

Hotspur Press, Manchester, M1 5QR



Indoor Air Quality Plan – Hea 02

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1.0 INTRODUCTION

This Indoor Air Quality (IAQ) Plan has been produced by Tetra Tech Ltd to minimise indoor air pollution during the development of Hotspur Press, Manchester, M1 5QR.

The report was fulfilled in relation to the 'Indoor Air Quality Plan – Pre-Requisite', in accordance with section Hea 02 of the BREEAM UK New Construction Version 6.1 guidance (published 2023).

It is understood that the credit for an indoor air quality plan is being sought.

This IAQP includes consideration of the following:

- a. Removal of contaminant sources;
- b. Dilution and control of contaminant sources, including:
 - Air quality requirements of specialist areas such as laboratories, where present;
- c. Procedures for pre-occupancy flush-out and purge ventilation;
- d. Third party testing and analysis;
- e. Maintaining indoor air quality in use; and,
- f. Any relevant local authority plans or policies (for example, Air Quality Management Areas or Local Air Quality Action Plans).

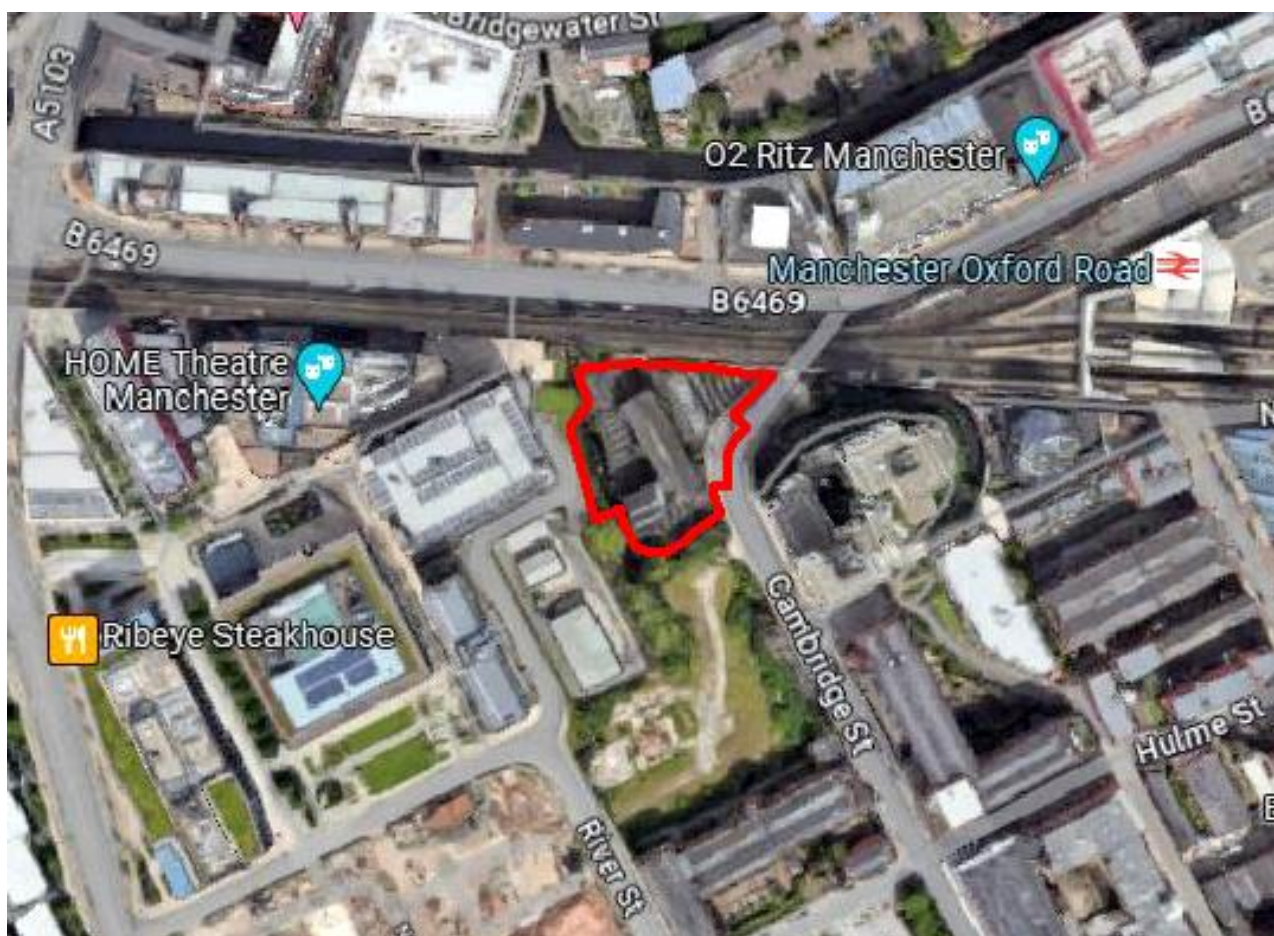
The recommendations made in this assessment regarding these points have been informed by a review of baseline air quality, internal finishes, specifications and plans, and correspondence with the client.

1.1 SITE LOCATION

The central Grid Reference is approximately 383842,397445. The application site is bounded to the north by the railway line, to the east by residential properties on Cambridge Street, to the south by green space and apartment buildings on Hulme Street and to the west by commercial buildings and a car park.

Reference should be made to **Figure 1-1** for a map of the application site and surrounding area. Figures within **Appendix B** illustrate the layouts of the proposed development at all levels.

Figure 1-1. Satellite Image of Site and Surrounding Area



Google Imagery (2023)

1.2 BASELINE AIR QUALITY CHARACTERISATION

1.2.1 Building Location and Ambient Air Quality at the Site

Indoor air quality is related to ambient air quality, which can be strongly related to location. Ambient air quality refers to the concentrations of relevant substances that are present in ambient air. These substances are emitted by various sources, including road traffic, industrial, domestic, agricultural and natural sources. Baseline air quality data employed in this study have been obtained from automatic monitoring stations maintained by Manchester City Council (MCC).

1.2.2 Local Authority Review and Assessment of Air Quality

As directed by the Environment Act 1995, Local Authorities are required to review and assess air quality with respect to the air quality objectives and air quality standards (AQSS) for the pollutants specified in the government's National Air Quality Strategy and in the Air Quality Standards Regulations 2010. The pollutants of main concern are likely to be nitrogen dioxide (NO₂) and particulate matter (PM₁₀ and PM_{2.5}), which are likely to disperse onto site from the tailpipes of vehicles utilising local roads.

Where these standards are not predicted to be met, Local Authorities must declare an air quality management area (AQMA) and prepare an action plan, which outlines measures to improve the air quality within the designated AQMA. MCC, as part of the Greater Manchester Combined Authority (GMCA), has declared an area encompassing the majority of major road networks across Greater Manchester. The area is an AQMA due to exceedances of the NO₂ and PM₁₀ annual mean limit values.

1.2.3 Air Quality Monitoring

Monitoring of air quality within MCC has been undertaken through automatic monitoring methods in 2019. These have been reviewed in order to provide an indication of existing air quality in the area surrounding the application site. The most recent representative monitoring data within MCC was undertaken during 2019.

Automatic Monitoring

MCC undertook automatic pollution monitoring during 2019 at 17 different locations. The closest monitoring location is MAN1, which is located at Manchester Oxford Road, approximately 0.4 km south-east of the application site. The most recently available data is from 2019 which is presented in **Table 1-1** for the four monitoring stations closest to the application site.

Table 1-1. Monitored Annual Mean Pollutant Concentrations at Automatic Monitoring Locations

Site ID	Location	Site Type	Distance from Kerb of Nearest Road (m)	Inlet Height (m)	2019 NO ₂ Annual Mean Concentration (µg/m ³)	2019 PM ₁₀ Annual Mean Concentration (µg/m ³)
MAN1*	Manchester Oxford Road	Kerbside	1	2	59	26

As outlined in **Table 1-1**, MAN1 monitored annual average concentrations above the AQO for NO₂ (40 µg/m³ annual mean) during 2019, and below the AQO for PM₁₀ (40 µg/m³ annual mean) during 2019.

Non - Automatic Monitoring

MCC operated a network of numerous passive diffusion tubes during 2019. The closest diffusion tube is diffusion tube MAN77, which is located on Hewitt Street, approximately 215 m west of the application site. The most recently available representative diffusion tube data is from 2019 which is presented in **Table 1-2**.

Table 1-2. Monitored Annual Mean NO₂ Concentrations at Diffusion Tubes

Site ID	Location	Site Type	Distance from Kerb (m)	Inlet Height (m)	Monitored 2019 Annual Mean NO ₂ Concentration (µg/m ³)
MAN29A	Oxford Street	Roadside	2.5	3	55.40
MAN77	Hewitt Street	Urban Background	8	3	43.70

As indicated in **Table 1-2**, both of the two nearest diffusion tubes located within the Air Quality Assessment area monitored annual average NO₂ concentrations above the AQO for NO₂ (40 µg/m³ annual mean) during 2019.

1.3 BACKGROUND INFORMATION ON POLLUTANTS

Some individuals are more susceptible to the effects of certain pollutants than others and this makes it difficult to ascertain the specific levels at which health may be affected.

BREEAM Hea 02 Indoor Air Quality identifies the potential pollutants that may be present within buildings. Particular attention is paid to Volatile Organic Compounds (VOCs) and Formaldehyde due to many organic compounds being known to cause cancer in animals.

VOCs and Formaldehyde

VOCs are emitted as gases from particular solids and liquids. When these VOCs are contained within buildings, they can be particularly notable. There are a number of sources that can produce VOCs including carpets, particle board, fabrics, paints, pesticides, glues, adhesives and numerous types of equipment that is generally found within any internal environment.

There are a number of elements that can affect the concentrations of VOCs indoors, such as the age of the source, ventilation rate, humidity and temperature.

The health effects caused by VOCs can range greatly, from those that present no health impact to those that are highly toxic. As with many pollutants the extent and nature of the potential health effect will depend on many factors including the time and level of exposure.

