the building fabric (façade option 11), MEP and renewable systems. Costs and paybacks are excluded from the scope of this work.

## 2.4 Embodied carbon targets

There is currently limited information available in relation to the WLC benchmarks, particularly for office buildings. It should be noted that Royal Institute of British Architects (RIBA) are based on whole life cycle stages A-C (excluding operational carbon) whilst LETI and UKNZCBS benchmarks include cradle to practical completion stages A1-A5. The benchmarks are summarised below. The figures in the below table include the timber sequestration unless else specified.

**Table 2:** Comparison of industry benchmarks for embodied carbon over time

| Embodied carbon benchmarks ($kgCO_2e/m^2$) | | | | |
|---|---|---|---|---|
| | **"Business as usual"** | **2020 Target** | **2025 Target** | **2030 Target** |
| **UKNZCBS Upfront Embodied Carbon Target Alignment – Offices Retrofit [5] (A1-A5)** | - | - | 600 | 450 |
| **RIBA 2030 Climate Challenge[1] – Offices** | 1,400 | - | <970 | <750 |
| **LETI Upfront Embodied Carbon Primer – Office best practice targets[2] (A1-A5)** | 1,000 (excl. seq.) | <500 | - | <250 |
| **LETI Upfront Embodied Carbon Target Alignment – Office[3] (A1-A5)** | - | <600 | - | <350 |
| **LETI Life Cycle Embodied Carbon Target Alignment – Office[3]** | - | <970 | - | <530 |

[1] https://www.architecture.com/-/media/files/Climate-action/RIBA-2030-Climate-Challenge.pdf
[2] https://www.leti.uk/_files/ugd/252d09_8ceffcbcafdb43cf8a19ab9af5073b92.pdf
[3] https://www.leti.uk/_files/ugd/252d09_25fc266f7fe44a24b55cce95a92a3878.pdf
[4] https://www.london.gov.uk/sites/default/files/lpg_-_wlca_guidance.pdf
[5] https://www.nzcbuildings.co.uk/_files/ugd/6ea7ba_55a9d021ca274eda8fbf7b07c70e70cb.pdf

# 3.0 Methodology

## 3.1 Life Cycle Assessment

Whole Life Carbon is the measure of the total carbon emissions of a building over its entire life cycle, as defined by EN 15978, from the material product stage (A1-A3), associated transportation (A4) and construction impacts (A5), through building operation (B1-B7), and end of life (C1-C4). Whole life carbon is generally split into embodied and operational carbon. Below are details of the different reporting mechanisms aligned with EN 15978 to monitor embodied carbon emissions through a building's lifecycle.

| Whole Life Carbon Assessment Information | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Project life cycle information | | | | | | | | | | | | | | | | Supplementary info. beyond the project life cycle |
| [A1-A3] | | | [A4-A5] | | [B1-B7] | | | | | | | [C1-C4] | | | | [D] |
| Product stage | | | Construction process stage | | Use stage Embodied | | | | | Use stage Operational | | End of life stage | | | | Benefits and loads beyond the system boundary |
| A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
| Raw material extraction & supply | Transport to manufacturing plant | Manufacturing & fabrication | Transport to project site | Construction & installation process | Use | Maintenance | Repair | Replacement | Refurbishment | Operational energy use | Operational water use | Deconstruction / Demolition | Transport to disposal facility | Waste processing for reuse, recovery or recycling | Disposal | Reuse, Recovery, Recycling potential |
| cradle to gate | | | | | | | | | | | | | | | | |
| cradle to practical completion (handover) / *Upfront Carbon* | | | | | | | | | | | | | | | | |
| cradle to grave / *lifecycle embodied carbon* | | | | | | | | | | | | | | | | |
| cradle to grave including benefits and loads beyond the system boundary | | | | | | | | | | | | | | | | |

**Figure 4:** EN15978 Life Cycle Assessment typical system boundaries – Source: RICS[1]

[1] RICS. Whole life carbon assessment for the built environment (September 2023)

