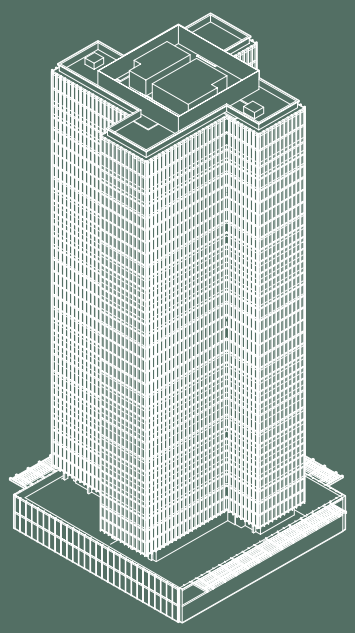

EUSTON TOWER

Feasibility Study Volume One
Assessing the Existing Building

November 2023

British Land

British Land

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CBRE

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Rev: D

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Executive Summary - Volume One

This study forms part of the design evolution and pre-application process to explore options for re-imagining Euston Tower. This document is Volume One of a detailed, three-part feasibility study to assess, in detail and transparently, the opportunities for reuse, degrees of retention and refurbishment of the existing tower.

The tower is centrally located within a key strategic social and economic location (Central Activities Zone, Euston Area Plan and Knowledge Quarter Innovation District), and is one of few existing buildings of this scale and location within the London Borough of Camden. It presents an exciting opportunity to ensure that the site is optimised to its full capacity, and to reinforce the area as a world leading business and innovation location.

A thorough review of the planning policy context has been undertaken, including the National Planning Policy Framework (NPPF) and the local development plan. With office floorspace in this location protected under policy, it is clear that there is overwhelming support for the continued use of the tower as a commercial building.

A "flight to quality" is evident in analysing the current state of the market. Driven by more stringent corporate ESG requirements from tenants, there is an increased desire by large office occupiers to acquire high quality buildings, that satisfy the latest guidance and achieve top certifications like BREEAM, WELL, and NABERS. Floor to ceiling heights play a critical role in lettability, with occupiers in Central London clearly preferring spaces in line with BCO recommendations. The existing structure introduces compromises to achieving these clear floor to ceiling heights, where this is possible.

The existing tower is currently vacant and stripped out, except for the retail tenants at ground level. Based on several condition surveys and assessments, the existing concrete in the sub- and super-structure appears to be in reasonable condition, with good strength, and would accommodate current loads. However, the tower requires significant intervention to key building elements to bring it up to the standard that is required by current Building Regulations and guidance, let alone the standards expected for a contemporary, high quality, flexible, and sustainable building.

- Wide-reaching upgrades of the fire safety provisions are required, including upgrades of the structural fire performance and new fire fighting lifts to meet current Building Regulations
- Existing servicing provisions (e.g. fresh air risers) are insufficiently sized to accommodate current Building Regulations, and new MEP services equipment is required, with almost all of the MEP equipment beyond its service life (and mostly already stripped out)
- The façade does not comply with current Building Regulations and guidance for fire or thermal performance, and many of its components are beyond their service life.

Substantial structural alterations are necessary to deliver these upgrades, including new lift shafts and new risers. Large portions of the floor slab are impacted by these interventions, where entire slab zones need to be removed if any portion of the existing ribbed system is overlapped by new vertical penetrations. The resulting floorplate is spatially inefficient with a net to gross efficiency of ca. 67%.

To accommodate modern MEP services, an increased floor and ceiling zone is required. The resulting clear floor to ceiling height is 2,425-2,475mm with exposed services or 2,375-2,450mm with a dropped ceiling. Regardless of which strategy is pursued, there are extensive areas of the floorplate that are not compliant with the BCO recommendation and would challenge lettability. It is not possible to accommodate lab-enabled spaces within the existing floor to floor height.

Flexibility of the floorplates is restricted by the existing pinwheel layout and positions of the satellite cores, which impede circulation resulting in a disconnected floorplate. Practically this limits the building to single-tenant floors only, and there appears to be no evidence that more than one tenant occupied any single floor plate at any one time.

With the interventions required to bring the building up to current standards, the restrictive existing floor layout, and the constrained floor to floor height, it is clear that the resulting spaces would not be suitable for the Central London market, nor would they support innovation and laboratory spaces with increased servicing requirements. At the same time, there is an opportunity at Euston Tower to create a world leading science, technology and innovation building and public realm for Camden and the Knowledge Quarter that inspires, connects and creates opportunities for local people and businesses.

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Euston Tower

Introduction

1.1 Background

Standing as a forgotten landmark on the northern edge of central London, Euston Tower is the tallest and oldest building in the Regent's Place campus. Comprising 645,000ft^2, it was completed in 1970 as an office building to provide cellular office accommodation typical of the period, and formed part of a wider master plan known as Euston Centre.

The site falls within the London Borough of Camden, and is bounded by Euston Road to the south, Hampstead Road to the east, and the pedestrianised Regent's Place Plaza to the west. It now sits within the Knowledge Quarter Innovation District.

Since its completion in 1970, it has undergone a small refurbishment to add a secondary glazing system and perimeter fan coil system (ca. 1990), but beyond this its external form and façade remain largely as originally constructed. These elements of the building are in a generally poor condition, due to a combination of wear in use and the quality of the original detailing.

Gradually it has been vacated, and since 2021, with the exception of the retail at ground level, the building is vacant.

Accordingly, British Land is seeking to transform Euston Tower into a beautifully designed, sustainable, new building, delivering pioneering workspace, accessible and inclusive spaces for neighbouring communities, and support the development of the local economy. Their vision is to create a world leading science, technology and innovation building and public realm for Camden and the Knowledge Quarter that inspires, connects and creates opportunities for local people and businesses.

As a first step in the re-imagining of Euston Tower, British Land is assessing the opportunities for retention and refurbishment of the existing tower and its basement. At a high level this assessment considers the condition of the existing building and its fitness for purpose, the technical feasibility of upgrades where appropriate, alternative use cases, the economic viability of these scenarios, and options for retention and extension of the existing tower.

Figure 1.1 Euston Tower in 1970 as seen from the BT Tower

1.2 Structure of this Study

This feasibility study is split into three volumes, which together form a detailed and transparent assessment of the opportunities for retention and refurbishment of the existing tower.

This document forms Volume One of the study.

Volume One (this document)
Volume One explores, in detail, the condition of the existing tower. It considers the planning policy relating to the future use of Euston Tower, as well as market requirements for continued commercial use of the tower.

It presents an appraisal of the operation of the existing building, including an assessment of the building services.

Finally it sets out the upgrades required to comply with current legislation, based on a technical review looking at the condition of the architecture, structures, and facade.

Volume One concludes that the cost of upgrades required for continued office use and the quality delivered would make viability challenging, and the resulting product would be compromised in the leasing market. Therefore alternative use cases should be explored.

Volume Two
Volume Two explores pathways for alternative uses within the existing tower. It studies a broad spectrum of realistic use cases, with both single- and mixed-use options, specifically:

- Office-only
- Office and lab
- Residential and office
- Residential and lab
- Residential and hotel
- Hotel-only
- Hotel and student accommodation.

It considers the policy position for each use case in turn, and how the specifics of the site and proposals are suited or unsuited thereto.

It presents stacking diagrams and test layouts, which are developed working through the implications on structures, MEP, fire, and vertical transportation.

As in Volume One, it sets out the upgrades required to comply with current legislation for each respective alternative use case.

Finally it considers the economic viability of the alternative use cases.

Volume Two concludes that only continued commercial use is appropriate, but that additional value is required to improve the viability. Therefore options that generate additional lettable area should be explored.

Volume Three
In response to the preceding two volumes, Volume Three explores options for retention and extension of the existing tower.

It considers commercial use only, and details several options for retaining portions of the existing tower while at the same time extending the floorplates. The options range from maximum retention and extension, through partial retention and extension retaining some floor slabs and/or the core, to new build.

The study shows how, due to the interventions required to comply with Building Regulations, there is no scenario that retains 100% of the existing structure within the existing envelope, and that accordingly the schemes should be judged against an upgraded tower.

Each option entails a different level of complexity. For each option the amount of structural salvage, the buildability and impact of temporary works is assessed. The resulting quality of space is considered looking at grid constraints and floor to ceiling heights. Finally, the impact on flexibility, adaptability, and potential to design for disassembly is studied. This is followed by a feasibility stage whole life-cycle carbon assessment of the options.

Figure 1.2 Three volumes of this feasibility study

1.3 Purpose of this Report

This study forms part of the design evolution and pre-application process to explore options for re-imagining Euston Tower. This document is Volume One of a detailed, three-part feasibility study to assess, in detail and transparently, the opportunities for reuse, degrees of retention and refurbishment of the existing tower.

This document is prepared in response to the requirements of the London Plan 2021, specifically policy SI 7 and its associated guidance on the circular economy, but also takes cognisance of policy D3 with regards to optimisation of site capacity. It is also aligned with the policies of the Camden Local Plan 2017 and its supplementary document: Camden Panning Guidance - Energy efficiency and adaptation which in clause 9.4 requires a condition and feasibility study, and an options appraisal for all major developments proposing substantial demolition.

Section 2 explores the planning policy relating to the future use of Euston Tower, and concludes there is overwhelming policy support for the continued commercial use of the tower.

Section 3 outlines the strategic approach to the relevant policy concerning proposals with significant demolition.

Section 4 sets out the market requirements for continued commercial use of the tower, and the standards and guidance relating to office uses.

Section 5 presents a brief history of the site and an analysis of the existing building.

Section 6 appraises the operation of the existing building, with a detailed assessment of the existing services considering MEP, fire, and vertical transport.

Section 7 sets out the upgrades required to comply with current legislation, based on a technical review looking at the condition of the architecture, structures, and facade.

The findings in this report are based on technical drawings and documentation, as well as the results of extensive non-intrusive and intrusive surveys. These are signposted where relevant throughout the report and included in their entirety in the appendices.

The aim of this study is to outline and explore the various factors — technical, economic, policy-driven, market demand, etc. — that inform a re-imagining of Euston Tower. Together with London Borough of Camden and its stakeholders, this will allow for an informed, fact-based decision to be made for Euston Tower's future. A future which realises British Land's vision to create a world leading science, technology, and innovation building and public realm for Camden and the Knowledge Quarter that inspires, connects, and creates opportunities for local people and businesses.

1.4 Project Team

Client	British Land
Project Manager	Gardiner & Theobald
Cost Manager	Gardiner & Theobald
Architect	3XN Architects
Executive Architect	Adamson Associates
Planning Consultant	Gerald Eve
Structural Engineer	Arup
Services Engineer	Arup
Fire Engineer	Arup
Wind	Arup
Transport & Servicing	Velocity
Lifting Consultant	SWECO (with input from Arup)
Facade Consultant	Thornton Tomasetti (with input from Arup)
Sustainability Strategy	GXN
Sustainability Consultant	SWECO
Daylight	Point2
Market Analysis	CBRE
Financial Viability	DS2

2

Euston Tower

Policy Position

2.1 Land Use Policy Context

2.1.1 General

This section sets out the planning policy context for the use of Euston Tower. It is clear in its overwhelming support for the continued use of the tower as a commercial building. In undertaking this assessment, Gerald Eve LLP have reviewed the relevant site designations and policies set out within the National Planning Policy Framework (NPPF), London Plan (2021) and other documents forming part of the London Borough of Camden's Development Plan, including other material considerations.

2.1.2 Relevant Site Designations

Euston Tower is located in the Central Activities Zone; the vibrant heart and globally-iconic core of London described in the London Plan as **'one of the world's most attractive and competitive business locations'.** Additionally, the Site is located within Camden's Central London Area described in policy terms at a local level as **a major business and employment centre and the main focus of Camden's economy.**

The Site is located within the Knowledge Quarter Innovation District which spans from Camden Town to Holborn and Covent Garden and is home to a world-class cluster of scientific and knowledge-based institutions and companies that specialise in areas such as life sciences, data and technology and creative industries. In recent years, such institutions have started to cluster around the area surrounding King's Cross and Euston Stations and owing to excellent transportation links, a highly skilled workforce and the high quality office and lab space in the vicinity.

The site is adjacent to the Euston Opportunity Area. Opportunity Areas are identified as significant locations with development capacity to accommodate new housing, commercial development and infrastructure (of all types), linked to existing or potential improvements in public transport connectivity and capacity.

The Mayor will provide the support and leadership to ensure Opportunity Areas deliver their growth potential for Londoners. He will promote and champion the areas as key locations for investment, and will intervene where required so that **an ambitious, imaginative and inclusive approach is taken to accelerate and realise their growth and development.**

2.1.3 NPFF

Sustainable development is at the very heart of the National Planning Policy Framework. Paragraph 8, chapter 2 of the NPPF sets out how the planning system can contribute to achieving sustainable development. One of the three overarching objectives is based around economic enhancements **'to help build a strong, responsive and competitive economy, by ensuring that sufficient land of the right types is available in the right places and at the right time to support growth, innovation and improved productivity; and by identifying and coordinating the provision of infrastructure'.**

The other two overarching objectives relate to a social objective – **'to support strong, vibrant and healthy communities...'** and an environmental objective which seeks to **'protect and enhance our natural, built and historic environment; including making effective use of land,** improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.'

Chapter 6 of the NPPF focuses on building a strong, competitive economy. Paragraph 81 states "Significant weight should be placed on the need **to support economic growth and productivity,** taking into account both local business needs and wider opportunities for development. The approach taken should **allow each area to build on its strengths, counter any weaknesses and address the challenges of the future.** This is particularly important where Britain can be a global leader in **driving innovation,** and in areas with high levels of productivity, which should be able to capitalise on their performance and potential."

Paragraph 83 states "Planning policies and decisions should recognise and address the specific locational requirements of different sectors. **This includes making provision for clusters or networks of knowledge and data-driven, creative or high technology industries;** and for storage and distribution operations at a variety of scales and in suitably accessible locations."

Furthermore, para. 125 states that local planning authorities should refuse applications which they consider fail to make efficient use of land, taking into account the policies in this Framework.

2.1.4 London Plan

At a Regional level, Chapter 1 of the London Plan sets out how growth should be managed in the Capital to build strong and inclusive communities, **making the best use of land,** creating a healthy city, delivering the homes Londoners need, growing a good economy and increasing efficiency and resilience.

London Plan Policy GG1 encourages development to seek to ensure changes to the physical environment achieve an **overall positive contribution to London.**

Policy GG2(C) sets out that development should **proactively explore the potential to intensify the use of land to support additional workspaces, promoting higher density development, particularly in locations that are well connected to jobs, services, infrastructure and amenities by public transport, walking and cycling.** London Plan Policy GG2(D) highlights that proposals should use a design-led approach to determine the **optimum development capacity of sites.**

London Plan Policy D3 requires all development to make the best use of land by following a design-led approach that optimises the **capacity of sites.**

London Plan Policy E1 makes specific reference to making improvements to the quality, flexibility and adaptability of office space of different sizes (for micro, small, medium-sized and larger enterprises), to be supported by new office provision, refurbishment and mixed-use development.

Policy E1 continues by recognising the Central Activities Zone (CAZ) as a location for unique agglomerations and dynamic clusters of work city business and other specialist functions.

Policy E2 of the London Plan states development of B Use Class business uses should ensure that the space is fit for purpose having regard to the type and use of the space.