Formaldehyde is of particular concern because it is a known irritant and sensitizer.

As identified in BREEAM Hea 02 Indoor Air Quality, there are a number of other pollutants that are of potential concern associated with the proposal, which include:

- Particulates from vehicle emissions (PM₁₀ and PM_{2.5}), pollen, dust from brake and tyre wear;
- Gaseous Oxides such as Carbon Monoxide (CO), Carbon Dioxide (CO₂), Nitrogen Oxide (NO_x), Sulphur Dioxide (SO₂) and Ozone (O₃);
- Other pollutants such as benzene, 1,3-butadiene, lead and polycyclic aromatic hydrocarbons;

- Airborne bacteria and micro-organisms and their spores;
- Airborne inorganic substances such as metal fumes, Ammonia, Chlorine and Radon; and,
- Unpleasant odours.

1.4 INDOOR AIR QUALITY ASSESSMENT

Background concentrations as used within the prediction calculations were referenced from the UK National Air Quality Information Archive database based on the National Grid Co-ordinates of 1 x 1 km grid squares nearest to the development site (471500,173500). The split between the principal sources of pollutants (NOx) is shown in **Table 1-3**, below.

Table 1-3. Published Background Nitrogen Oxide Levels ($\mu\text{g}/\text{m}^3$) (NOx)

2019						
Total	Road Sources	Industrial Sources	Rail Sources	Domestic Sources	Aircraft Sources	Motorways
39.95	18.97	2.27	8.06	0.09	1.69	8.87

Vehicle Sources

The proposed development is anticipated to be car-free and will have minimal daily trip generation. It is expected that there will be 61 daily two-way vehicle movements associated with the proposed development in the form of taxis, servicing vehicles and deliveries. As a result, vehicular movements from the application site are expected to be negligible. The site is located adjacent to Whitworth Street, which may experience high levels of traffic. **Table 1-3** indicates that the background contribution to nitrogen oxide levels from road sources is $18.97 \mu\text{g}/\text{m}^3$ which constitutes 47.5% of the total NOx concentrations at the site. **Table 1-3** indicates that the background contribution to nitrogen oxide levels from motorway sources is $8.87 \mu\text{g}/\text{m}^3$ which constitutes 22.2% of the total NOx concentrations at the site. The nearest motorway is the A57(M) which is located 330 m to the south of the site, which is likely to account for the majority of the motorway source. The risk from the air quality effects for road emissions is **MEDIUM**.

Rail Traffic Sources

The nearest railway line is runs adjacent to the northern boundary of the site. **Table 1-3** shows that the background contribution to nitrogen oxides levels from rail traffic is $8.06 \mu\text{g}/\text{m}^3$ which constitutes 20.2% of the total NOx concentrations at the site. As such the risk from the air quality effects from railway emissions is **MEDIUM**.

Air Traffic Sources

Air sources of pollutants are very low and **Table 1-3** shows that the background contribution to nitrogen dioxide levels from air traffic is $1.69 \mu\text{g}/\text{m}^3$ which constitutes 4.2% of the total NOx concentrations at the site. As such the risk from the air quality effects from aircraft emissions is **LOW**.

Nearby Vents, Extracts or Localised Emissions Sources

There are no stack vents or emission points from other buildings within 30 m. As such the extraction fumes are considered to be likely to suitably disperse and therefore the risk from the air quality effects from local emissions sources is **LOW**.

Radon

The maximum radon potential has been identified using the UK Radon Map found on the website: <http://www.ukradon.org/information/ukmaps>. This is shown as being less than 1%. Therefore, the risk for the effects of radon gas is **LOW**.

1.5 SUITABLY QUALIFIED EXPERT

The author of the report has over three years' experience in the air quality sector. The quality checker of this report can confirm it meets the following requirements:

- Represents sound industry practice.
- Be appropriate given the buildings assessed and scope of works.
- Avoids invalid, biased and exaggerated recommendations.

2.0 CONTROL OF CONTAMINANT SOURCES

2.1 REMOVAL OF CONTAMINANT SOURCES

2.1.1 Building Location and Development Configuration

Indoor air quality will be affected by the external ambient air quality, the ways in which external air is allowed to mix with internal air, and the distance between sources of pollution and receptors potentially sensitive to pollution.

As indicated in Section 1.0, the application site is situated in an AQMA. The air quality assessment produced by Tetra Tech Ltd (ref: 784-B050197, dated 26th March 2024) concludes that the concentrations of NO₂, PM₁₀ and PM_{2.5} are predicted to be below the respective AQOs at proposed sensitive receptor locations in the worst-case assessed operational year. Therefore, no further mitigation is required to protect future occupants.

The location of the buildings should be taken into account at the design stage to ensure external pollution sources are accounted for. These considerations should drive the development configuration in terms of building form, permeability and layout.

The following factors as also discussed in Section 1.4 above should be considered:

- The potential for and nature of pollution from nearby road traffic sources;
- The potential for and nature of pollution from nearby parking / vehicles;
- The potential for and nature of pollution from nearby rail traffic sources;
- The potential for and nature of pollution from nearby air traffic sources;
- The potential for and nature of pollution from nearby vents /emission points;
- The potential for and nature of pollution from nearby industrial processes;
- The size, usage and proximity of any adjacent farmland; and
- The risk of exposure to radon gas.

2.1.2 Emissions from Building Materials

Building and fit-out materials can be a significant source of volatile organic compounds (VOC) and formaldehyde, which may adversely affect indoor air quality and the wellbeing of occupants. Potential sources of VOC and formaldehyde should be removed from the building by the specification of low VOC materials, wherever practicable.

Credits are available under BREEAM Hea02 for the specification of certain classes of products with low VOC content, listed in Table 20 (VOC criteria by product type) of the BREEAM guidance. Therefore, it is recommended that products and finishes chosen for the project comply with Table 20 of the BREEAM guidance, where possible.

2.2 DESIGN CRITERIA

The building design should ensure that the following requirements, appropriate for the proposed simple units which will not be subject to unpredictable or variable occupancy patterns, are met:

- Provide fresh air into the buildings in accordance with the criteria of the relevant standard for ventilation;
- Ventilation pathways are designed to minimise the ingress and build-up of air pollutants inside the buildings;
- The location of the building's air intakes and exhausts, in relation to each other and external sources of pollution, is designed in accordance with CEN/TR 16798-4:2017 Sections 8.8.1 to 8.8.4;
- Where present, HVAC system must incorporate suitable filtration to minimise external air pollution;
- For naturally ventilated or mixed mode buildings, the design demonstrates that the ventilation strategy provides adequate crossflow of air to maintain the required thermal comfort conditions and ventilation rates in accordance with CIBSEAM10;
- Construction materials, finishes and furnishings that emit low or zero VOCs or Formaldehyde should be chosen where possible and meet with the relevant European Standards as described within Table 20 'VOC criteria by product type' of BREEAM Hea 02-Indoor Air Quality;
- Ventilation systems should be checked and cleaned as necessary prior to or during commissioning so that pollutants are not released into the buildings. There should be a written report with photographic evidence of this, supported by surface sampling test results if the system has been cleaned;
- Pollutant dispersion modelling can be used to inform the location of the building's air intakes and exhausts in relation to each other and sources of external pollution;
- The buildings' air intakes and exhausts should be suitably located to reduce the risk of the intake air being contaminated by the exhausts, where practical; and
- Exhausts or other pollutant sources should not be discharged into enclosed spaces, such as courtyards, in which intakes are also located.

2.3 CONTROL AND DILUTION OF CONTAMINANTS

The building designer must ensure that all occupied spaces have access to a sufficient quantity of fresh or purified air. The ventilation systems that are being proposed will help achieve this. The design and maintenance of these systems must consider any external or additional factors as well as the needs of the building users.

2.3.1 Construction Phase

Procedures for protecting the indoor air quality of areas outside of the refurbishment or fit-out zone that may be affected by the refurbishment/fit-out works

As the refurbishment activities nears completion, the generation of dust and other air pollutants during the remaining construction/ decoration activities should be minimised, to reduce the quantity of pollutants present in the building at 'handover' and the start of the occupation phase.

The following measures for protecting the indoor air quality of areas outside of the refurbishment or fit-out zone that may be affected by the refurbishment/fit-out works are recommended:

- Mitigation measures such as water-based dust suppression mechanisms should be utilised to limit fugitive dust emissions from being generated during construction activities;

- Ventilation systems and ductwork should be checked and cleaned appropriately prior to or during commissioning, so that pollutants are not released into the building;
- Electric equipment or bottled gas to be used in place of petrol and diesel-emitting equipment wherever practicable;
- Exhausts from any sources of petrol, diesel or other building materials or equipment which could give rise to significant air pollution should be kept away from air intakes;
- Wet and waste materials should be covered, sealed and removed from the building;
- Walk-off mats should be provided to reduce the tracking of pollutants and dust into buildings;
- Overshoes should be worn inside buildings to prevent the 'track-in' of mud and dust;
- Dust movement within the buildings should be minimised and any visible dust should be cleaned up;
- Completed areas should be isolated from active construction as far as practicable;
- Any paint used should be allowed to dry for at least 48 hours before carpets are installed in the painted area;
- Any sealants should be utilised before any carpets are installed;
- The following measures should be implemented to minimise dust accumulation on material surfaces and the absorption of other pollutants by absorbent materials:
 - Materials should be wrapped and stored properly;
 - Highly absorbent materials like carpeting should be covered and sealed;
 - Porous materials should be stored indoors and wrapped;
 - Timber, unless stored indoors, should be covered with a waterproof coating and stored off ground away from standing water; and
 - If condensation forms on cold materials, care should be taken not to expose it to dust or particulates.
- Measures to mitigate water ingress, such as temporary water barriers, should be utilised where required;
- If possible, store off-gassing furnishings and materials in well-ventilated spaces before installing;
- If possible, remove or at least loosen product coverings to maximise the exposure of the surface area of off-gassing furnishings and materials to fresh air for as long as possible;
- Meet or exceed labelled precautions on products;
- Avoid storage of opened containers of paints or similar materials within the spaces to be occupied or anywhere else for longer than is necessary;
- Do not mix products unless directed on labelling;
- Minimise use of pesticides;
- When work is completed in an area, it should be protected from pollutants generated in other parts of the construction site as far as is practicable. This can be achieved by closing and sealing doors and windows, for example;
- Making good of snagging defects should be avoided during and immediately prior to post-construction air quality testing; and

- Following the pre-occupancy flush-out, care should be taken to avoid potential ingress of pollutants during external works that are likely to emit high levels of VOCs e.g. external painting.