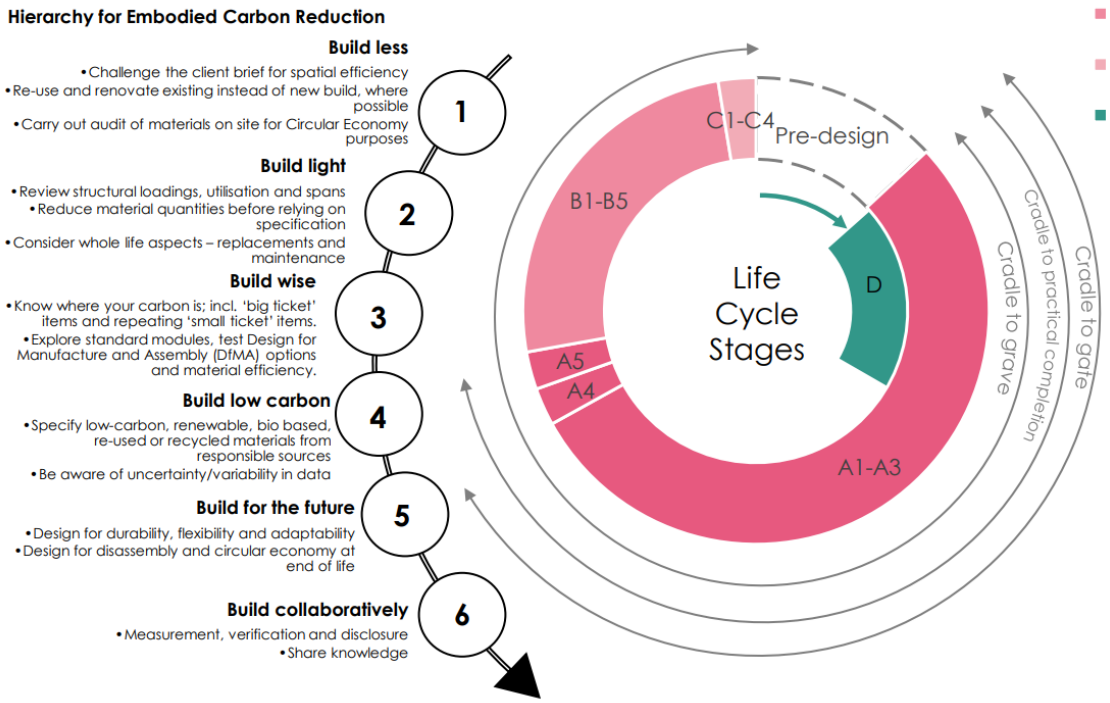



**Figure 5:** LETI Hierarchy for Embodied Carbon Reduction, according to BS EN 15978:2011

## 3.2 Scope of Assessment

A whole life carbon assessment should consider all building components and works relating to the project, including any external works within the site boundary. The professional statement on undertaking Whole Life Carbon assessments (September 2023) defines the building elements which must be included in a complete whole life carbon assessment. Table 3 outlines the building parts, based on the ICMS 3 breakdown, that should be covered in the whole life assessment, as applicable to each project.

**Table 3:** Building element groups (based on the BCIS breakdown)

| | Building part/ Element group |
|---|---|
| 01 | Demolition |
| 02 | Substructure |
| 03 | Structure |
| 04 | Non- structural works |
| 05 | Services and equipment |
| 06 | Surface and underground drainage |
| 07 | External and ancillary works |
| 08 | Preliminaries/ constructors' site overheads/ temporary works |
| 12 | Production and loose furniture, fittings and equipment |

## 3.3 Proprietary Software

The tool TFT used to undertake the LCA is One Click LCA which has an extensive material database (circa 10,000) allowing for a more reflective carbon model to be produced, in reference to the design specifications. In comparison the BRE's IMPACT dataset currently only contains approximately circa 350 products as well as being limited to UK-specific datasets, compared to the OneClick which has material information across continents (predominantly Europe, North America, Australia and Asia).

