

117-119 Portland Street Manchester

M&E Services and Extraction Statement

Version: 01

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Introduction

This report has been produced by Kaizen-CE to provide an overview of initial HVAC Strategy to enable early engagement with the MCC.

The project aims to sympathetically refurbish the listed building with minimal heritage implications whilst aiming to improve amenity and operational carbon efficiency and thermal comfort.

Our early due diligence has been focused on Bruntwood NZC intentions and building load calculations to determine small power and HVAC strategy.

including:

- Heating/cooling strategy
- Power requirements and the need for a power/capacity upgrade
- Ventilation strategy

A thermal model of the building has been constructed using IES *Virtual Environment* software.

Building fabric performance has been taken from the base-build specification and the internal arrangement reflecting the proposed fitout. Mechanical services provision and performance is speculated from the Cat. A installation and room type.

Dynamic simulation has been undertaken using Apache software module against Test Reference Year (TRY) weather data for the region. Results show the predicted energy demand, consumption and associated CO₂ emissions on an hour-by-hour basis, please refer to the Energy Statement for further information.

Results have been used to help define the most balanced approach to reducing the carbon intensity of the building. It must be noted that although dynamic modelling intends to provide a reliable estimate of energy use, it relies upon many variables subject to change.

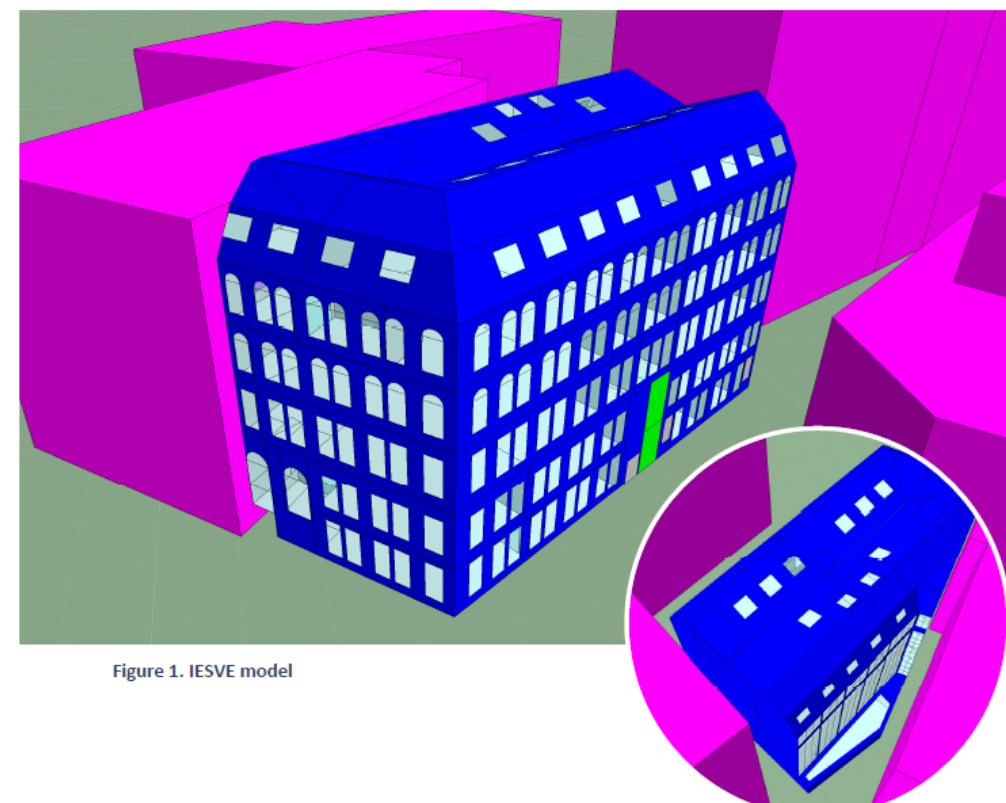


Figure 1. IESVE model

Operational Net Zero Carbon

The scope and definition of ONZC (Operational Net Zero Carbon) is taken from guidance published by the UK Green Building Council.

Net Zero Carbon – Operational Energy

“When the amount of carbon emissions associated with the building’s operational energy on an annual basis is zero or negative. A net zero carbon building is highly energy efficient and powered from on-site and/or off-site renewable energy sources, with any remaining carbon balance offset.”

There are three key steps to achieving ONZC:

1. Reduce Operational Energy Use

Priority should be given to energy demand, commonly referred to as the ‘Lean’ stage of the established energy hierarchy.

2. Increase Renewable Energy Supply

Maximise on-site renewable energy generation. Any off-site renewable energy supplies should demonstrate additionality.

3. Offset any Remaining Carbon

Offset any residual carbon via a recognised framework.