The plan should be reviewed subject to any significant material changes in the design plans or work practices.

2.3.2 Occupation Phase

Protection of Heating Ventilation and Air Conditioning (HVAC) systems from sources of pollution during refurbishment/fit-out works: Building Occupancy and Ventilation

Sources of air pollutants inside the building will include:

- Building occupants; and,
- Combustion sources (space/water heating).

These sources are considered in further detail in the sections below.

It is considered likely that the building has been designed in accordance with appropriate criteria for relevant ventilation standards and would therefore assist in removing contaminants from within the building whilst maintaining internal thermal comfort, notwithstanding the recommendations below.

The BREEAM guidance also indicates that rooms which are subject to large and unpredictable or variable occupancy patterns could have carbon dioxide (CO₂) filters fitted to assist building owners or managers to adjust the quantity of fresh air, i.e. using openable windows.

The ventilation strategy for the proposed development is detailed in the Energy Strategy Report produced by Applied Energy (ref: 23057, dated 16th November 2023) and includes the following:

“The studios and cluster flats will be provided with continuous supply and extract ventilation 24/7 with stale air being removed from bathroom and kitchen areas, and fresh air provided to the bedroom/living spaces.

Within each cluster kitchen and studio, separate dedicated extract will be provided via a cooker hood extraction system. This will ensure smells and heat are removed directly from the kitchen.

Separate dedicated extract systems will be provided for the bin stores...

...In order to allow the removal of pollutants via a short-term higher rate ventilation method, openable windows will be provided to each habitable space. This will also have the benefit of allowing the occupants to open a window to enhance room ventilation during suitable external conditions.

A small retail unit is to be located at ground floor which will require supply and extract ventilation for general purposes as well as provision of the café which will require a dedicated kitchen exhaust.”

Combustion Sources

The Energy Strategy Report provides further detail on the proposed heating and hot water provision for the development:

“Conventionally heating network have utilised gas fired Combined Heat & Power Units for both the heating and domestic hot water provision of developments.

Given the associated poor NOx emissions as well as an industry wide push to utilise non-gas consuming plant, the domestic side of the development is proposed to be all electric.

Therefore, the site wide heating and hot water provision is proposed to be met via the use of Air Source Heat Pumps (ASHPs).

There will be a roof mounted community ASHP energy centres with common distributing pipework to serve all flats and bedrooms.

This will then be branched to serve the heating and domestic water requirements respectively.”

2.3.3 Ductwork

Any openings to air handling equipment and ductwork not in active use should be sealed using a reasonably airtight covering, at or before the ductwork is installed. Construction work generating air pollution should be avoided where ductwork or air handling equipment is being installed. Equipment should be cleaned if visible dust plumes are generated where ductwork is being installed.

If any mechanical ventilation systems are used during construction, any filters in the exhaust and makeup air supply systems should be replaced once construction is completed, or, if construction activities are undertaken over a long period of time, they should be regularly inspected and replaced when found to be dirty.

The components on the supply and return air flow side, such as return vents, ducts and shafts and transfer ducts, should be protected during construction works. If inspections indicate that protection is required on the supply side, coarse filters covering supply outlets would need to be utilised to prevent the distribution of particulates (and potentially NO_x) into the building.

If other measures fail, duct cleaning should be undertaken. Any cleaning should be undertaken by experienced personnel following best practice guidance. Any cleaning which is undertaken whilst construction works are still underway should be logged, and the duct work should be sealed once cleaning is complete.

It is also recommended that ductwork is cleaned regularly during the operational phase of the development in accordance with established standards.

2.4 PROCEDURES FOR PRE-OCCUPANCY FLUSH-OUT

Following the completion of refurbishment and fit-out activities but before handover of the building and its occupation by users, it is recommended that the building be thoroughly cleaned and purged or ‘flushed out’ to reduce concentrations of pollutants emitted from construction activities or materials. Subsequent air quality tests could be undertaken to monitor the effectiveness of the flushout.

Flushing out is typically carried out for a minimum of 7 days. Flushing out should be conducted in consultation with the M&E engineer, by operating the mechanical air supply and extraction system continuously (24 hours per day) with 100% outdoor air supplied (i.e. no recirculation). Normal air temperature and humidity shall be maintained in the building during flush out. In naturally ventilated areas (including areas served by the natural ventilation system), doors, windows and breathing building openings or stacks should be left open as far as reasonably practicable, for several days.

A record should be made of the length of time and events undertaken in achieving the flush-out. Any issues raised during the procedure can be documented and this will assist with the onsite sample testing. For any additional work that is carried out after the procedure has taken place, considerations should be given to sealing off these areas from other locations that may still require air quality testing.

3.0 TESTING AND ANALYSIS

It is recommended that concentrations of formaldehyde and total volatile organic compounds ('T-VOC') in indoor air are tested post-construction but pre-occupancy.

3.1 TIMING

If required, the testing of VOCs and formaldehyde should ideally be done before the occupation of the building and after the pre-occupancy flush out has been conducted.

The ventilation and heating systems prior to measurements should be in operation for a period of time, ideally between 12-24 hours, to ensure the relevant spaces throughout the building reach equilibrium in terms of internal environmental conditions.

Any use of sealants must not be applied less than five days before testing commences as this can produce relatively high levels of VOC and/or formaldehyde. If new finishes and furniture are installed after the testing has been carried out, a retest will have to be completed.

3.2 METHOD

If VOCs and Formaldehyde testing and analysis is required to satisfy the BREEAM (Building Research Establishment Environmental Assessment Method) scheme, then it needs to be undertaken in accordance with the following standards:

- BS ISO 16000-4: 2011 Diffusive sampling of formaldehyde in air
- BS ISO 16000-6: 2011 VOCs in air by active sampling
- BS EN ISO 16017-2: 2003 VOCs - Indoor, ambient and workplace air by diffusive sampling
- BS ISO 16000-3: 2011 Formaldehyde and other carbonyls in air by active sampling

Further details of the testing requirements by product type are detailed within Table 20 of Hea 02-Indoor Air Quality.

3.3 LOCATIONS

If undertaken, airborne concentrations of VOCs would be sampled at various locations within the building. Locations would be selected to facilitate sampling in representative occupiable rooms with similar internal finishes and the same type of ventilation system, as these two factors will likely dominate internal concentrations of formaldehyde and VOCs.

Samples should be taken in representative rooms that are likely to be occupied regularly, however this excludes storerooms, toilet areas, stairwells and corridors. One sample taken in a room will suffice for all other rooms of a similar size and of similar material specification. If there are rooms of a larger size, further samples should be taken to understand the homogeneity of the indoor environment. Samples should also be taken in the dressing rooms, office, control room and community space.

3.4 GUIDANCE ON INTERPRETATION

To ensure the sampling analysis follows BREEAM, the results should be compared to the following limits:

- Formaldehyde – less than or equal to 100 $\mu\text{g}/\text{m}^3$ over a 30-minute time-weighted-average (TWA).
- Total Volatile Organic Compounds (TVOC) – less than 500 $\mu\text{g}/\text{m}^3$ over an 8-hour TWA.

It should be noted that the Workplace Exposure Limit (WEL) in the UK for the Formaldehyde is 2 parts per million (ppm – which is roughly equivalent to 2,500 $\mu\text{g}/\text{m}^3$).

There is additional WELs for specific VOCs but not for TVOC. However, European limits state that TVOC levels over 3,000 $\mu\text{g}/\text{m}^3$ can cause discomfort and levels above 25,000 $\mu\text{g}/\text{m}^3$ are considered to be toxic.

4.0 MAINTAINING INDOOR AIR QUALITY IN-USE

4.1 BUILDING MAINTENANCE

'The Building User Guide' produced and supplied by the developer should include the following guidance to occupiers with regards to establishing policies and procedures:

- For minimising the use of VOC/Formaldehyde emitting materials or substances within the building throughout operation;
- For carrying out regular cleaning of the building interior to prevent collection of dust and other pollutants;
- For carrying out maintenance of ventilation plant. This can include replacing filters at regular intervals in addition to cleaning of heating/cooling coil surfaces, ductwork such as kitchen extracts and humidifiers;
- For carrying out regular inspection of ventilation supply ductwork to check for system cleanliness; and
- The inspection should be carried out once every two years and documented, together with details of any remedial action(s) taken.

The guide may also include some recommendations for establishing regular testing of certain parameters as this will ensure that the Indoor Air Quality is compliant in maintaining levels for the health and well-being of occupants.

5.0 RECOMMENDATIONS

The following constitute the recommendations for maintaining the indoor air quality at the proposed development and will be incorporated into the Briefing documents for contractors and the end-user handover documents.