One Click LCA is an online Building Life-Cycle Assessment software. It is an industry-leading platform that is used by many construction industry firms.

One Click LCA is compliant with BREEAM UK NC 2018 and can achieve up to 10 Mat 01 credits; it has the highest rated LCA software for BREEAM, with a verified maximal Mat 01 score of 100% for BREEAM UK RFO 2014. The tool is also third-party verified for EN 15978, ISO 21931-1, ISO 21929-1 and for input data for ISO 14040/44 and EN 15804 standards.

## 3.4 Approach

A cradle-to-grave system boundary LCA was undertaken using One Click, which included the following modules:

- A1-A5 (Cradle to practical completion)
- B1-B5 (In Use)
- B6 & B7 (Operational carbon from energy and water use)
- C1-C4 (End of Life)

The approach presents the whole life embodied carbon performance of materials and operations and aligns with the Royal Institution of Chartered Surveyors (RICS) methodology in accordance with the professional standard on undertaking Whole Life Carbon assessments (September 2023). Table 1 confirms the approach to the WLC for the asset.

**Table 4:** WLC modelling parameters.

| **Study Period** |
|---|
| The assessment design life assumes 60 years in accordance with RICS methodology. |
| **Material Service Life** |
| Unless confirmed via the project team, component lifespans follow the expected lifespans presented in Table 9 of the RICS professional statement on undertaking whole life carbon assessments. Where the component type is not presented in Table 9 of the RICS guidance, the default OneClickLCA value has been used, which aligns with the RICS methodology. |
| **Functional Unit** |
| To allow comparisons to be made with benchmarks and policy targets, the functional unit for WLC is shown in $kgCO_2e/m^2$ for gross internal floor area (GIA). The GIA for the project (51,375 $m^2$) and has been extracted from the accommodation schedule cost plan provided by Simpson Haugh on the 17th of January 2025. This excludes the leisure function and retail areas. An accompanying WLC report for the leisure, function and retail areas will follow once details of the fit out are provided. |
| **System Boundary** |
| The WLC assessment for the whole building includes embodied carbon cradle to grave (modules A1-A5, B1-B5 and C1-C4) and operational emissions (modules B6 and B7) reported separately. |

| Materials Inputs |
| --- |
| The Revit models provided by the design team on the 28th October 2024 have been used as the basis for the assessment. This has also been supplemented by the cost plan received from Gardiner & Theobald LLP 6th of March 2025.<br><br>Email clarifications on specifications and quantities from the Design Team including Architect (Simpson Haugh), Structural Engineer (Curtins) and Services Engineer (CWC) for information on specified materials, products, and quantities. |
| **Operational Energy Consumption** |
| The expected annual energy consumption was provided by the Services Engineer, CWC. |
| **Operational Water Consumption** |
| TFT has estimated the water consumption data based on guidance on occupant density per floor area for the building type provided by BRE and standard water consumption per occupant provided by BSRIA. The predicted operational water consumption is 40,832.55$m^3$ assuming 2,846 occupants and that one occupant will use 45 l/d of water. |
| **Material Wastage Rates** |
| Waste factors for the materials have been taken from the default values provided within the OneClickLCA software. The wastage for prefabricated elements, such us the composite metal panels and the build-up roofs, has been assumed equal to zero. |
| **Transportation to Site (Module A4)** |
| In line with Table 17 of the RICS professional statement on whole life carbon assessment, the default transport scenarios have been used in the calculation of the module A4 transportation emissions. Where the component type is not presented in Table 7 of the RICS guidance, the default OneClickLCA value has been used, which aligns with the RICS methodology. |
| **Maintenance and Repair (Modules B2 & B3)** |
| The repair and maintenance emissions have been estimated using a default scenario from the OneClick LCA database. |
| **Material Replacement (Module B4)** |
| Maintenance and servicing arrangements are not fully developed for the project; however, an allowance has been made for material and product replacement. These allowances are based on the default figures produced by the One Click LCA software. |
| **Material End of Life Scenarios** |
| Recycling content and recycle rates at end of life of the materials are as per RICS methodology default recommendations. For the materials where information was not available, the default values within the software tool have been used. |
| **Construction Site Scenarios** |
| Average UK site impacts per $m^2$ of total project value have been used, based on data entry points in the One Click LCA software. The scenario includes associated fuel, electricity, waste generation and transportation impacts whilst on site. |

## 3.5 Methodology

The Revit models provided were analysed and the information from these models was inputted into the OneClickLCA model. This was supplemented by the cost plan received from Gardiner and Theobald. Additionally, email clarifications from the Design Team were used to ensure that the modelled elements accurately represent what has been specified.