London Plan paragraph 6.1.2 states that it is important that the planning process does not compromise potential growth in the office market, and the CAZ is expected to grow by 59% over the period of 2016-2041.

Policy SD4 of the London Plan sets out how the nationally and internationally significant office functions of the CAZ should be supported and enhanced by all stakeholders, including the intensification and provision of sufficient space to meet demand for a range of types and sizes of occupier and rental values.

Policy E8 of the London Plan states Employment opportunities for Londoners across a diverse range of sectors should be promoted and supported along with support for the development of business growth and sector-specific opportunities. This policy also notes that Innovation, including London's role as a location for research and development should be supported, and collaboration between businesses, higher education providers and other relevant research and innovation organisations should be encouraged.

The Mayor wants London to continue to provide the best environment in the world in which to do business, so that businesses of all different sizes and sectors can reach their growth potential. This includes supporting business and employment across all sectors of the economy and capitalising on new growth opportunities in emerging sectors.

The Central Activities Zone SPG sets out the aspirations of the CAZ and supplements London Plan policies. It recognises that to accommodate projected growth in employment and ensure that the CAZ, north of the Isle of Dogs and Tech City remain globally competitive, London Plan policy should be implemented in ways that **promote and incentivise office and other CAZ strategic functions.** It continues to note that regard should also be had to significant changes in the way business space is being used, including new technologies, employment densities and working practices and the need to accommodate employment growth may also entail **more intensive and higher density development in parts of the CAZ.**

The London Plan also notes that London, Cambridge and Oxford form the "golden triangle" – a world-leading inter-connected region for life sciences research, development, manufacturing and commercialisation. MedCity – a collaboration between London, Cambridge and Oxford Academic Health Science Centres, co-funded by the Mayor – seeks to promote and grow this life sciences cluster. Development Plans should support the range of existing and proposed medical and life sciences research districts associated with MedCity such as those around the Euston Road (including the Francis Crick Institute, Wellcome Trust and University College Hospital); Imperial College London's White City Campus; around Whitechapel, associated with Queen Mary University of London; and the London Cancer Hub. Within this sector there is particular demand for affordable 'grow-on' space (including laboratory space) to ensure London retains the innovations emerging from London-based universities. The networks and facilities that support London's role as a centre of medical excellence should also be supported.

2.1.5 Camden Local Plan

Policy G1 of Camden's Local Plan sets out how the **Council will create conditions for growth to deliver homes, jobs and infrastructure by supporting development that makes the best use of the site,** providing a mix of uses in accessible parts of the Borough (including self-contained housing) to deliver 16,800 new homes, 695,000sqm of new office floorspace and 30,000 sqm of new retail floorspace by 2031. The Council anticipate the most significant growth to be delivered across the Borough, with Central London playing a key role in facilitating that growth.

The Euston Tower is located within the Euston Area Plan, specifically the Euston Road Character Area Development Principle EAP2. This policy states that the Euston Road will be transformed to provide a more pleasant and accessible street environment; opportunities will be made available to improve the setting of heritage assets and Camden and TfL will work with developers and HS2 to improve new road crossings and the overall quality of public realm.

Camden seeks to protect existing employment floorspace under policy E2 of the Local Plan, especially on sites that are suitable for continued business use, in particular premises for small businesses, businesses and services that provide employment for Camden residents and those that support the functioning of the Central Activities Zone (CAZ) or the local economy.

The Camden 2025 Vision seeks to ensure that Camden is a place where everyone has a chance to succeed and where nobody gets left behind. The Council is keen to promote social value as part of development opportunities to maximise public benefit and outcomes that support the public good.

Figure 2.1 Euston Tower under construction, photo undated thought to be ca. 1968

2.2 The Knowledge Quarter

2.1.6 The Life Sciences Sector

London has a long history as a centre for advancement in medicine and biology and today, together with Oxford and Cambridge, forms the 'Golden Triangle', a global hub for life sciences.

In 2017, the Life Sciences Sector Deal which is a partnership between the Government and the Life Sciences industry, set out the first phase of implementing the Life Sciences Industrial Strategy through joint commitments between the Government and the sector to invest in the United Kingdom's life sciences landscape. The sector deal sets out the recommendations for the UK's world-leading life sciences industry to drive growth, increase productivity, improve the use of data, reinforce the country's science base, deepen the UK's skill set and secure benefits for patients throughout the United Kingdom.

The Life Sciences Sector Deal will help ensure new pioneering treatments and medical technologies are produced in the UK, improving patient lives and driving economic growth. The agreements made in the first deal capitalised on the enormous opportunities for growth that the life sciences sector presents for the UK and the continual flow of new investment across health tech and pharmaceutical sectors since the deal was published, with the second deal seeing more life sciences companies investing in the UK and creating high-quality and well-paid jobs. Life Sciences is a sector that operates at the cutting edge of technological developments.

The life sciences industry continues to be one of the most important pillars of the UK economy and the continued strength of the partnership between the government, the NHS (National Health Service) and the life sciences sector is continuing to make the UK a global standard-bearer for discover research and advance manufacturing.

2.1.7 The Knowledge Quarter

The Knowledge Quarter (KQ) Partnership was established in December 2014 to recognise and develop Camden's strength as a thriving knowledge economy with world-class institutions in science and creative industries. The KQ is a consortium of partner organisations of many different kinds but all actively engaged in disseminating knowledge. They are formed of over 100 academic, cultural, research and scientific and media organisations and their vision is described as 'transforming lives through innovation.'

The KQ identify their four strategic priorities as follows and the proposals for the redevelopment of Euston Tower have been developed with these values at its core:

1. Advocacy – the Knowledge Quarter will increase the area's profile through advocacy and stakeholder engagement, both nationally and internationally
2. Knowledge exchange – The Knowledge Quarter will facilitate knowledge exchange and identify opportunities for openness, collaboration and networking between its members
3. People – The Knowledge Quarter will work with its members to increase public access to their knowledge resources and collections, creating opportunities for exchange with local citizens
4. Place – The Knowledge Quarter will work with its members to identify and support work that improves our local environment, creating a great place for people to live, work and visit.

Camden has a thriving knowledge economy with world-class academic, cultural, research, scientific and media institutions and organisations. In recent years these institutions and organisations have started to cluster in the area surrounding King's Cross and St Pancras and Euston Stations. The area has seen tremendous growth owing to the excellent transportation links, highly skilled workforce high quality office and laboratory floorspace and the enhanced retail, art and leisure offer.

Draft Site Allocations Local Plan policy KQ1 states that to ensure the sustainable growth and success of the Knowledge Quarter Innovation District, major proposals for additional employment, research and/or learning floorspace within it must demonstrate that proposals have been developed collaboratively.

The draft policy also proposes that at least 20% of additional employment floorspace is affordable workspace.

Knowledge Quarter policy KQ1 states that schemes coming forward within the policy area should **ensure development and its occupiers contribute to reducing inequalities and increasing life chances in neighbouring communities and the borough generally through maximising social value at the planning, construction and end user phases, including supporting increased access to jobs, skills training and education opportunities.**

The site presents an excellent opportunity to enhance, promote and sustainably improve the Knowledge Quarter through the provision of a range of flexible commercial floorplates which could accommodate wet or dry labs or headquarters space for KQ uses.

In accordance with Camden's aspirations for the KQ, as set out in the Draft Site Allocations Local Plan Policy KQ1, any floorspace proposed should support future reconfiguration for different activities and where possible include flexible floorplates, plant room and mechanical and electrical systems that allow a change from offices to laboratories or vice versa. Suitable floorspace for priority growth sectors within the district such as life sciences, digital collections and machine learning will also be required.

2.3 Policy Summary

Euston Tower is located centrally within one of Camden's and London's most strategically important, and thriving, economic areas. Maintaining, protecting and promoting the world class status of this business hub is crucial to the economic success of Camden, to encourage market leaders to the area and provide a range of jobs for local people and across London.

Euston Tower is centrally located within the CAZ, Euston Area Plan and Knowledge Quarter Innovation District, and is one of the few existing buildings of this scale and location within the London Borough of Camden. There is therefore an exciting opportunity to ensure that the site is maximised to its full capacity, in line with London Plan and Camden policy aspirations, to cement the area as a world leading business and life sciences location. Ensuring that the area is maintained as a leading centre will enable Camden to compete on the world stage in business and innovation.

Ultimately, office floorspace in this location is protected under regional and local planning policy. The loss of the commercial floorspace would not only be contrary to policy but would be a lost opportunity to provide world class commercial floorspace in this sustainable location which would complement and enhance the economic prosperity of the area. A commercial building of this size could provide significant opportunities for local people through a range of jobs, through the construction and operational phase of the development and provide a focal point for the community.

Euston Tower is currently vacant above ground floor level. There is little prospect of letting the floorspace in its current state due to the various technical and market considerations as set out in this report. The tower in its current state is therefore not maximising the capacity of the site, in this strategic social and economic location and there is an opportunity to maximise the capacity of this underutilised site by providing higher quality floorspace and ultimately provide jobs for local people in Camden and across London.

Figure 2.2 View from base of Euston Tower 2022

3

Euston Tower

Strategic Approach

3.1 Strategic Approach

3.1.1 Policy Requirements and Guidance

London Plan Policy SI 7 Reducing waste and supporting the circular economy, sets out how Greater London will achieve "resource conservation, waste reduction, increases in material re-use and recycling, and reductions in waste going for disposal". All referable developments are required to submit a Circular Economy Statement as part of the planning application.

The LPG Circular Economy Statements (March 2022), sets out detailed guidance to assist with the introduction of circular economy principles. It sets out an approach (reproduced from London Plan Policy D3, see Figure 3.1), where retaining existing built structures totally or partially should be prioritised before considering substantial demolition.

Where existing buildings are present on site, the GLA's decision tree (see Figure 3.2) should be followed to inform the design process. Paragraph 2.4.5 requires "when assessing whether existing buildings are suited to the requirements for the site, applicants should robustly explore the options for retaining existing buildings (either wholly or in part). Where disassembly or demolition is proposed, applicants should set out how the options for retaining and reconstructing existing buildings have been explored and discounted; and show that the proposed scheme would be a more environmentally sustainable development".

This "robust exploration" takes the form of pre-redevelopment and pre-demolition audits. Paragraph 4.6.3 requires that "if there are existing buildings on a site, a third-party, independently verified or peer-reviewed pre-redevelopment audit is strongly encouraged, including analysis that fully explores options for retaining existing structures, materials and the fabric of existing buildings into the new development; and the potential to refurbish buildings before considering substantial demolition".

Policy SI 2 Minimising greenhouse gas emissions sets out requirements for all major development to be net zero carbon, as well as calculating embodied carbon of developments. Further guidance is given in the Energy Assessment Guidance (June 2022), and LPG Whole Life-cycle Carbon Assessments (March 2022) respectively.

These requirements will be complied with as part of a full planning application for a single development option (to follow).

The Camden Local Plan 2017 Policy CC1 Climate change mitigation, sets out how the council will require " all development to minimise the effects of climate change and encourage all developments to meet the highest feasible environmental standards that are financially viable during construction and occupation". Paragraph 8.3e requires "all proposals that involve substantial demolition to demonstrate that it is not possible to retain and improve the existing building".

Detailed guidance on Policy CC1 is given in Camden Planning Guidance (CPG) Energy efficiency and adaptation (January 2021).

This feasibility document sets out to explore whether the existing the building can be retained or refurbished, and how it may be incorporated into a new development. It follows the framework of the CPG Energy efficiency and adaptation (specifically Chapter 9) which goes beyond the requirements of a pre-redevelopment audit as set out in LPG Circular Economy Statements Paragraph 4.6.2.

The majority of the CPG is concerned with operational carbon emissions (energy performance). Any proposal taken forward would seek industry-leading energy performance. It is acknowledged that an assessment against all relevant elements of planning policy will be required for a for a full planning application for a single development option, though at feasibility stage it is too early to address all planning requirements in the London Plan, Camden Local Plan, and CPG. Accordingly they do not form part of this document.

Section 3.1.2 outlines the approach that will be taken as part of the full planning application (to follow) by stepping through the CPG chapters. This feasibility document in totality, is intended to satisfy the exploration of options for retaining and redeveloping the existing building.

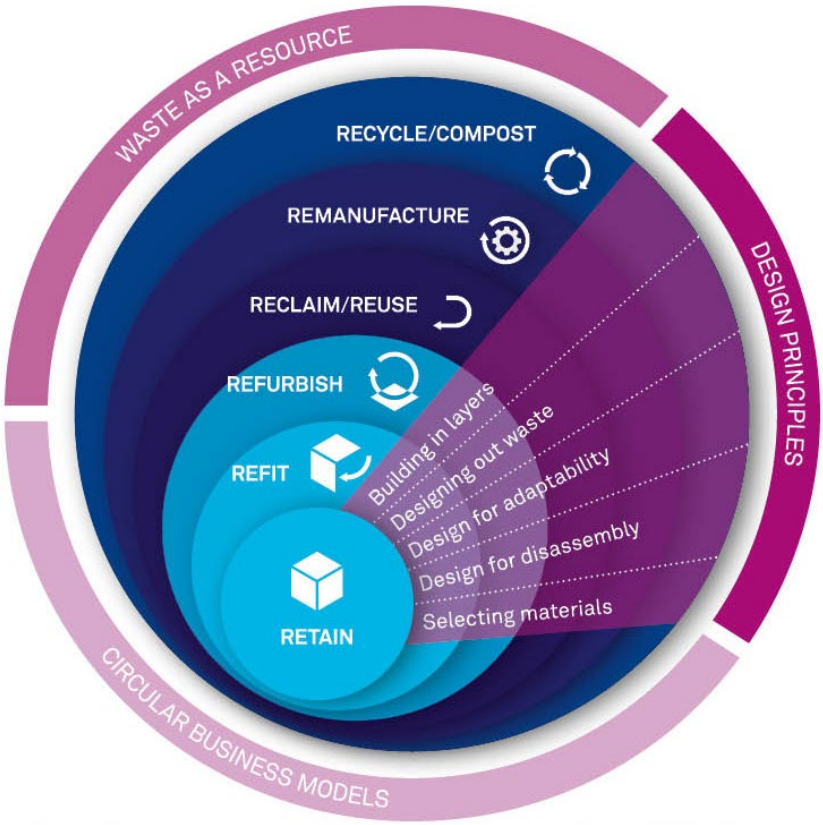


Figure 3.1 Circular economy hierarchy for building approaches. Source: LPG CE Statements / Building Revolutions (2016) Dave Cheshire

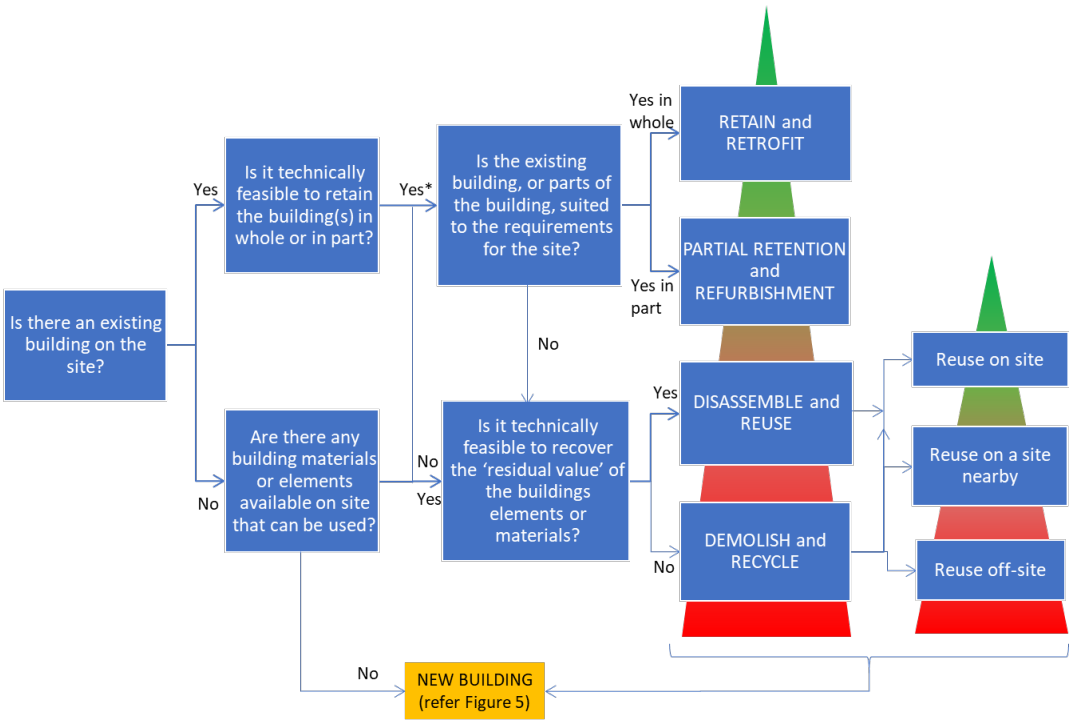


Figure 3.2 Decision tree for design approaches for existing buildings. Source: LPG CE Statements

3.1.2 Camden Planning Guidance (CPG) Energy efficiency & adaptation

General

Regardless of redevelopment option, to realise the aspiration of a net zero building in operation, the building form and function must be considered from the outset and respond holistically to realise these project targets throughout all the projects development stages.