- Construction materials, finishes and furnishings that emit low or zero VOCs or Formaldehyde should be chosen where possible and meet with the relevant European Standards as described within Table 20 'VOC criteria by product type' of BREEAM Hea 02-Indoor Air Quality, as shown in **Appendix A**;
- HVAC equipment and ductwork will be protected from dust and other pollutants during installation and when in the vicinity of other construction/installation works;
- Ventilation systems will be checked and cleaned as necessary prior to or during commissioning so that pollutants are not released into the buildings. A written report with photographic evidence will be produced and this will be supplemented with surface sampling test results when the system has been cleaned. Fresh air ventilation during construction/fitting out will be increased, especially during the use of high-emitting products such as paints, lacquers and adhesives or any product containing Methyl chloride;
- Off-gassing furnishings and materials will be stored in well-ventilated spaces before installing. If possible, they will be removed or at least product coverings loosened to maximise the exposed surface area of these items to fresh air for as long as possible;
- Labelled precautions on products will be met or exceeded;
- Storage of opened containers of paints or similar materials within the spaces to be occupied will be avoided;
- Storage of fuels in spaces to be occupied will be avoided;
- Products will not be mixed unless directed on labelling;
- Pesticides will not be used;
- When work is completed in an area, the area will be protected from pollutants generated in other parts of the construction site as far as is practicable by closing and sealing doors and windows;
- Making good of snagging defects will be avoided during and immediately prior to post-construction air quality testing;
- A pre-occupancy flush-out will be undertaken in accordance with Section 2.4 above;
- HVAC systems must include suitable filtration to minimise external air pollution, as defined in EN 16798-3:20172 Section B4.2; and,
- Following the pre-occupancy flush out care will be taken to avoid potential ingress of pollutants during external works that are likely to emit high levels of VOCs e.g. external painting.

6.0 CONCLUSIONS

This Indoor Air Quality (IAQ) Plan has been produced by Tetra Tech Ltd to minimise indoor air pollution during the development of Hotspur Press, Manchester, M1 5QR.

The report was fulfilled in relation to the 'Indoor Air Quality Plan – Pre-Requisite', in accordance with section Hea 02 of the BREEAM UK New Construction Version 6.1 guidance (published 2023).

It is understood that the credit for an indoor air quality plan is being sought.

This IAQP includes consideration of the following:

- a. Removal of contaminant sources;
- b. Dilution and control of contaminant sources, including:
 - Air quality requirements of specialist areas such as laboratories, where present;
- c. Procedures for pre-occupancy flush-out and purge ventilation;
- d. Third party testing and analysis;
- e. Maintaining indoor air quality in use; and,
- f. Any relevant local authority plans or policies (for example, Air Quality Management Areas or Local Air Quality Action Plans).

The recommendations made in this assessment regarding these points have been informed by a review of baseline air quality, internal finishes, specifications and plans, and correspondence with the client. The assessment has determined that the overall risk from external pollutant sources at the site is **MEDIUM**, with local concentrations of all measured pollutant sources falling significantly below the air quality objective for long-term exposure. As this IAQP is compliant with the requirements specified in Hea 02 for the development of an IAQP, it is considered that this credit can be awarded for this development.

APPENDIX A - VOC CRITERIA BY PRODUCT TYPE FROM HEA 02

Product Type	Performance requirements	Compliant performance standard	Compliant testing standard	Compliant testing standard
Interior Paints and Coatings	VOC content limit	EU Directive 2004/42/CE ('Paints Directive')	BS EN ISO 11890-2:2013 – Paints and varnishes – Determination of VOC content, Part 2 – Gas Chromatographic method OR ASTM D2369 - 10(2015) Standard Test Method for Volatile Content of Coatings (only where reactive diluents are present) OR Manufacturers' calculations of VOC content (based on the constituent ingredients)	Paint to be fungal and algal resistant in wet areas e.g. bathrooms, kitchens, utility rooms
Wood-based products (including wood flooring)	Formaldehyde E1 class/ Formaldehyde concentration in indoor air of 0.1mg/m ³	-	BS EN 13986:2004+A1:2015 Wood-based panels for use in construction - Characteristics evaluation of conformity and marking OR BS EN ISO 16000-9:2006 Indoor air - Part 9: Determination of the emission of volatile organic compounds from building products and furnishing - Emission test chamber method. OR Californian Department for Public Health Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers, Version 1.2 (Emission testing method for California Specification 01350), 2017. Note: For either method the resultant emission rate obtained from the chamber test method must be extrapolated to predict what the emissions would be in a theoretical model room (as detailed in the standard) and this extrapolated emission rate compared with the required formaldehyde	The absence of prohibited wood preservatives.

			concentration of 0.1mg/m ³ .	
Timber structures (e.g. glue laminated timber)	Formaldehyde E1 Class	BS EN 14080:2013 Timber structures - Glued laminated timber and glued solid timber - Requirements	In accordance with Annex A of BS EN 14080:2013	-
Wood flooring (e.g. parquet)	Formaldehyde E1 Class	BS EN 14342:2013+A1:2008 Wood flooring - Characteristics, evaluation of conformity and marking	In accordance with Annex A of BS EN 14342:2013	-
Resilient textile and laminated floor coverings (e.g. vinyl, linoleum, cork, rubber, carpet, laminated wood flooring)	Formaldehyde E1 Class	BS EN 14041:2018 Resilient, textile, laminated and modular multilayer floor coverings - Essential characteristics	In accordance with Section 4.3.3 of BS EN 14041:2018	-
Suspended ceiling tiles	Formaldehyde E1 Class	BS EN 13964:2014 Suspended ceilings - Requirements and test methods	In accordance with Annex E of BS EN 13964:2014	-
Flooring adhesives	Carcinogenic or sensitising volatile substances are substantially absent	BS EN 13999-1:2013 Adhesives - Short term method for measuring the emission properties of low-solvent or solvent-free adhesives after application - Part 1: General procedure	BS EN 13999-1:2013 Adhesives - Short term method for measuring the emission properties of low-solvent or solvent-free adhesives after application - Part 1: General procedure BS EN 13999-2:2013 Adhesives - Short term method for measuring the emission properties of low-solvent or solvent-free adhesives after application - Part 2: Determination of volatile organic compounds BS EN 13999- 3:2007+A1:2009 Adhesives - Short term method for measuring the emission properties of low-solvent or solvent-free adhesives after application - Part 3: Determination of volatile aldehydes BS EN 13999- 4:2007+A1:2009 Adhesives - Short term method for measuring the emission properties of low-solvent or solvent-free adhesives after application - Part 4: Determination of volatile diisocyanates	-
Wall coverings	Vinyl chloride monomer (VCM) content Formaldehyde level Migration of heavy metals	BS EN 233:2016 Wallcoverings in roll form - Specification for finished wallpapers, wall vinyls and plastics wall coverings BS EN 15102:2019	BS EN 12149:1998 – Wall coverings in roll form - Determination of migration of heavy metals and certain other elements, of vinyl chloride monomer and	-

		Decorative wallcoverings - Roll form BS EN 259-1:2001 Wallcoverings in roll form - Heavy duty wallcoverings - Part 1: Specifications	of formaldehyde release	
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APPENDIX B - FIGURES