In accordance with the RICS methodology on whole life carbon assessments, a sufficient number of elements from the design information provided were modelled so that a minimum of 95 % of the cost allocated to each building element category defined in 0-8 of Table 3 are accounted for in the assessment. Items excluded from the model, each account for less than 1 % of the total category cost.

As this assessment has been completed in the early design phase all figures are reported to two significant figures as per the RICS methodology. A 15% contingency factor has been applied with a top up factor (7%) to account for the carbon data uncertainty factor.

Following the above, the remainder of the information such as energy consumption, water consumption and refrigerant details were included in the model using the methodology and sources defined in Table 1. This was then identified as the baseline model for the project. The model was analyzed, and carbon reduction opportunities identified.

## 3.6 Limitations of Study

In cases where exact product matches are not provided by the database, the following steps, recommended by OneClickLCA have been followed to ensure the most representative EPD for the specified product is used in the model:

- Option 1: Exact materials (search for the exact product from the manufacturer you are planning to choose).
- Option 2: Closest matches (if you cannot find the product from your manufacturer, try to search for other manufacturers typically used in your country).
- Option 3: Use generic data (if you cannot find a suitable product choose a generic one with similar qualities).

Furthermore, there are some items that do not exist in OneClick LCA's EPD library, or items for which provisional allowances have been attributed to the cost plan, but specifications have currently not been finalised. These items have been omitted from the scope of this assessment. In line with RICS guidance, it has been ensured that items excluded each account for less than 1 % of the total building element category cost.

The WLC assessment is an ongoing and iterative process that is refined and enhanced as project information becomes available through the design process. The data input into the WLC model will be added to, reviewed, and refined throughout the design process as designs become formalised and more specific materials/ systems/ component information becomes available.

# 4.0 Results

## 4.1 WLC Results

The following results summarise the WLC emissions for the proposed development. The whole life carbon assessment encompasses the full scope in line with the RICS professional statement and utilises the OneClick material component database. For the embodied carbon, the upfront carbon emissions (A1-A5, excluding sequestration) are equal to 27,000 $tCO_2e$ or 530 $kgCO_2e/m^2$ (GIA). The life cycle embodied carbon emissions (A-C excluding B6-B7 operational carbon and including sequestration) are equal to 54,000 $tCO_2e$ or 1000 $kgCO_2e/m^2$ (GIA).

**Table 5:** CIS Tower Carbon Emissions Summary (60 Year Reference Study Period)

| | $tCO_2e$ | $kgCO_2e/m^2$ |
|---|---|---|
| **Upfront Carbon (A1-A5) (excluding Sequestration)** | 27,000 | 530 |
| **Life Cycle Embodied Carbon (A-C excluding B6-B7, including Sequestration)** | 54,000 | 1,000 |
| **Operational Energy and Water Use (B6-B7)** | 13,000 | 260 |
| **B-C embodied carbon emissions (excluding B6-B7 and sequestration)** | 26,000 | 510 |
| **Whole Life Carbon (A-C including B6-B7)** | 67,000 | 1,300 |

Figure 6 highlights the proportion of carbon emissions attributed to each life cycle stage. It includes emissions associated with the product stage (A1-A3), construction process stage (A4-A5), use stage (B1-B7) and end of life (C1-C4). The figure shows that the greatest contribution to the scheme's WLC emissions are the emissions associated with product stage (A1-A3) (39.77 %). Emissions attributed to the use stage (B1-B5) (35.49%) are the second largest contributor, followed by the regulated operational energy (B6a), which accounts for 21.57% of total WLC emissions.