The Climate Emergency Design Guide by the Low Energy Transformation Initiative (LETI) has been used as a basis for brief setting. It identifies key areas of focus for leading energy performance, and has enabled to the team to challenge a typical brief to reduce the internal gains (low solar but maximising daylight and desirable views from the floors), relaxed temperature set points, and appraising the viability of natural ventilation where possible.

Strategic objectives within London and Camden have shifted significantly in the last five years with developments expected to have sustainability credentials, for both planning approval and for market attractiveness to tenants (see Section 4). A clear route to achieving net zero carbon is the bedrock of all best-in-class buildings' sustainability strategies.

A whole life-cycle approach for net zero carbon requires the right design brief, and clear thinking about the sequencing of interventions and innovations. A site-specific approach is crucial to take advantage of local opportunities and avoid over design. Employing a series of measures to reduce carbon, both embodied and operational, will be required regardless of development option. See Figure 3.3.

The Camden Planning Guidance Energy efficiency and adaptation (January 2021) has been considered as part of the design process. The following provides an overview of our approach to ensuring alignment with best practice sustainable development, the local plan, and its CPG.

Energy Hierarchy

For all development options, the building will be developed in line with the energy hierarchy.

- **Be Lean** A fabric first approach will be adopted, utilising passive measures to use less energy. This will be achieved with a high performance fabric, limiting solar gains through passive shading and limited glazing areas with low g-values. An on-floor plant strategy may be proposed to maximise controllability and reduce energy waste. High efficiency plant and services, combined with fabric performance, will ensure a lean building.
- **Be Clean** An all-electric building using simultaneous air source heat pumps will be proposed to maximise energy efficiency and reduce carbon emissions in operation.
- **Be Green** The introduction of renewable energy through maximising the installation of renewable heat pumps (in heating) and photovoltaic panels where possible.

An energy strategy in accordance with the London Plan Energy Assessment Guidance and CPG Energy efficiency and adaptation, will be developed and submitted as part of a full planning application (to follow).

Making buildings more energy efficient

All development options will provide a step change in building efficiency over the existing building performance. There is limited record information, but it is predicted that the existing building performance is 300kWh/m^2/annum with the anticipated schemes targeting 90-100kWh/m^2/annum.

The Energy Performance Certificate (EPC) for the building as a whole was undertaken in December 2019, and is valid until January 2030 (certificate number 9728-3062-0910-0090-6091). The EPC achieved Band E with a 121 rating, and primary energy use of 178 kWh/m2/annum. A similar modern building would be expected to achieve EPC B at a minimum. The EPC is available at: https://find-energy-certificate.service.gov.uk/energy-certificate/9728-3062-0910-0090-6091.

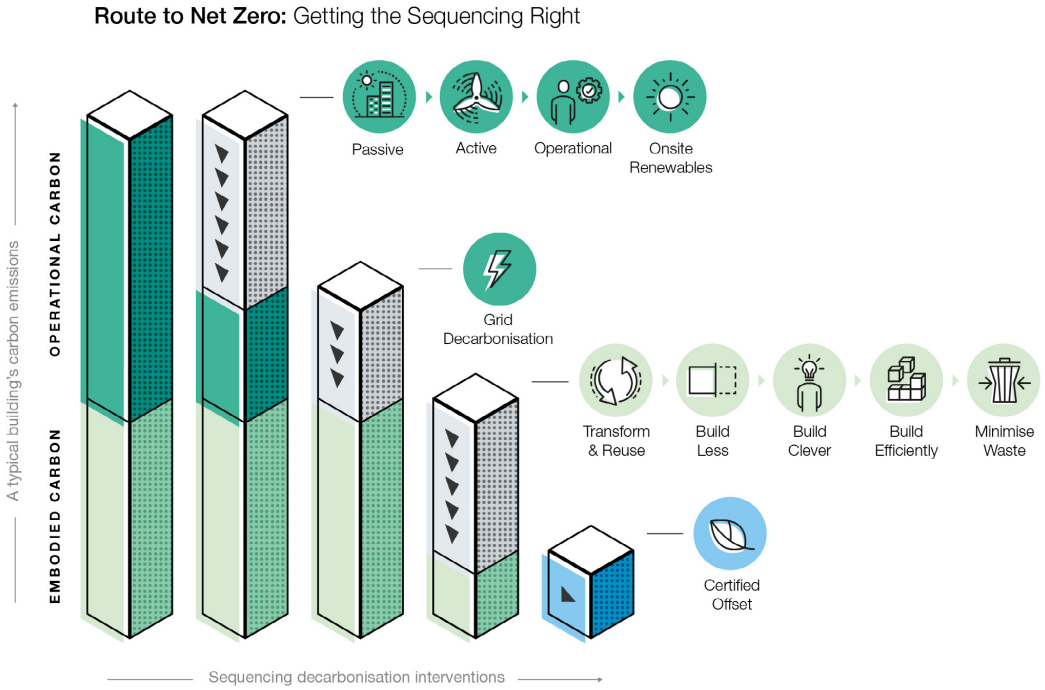


Figure 3.3 Sequencing of interventions for net zero development. Source: Net Zero Carbon Buildings: Three Steps to Take Now, Arup

Energy Targets and Net Zero

Typical high rise office buildings in London currently consume circa 140-160kWh/m²/annum of energy, and this can be significantly higher for lab-enabled buildings. Reducing the number through design is important for attracting the best tenants and as such the development is targeting an aspirational target for the office component of the building of 90-100kWh/m²/annum regardless of development option. Performance for lab-enabled spaces are contingent on specifics of the occupier.

By the use of REGO-backed electricity for the remaining energy consumption, the development could be truly net zero carbon in operation. This would constitute an exemplary development and market facing offer.

Decentralised energy
It is proposed that the building services strategy will use an air-source heat pump (ASHP) wet system. Space provision will be held for a future district heating connection.

Renewable energy technologies
The building service strategy will employ an ASHP system and seek to maximise on other building renewables such as PV. These options will be appraised as part of the Energy Statement for a full planning application for a single development option, and BREEAM ENE 04 Low and zero carbon technologies study.

As part of the Energy Statement, we will appraise the 20% "Be Green" target and will endeavour to maximise this but it is recognised this could be a challenge due to the limited roof area of a tall tower.

Energy statements
To be developed as part of a full planning application for a single development option.

Energy reduction
All options will deliver a step change in building efficiency over the existing building performance. There is limited record information, but it is predicted that the existing building performance is 300kWh/m^2/annum with the anticipated schemes targeting 90-100kWh/m^2/annum.

Performance against the London Plan energy targets, and the estimation of any carbon offsetting contribution, will be assessed in the Energy Statement as part of a full planning application for a single development option.

Energy efficiency in existing buildings
All options will deliver a significant improvement over the existing building (see Section 6.2), through:

- Fabric, improved solar and thermal performance
- Internal gains optimised in line with industry best practice
- New highly, all-electric efficient central plant.

Reuse and optimising resource efficiency
This chapter in the CPG sets the framework for this feasibility study document. CPG Paragraph 9.4 outlines the information required to inform decision making with a "transparent and holistic approach to assessing options that deliver the best outcomes". Refer to Figure 3.4 for details of where to locate this information in this document.

Considering the condition of the existing bundling and its feasibility of reuse, CPG Paragraph 9.5 sets out requirements for exploring potential options for redevelopment. It recommends a hierarchy ranging from (I) refit to (IV) reclaim and recycle. These descriptions loosely map against the GLA decision tree in Figure 3.2. All options should optimise resource efficiency (in line with CPG Paragraphs 9.9 - 9.12). The CPG recognises that some development options may be hybrids of the hierarchy.

Five options across this spectrum are explored in Volume Three of this feasibility document, including feasibility whole life-cycle carbon assessments:

- Major Refurbishment (refurbish / refit)
- Retention and Partial Extension (substantial refurbishment and extension)
- Retention and Extension (substantial refurbishment and extension)
- Partial Retention and Extension (substantial refurbishment and extension)
- New Build (reclaim and recycle).

	CPG PARAGRAPH 9.4	WHERE TO FIND THIS INFORMATION
EXISTING BUILDING USES	How well does the building function? Identify operational positives/ negatives.	Volume One, Section 5.3
	Existing user surveys (if occupied) to understand what works / or doesn't work.	Currently vacant. Volume One, Section 5.3
	If the building is not occupied have other options for reuse been explored?	Alternative Use Study. Volume Two
SERVICING	Summary of MEP (Mechanical, Electrical, Plumbing) servicing, thermal performance and efficiency for each building component.	Volume One, Sections 6.1 - 6.6
	Identify remaining lifespan of plant and discuss pros/cons of plant upgrade.	Volume One, Section 6.1 - 6.6
TECHNICAL: REVIEW, WITH EVIDENCE AND PHOTOS, OF EXISTING BUILDING, BASED ON INTRUSIVE SURVEY	Upgrades required to comply with current legislation.	Volume One, Section 7.4
	A material inventory audit, including an estimate of embodied carbon.	Volume One, Section 7.5 & Appendix M
	Scaled section drawings showing slab depths, floor to ceiling dimensions etc.	Volume One, Section 7.1
	Loading capacity of structural frame, materials strength, pile testing.	Volume One, Section 7.2
	Energy performance of the façade.	Volume One, Section 7.3
	SBEM (Simplified Building Energy Model) energy modelling.	Valid EPC available. Volume One, Section 6.1
	Details of Air Tightness, thermal bridge modelling and condensation analysis in exploration of limits to fabric upgrade in existing building.	Fabric beyond its service life and upgrade is not feasible. Volume One, Section 7.3
	Future projections for carbon content of electric load should incorporate latest BEIS carbon factors.	Included in carbon assessments. Volume Three, Section 17
SITE CAPACITY	What is the best use of the site? And can optimal site capacity be achieved?	Volume One, Section 5.4

Figure 3.4 Information required for condition and feasibility studies (to understand the reuse potential of the existing building/s

4

Euston Tower

Market Commentary & Standards and Guidance

4.1 Market Commentary

4.1.1 General

The following Section describes the current office market conditions with reference to Euston Tower.

It explores said market conditions, what is driving change in the market, and compares with other Central London competing markets. At the same time it sets out how this, as well as the inherent characteristics of the existing Euston Tower, influences its potential lettability.

4.1.2 Office Occupier Preferences and Impact on the Market

One of the most notable trends to have emerged in office markets over recent years (likely accelerated by the pandemic but not caused by the pandemic) is an increased desire by large office occupiers to acquire high quality buildings. This is shown in Figure 4.1 where the MSCI yield quartiles are used as proxy for prime (low yield quartile) and secondary assets (high yield quartile), and there is a forecast, growing divergence between these asset classes.

The drivers of the flight to quality are multi-faceted and include corporate ESG targets and the use of real estate as a tool in the war for talent. This so-called "flight to quality" shows itself both in survey evidence and in the market data.

CBRE's annual EMEA Occupier Survey provides useful insight into the preferences of occupiers. When asked what the most in-demand building features are, the majority of responses are related to the building quality or demand for high quality amenity-rich space. Refer to Figure 4.2.

This clearly points to a preference for modern buildings. With the most in-demand feature identified as "flexible open space", which reinforces the view that the space at Euston Tower needs to be suitable for reconfiguration, unlike the existing space.

MSCI yield quartile forecasts, Central London, ERV, April 2022

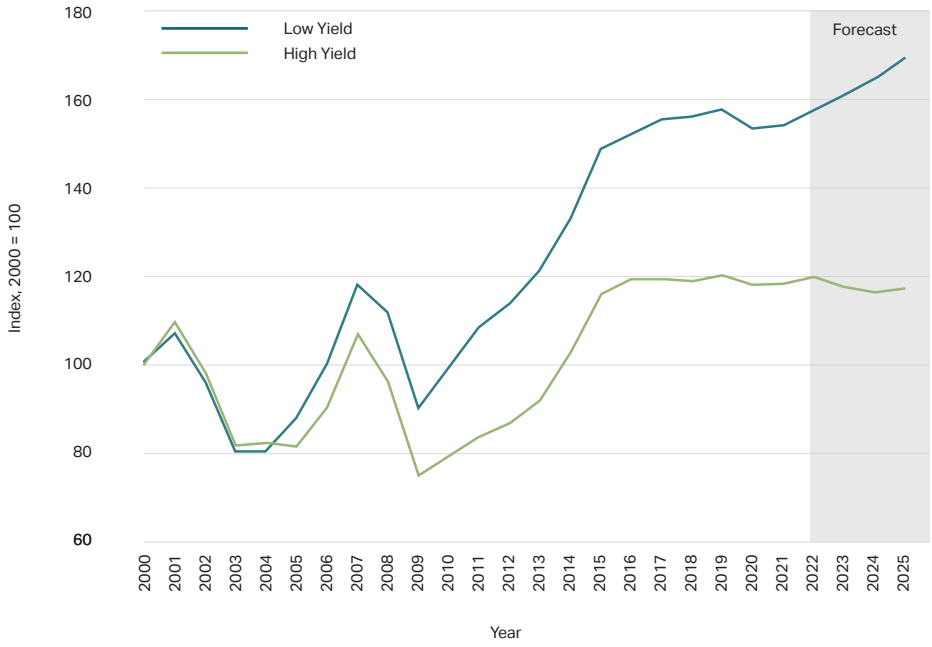


Figure 4.1 MSCI yield quartile forecasts, Central London, ERV, April 2022. Source: CBRE Research / MSCI

"What will be the most in-demand building offering(s) in the future?"