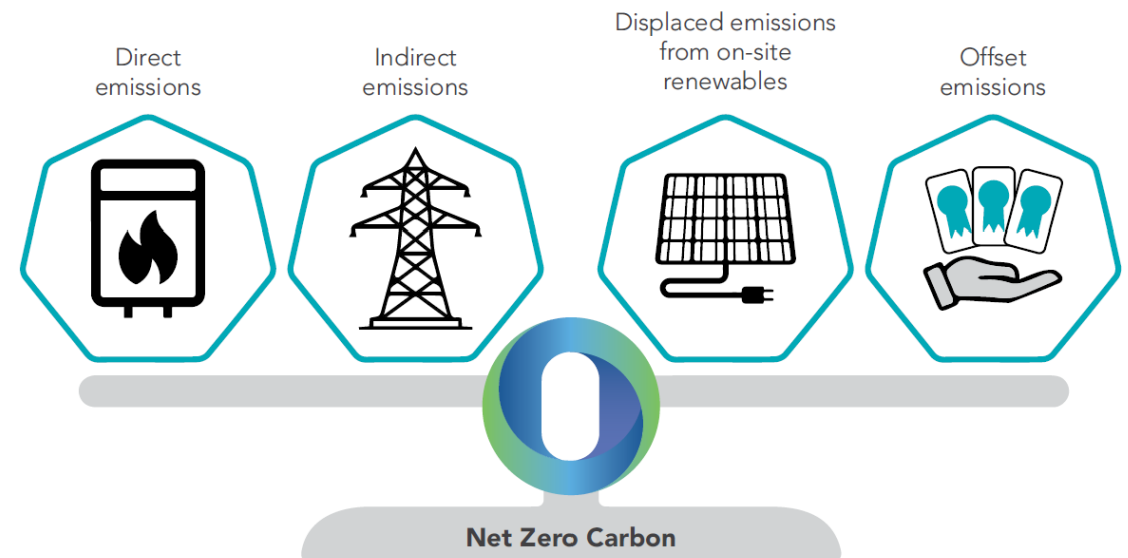


Figure 2. UKGBC definition

This assessment considers Scope 1 and 2 emissions only. Full understanding of Scope 3 emissions is still emerging within the industry, though is expected to be largely addressed via a company’s ESG policy etc.

Scope 1. CO₂ emissions occurring directly from a company’s activities, e.g. burning natural-gas for heat generation.

Scope 2. CO₂ emissions occurring indirectly from a company’s activities, e.g. from the generation of electricity consumed by building equipment.

Scope 3. All other CO₂ emissions that occur as a result of a company’s activities but which it has no direct control over, e.g. employee transportation, leased assets etc.

Energy consumption, energy generation and all associated CO₂ emissions should be recorded and published annually with any residual offset. The UKGBC have published a reporting template which can be used to record and declare Net Zero status.

Thermal Envelope

Envelope performance is taken from the building specification including proposed additional improvement measures.