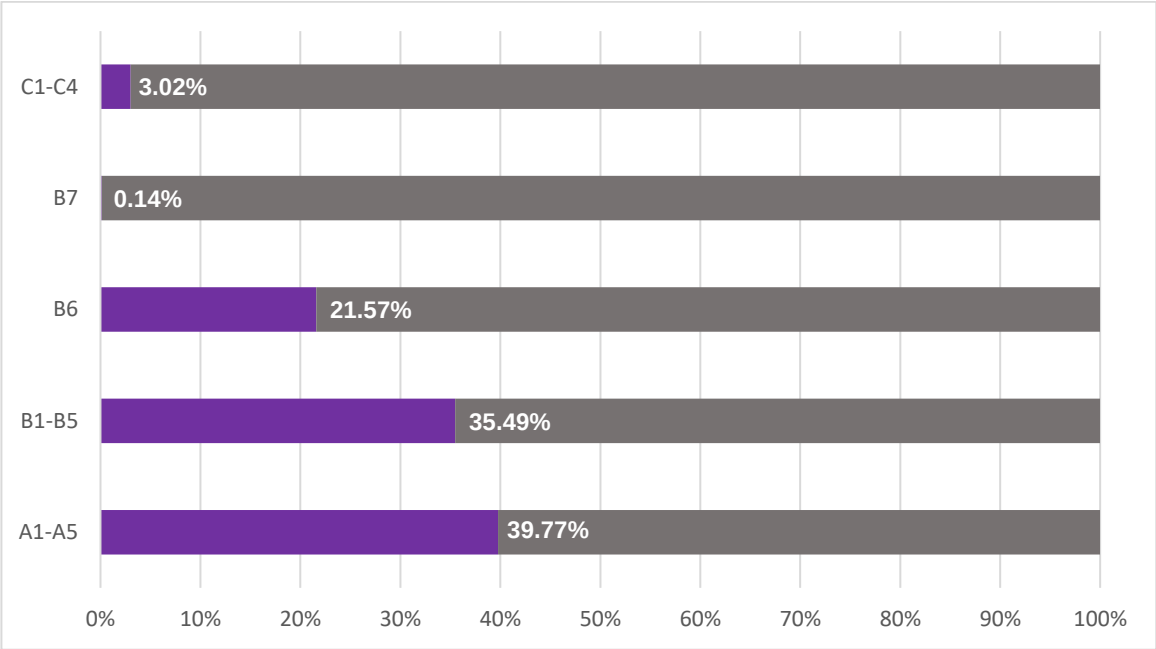



**Figure 6:** Breakdown of total carbon emissions by lifecycle stage

## 4.2 Embodied Carbon Emissions Breakdown (A1-A3)

Figure 7 shows the breakdown of the total carbon emissions by classification. It shows that the main sources of carbon emissions are from the curtain walling (41%), cables (14%) and HVAC (13%).