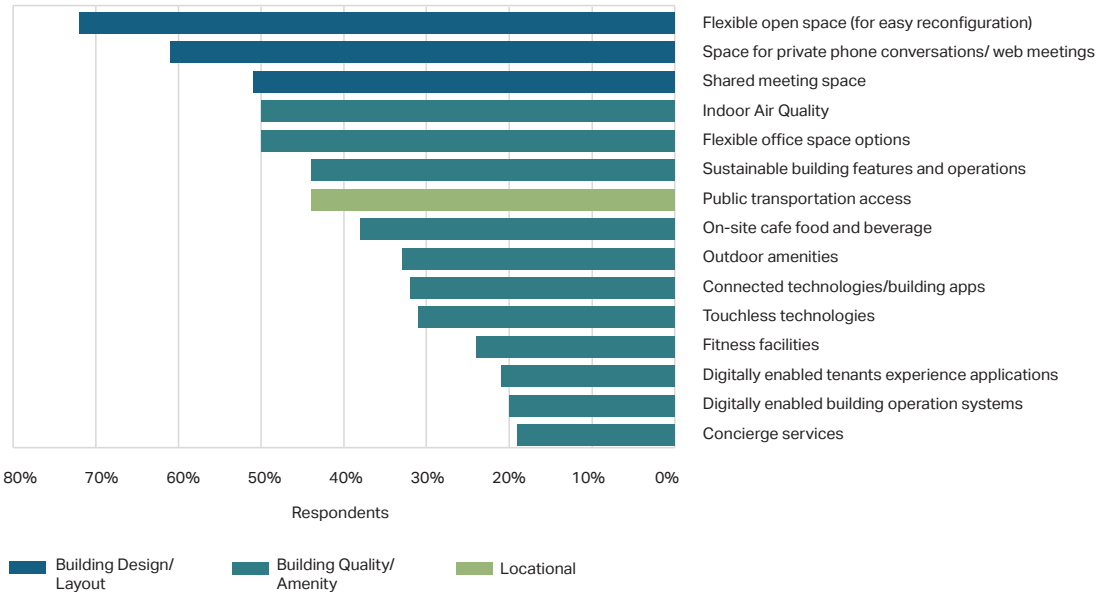


Figure 4.2 CBRE EMEA Occupier Survey 2022. Source: CBRE Research

The number of super-prime deals transacting has increased in recent times. Over the 12 months to the end of Q3 2022, 13% of all deals done in Central London were transacted at a rent above the prevailing prime level, a significant shift from 10 years ago when just 5% of deals were transacted at a super-prime level. Refer to Figure 4.3.

Just as demand for higher quality space has increased (evidenced by the increase in the number of super-prime deals), so has the demand for poorer quality space fallen. This is shown in Figure 4.4. Second-hand space is becoming increasingly difficult to lease. At the end of Q3 2022, vacant second-hand space had been on the market for an average of over two years (760 days), whereas newly completed vacant space had been on the market for an average of 1.25 years. The "time on market" 10-year average for new space is just over one year (370 days), whereas for second-hand space the average "time on market" is 420 days.

The average "time on market" of new space is broadly within the range of historic norms, accounting for the long period during Covid restrictions that saw historically low levels of take-up (Q2 2020-Q2 2021). **The average "time on market" of second-hand space, however, is unprecedentedly high, 63% higher than at the previous high point in 2019.**

Not all second-hand space is necessarily of poor quality. Some of the better quality, large, well located second-hand space has leased successfully in recent months including Stirling Square in St James's and 20 Grosvenor Street in Mayfair. The out-performance of higher quality second-hand buildings implies that poorer quality second-hand space is on the market for an extremely long period of time and has likely become technically obsolete.

CBRE classifies availability as one of three qualities: second-hand; newly completed or new early marketed. Newly completed space is space which has been either newly built or comprehensively refurbished prior to its first letting, early marketed space is space in the development pipeline and due for completion within 12 months. Second-hand space covers all other types of space. While this does not necessarily denote the space is of poor quality, at the current time, the overwhelming majority of second-hand space is of poor quality.

Central London take-up and deals transacted above prevailing prime, rolling 12 months

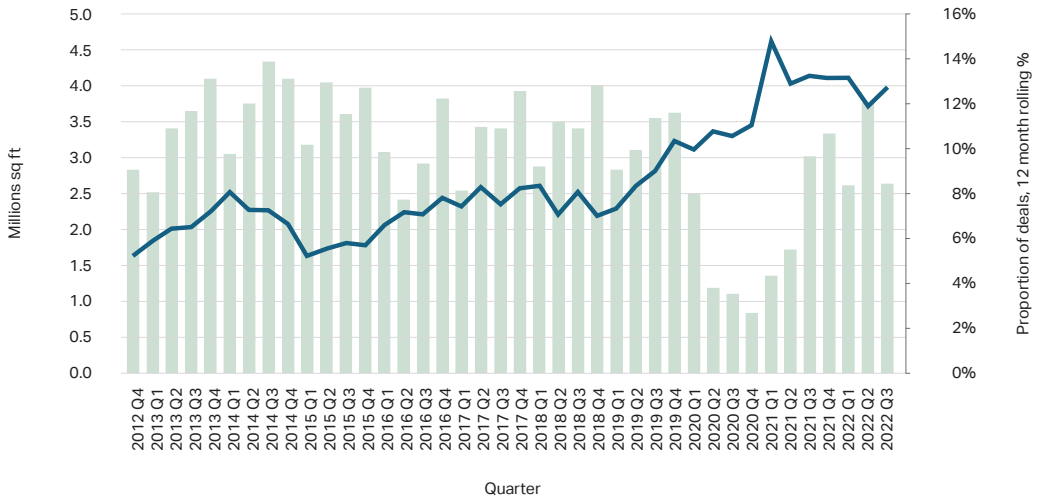


Figure 4.3 Deals transacted above prevailing prime. Source: CBRE Research

Average days on market of vacant stock, Central London

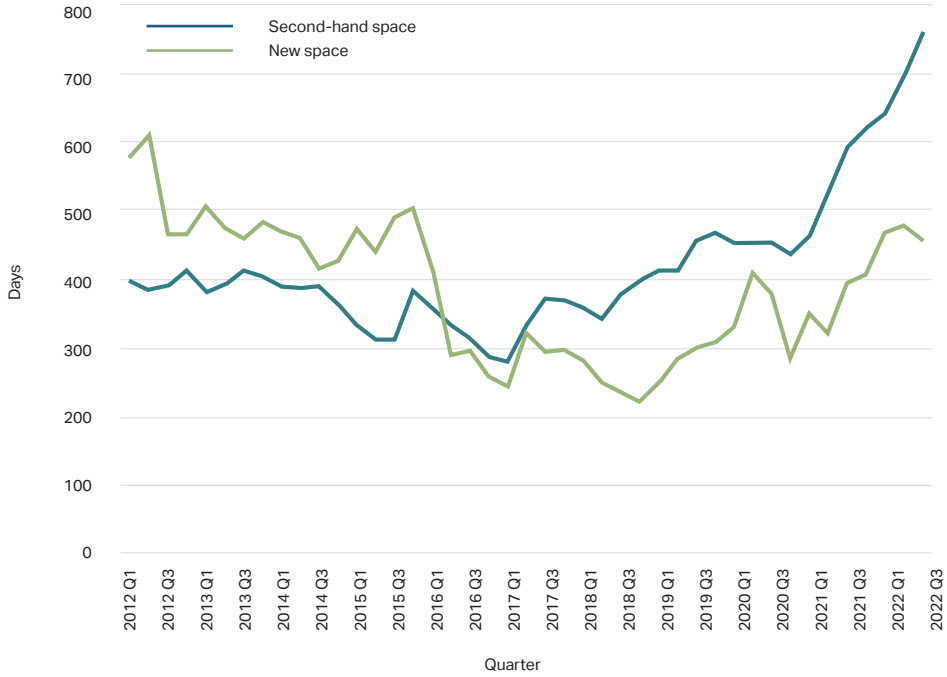


Figure 4.4 Average days on market of vacant stock in Central London. Source: CBRE Research

4.1.3 Impact of Floor to Ceiling Heights

The floor to ceiling heights (and by implication floor to floor heights) are a critical factor in determining the feasibility of retaining elements of the existing structure. Indeed regardless of the intervention, it is crucial that the space delivered is attractive to the market, and eminently lettable.

From Carl Elefante's perspective, the greenest building may well be the one already built. But also, it must be occupied.

As referenced in Section 4.2.2, in its Guide to Specification, The British Council for Offices (BCO) recommends floor to ceiling heights. For new-build it recommends between 2.6 and 2.8m, while for refurbishment the recommendation is 2.45 - 2.8m.

The existing floor to ceiling heights (2.55m, see Figure 7.4) at Euston Tower sit outside of this range for new build.

For refurbishment, the existing clear height is already at the lower end, and would be reduced with the introduction of modern services which are required. Without a ceiling, it would be possible to achieve the lower range of the floor to ceiling heights in limited areas, noting that significant areas would be compromised and/or non-compliant. With a ceiling included, the floor to ceiling heights would fail to meet the recommendations of the BCO across extensive portions of the floorplate (refer to room sections in Section 7.4). The evidence suggests that the market demands significantly taller floor to ceiling heights than currently exist at Euston Tower, especially for larger floorplates at the higher end of the market which Euston Tower will provide.

Larger Floorplates (20,000+ sq ft)

When analysing the Central London deals for floorplates of larger than 20,000 sq ft, it is clear that occupiers have a preference for floor to ceiling heights in-line with BCO recommendations. Of the 521 leasing transactions in the last 10 years (Q4 2012-Q3 2022) involving at least one floor of 20,000 sq ft or larger, only six were for floors where the ceiling heights were 2.5m or lower. In contrast, 415 of the 521 deals (80%, or 81% in terms of total sq ft area) were within the BCO-recommended range of 2.6 - 2.8m. See Figure 4.5.

The clear implication of this analysis is that, on larger floorplates, occupiers in Central London at the higher end of the market demand floor to ceiling heights of at least 2.7m, or preferably higher.

A more detailed breakdown of the data is shown in Figure 4.6 and shows that occupiers taking floors of 20,000 sq ft or larger most frequently take space in the range 2.7 - 2.8m, and even though floor to ceiling heights of 2.6 - 2.7m are within the BCO-recommended range, larger floor to ceiling heights are preferred.

More technical detail on drivers of floor to ceiling height is given in Section 7.

Central London take-up of floors larger than 20,000 sq ft split by floor to ceiling height

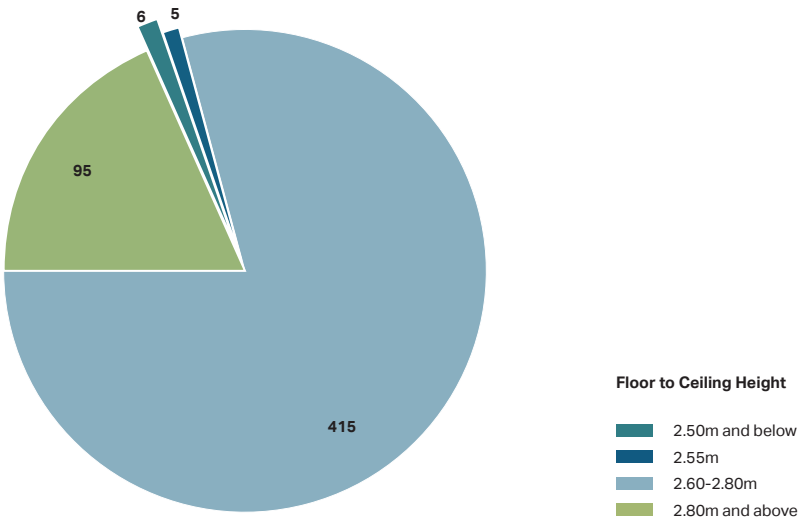


Figure 4.5 Central London take-up of floors larger than 20,000 sq ft split by floor to ceiling height, Q4 2012-Q3 2022. Source: CBRE Research

No. of deals for take-up of floors 20,000 sq ft split by floor to ceiling height

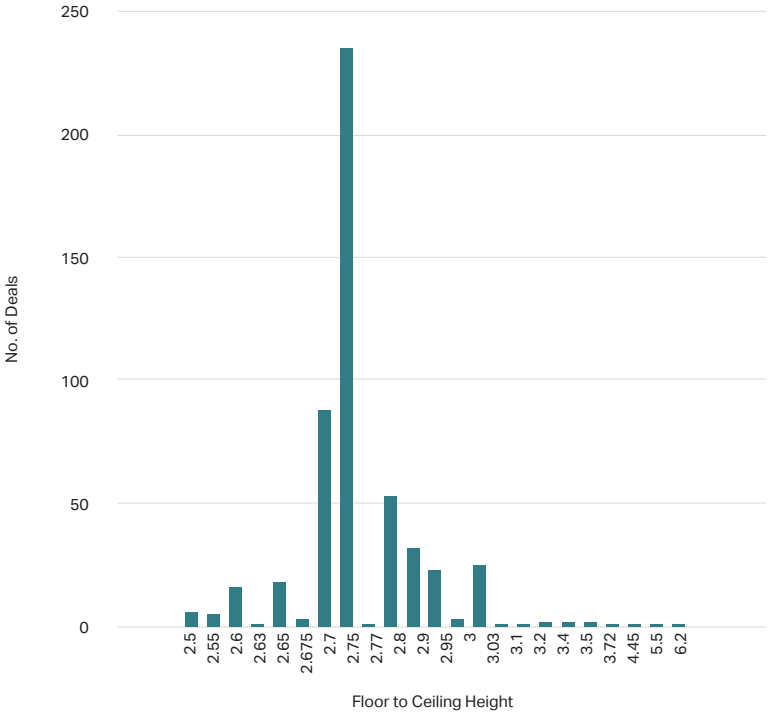


Figure 4.6 No. of deals for take-up of floors larger than 20,000 sq ft split by floor to ceiling height Q4 2012-Q3 2022. Source: CBRE Research

Smaller Floorplates (10,000-15,000 sq ft)
The outlook is similar when analysing deals involving floors of 10,000-15,000 sq ft.

During the same 10 year period (Q4 2012-Q3 2022) there were 205 deals involving at least one floor of between 10,000 and 15,000 sq ft. Of these deals, only 15 were for floors where the ceiling heights were 2.5m or lower. Of the remainder, 154 were within the BCO-recommended range of 2.6 - 2.8m. This represents 75% of the deals by number and 77% of the deals by sq ft. This is shown in Figure 4.7.

The distribution analysis for the 10,000-15,000 sq ft floors is similarly in line with the larger floorplates. Refer to Figure 4.8. For the buildings with floor to ceiling heights within the BCO-recommended range, there is a clear bias towards the higher end of the range, with the significant majority being either 2.7m or 2.75m.

It is worth noting that there are only 5 deals in this analysis for the floor to ceiling height that could reasonably be achieved with or without a ceiling zone within the existing structure at Euston Tower (2.5% of all deals analysed on the smaller floorplates).

Combining the trends for the smaller and larger floorplates (10,000 - 20,000+ sq ft), the implication is that occupiers in Central London lease spaces with floor to ceiling heights of at least 2.6m, or preferably higher. The existing slab levels at Euston Tower do not allow for this.