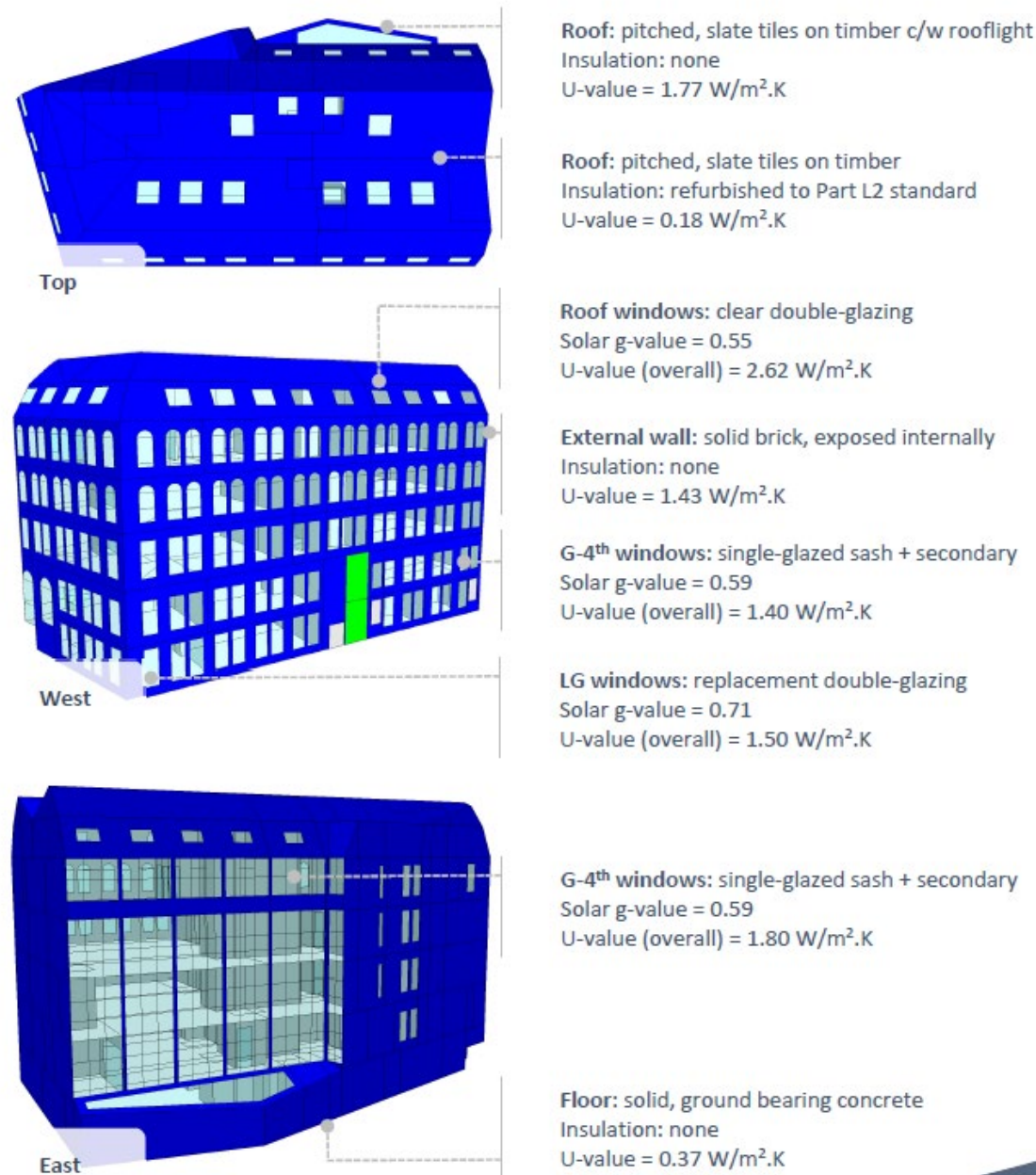


Figure 2. Thermal envelope performance

Design Conditions

Internal conditions are speculated from CIBSE guidance.

Winter external: -3.9°C (db)
 Summer external: 28.8°C /18.9°C (db/wb)
 Terrain type: City
 Wind exposure: Normal
 Heating control temperature: Dry resultant
 Cooling control temperature: Dry bulb

Area	Setpoint (°C) Heat / Cool	Infiltration (ach ⁻¹)	Ventilation*	Internal Gain**		
				Occ.	Lighting (W/m ²)	Misc. (W/m ²)
Open workspace	21 / 23	0.65-1.00	MV omitted	8m ² /p	10	20
Small meeting	21 / 23	0.65-1.00	MV omitted	2p	10	20
Medium meeting	21 / 23	0.65-1.00	MV omitted	3p	10	20
Large meeting	21 / 23	0.65-1.00	MV omitted	4p	10	20
Breakout	21 / 23	0.65-1.00	MV omitted	8m ² /p	10	20
Gym	21 / 18	1.00	MV omitted	8m ² /p	10	20
Circulation	18 / -	0.00-1.50	-	-	10	-
Store	18 / -	0.65	MV omitted	-	10	-
Plant	5 / -	0.65	-	-	10	-
Kitchen	21 / 23	0.65	MV omitted	8m ² /p	10	20
WC	21 / -	0.65	-	-	10	-
Changing	23 / -	0.65	1/3 of 5ach ⁻¹	-	10	-

Table 1. Internal design conditions

* Except for the changing area, mechanical ventilation is omitted from the model on the premise that it will be offset by heat recovery and internal gains or accounted separately.

** Internal heat gain is excluded from heat loss calculation.

Model Revisions

Geometry

Amendments:

- (1) Geometry re-constructed from the architectural drawings provided, surrounding building geometry retained.
- (2) Deep rooms sub-divided to form separate 6m perimeter and internal zones.

Fabric

Amendments:

- (1) Ground floor U-value calculated from anticipated construction and dimensions.
- (2) Roof U-value improved to account for insulation as identified during surveys.
- (3) Window U-values improved to account for the provision of secondary glazing (G-4th) and replacement units (LG).
- (4) New fire stair block insulated to current Part L standards.
- (5) Revised U-values for new and refurbished building elements are increased by a nominal 20% to account for an element of thermal bridging.
- (6) General background infiltration rate of 0.650ach⁻¹ applied from CIBSE guidance. Omitted from internal, 'land-locked' zones, increased to 1.00ach⁻¹ in perimeter naturally ventilated areas and 1.50ach⁻¹ within the entrance reception.

External Conditions

Amendments: None

Internal Conditions

Amendments:

- (1) Auxiliary ventilation included to LG changing areas to represent fresh air provision.
- (2) Internal occupancy based upon 8m²/person.

Internal Loads/Gains

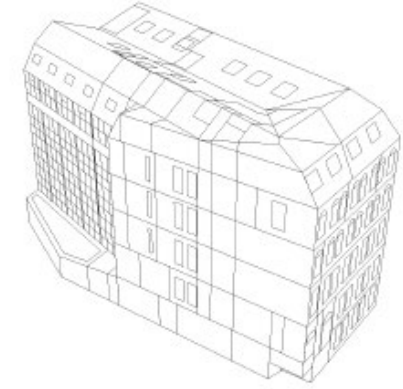
Heat loss is calculated through a steady-state scenario.



Conditioned Area					Heat Loss (kW)	Heat Loss (W/m²)
	(m²)	Conduction	Aux. vent	Infiltration	Total	Total
LG	703.6	29.0	3.6	16.2	48.8	69.3
G	620.9	18.0	0.0	15.9	33.9	54.6
01	664.0	19.0	0.0	16.4	35.4	53.3
02	668.6	17.4	0.0	14.8	32.2	48.1
03	668.6	17.0	0.0	16.4	33.4	50.0
04	721.7	14.3	0.0	18.2	32.5	45.0
Total	4047.5	114.7	3.6	97.9	216.2	(53.4)

Table 2. Internal loads by level

Peak room cooling loads are calculated using the CIBSE admittance method. These are summated below though not simultaneous.



Conditioned Area		Sensible Load (kW)	Sensible Load (W/m ²)
(m ²)	Total	Total	
LG	522.4	37.1	71.1
G	526.4	41.9	79.5
01	526.5	47.9	91.1
02	572.2	50.6	88.4
03	579.0	50.1	86.5
04	634.2	44.7	70.4
Total	3360.8	272.3	(81.0)

Summary of HVAC Interventions

Heating, cooling, ventilation and hot water demands are speculated from general industry guidance.