Figure B-1. Level 0 Layout

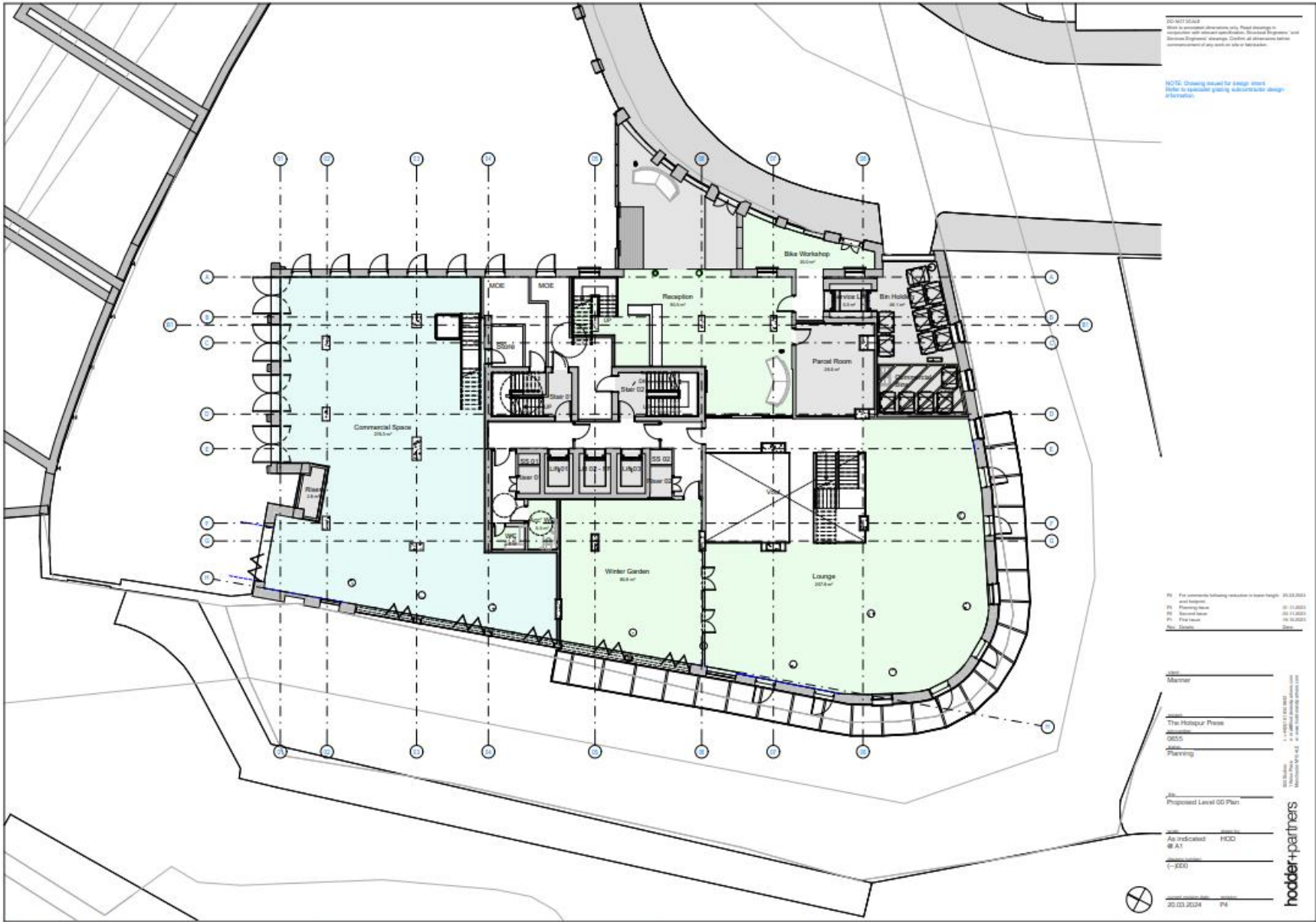


Figure B-2. Level 1 and 2 Layout

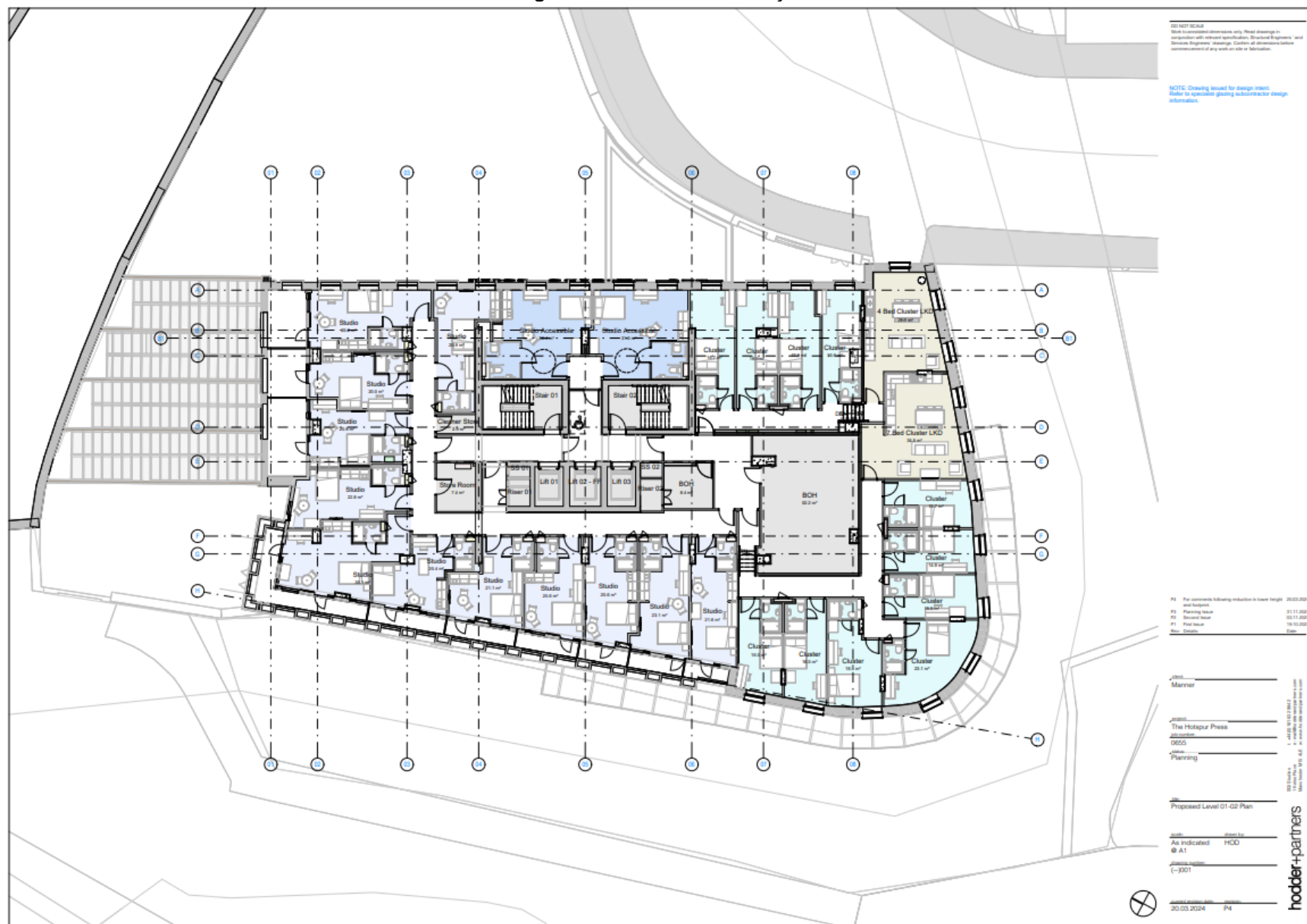


Figure B-3. Level 3 Layout

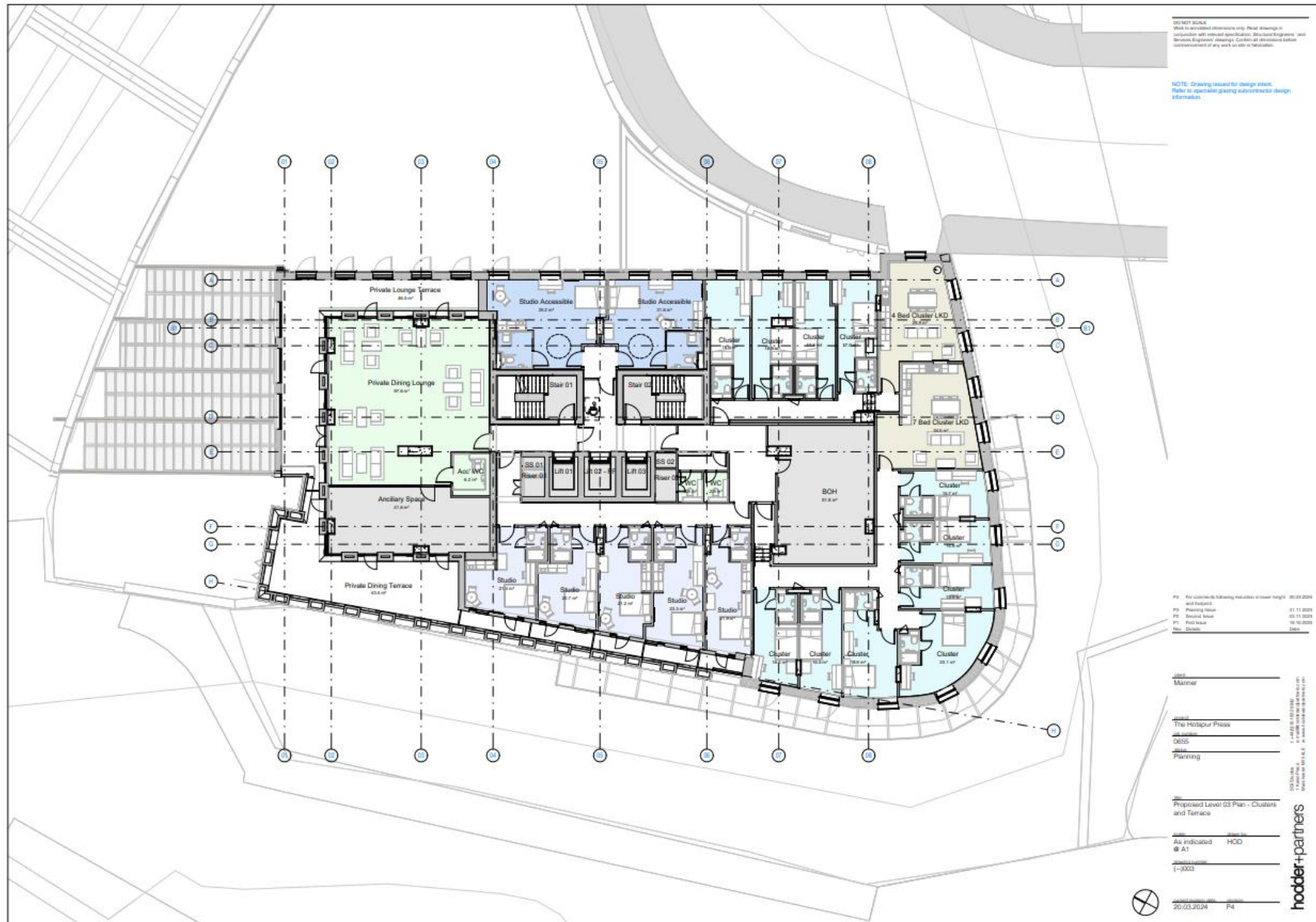


Figure B-4. Level 4 Layout

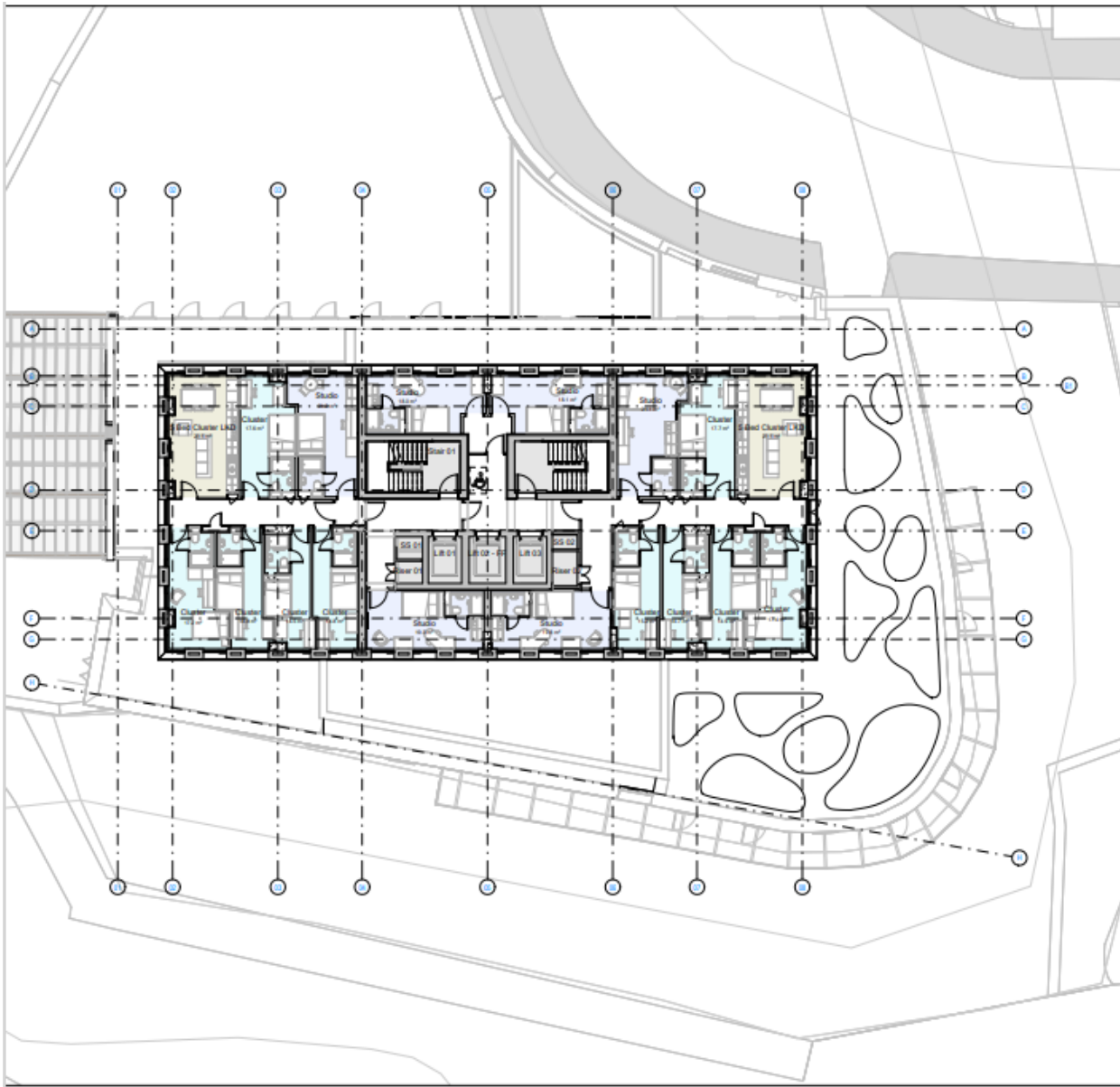


Figure B-5. Level 5, 9, 13, 17, 21 and 25 Layout

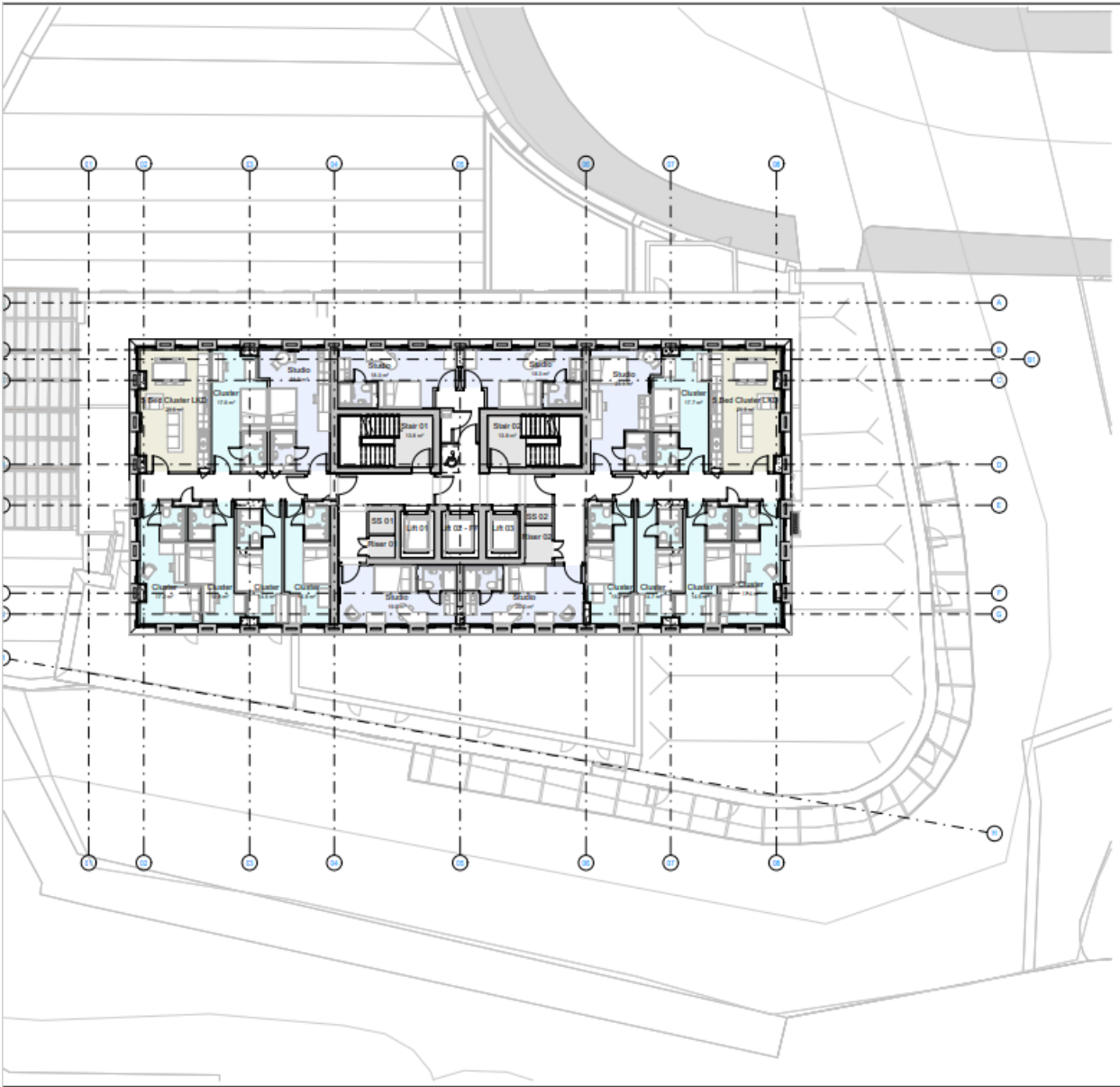