Central London take-up of floors 10,000-15,000 sq ft split by floor to ceiling height

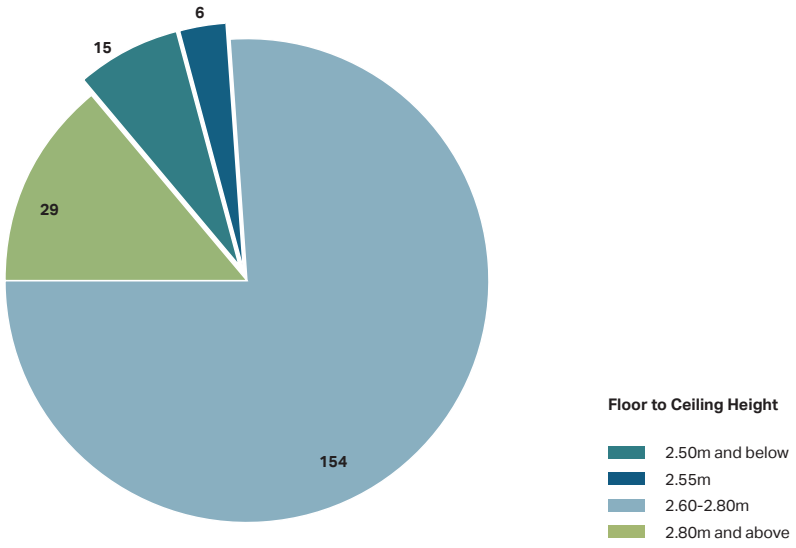


Figure 4.7 Central London take-up of floors 10,000-15,000 sq ft split by floor to ceiling height, Q4 2012-Q3 2022. Source: CBRE Research

No. of deals for take-up of floors 10,000-15,000 sq ft split by floor to ceiling height

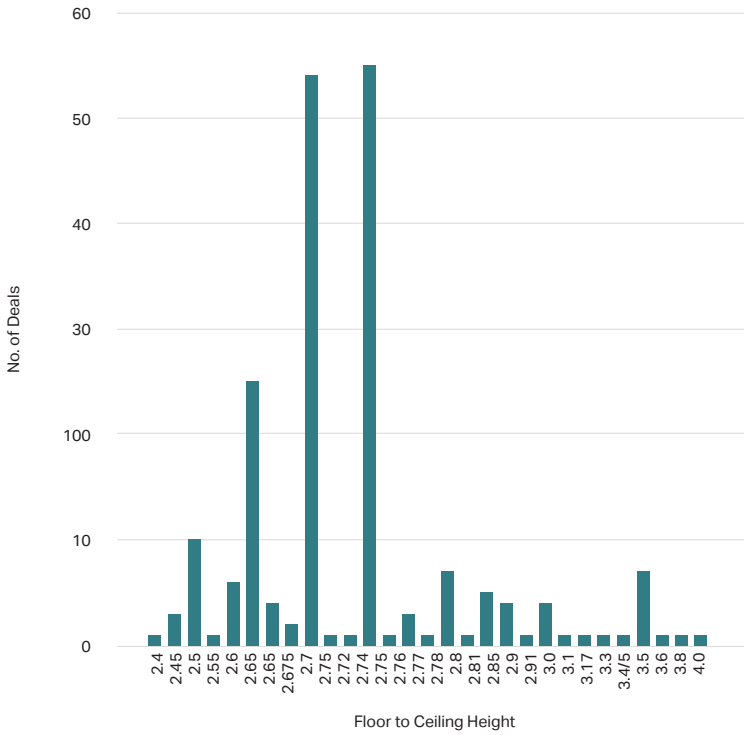


Figure 4.8 No. of deals for take-up of floors larger than 20,000 sq ft split by floor to ceiling height Q4 2012-Q3 2022. Source: CBRE Research

4.1.4 Comparable West End Buildings

The following buildings are thought to be comparable and give insights into the state of the market for Euston Tower:

- 33 Cavendish Square
- Portland House.

33 Cavendish Square

33 Cavendish Square was constructed in 1962. The building extends to ca. 390,000 sq ft of office space. There have been rolling refurbishments in the intervening years but none have been fully comprehensive. As a result the quality, grade and perception of the building has diminished over time.

In the last five years (since 2017), there have been 17 deals at 33 Cavendish Square totalling ca. 100,000 sq ft (just over a quarter of the total building size). Other than two deals to serviced office operators (21,000 sq ft to Landmark in 2018 and 14,900 sq ft to Regus in 2019), there have been no transactions larger than 10,000 sq ft. The majority of deals completing have been smaller than 5,000 sq ft. A total of four were smaller than 2,500 sq ft and six were between 2,500 sq ft and 5,000 sq ft. See Figure 4.9.

By contrast, over the last 10 years the average deal size in Central London for either new buildings or for pre-let is over 20,000 sq ft.

This implies that 33 Cavendish Square has been unable to attract occupiers of scale that have been in the market since 2017 (69 space takes of over 20,000 sq ft have transacted in the wider West End market since 2017.

Not only have the deals tended to be small in terms of scale, the deals have tended to be low value relative to the sub-market prime. This is despite the fact that buildings with good views (as is the case at 33 Cavendish Square) tend to attract a premium to prime.

Over time, the rental performance at 33 Cavendish Square has become weaker relative to the market prime. Deals transacting in 2019 were on average 42% lower than the prevailing prime level, whereas the discount in 2005 was much lower at just 12.5%. Refer to Figure 4.10.

What the drop in relative rental value over time shows is that due to the deterioration of the quality of 33 Cavendish Square, the building has been unable to attract the high growth companies that have driven employment in London in recent years.

33 Cavendish Square transactions, 2017 – 2022 Q3

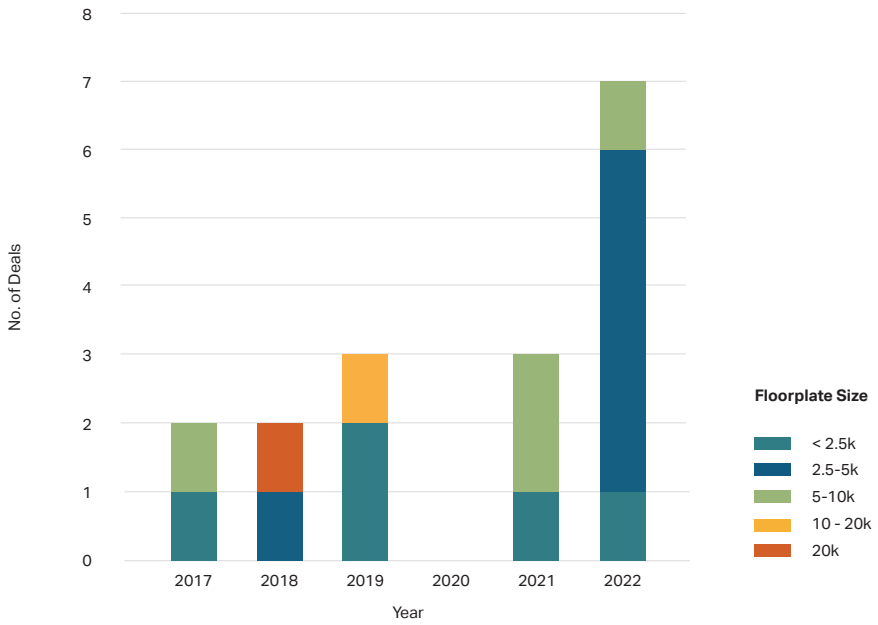


Figure 4.9 33 Cavendish Square transactions, 2017 – 2022 Q3. Source: CBRE Research

Average discount to prime North Oxford Street rent, deals at 33 Cavendish Square

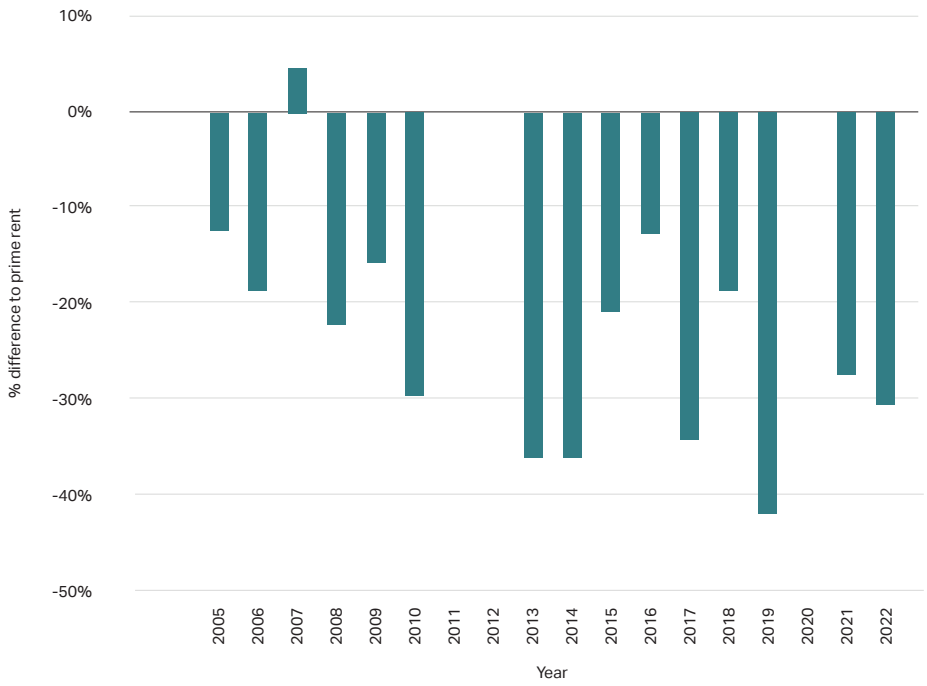


Figure 4.10 Average discount to prime North Oxford Street rent, deals at 33 Cavendish Square. Source: CBRE Research

Portland House

Portland House was completed in 1962, making it the same age as 33 Cavendish Square and is ca. 25% smaller at 300,000 sq ft. The building has not been comprehensively refurbished since this date, but is currently undergoing a large-scale redevelopment.

Due to the need to vacate the building by 2020 ahead of the proposed redevelopment, there have been no leasing deals at Portland House since 2018. In the five years up to 2018 (2014-2018) there were 32 individual deals in the building totalling 234,500 sq ft, equivalent to over three quarters of the total floorspace within the building.

Although larger on average than the deals at 33 Cavendish Square, Portland House in its previous form was generally unable to attract occupiers of scale. The only deal larger than 20,000 sq ft between 2014 and 2018, was a 33,000 sq ft letting across three floors to Westminster City Council. The largest proportion of deals were in the size range 5-10,0000 sq ft (14 of 32) with a further nine between 10-20,000 sq ft. This is shown in Figure 4.11.

While the size profile of the deals at Portland House is larger than the deals at 33 Cavendish Square (and significantly larger than the West End average for the same period), the rent achieved on the deals lags the prevailing market prime (Victoria) to a greater extent. One of the reasons why the average deal size at Portland House has been larger than average is due to the inability to easily split the floors.

The fall in the relative value of Portland House has progressively deepened over time, with deals transacting between 2014 and 2018 typically being done at a level of ca. 50% lower than the prime level, see Figure 4.12.

The large rental discount implies that Portland House was only able to attract lower-grade occupiers, not conducive to the creation of dynamic innovative office districts, which attract high growth, high employment companies.

Portland House transactions, 2014 – 2018

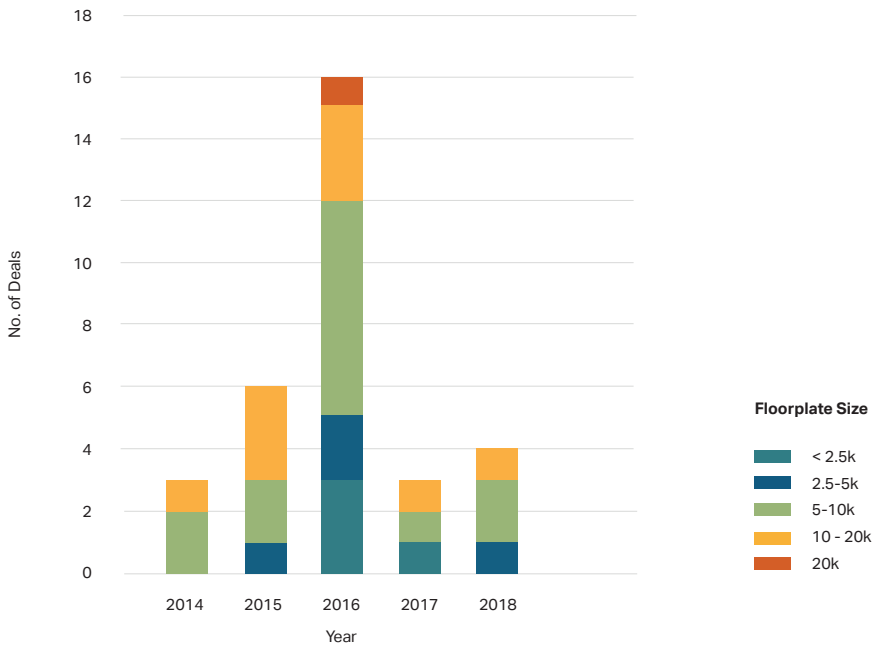


Figure 4.11 Portland House transactions, 2014 – 2018. Source: CBRE Research

Average discount to prime Victoria rent, deals at Portland House

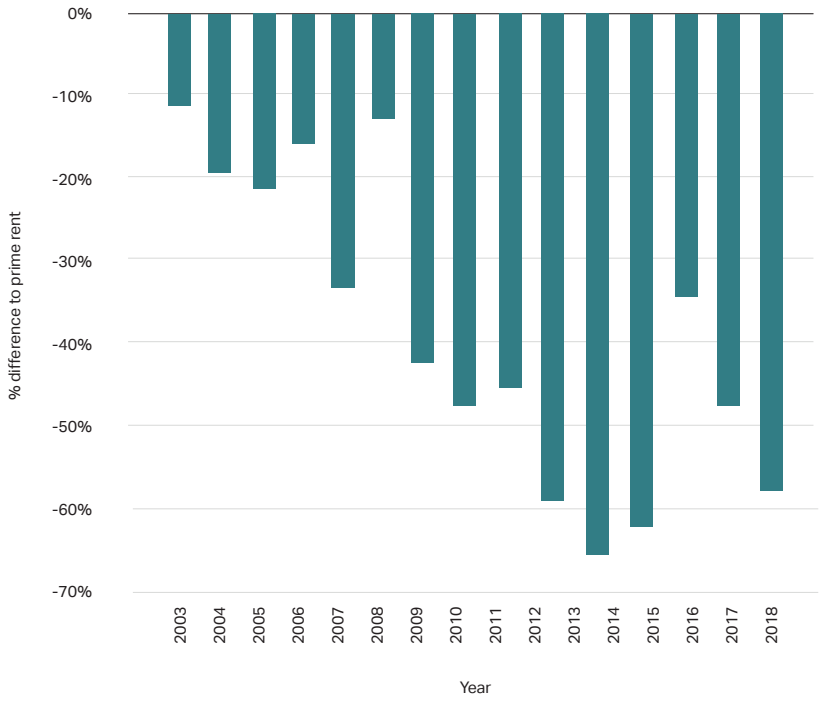


Figure 4.12 Average discount to prime Victoria rent, deals at Portland House. Source: CBRE Research

4.1.5 Competing Office Locations

The following section outlines several comparator / competitor markets to Euston. They are:

- Fitzrovia / Tottenham Court Road
- Paddington
- King's Cross
- Victoria
- Canary Wharf.