Heating/Cooling

The primary source of heating is provided by 3 x Broag Remeha Gas 350 units, these boilers were manufactured in 1998, are atmospheric types and are very inefficient. Only two have been operational in recent years due to mechanical failure and the building has been equipped with various VRF and split type air conditioning systems and most likely to provide cooling and supplement the ageing and failing heating system. The aspiration is to remove the reliant on natural gas and electrify the heating system utilising VRF systems.

Key drivers – improve thermal fabric efficiency and remove reliance on fossil fuels.

Offices have a heating setpoint temperature of 21°C (6am – 8pm) with a setback temperature of 15°C. Occupied office areas are mechanically cooled to 24°C via VRF fancoils. SCOP = 4.00, SEER = 5.00



Ventilation

The existing ventilation strategy for the building is primarily naturally ventilated with openable windows throughout, with the exception of the lower ground floor which has some mechanical ventilation at the rear of the building.

Occupied offices areas are to include a mechanical supply rate of 12l/s/person, complete with 65% heat recovery with a blended mixed mode ventilation strategy minimising as far as possible the reliance on mechanical ventilation – this minimises the requirement for interfacing with the external façade SFP = 1.60W/l/s

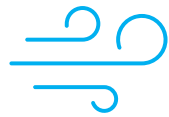


Hot Water

Toilets, showering areas and the kitchens are to be served by mechanical extract ventilation with an air change rate of 6ach⁻¹, 10ach⁻¹ respectively. SFP = 0.50W/l/s

Domestic hot water consumption is assigned to office areas only and based upon a demand of 15l/person/day and an 8hour working day

Extraction Statement



Ventilation

The development will be provided with ventilation in accordance with Part F 2016 of the Building Regulations. The preferred method of providing ventilation to this new development would be via natural ventilation with openable windows where possible and mechanical ventilation with heat recovery wherever possible due to the limitations of using passive ventilation and the listed status of the façade as described elsewhere.

Extract shall be provided to kitchenettes at a nominal rate of 15-20 l/s for microwaves and drinks prep (no cooking), along with dedicated mechanical ducted extract systems to WCS, changing rooms, discharging through the rear façade as existing providing 6ACH and 10ACH.



We have considered an additional extended roof level plant deck but this would incur major roof and structural modifications and would be significantly more intrusive than locating equipment in the external yard, expanding on what is already present.

This will require relocation of existing adjacent Bruntwood tenants equipment to make space for the additional equipment, as per the below markups.



Existing AC External Plant

Existing Air conditioning
Condensers are mounted at roof
level cantilevered from the fabric
of the building.