Figure B-6. Level 6-8, 10-12, 14-16, 19, 20 and 22-24 Layout

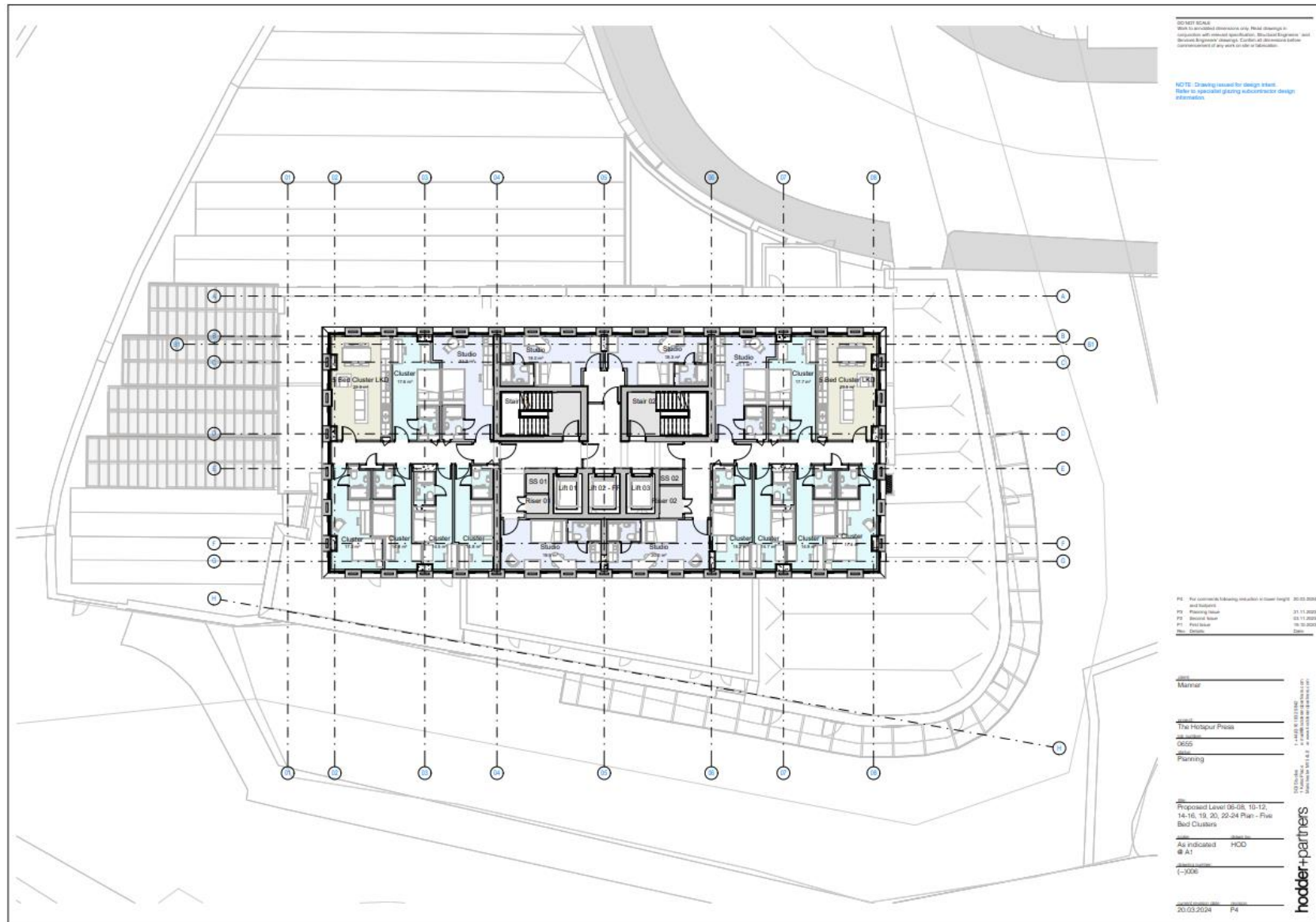


Figure B-7. Level 18 Layout

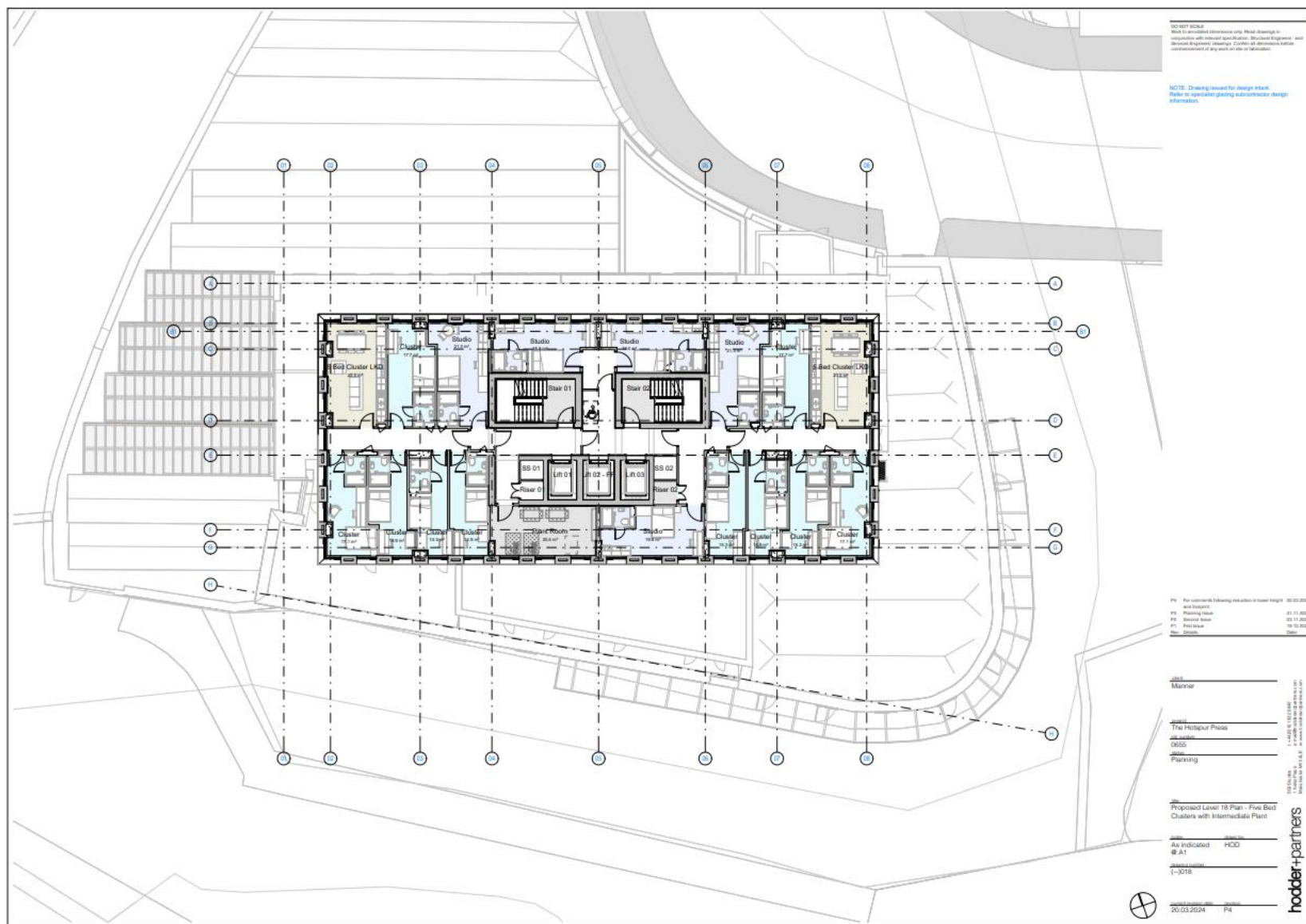


Figure B-8. Level 26-28, 30-32 and 34-36 Layout

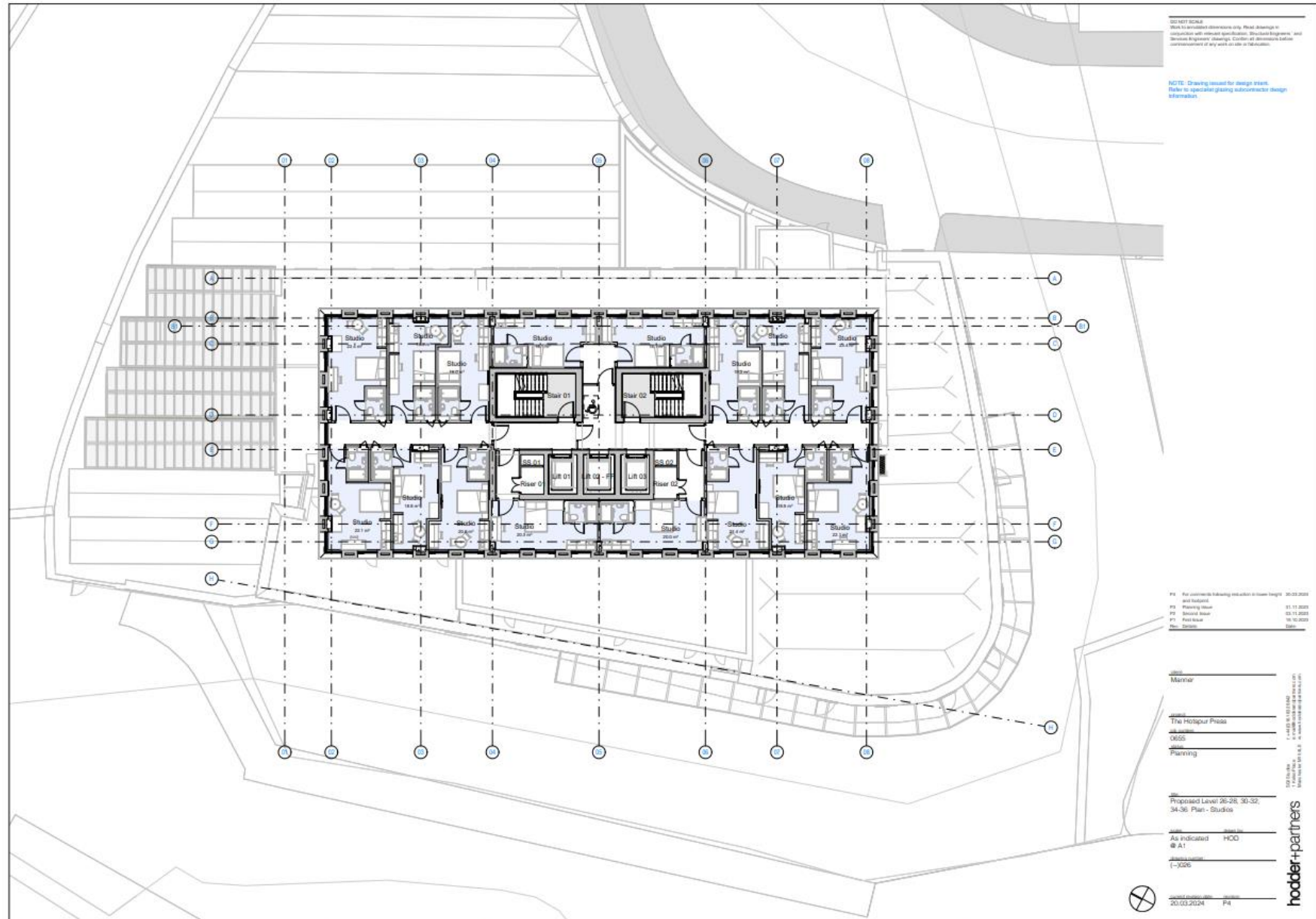


Figure B-9. Level 29 and 33 Layout

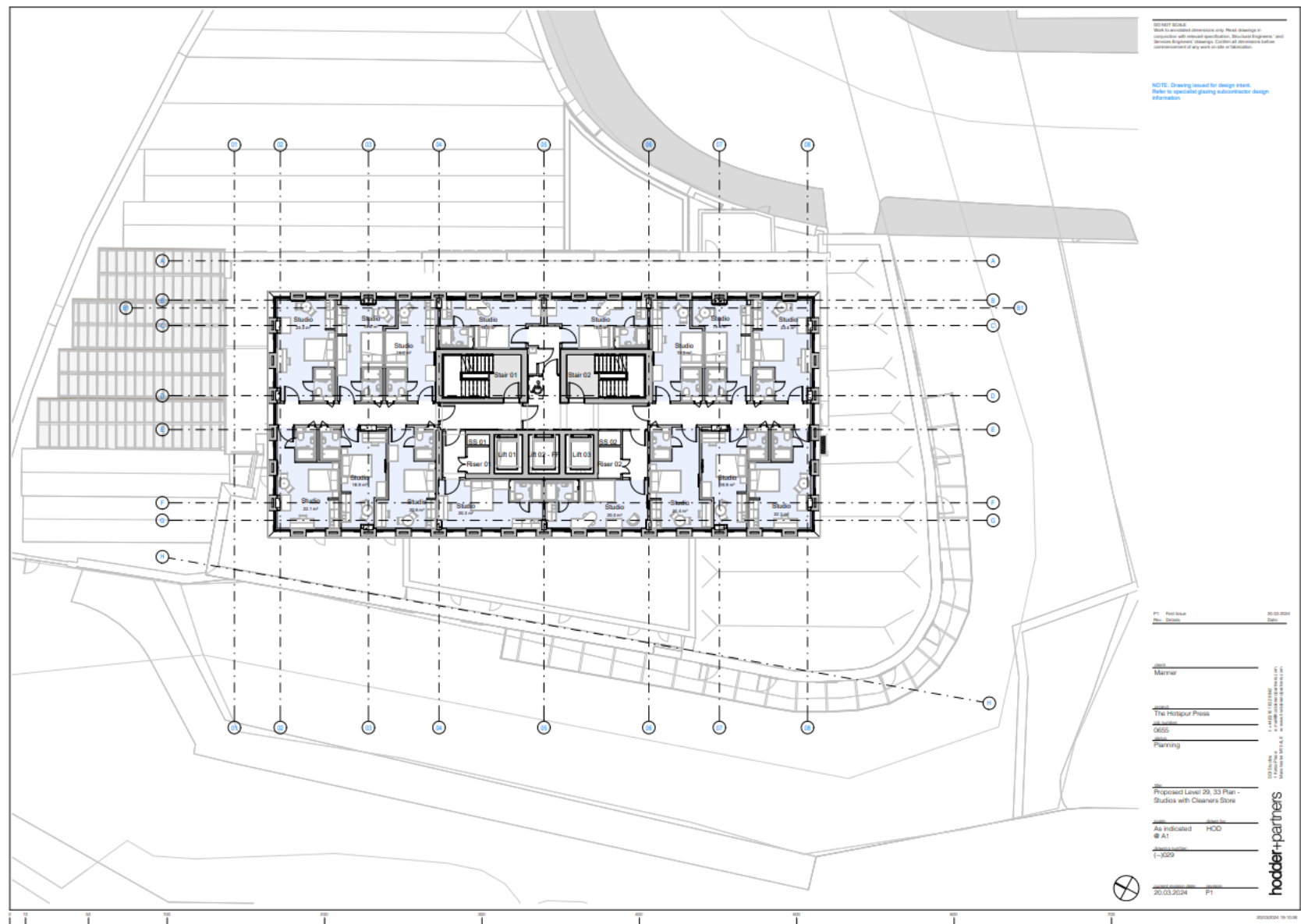


Figure B-10. Level 37 Layout

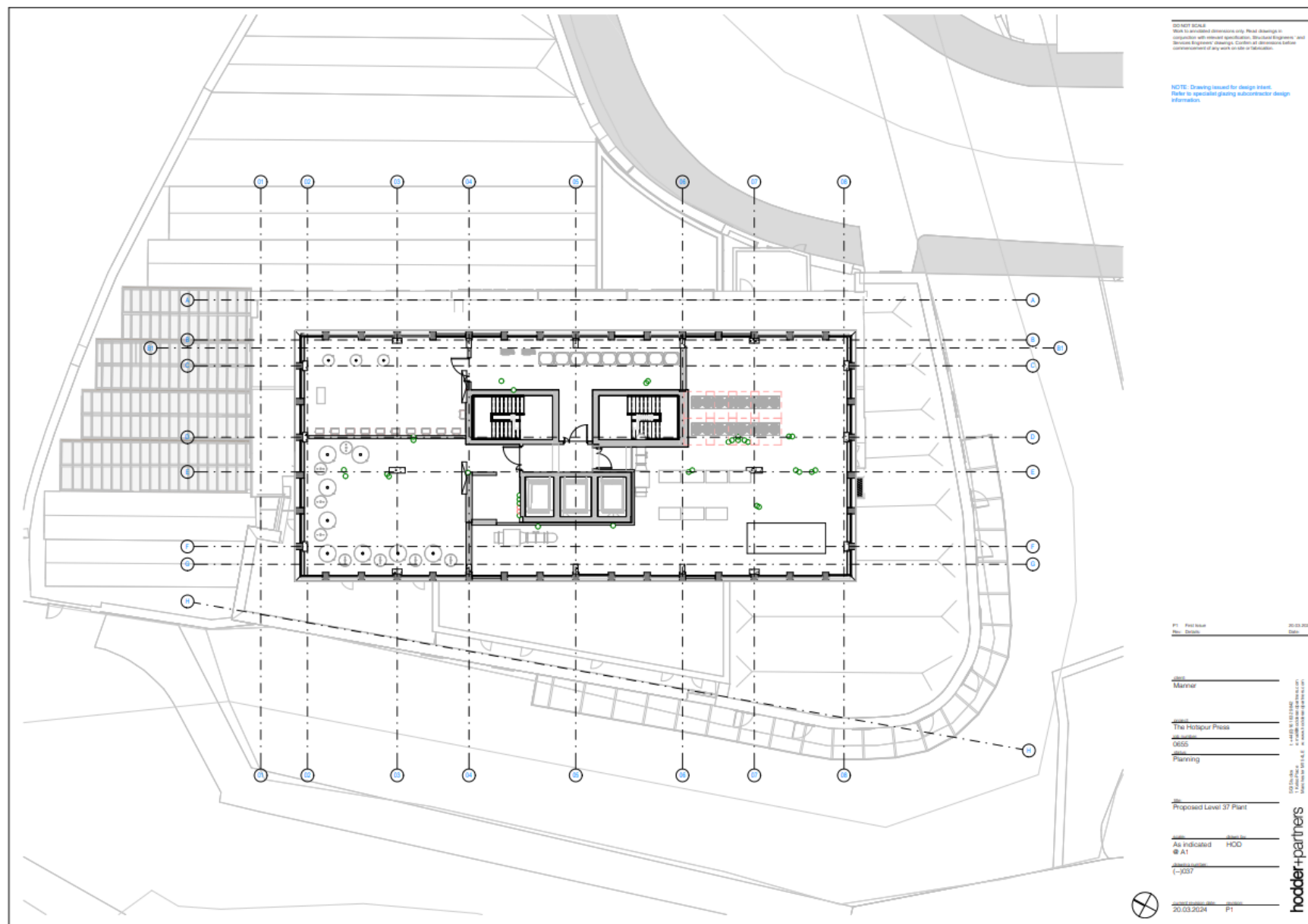