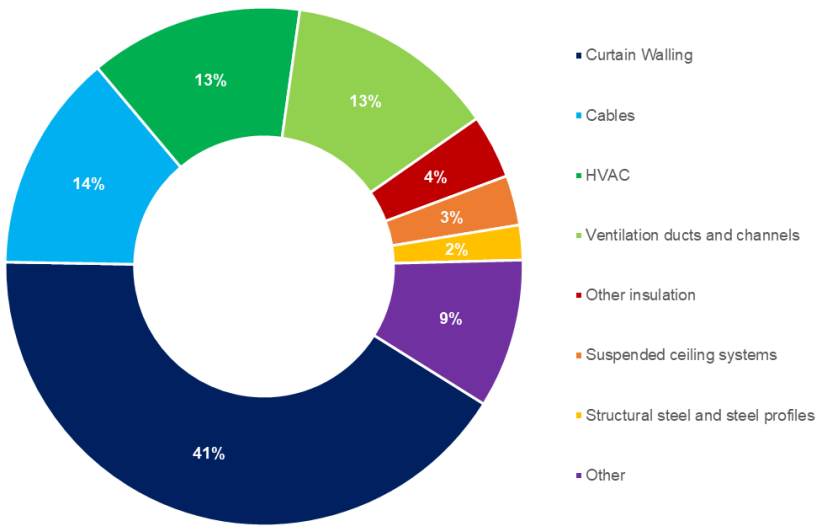



**Figure 7:** Embodied carbon breakdown of total emissions by resource type

## 4.3 Embodied Carbon Performance

The embodied carbon emissions have been extracted from the baseline model and reported in Tables 6 to 8 below against relevant industry and GLA benchmarks. The following guidance has been consulted in order to determine relevant industry benchmarks for the project:

- UKNZCBS Pilot Version (September 2024)
- London Energy Transformation Initiative (LETI) – Embodied Carbon Primer (2020)
- London Energy Transformation Initiative (LETI) – Embodied Carbon Target Alignment (2020)
- Royal Institute of British Architects (RIBA) – 2030 Climate Challenge (2021)

Shown in Table 6 below, the total upfront embodied carbon emissions from cradle to practical completion (modules A1-A5, excluding sequestration), based on the information provided at the design stage, are 27,000 $tCO_2e$, equal to 530 $kgCO_2e/m2$ (GIA). The proposal is significantly below the UKNZCBS 2025 target (<600 $kgCO_2e/m^2$).

**Table 6:** Building performance against upfront embodied carbon A1-A5 (excluding sequestration) benchmarks

| Upfront Embodied Carbon A1-A5 (excluding sequestration) ($kgCO_2e/m^2$) | | |
|---|---|---|
| | **Benchmark** | **CIS Tower** |
| **LETI Upfront Embodied Carbon Primer – "Business as usual"** | < 1,000 | 530 |
| **UKNZCBS 2025 Target for office retrofit** | <600 | |
| **UKNZCBS 2026 Target for office retrofit** | <575 | |
| **LETI Upfront Embodied Carbon Target Alignment – Office 2030 target** | < 350 | |
| **LETI Upfront Embodied Carbon Primer – Office best practice 2030 target** | < 250 | |

Shown in Table 7 below, the life cycle embodied carbon emissions (A-C modules, excluding modules B6 & B7 and including sequestration), based on the information provided at the design stage, are 54,000 $tCO_2e$, equal to 1000 $kgCO_2e/m^2$ (GIA). The building meets RIBA's 2030 Climate Challenge business as usual target (<1,400 $kgCO_2e/m^2$) for non-domestic (new build offices).

**Table 7:** Building performance against life cycle embodied carbon (A-C, excluding B6 & B7, including sequestration) benchmarks

| Life Cycle Embodied Carbon (A-C, excluding B6 & B7, including sequestration) ($kgCO_2e/m^2$) | | |
|---|---|---|
| | **Benchmark** | **CIS Tower** |
| **RIBA 2030 Climate Challenge target metric non-domestic (new build offices) – "Business as usual"** | < 1,400 | 1000 |

# 5.0 Carbon Reduction Opportunities

As stated, the majority of the existing structure is retained. A pre-demolition audit is to be carried out and the findings of which will inform potential areas for reuse. The key works taking place are:

- New podium extension
- Façade replacement
- Inclusion of new MEP systems

A material breakdown highlighting elements with the highest associated carbon impact from within the baseline model has been identified. The top 10 material contributors of upfront embodied carbon (modules A1-A3) are presented in Table 8.