Existing air conditioning external plant is currently
located in three key areas

- 1. Roof Level
- 2. Within the Bin Store (Internal)
- 3. External Yard



Figure 3. Roof Plan – Existing Condensers

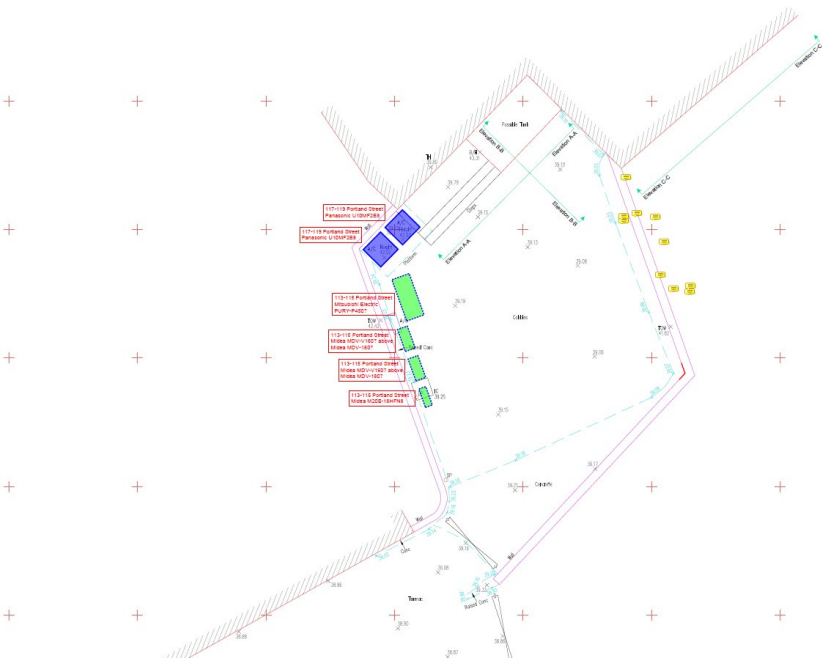


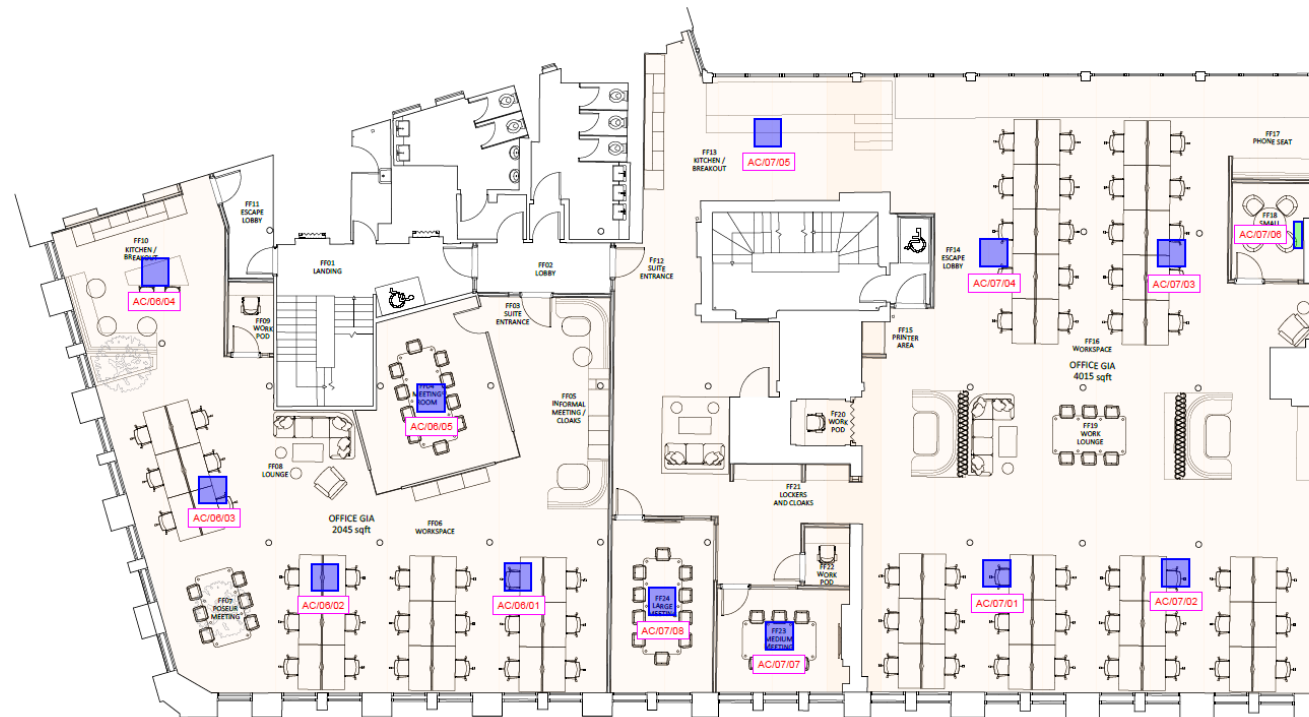
Figure 4. External Yard– Existing Condensers

Heating and Cooling Typical Layout

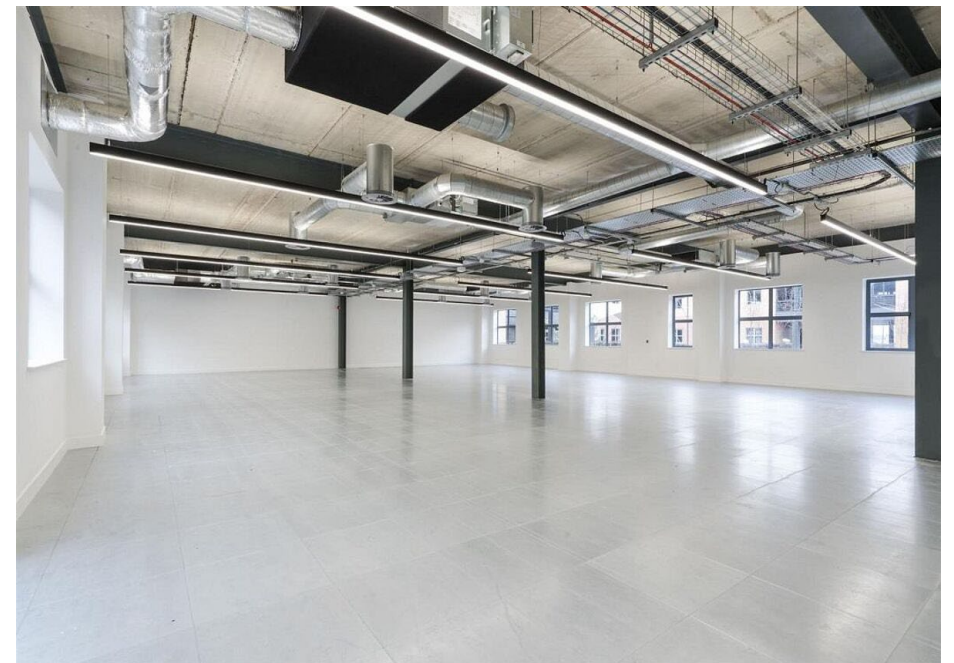


Heating/Cooling

Internal air conditioning units shall be installed indicatively as the figure below most likely ducted to swirl diffusers coordinated with the lighting. Exposed containment carrying interconnecting services shall be coordinated and agreed with the architect using existing services routes wherever possible.



01 FIRST FLOOR PLAN AS PROPOSED
SCALE - 1/75 @ A1
PLAN



Ventilation Proposals



Ventilation

Addition of mechanical ventilation where necessary due to the proposed layout and special requirements.

The existing ventilation strategy for the building is primarily naturally ventilated with openable windows throughout, with the exception of the lower ground floor which has some mechanical ventilation at the rear of the building.