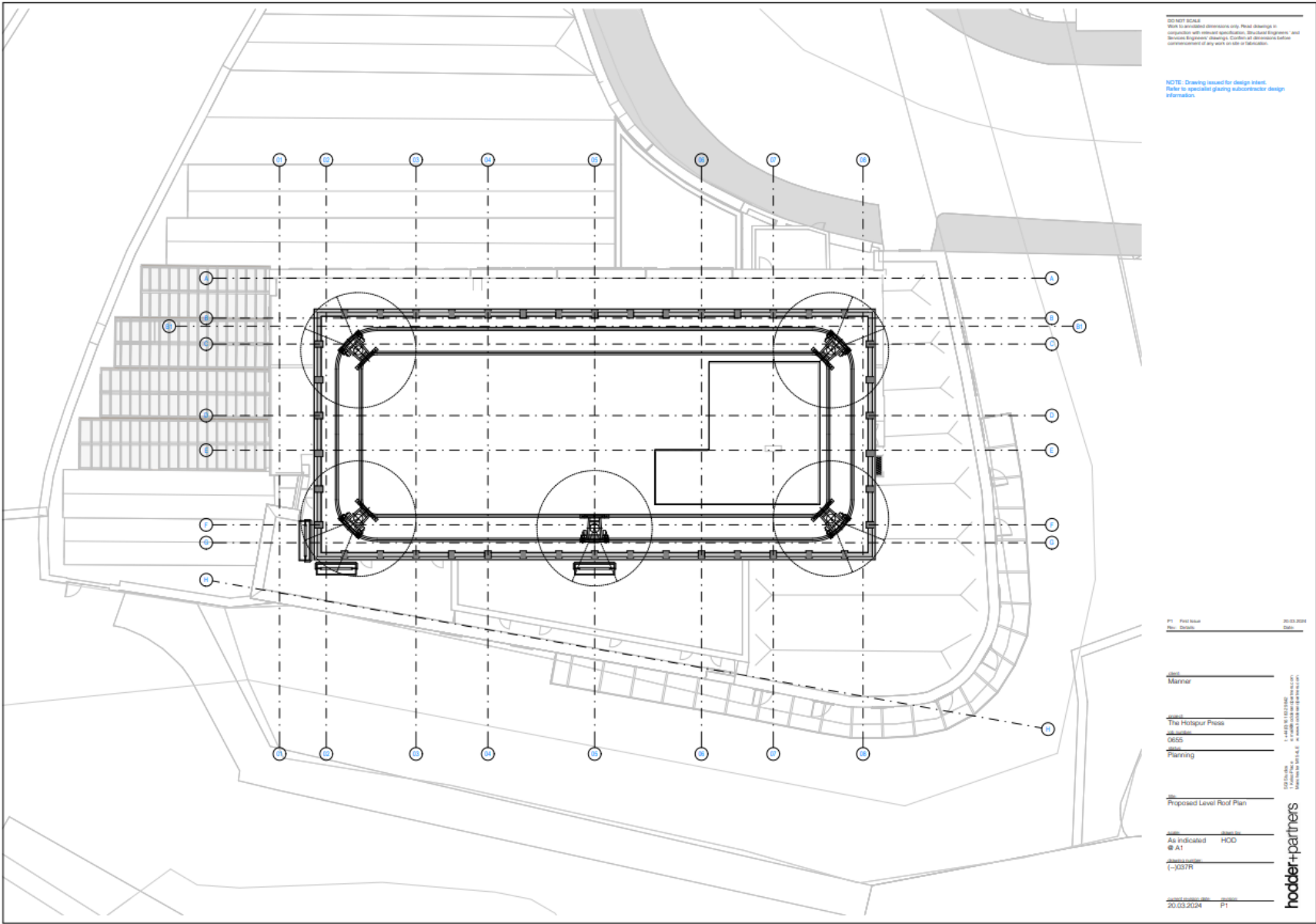


Figure B-11. Roof Layout



APPENDIX C - REPORT TERMS & CONDITIONS

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The whole of the report must be read as other sections of the report may contain information which puts into context the findings in any executive summary.

The performance of environmental protection measures and of buildings and other structures in relation to acoustics, vibration, noise mitigation and other environmental issues is influenced to a large extent by the degree to which the relevant environmental considerations are incorporated into the final design and specifications and the quality of workmanship and compliance with the specifications on site during construction. Tetra Tech accept no liability for issues with performance arising from such factors.