**Table 8:** Most contributing materials to product stage (A1-A3) embodied carbon emissions

| Building component | Contribution (%) of cradle to gate (A1-A3) | Cradle to gate (A1-A3) impacts ($tCO_2e$) |
|---|---|---|
| Curtain walling | 40% | 7300 |
| Steel ducting | 13% | 2300 |
| Low voltage cabling | 9% | 1600 |
| Heating system | 7% | 1300 |
| Pipework | 6% | 1000 |
| Medium voltage cabling | 5% | 820 |
| Insulation for MEP installations | 4% | 670 |
| Ceiling finish | 3% | 570 |
| Steel sections | 1% | 250 |
| Flooring finish | 1% | 220 |

As identified from the above table of significant contributors, the greatest potential to make meaningful reductions in the building's carbon emissions lies with the curtain walling and MEP systems. The scheme already benefits from aluminium with 70% recycled content within the curtain walling so there lies little scope for improvement. The model used OneClick generic profiles for the MEP systems. In the technical design stage, when MEP data is more readily available steps should be taken to ensure that the best materials are chosen in terms of durability, cost and a carbon perspective.

Materials should also be sourced locally, if possible, to reduce transport emissions. To further reduce B1-B5 emissions the scheme would benefit from purchasing products as a service. This would encourage the reuse of existing components. Further information can be found in the circular economy statement.

# 6.0 Conclusion

TFT undertook a Whole Life-Cycle Carbon Assessment (WLCA) of CIS Tower to understand the embodied and whole life carbon performance of the proposed design and to suggest improvements for the reduction of the embodied carbon impact.

The total upfront embodied carbon emissions (modules A1-A5, excluding sequestration) are 27,000 $tCO_2e$, equal to 530 $kgCO_2e/m2$ (GIA). The building meets the UKNZCBS 2026 target for office retrofits (<575 $kgCO_2e/m^2$).

The life cycle embodied carbon emissions (A-C modules, excluding modules B6 & B7 and including sequestration), based on the information provided at the design stage, are 54,000 $tCO_2e$, equal to 1,000 $kgCO_2e/m^2$ (GIA). The building meets RIBA's 2030 Climate Challenge "Business as usual" target (<1,400 $kgCO_2e/m^2$) for non-domestic (new build offices).

## 6.1 Recommendations

Section 5 of this report summarizes the embodied carbon reduction opportunities for further investigation. In the technical design the selection of MEP components is a key consideration in terms of durability, cost and a carbon perspective.

Where possible materials should be sourced locally, if possible, to reduce transport emissions. The scheme would also benefit from purchasing products as a service. This would further encourage the reuse of existing components and reduce the B1-B5 emissions.

## 6.2 Limitations of this study

The study was completed using the best information available at the time of analysis. However, there were limitations with the scope of the data sources available. Please refer to Section 3.6 for further details.

# Core services

Development
Built Assets
Sustainability

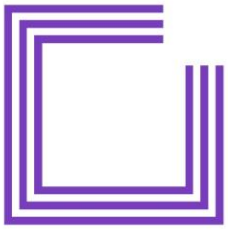
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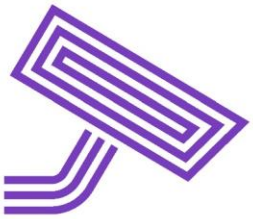
Technical Due Diligence



Project Management



Dilapidations



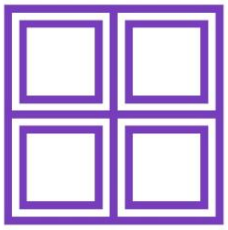
Project Monitoring



Cost Consultancy



M&E Consultancy



Rights of Light



Lender Monitoring



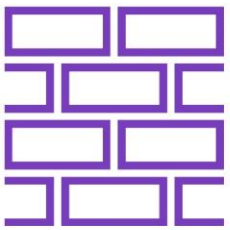
CDM Consultancy



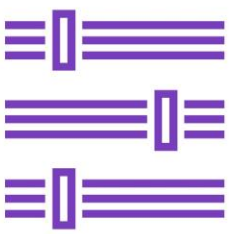
Geomatics



Life Cycle Assessments



Party Walls



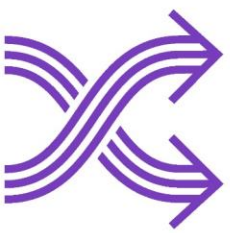
Performance Optimisation



Asset Certification



Wellbeing



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