Occupied offices areas are to include a mechanical supply rate of 12l/s/person, complete with 65% heat recovery with a blended mixed mode ventilation strategy minimising as far as possible the reliance on mechanical ventilation – this minimises the requirement for interfacing with the external façade

We have considered various options;

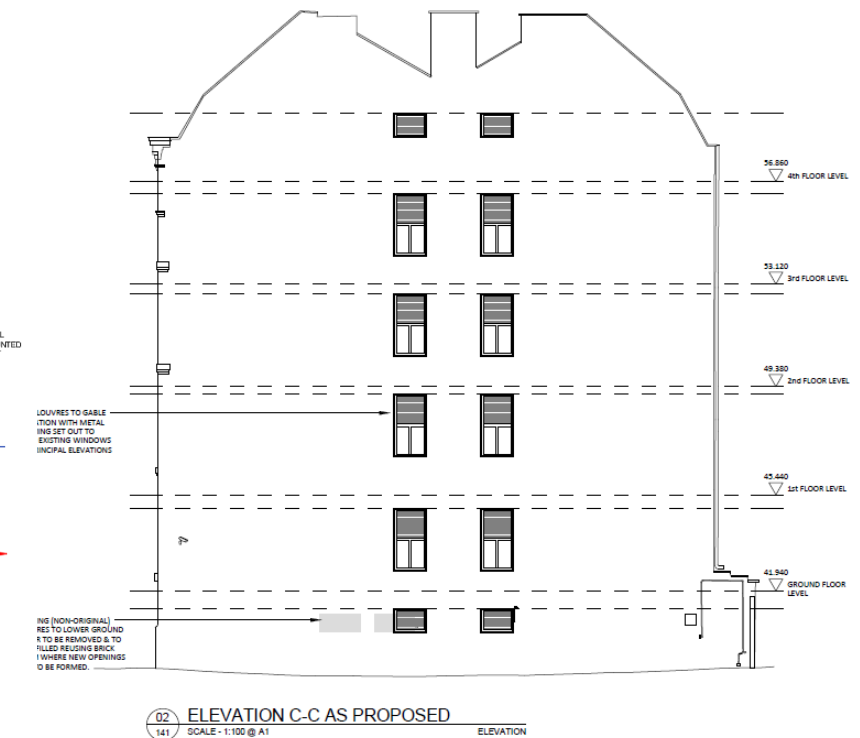
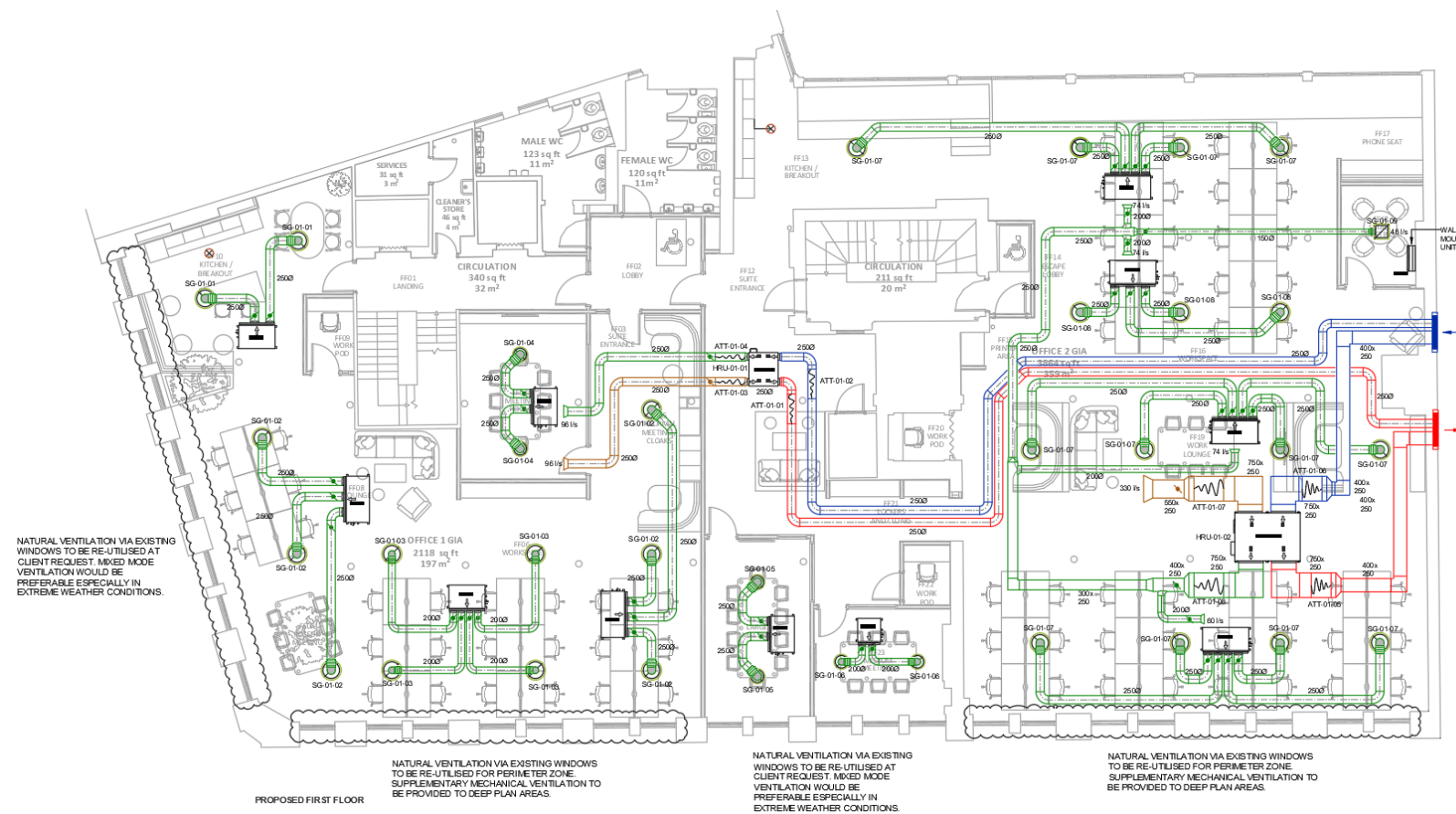
1. Retaining the existing strategy of natural ventilation throughout. The challenge is that where floor plates are deeper than 6m from opening windows there would be no fresh air penetration. This coupled with the requirement for cellular spaces, and the drive to make the building more efficient from a heating and cooling perspective, a blended approach limiting infiltration has been determined.
2. Roof Mounted central plant. This was considered along with roof mounted air conditioning plant but discounted due to the level of roof and structural works required including the additional risers through the floor plates to carry central distribution.
3. On floor heat recovery systems ducted to the side curtain walling, removing windowpanes in lieu of weather louvres. This has been discounted working with the design team on the basis that the rear curtain walling and associated façade carries heritage significance.
4. On floor heat recovery systems ducted to the rear gable, via weather louvres in-keeping with the existing already in position.