Fitzrovia / Tottenham Court Road (North of Oxford Street East)

Partially due to the announcement of the Crossrail project and its subsequent construction and completion, a number of high quality developments have completed in North of Oxford Street East in the last 10 years. This has brought a wide range of blue-chip tenants to the area. Notable examples include Facebook at One Rathbone Square, Boston Consulting Group (BCG) at 80 Charlotte Street, Netflix at The Copyright Building, and Apollo and G Research at 1 Soho Place.

A feature of the notable deals that have occurred in the large new North of Oxford Street East developments, is the fact that two occupiers moved to the area for the first time having previously been located elsewhere. Facebook moved its HQ from Euston and BCG moved from 20 Manchester Square in Marylebone. Netflix expanded within the market, having previously taken space at 2 Fitzroy Place. The three above-mentioned deals demonstrate that markets that deliver high quality space are able to both attract and retain occupiers.

Looking at the buildings over 50,000 sq ft that have completed in the last 10 years, the vast majority have seen exceptionally strong leasing performance. Figure 4.13 tracks the number of months each building took to reach 75% let relative to the date of practical completion (a negative number indicates that the building reached 75% let prior to PC).

Paddington

Like North of Oxford Street East, Paddington is an office market that has directly benefited for the emergence of Crossrail, which has acted as a catalyst for the development of new office space.

New buildings in Paddington have attracted high quality tenants from an exceptionally diverse mix of industries. For example, Capital International who moved from Belgravia to take 221,000 sq ft at Paddington Square. Deals at the Brunel Building saw Sony Pictures move from Soho, the Premier League move from Gloucester Place and Hellman & Friedman move from Millbank Tower.

The developments to have completed in Paddington in the last 10 years over 50,000 sq ft have generally leased quickly. See Figure 4.14. Paddington Square was a notable success story, being fully let six months before completion. One recently completed building has yet to reach 75% (Fifty Paddington, which completed in December 2021), although 40% of the building had been let as at the end of October 2022.

Time to 75% let, buildings completing in North of Oxford Street East over 50,000 sq ft, 2012-2022 Q3

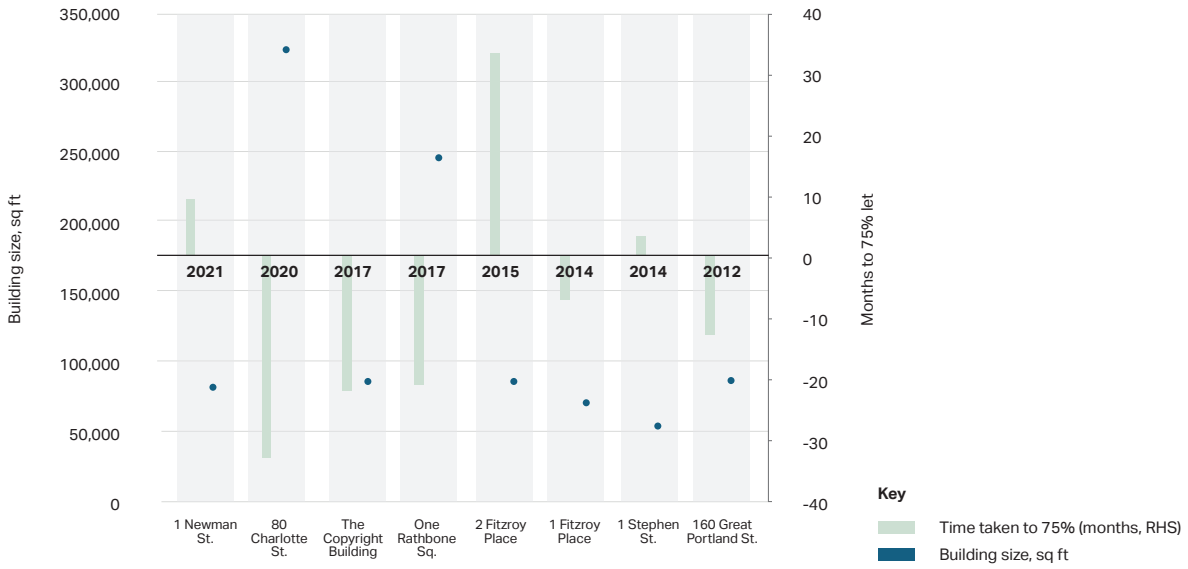


Figure 4.13 Time to 75% let, buildings completing in North of Oxford Street East over 50,000 sq ft, 2012-2022 Q3. Source: CBRE Research

Time to 75% let, buildings completing in Paddington over 50,000 sq ft, 2012-2022 Q3

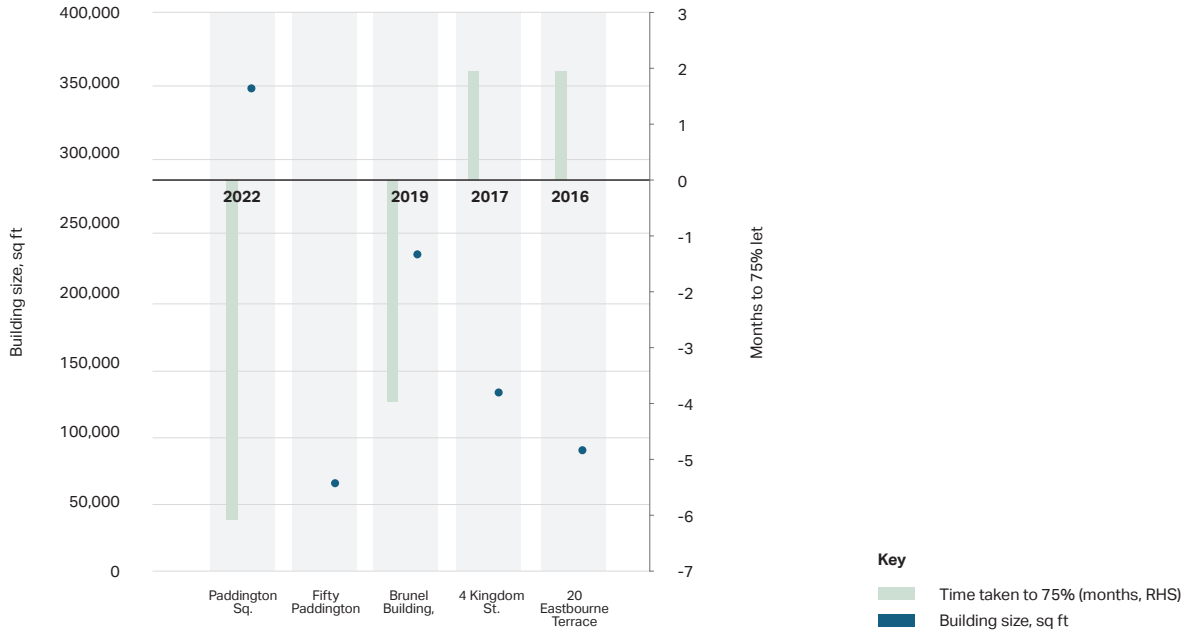


Figure 4.14 Time to 75% let, buildings completing in Paddington over 50,000 sq ft, 2012-2022 Q3. Source: CBRE Research

Time taken to 75% (months, RHS)
Building size, sq ft

King's Cross

The development of an office market at King's Cross has been one of London's most successful examples in the last 20 years. Led primarily by Google, who will soon occupy over 1m sq ft in the market, a number of high-value occupiers have been attracted to the market. Notable occupiers who have taken space at King's Cross include Universal Music and Sony Music who both moved from Kensington, Havas who consolidated several Central London offices, and AstraZeneca who moved their HQ function to King's Cross from Luton.

The leasing velocity of schemes completing in King's Cross is amongst the best performing of any market at any time on record. Of the office schemes larger than 50,000 sq ft completing in the last 10 years (the first major phase of King's Cross Central completed in 2014), each building reached 75% prior to practical completion. Refer to Figure 4.15.

The King's Cross market has benefited from significant placemaking, including public outdoor space, high quality retail (most recently the opening of Coal Drops Yard) and the establishment of a campus for the University of the Arts London.

The office-led development of King's Cross has provided significant positive externalities to the local community through the improvement in amenity and retail offer. This has increased economic activity in the local area resulting in increased employment growth in non-office-based sectors such as retail and hospitality.

Victoria

Having shifted its focus away from Central Government occupiers, the Victoria market has experienced a significant transformation in the last 10 years. Since 2012, eleven large office buildings (larger than 50,000 sq ft) have been built or comprehensively refurbished totalling ca. 2m sq ft.

On average, schemes over 50,000 sq ft in Victoria completing since 2012 achieved 75% let 10 months after practical completion. There were some notable outliers, such as 1 Page Street which was fully pre-let 19 months prior to completion and 62 Buckingham Gate which took 30 months to fully lease up (24 months to reach 75% let). See Figure 4.16.

Time to 75% let, buildings completing in King's Cross over 50,000 sq ft, 2012-2022 Q3

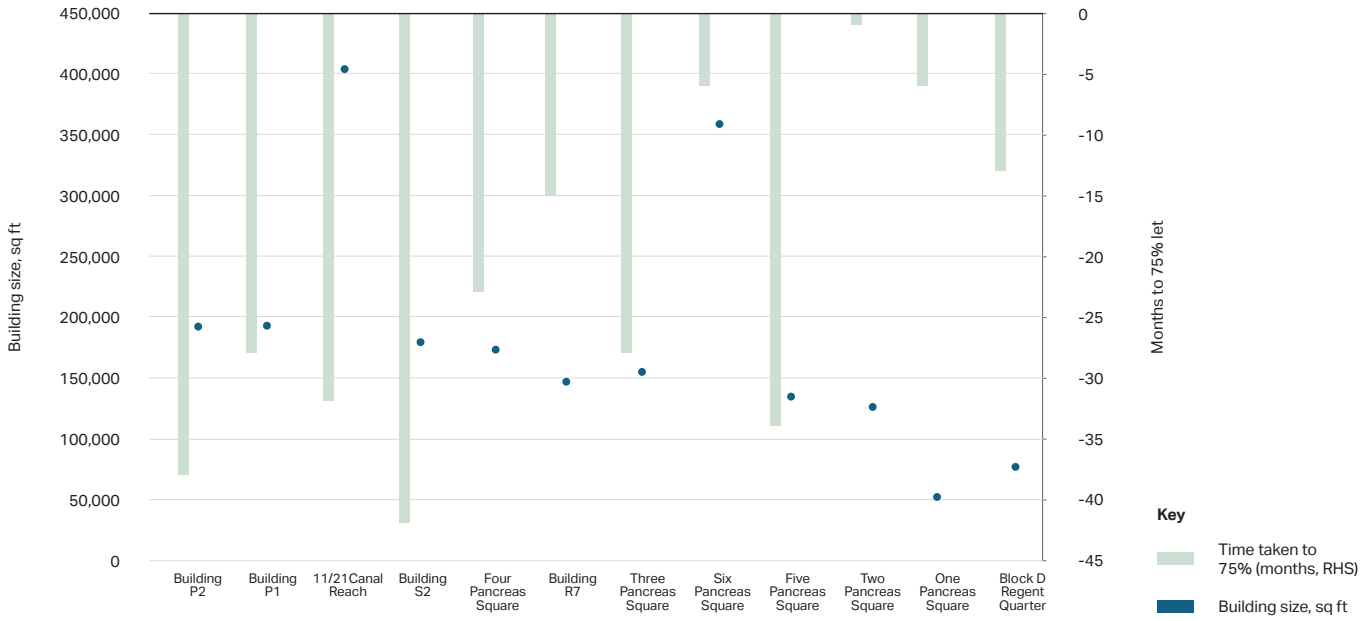


Figure 4.15 Time to 75% let, buildings completing in King's Cross over 50,000 sq ft, 2012-2022 Q3. Source: CBRE Research

Time to 75% let, buildings completing in Victoria over 50,000 sq ft, 2012-2022 Q3

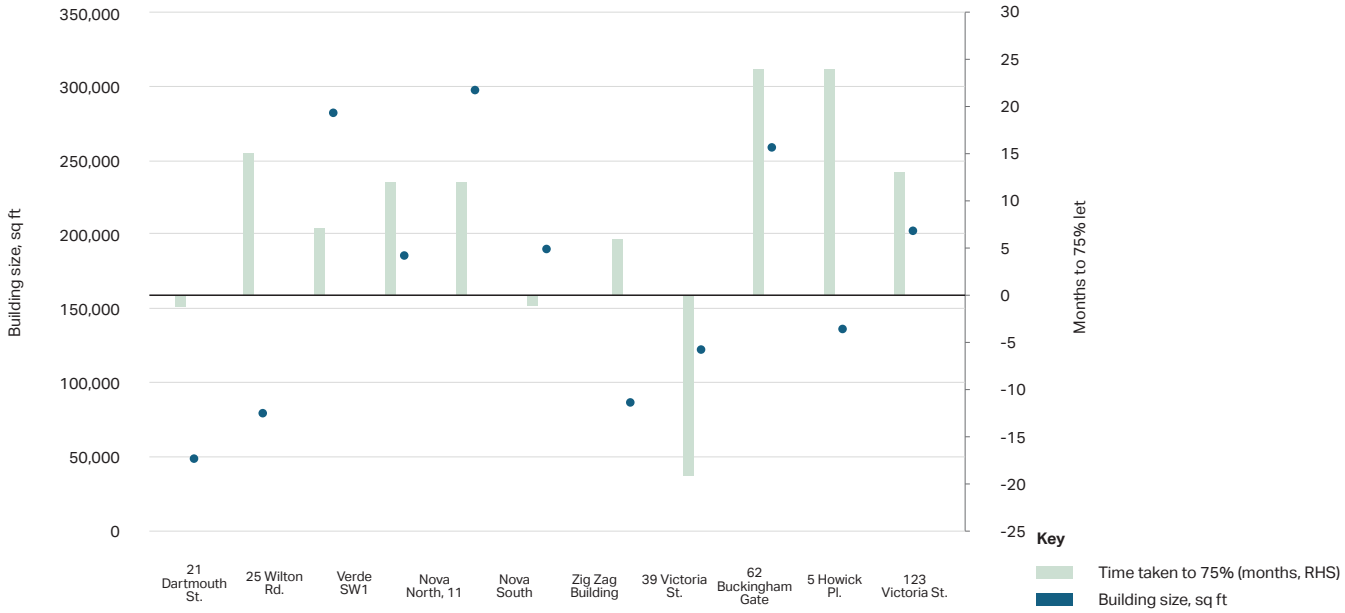


Figure 4.16 Time to 75% let, buildings completing in Victoria over 50,000 sq ft, 2012-2022 Q3. Source: CBRE Research

Canary Wharf

The first major development at Canary Wharf was One Canada Square which completed in 1991. At 1.3m sq ft, the size of One Canada Square is equivalent to ca. 50% of all office stock in Euston currently. Along with One Canada Square, six other buildings completed in the first phase of Canary Wharf totalling 2.7m sq ft.

Due to the unfortunate timing of completion of the first phase of development at Canary Wharf during a deep recession, the buildings took a long time to lease and market vacancy rates in Docklands remained elevated for several years.

However, by the late 1990s leasing momentum had accelerated in Canary Wharf (7.4m sq ft of space was leased in Docklands between 1995 and 1999). Aided by a liberal planning regime and strong pre-letting activity, the next phase commenced. Phase two of Canary Wharf completed between 2002 and 2004 and added ca. 8m sq ft of stock to the Docklands market across 15 buildings. Refer to Figure 4.17.