Ventilation Proposals



Ventilation

On floor heat recovery systems ducted to the rear gable, via weather louvres in-keeping with the existing already in position. This elevation is the least significant and is not visible from any main road. in terms of Ductwork would be in-keeping with the secondary air from the AC units and coordinated with the lighting scheme.

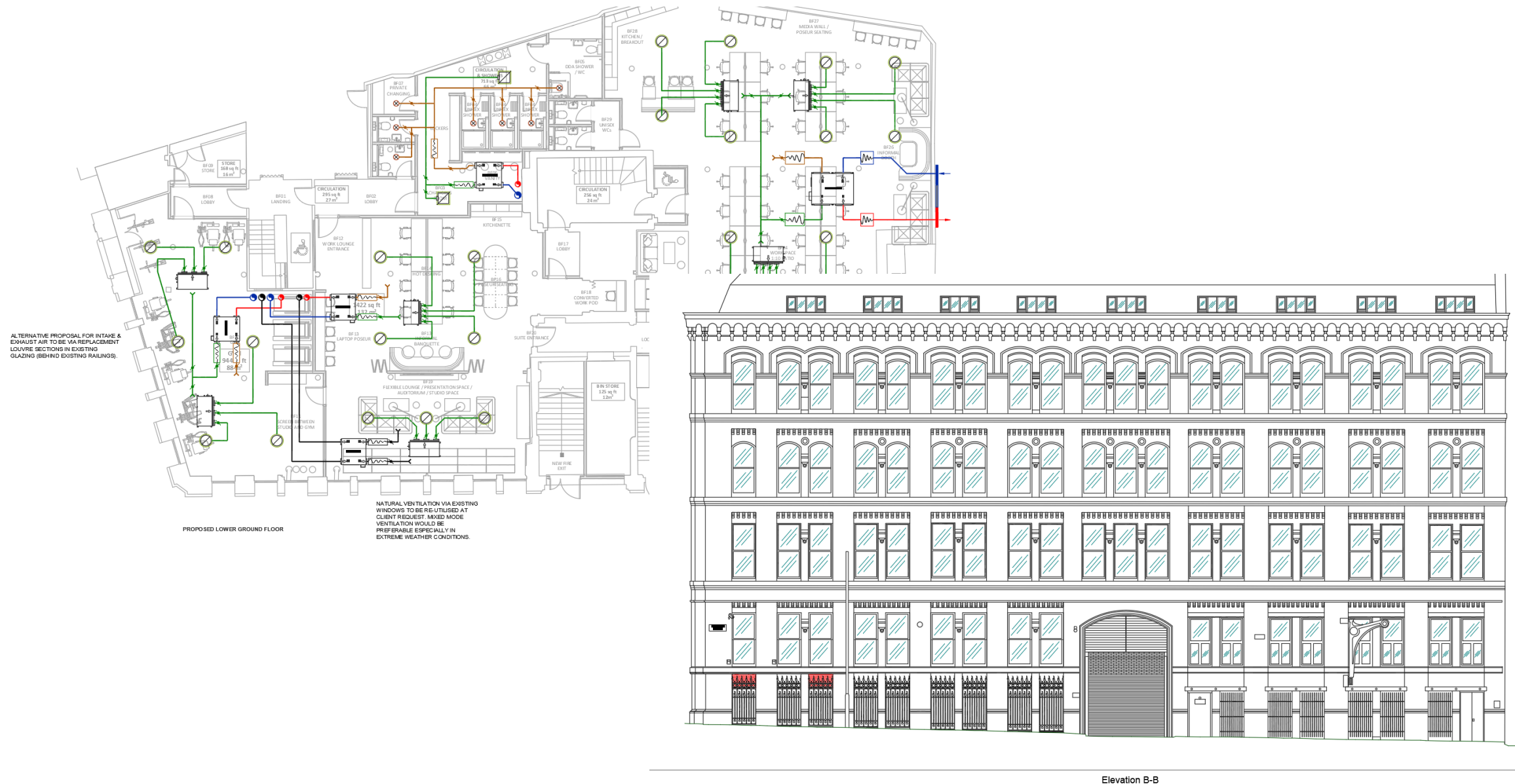


Ventilation- Dismissed Proposals



We also have the option at lower levels to incorporate ventilation louvers into the façade behind iron railings, as the image below, or an additional riser to the rear of the stair core. These options were dismissed during pre-app, as discussed with all stakeholders.

Ventilation



Ventilation - Dismissed Options



Ventilation

We have dismissed utilising the eastern curtain glazing for intake and discharge, given the significance of this façade. This would have required windowpanes to be replaced with louvers as the figure below.



Elevation D-D



Dismissed Roof Level Central Plant



Ventilation



Heating/Cooling

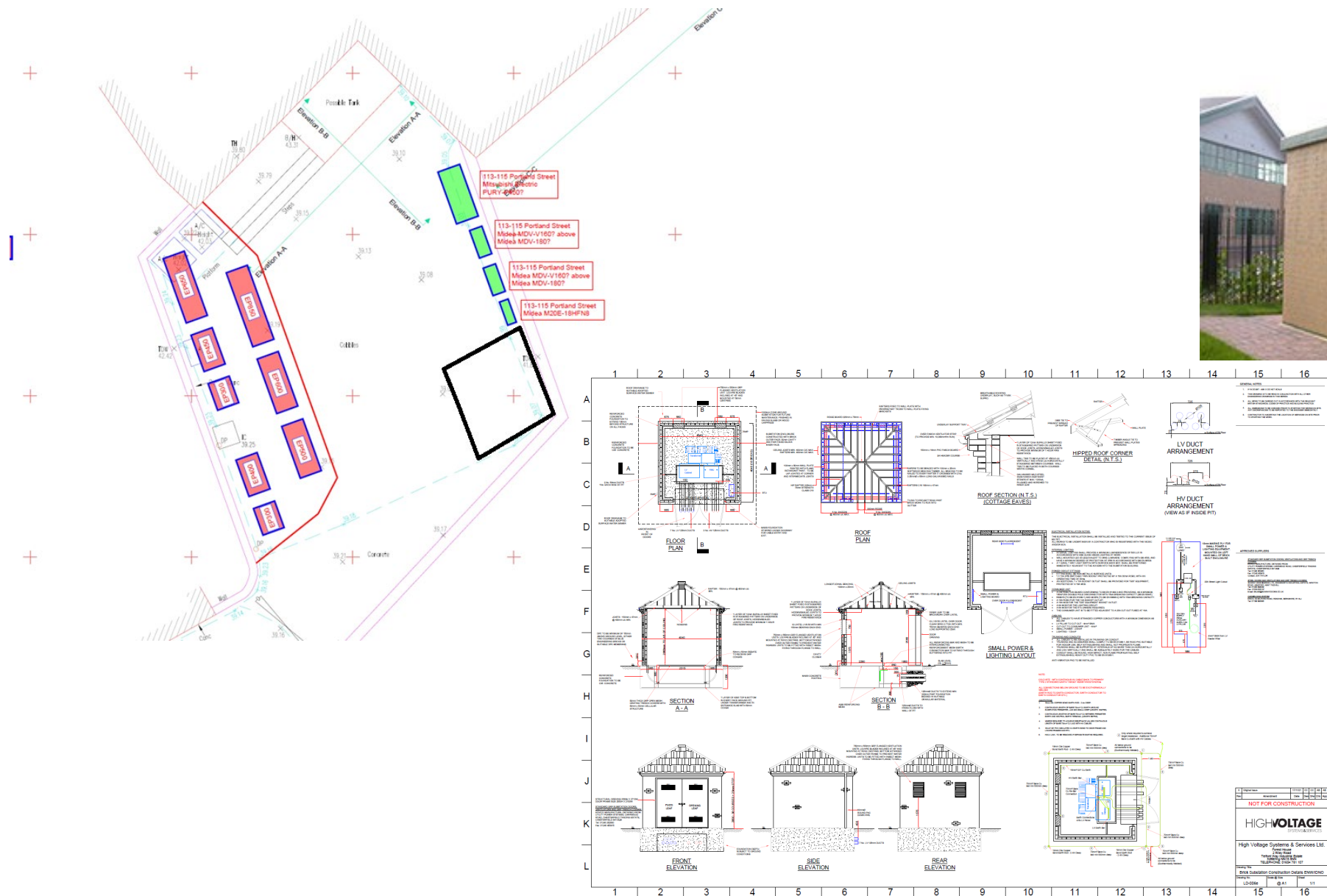
We have dismissed utilising centralised roof mounted plant located on a plant deck/gantry. This was considered along with roof mounted air conditioning plant but discounted due to the level of roof and structural works required including the additional risers through the floor plates to carry central distribution.



HV/LV Substation



Due to the increased LV load the refurbishment and decarbonisation strategy is imposing on the building, along with potential future LV load increases we are proposing a new a new HV to LV substation brick built, within the external yard approximately 4x4m. This can either be owned and operated by ENWL or an independent connection provider. Various options are available in terms of look and feel and materiality. Meetings are progressing along with detailed load assessments.





KAIZEN

Consulting Engineers