The early years of leasing activity at Canary Wharf were dominated by financial services occupiers. In the 10 years between 1991 and 2000, 59% of all take-up in the Docklands market was from banking and finance occupiers. The critical mass of office space and improved amenity has enabled Canary Wharf to significantly diversify its occupier base in more recent years.

In the most recent 10-year period, the sector breakdown of take-up is much more mixed. Although banking and finance still represented the largest proportion of take-up at 31%, there were three other sectors representing more than 15% of the market (business services, creative industries and the public sector). This is shown in Figure 4.18.

The Docklands market benefits from a business-friendly planning regime, which allows for the development of large office buildings during several phases, enabling the market to fulfil requirements of office occupiers during booms in demand. As the London market has adapted, so has the Docklands market, significantly diversifying away from the previously dominant banking sector.

Docklands market stock and vacancy rate, 1991-Q3 2022

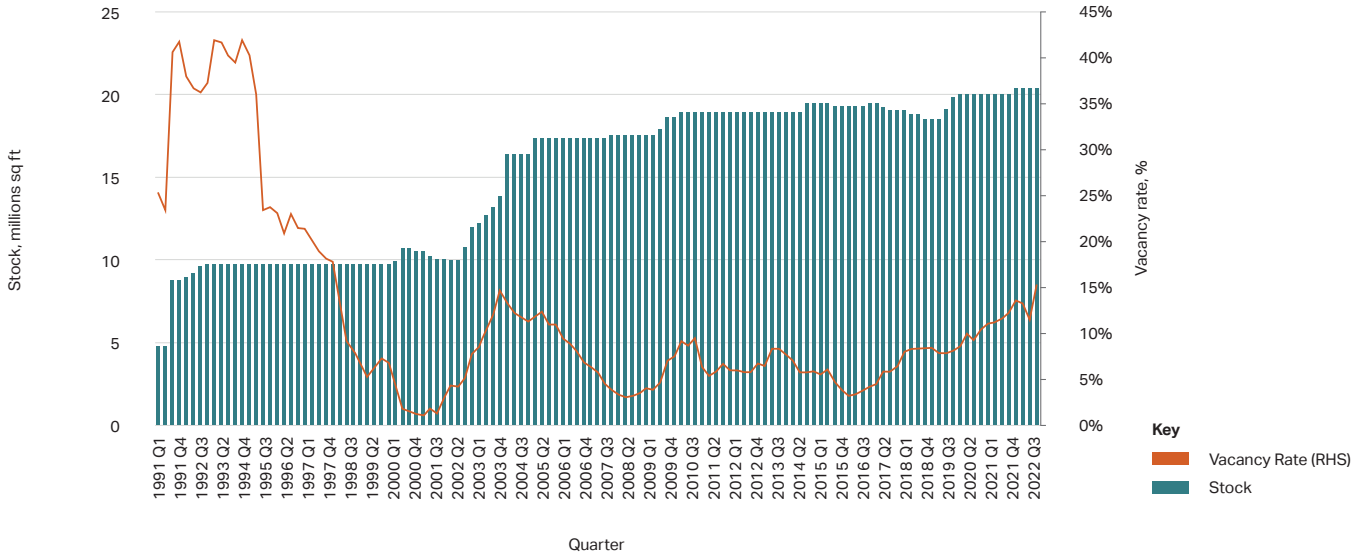


Figure 4.17 Docklands market stock and vacancy rate, 1991-Q3 2022. Source: CBRE Research

Docklands market take-up by sector, 1991-2000 vs 10 years to Q3 2022

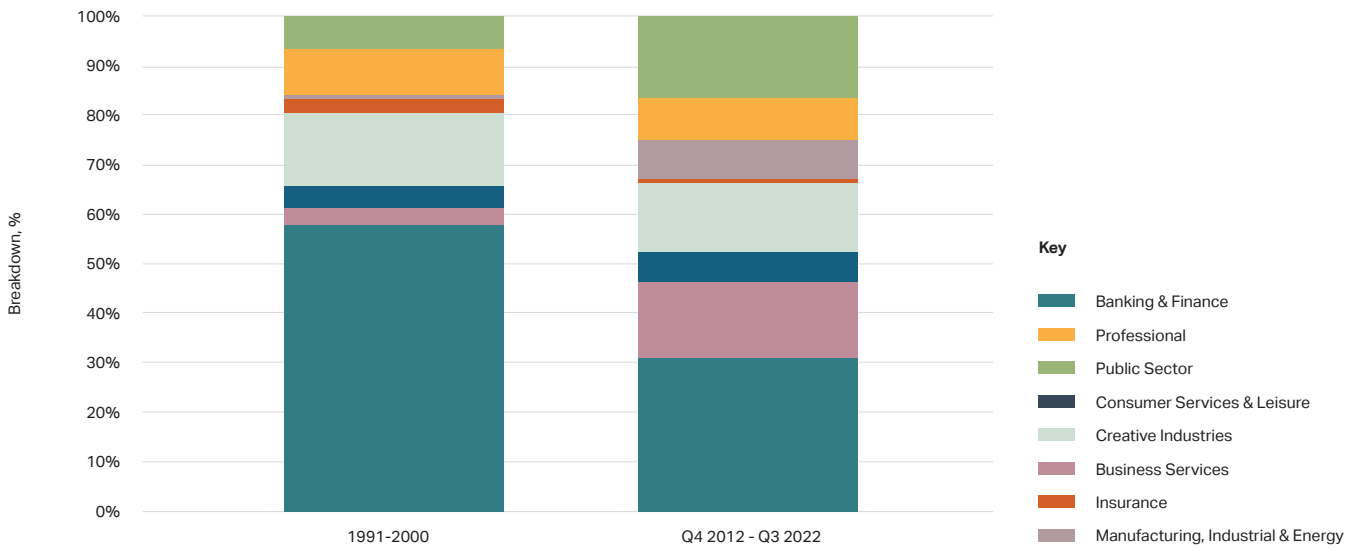


Figure 4.18 Docklands market take-up by sector, 1991-2000 vs 10 years to Q3 2022. Source: CBRE Research

4.2 Standards and Guidance

Designed in the 1960s and constructed in 1970, and with little major refurbishment since, the existing Euston Tower falls well short of the expectations of a modern office building.

Some of these shortcomings are regulatory - elements of the existing building that do not comply with current building regulations and/or requirements of current planning policy, and some of these are market expectations - elements that do not meet the guidance expected of a 2020s, central London office building (i.e. flight to quality).

Underpinning this shift is a regulatory environment that is more mature with regards to life safety (especially fire) and energy performance. Similarly the more recent focus on broader sustainability (e.g. embodied carbon, circularity) and wellness has led to both planning policy and guidance, and a consequent market expectation for these considerations to be embedded within any high quality scheme.

Key regulatory and guidance documents are outlined in this section. The strategic policy context is given in Section 2, and more detail on specific performance is given in Sections 5 and 6.

4.2.1 Building Regulations and Planning Requirements

Approved Document L
Building regulation statutory guidance for conservation of fuel and power (i.e. energy performance) is given in Approved Document L (ADL). ADL was first published in 1985 (15 years post construction of Euston Tower) as part of the Building Regulations 1985, and was most recently updated in February 2023. **The existing facade performance and central plant of Euston Tower do not support the operational energy performance required to meet the latest requirements.**

Approved Document F
Statutory guidance for ventilation is given in Approved Document F (ADF). ADF was first published in 1985 (15 years post construction of Euston Tower) as part of the Building Regulations 1985, and was most recently updated in 2021 with changes responding to increased wellness and post-Covid ventilation. **The existing central plant of Euston Tower, complete with its riser provision, do not support the increased ventilation requirements to meet the latest requirements.**

Approved Document B
Statutory guidance for fire safety is given in Approved Document B (ADB). ADB was first published in 1985 (15 years post construction of Euston Tower) as part of the Building Regulations 1985, and was most recently updated in 2019 with amendments in 2020 and 2022. **The existing tower falls short of current fire safety standards, with items ranging from inadequate structural fire resistance and compartment slab fire stopping provisions, to lack of automatic sprinkler systems and dedicated fire fighting lifts. These requirements must be addressed to meet current fire safety standards.** A detailed Structural Fire Engineering Assessment was conducted by Arup following intrusive structural investigations.

The London Plan
The London Plan 2021 is the spatial development strategy for Greater London. It sets out a framework for how London will develop over the next 20-25 years and the Mayor's vision for "good growth".

Policy D3 sets out requirements for developments to make best use of land that optimises the capacity of sites. The extent to which this is delivered by the existing tower, considering its connectivity and including its interaction with the public realm, can be significantly improved.

Policy SI 2 sets out requirements for developments to reduce their GHG emissions across the development life-cycle. All major developments are expected to be net zero carbon (in operation). The performance of the existing building would rely heavily on a cash-in-lieu payment to achieve this. Policy SI 7 sets out requirements for conserving resources and reducing waste across the development life-cycle (circular economy guidance).

While clearly refurbishing the existing tower would have a positive impact on reducing construction/demolition waste today, **the existing tower would generally not support the sustainable objectives of the London Plan.**

Figure 4.19 The regulatory environment has changed significantly since Euston Tower was design and built in the late 1960s

4.2.2 Guidance and Certification

BREEAM

BREEAM (Building Research Establishment Environmental Assessment Method) is a tool that enables the assessment of the environmental sustainability of a development. High scoring BREEAM ratings are expected for high quality office developments, and the Camden Local Plan 2017 requires BREEAM "Excellent" as a minimum (the second highest rating, after "Outstanding"). **The existing facade performance and central plant of Euston Tower do not support the requirements for high scoring BREEAM ratings.** The current premium office market would expect nothing less than BREEAM "Outstanding".

NABERS UK

NABERS UK is a tool that certifies office energy performance. NABERS ratings range from 1 star ("poor") to 6 stars ("world leading"). Unlike design-based energy ratings, NABERS UK measures and rates the actual energy use of offices in use, helping building owners to accurately track and communicate the energy performance of buildings. **The existing facade performance and central plant provisions (including extensive sub-metering requirements) of Euston Tower do not support the requirements for good NABERS UK ratings. The current premium office market would expect at least NABERS UK 5 star.**

WELL Building Standard

The WELL Building Standard is a certification scheme that, unlike BREEAM and NABERS UK, focuses entirely on human health. It is used as a tool to implement, validate and measure features that support and advance human health and wellness. The tool assesses various elements that affect the indoor environment including ventilation, daylight, water quality, thermal comfort, and many others. **The performance of the existing building - especially with regard to ventilation and comfort - is not compatible with high scoring WELL ratings.** The current premium office market would expect at least WELL "Gold" (second highest rating) with most top developments seeking "Platinum" ratings (the highest rating).

Figure 4.20 Key guidance and certifications expected by the central London commercial office market

LETI

The Low Energy Transformation Initiative (LETI), previously the London Energy Transformation Initiative, is a voluntary network developing and publishing guidance to accelerate the built environment's transition to zero carbon future. As part of its published guidance, LETI has developed targets for embodied carbon emissions, operational energy, and circularity. These targets have been aligned with guidance elsewhere in the industry (e.g. RIBA Climate Challenge, London Plan 2021), and may be considered the de facto targets for modern office development in London. **The existing tower would not meet the LETI targets for operational energy or end of life (design for reuse, disassembly and the like).**

BCO Guide to Specification

The British Council for Offices (BCO) publishes a suite of guidance for the commercial property sector, the most well-known of which is the Guide to Specification. The Guide to Specification was most recently updated in 2019 (noting the BCO's 2022 position paper on the topic). The guide covers specification metrics covering subjects ranging like: architectural dimensions, office temperatures, occupier densities, small power consumption, lift waiting times. **The existing tower would fail to meet many of the BCO criteria.** See Figure 4.21 which lists the BCO Guide to Specification 2019 criteria that are unlikely to be supported by the existing building without significant intervention (e.g. facade replacement, new risers, etc.). Criteria that would be met, or could be met by lighter upgrades to existing are not listed (e.g. provision of new lighting, new raised access floors, etc.). Like the other guidance in this section, the BCO is not a requirement but is **generally demanded by developers and tenants alike in the central London office market, and is therefore an expectation of such developments.**

	BCO 2019 CRITERION	COMMENT
OCCUPANCY	Density 8-10m2/p	Not supported by servicing provisions
PLAN EFFICIENCY	80-85% (for up to 9 storeys)	Not achievable with increased riser demands and circulation (no target above 9 storeys)
CLEAR HEIGHTS	Floor to ceiling (new build) 2.6-2.8m	Not achievable with existing floor to floor heights and new servicing
	Floor to ceiling (refurbishment) 2.45-2.8m	Only achievable to limited areas with existing floor to floor heights and new servicing
GRIDS	Planning grid 1.5 x 1.5m	Not supported by existing grid's irregular spacing
CIRCULATION	Percentage of primary circulation to NIA 15-22%	Not achievable with increased riser demands and circulation
VERTICAL TRANSPORTATION	NIA per person 10-12.5m2	Not supported by current lifting equipment to achieve waiting times
	Average waiting time (morning up-peak)<25 seconds or <30 seconds where average time to destination is <80 seconds	Not supported by current lifting equipment to achieve target occupancies
	Goods lift rated load 1,600-3,000kg	Existing equipment undersized
COOLING AND SMALL POWER	Solar loads not to exceed 50 - 65 W/m² -averaged over the 4.5m deep perimeter zone for each façade	Unlikely achievable with existing facade performance
LIGHTING	Well daylit office space average daylight factor 2-5%	Unlikely achievable for >80% of floor area (shallow plan)
COMFORT	Airtightness air leakage of not more than 3.5-7m3 /hr/m2 at 50 Pa test pressure differential	Not supported by existing facade
	Outdoor air min.12 l/s per person + 10% spare. 1.6 to 1.8 l per m2 for a range of solutions	Not supported by existing fresh air risers

BCO Guide to Specification 2019 criteria that are unlikely to be supported by the existing building without significant intervention (e.g. facade replacement, new risers, etc.). Criteria that would be met, or could be met by lighter upgrades to existing are not listed (e.g. provision of new lighting, new raised access floors, etc.).

Figure 4.21 Table of BCO 2019 criteria that are unlikely to be supported by the existing building.

5

Euston Tower

Existing Building

5.1 Background and Context

5.1.1 History

Euston Tower is located at 286 Euston Road, at the intersection of Euston Road, Tottenham Court Road, and Hampstead Road.

The tower is more than 100m tall comprising 36 storeys, with office accommodation over the 34 upper floors and retail space at ground floor.

The building was designed by Sidney Kaye Eric Firmin & Partners in the 1960s as part of a wider master plan, and completed in late 1970. It was designed in the "International Style", popular of the period, and built by the construction firm George Wimpey. The site was developed by Joe Levy who had a large property portfolio along Euston Road.

One of the most prominent early tenants was Capital Radio, one of the first commercial radio stations in the United Kingdom. The station remained as tenants in the tower until moving in 1997.

The tower is the only building that remains from the original development, and now forms part of British Land's Regent's Place campus. It shares a common basement with the rest of the campus, which is used for deliveries, waste removal, car parking and bicycle parking.

A couple of decades after the tower's completion, in 1990, significant modernisation works were undertaken to the lifting systems. The lift controllers were replaced, as well as all car and landing signalisation, but the remainder of the equipment was retained.

Shortly thereafter, in the late 1990s changes were made to the facade due its poor thermal performance (the original facade is a single-glazed, uninsulated assembly). A secondary glazing system was installed behind the existing system in an attempt to improve its thermal performance.

In approximately 2000, some of the MEP equipment was overhauled. This comprised some new heating and cooling central plant, plate heat exchangers, motor control centres, cold water storage, and BMS. New fan coil units were installed, but some of the existing fan coils were retained at the time, resulting a mix of terminal units.

Following the secondary glazing system retrofit, in circa 2010 a security film was applied to the existing spandrel glazing to prevent spontaneous breakages (due to potential NiS inclusions).

In 2017, stabilisation works were undertaken to the lifts. This allowed for a full overhaul of the lift machines, replacement door operators and significant health and safety upgrades, along with the provision of critical spares. Crucially still, much of the original equipment was retained.

Over the last 10 years through to 2021, tenants gradually moved out of Euston Tower leaving many floors unoccupied and disused. It is understood that during its lifetime, the building was never fully-occupied. The last tenants, being HMRC, in the last approximately four years occupied the lower 10 floors only, with two sub-tenants occupying only Levels 33 and 34 (partial floor plates). The last of these moved out in April 2021 and, save the retail tenants at ground level, the tower has been entirely vacated since.

1970
Euston Tower designed in 1960s, completed in 1970

1990s
Secondary, internal glazing system added

2010s-2021
No more than 70% occupied, vacant possession achieved of all upper floors achieved in April 2021

Today
Building vacant and stripped out (except retail tenants at grade level)

Figure 5.1 Timeline of key milestones in the history of Euston Tower

5.1.2 Surveys and Fact Finding

Many of the original drawings and documentation for the existing building have been lost. To support this feasibility assessment with the best information possible, several intrusive and non-intrusive surveys have been conducted, along with several site visit surveys.

A condition survey of the existing facade was conducted in 2018, compromising five abseil drops at select locations on the tower. Due to the paucity of existing documentation, later site visit surveys were conducted to visually assess condition and better understand the existing systems build ups.

An extensive structural investigation was commissioned to Sandberg at the end of 2019 to test the reinforced concrete elements for concrete strength and condition, and to confirm the location of reinforcement and existing concrete cover. Testing covered 13 storeys including ground floor and basement. In 2021, targeted excavation work was conducted under the existing tower's foundation to reveal the distribution, quality, and composition of the existing piles.

Several fire-related surveys have been conducted. In 2020, a fire risk assessment was conducted as part of the statutory requirements for compliance with Article 9 of the Regulatory Reform (Fire Safety) Order 2005 (the "Fire Safety Order"). In 2020, a detailed Structural Fire Engineering Assessment was conducted by Arup on the back of Sandberg structural investigations. The Arup assessment is confidential, and therefore is not included in the Appendices, but its findings inform the understanding of the existing suitability of the existing structure with regards to fire. In 2021, an intrusive investigation was conducted to identify the sprayed fire protection material applied to some of the underside of the concrete floor slabs and beams.

Also in late 2019, an MEP and VT condition survey was conducted finding that most of the central MEP and VT plant (except possibly cooling towers) would need complete overhaul on a medium term basis (approximately ten years). The existing lifts especially are at risk of both component and skills obsolescence.

In 2021, internal strip out began and a Matterport (photographic 3D scan) survey was commissioned for all levels.

A full asbestos survey was carried out in 2020 ahead of the strip out works, which identified some asbestos that needed to be removed, some of which was completed during the strip out works. The remaining asbestos located within risers and basement plant rooms will be removed upon full strip out works under any main works development.

The following surveys have been completed, and the reports are contained in the Appendices unless indicated otherwise:

- Vertex Access Euston Tower Inspection (Facades)
- Sandberg Euston Tower Structural Investigation (Structures)
- AC Fire Safety Fire Risk Assessment2020 (Fire)
- Arup Structural Fire Engineering Assessment (Fire, not included in Appendices due to confidentiality)
- PFP Specialists Investigation of an Existing Spray Fire Resistive Material Applied to Concrete Structural Elements (Fire)
- SVMA Condition Survey Euston Tower, London (MEP and VT)
- SVMA Lift Dilapidation Report (VT)
- JF Hunt Matterport scans (online, not included in Appendices)
- William Martin asbestos Report
- McGee Investigation Report
- D2 Fire Report.

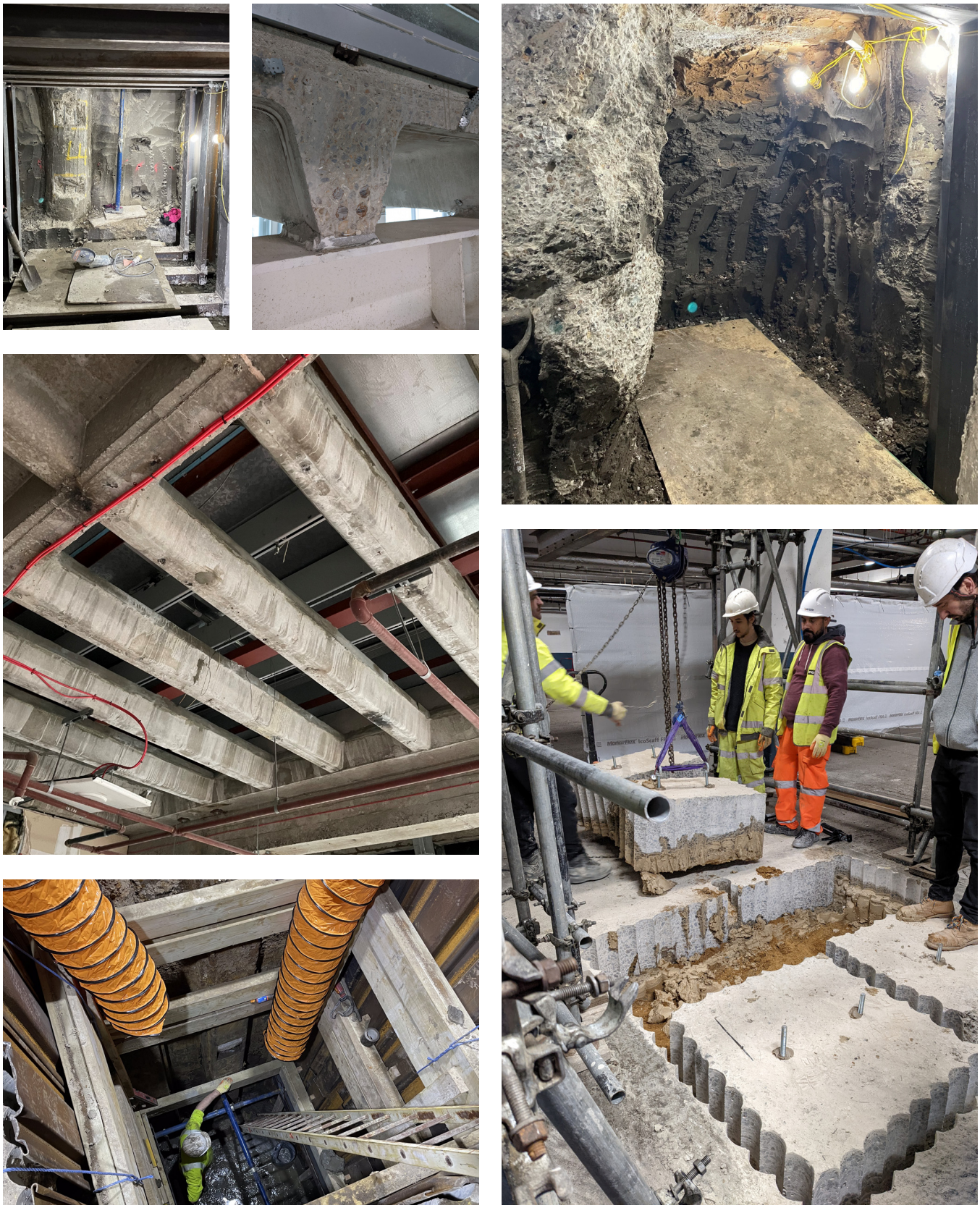


Figure 5.2 Intrusive surveys have been conducted to understand existing condition

5.1.3 Current Office Conditions

The current Euston Tower had most recently been used as workplace tenancies in the main tower stack with retail on the ground plane. The retail space to the west spills out onto Regent's Place Plaza, a public space shared with the neighbouring commercial buildings. The basement below Euston Tower is a shared basement for delivery access, car and cycle parking, that services the wider Regent's Place campus.

As shown in the images in Figure 5.3, all workplace levels have been stripped back to their base build condition.

Figure 5.3 Office levels currently stripped back to base build conditions

Figure 5.4 Euston Tower at night, photo 2022

5.1.4 Current Public Realm

Alongside works to 1 Triton Square and 338 Euston Road that form part of the wider campus, the plaza has undergone a recent transformation. Its size has been doubled, and new walkways have been added connecting the campus and its surroundings.

As a focal point, the plaza is intended as the heart of British Land's Regent's Place Campus. But its relationship to Euston Tower and the microclimate at ground level could be significantly enhanced.

Not only is the space at grade underutilised, but the existing building is impermeable leading to a poor connection with the plaza. This is a function of both the verticality, the way the building lands harshly on the plaza, and some of the opaque shopfronts which present closedness.

Despite the existing wind canopies on the current podium, **the plaza is known to be windy, a hindrance to public activity.**

Today the plaza is currently undergoing further public realm improvement works, with the provision of additional planters and seating. But these will not address its relationship to Euston Tower.

Figure 5.5 Windy, uncomfortable conditions are common around Regent's Place Plaza

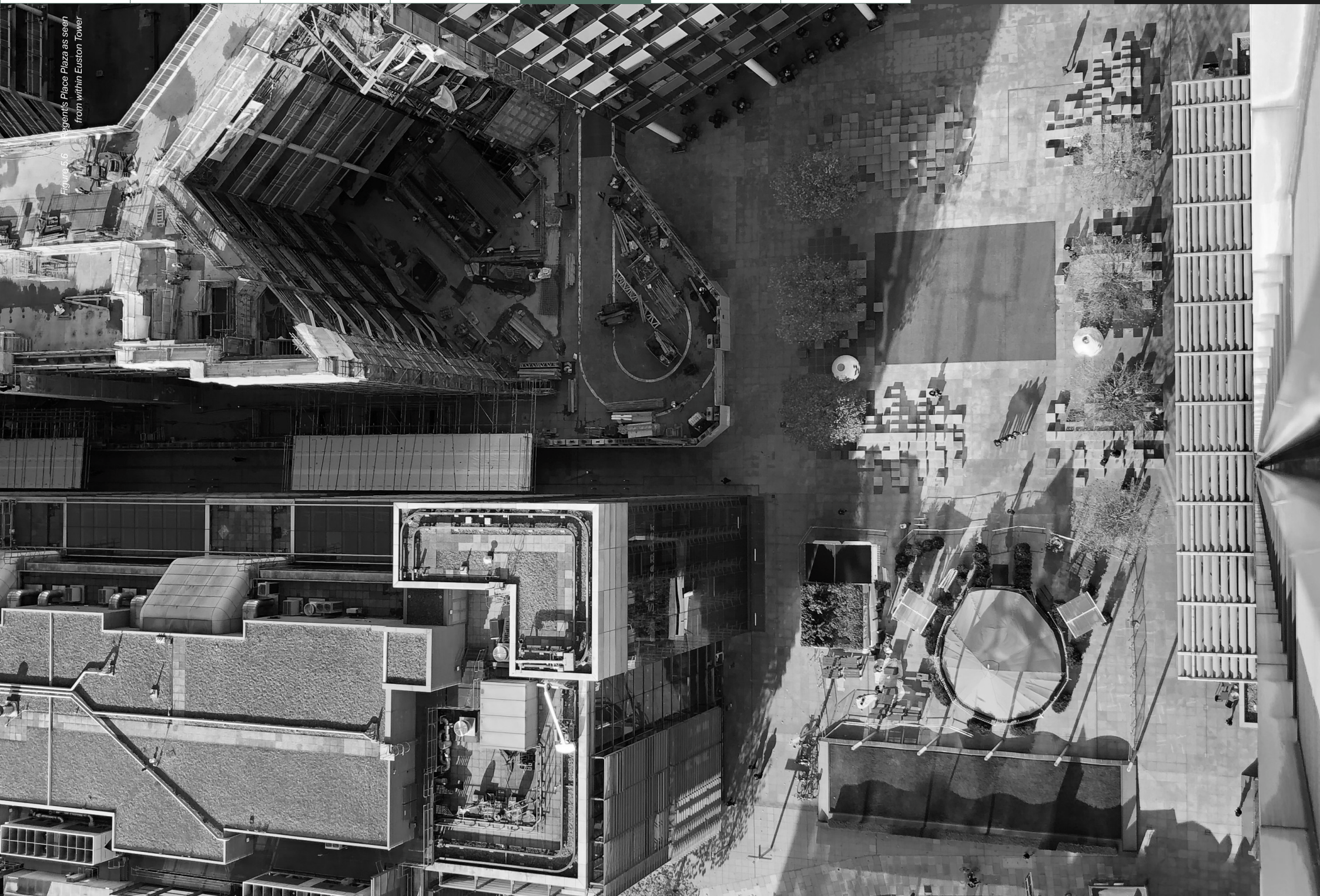


Figure 5.6 Regents Place Plaza as seen from within Euston Tower

5.2 The Neighbourhood

5.2.1 Site Location

Euston Tower is located on the corner of Euston Road and Hampstead Road. The tower shares the busy intersection with The University College London Hospital campus and is directly opposite the Warren Street Underground Station.

Euston Road is a major east-west arterial route through London (A501) and is an extension of the A40 Westway coming from the east before turning into Pentonville Road after Kings Cross Station.

The current tower has a prominent physical presence along Euston Road and acts as a physical landmark for the nearby Euston Station. The intersection where the tower is located is generous in scale, allowing ample sunlight to hit its tree-lined streets. It represents a fantastic opportunity for the tower's public realm to directly engage with its surroundings on a human scale.

Figure 5.7 Site plan

Figure 5.8 Euston Tower on the corner of Euston Road and Hampstead Road

5.2.2 Connectivity

The tower is incredibly well connected to London's public transport network and green spaces. The site is near some of London's busiest train and underground stations: Euston, St Pancras, and Kings Cross Stations. This allows for major connectivity across the United Kingdom.

Five underground lines pass below the Euston/Hampstead Road intersection, with Warren Street Tube Station opposite the Euston Tower site, and three other stops (Great Portland Street, Euston Square and Goodge Street) only a short walk away.

By virtue of its location on major arterial roads, the site is well serviced by the London bus network.

This connectivity is a boon and bane, with the busy road network contributing to local air and noise pollution. It is understood that TfL has recently widened the pavement on the corner of Hampstead Road and Tottenham Court Road to narrow Euston Road. The reason for adjustment was due to the pedestrian traffic using this corner, so to widen the pavement and remove the dangerous slip lane into Hampstead Road. But this corner will always be a very busy road due to UCLH opposite and its being a main road out of London.

The site is within walking distance to the world-famous Regent's Park, as well as multiple smaller parks within ten minutes by foot. Euston Tower is also within walking distance of major cultural icons such as the British Library and the British Museum.

Given the site's history of being a working campus, and the finer grain scale of the surrounding areas, the nearby streets are conducive to pedestrian flows to and from the site.

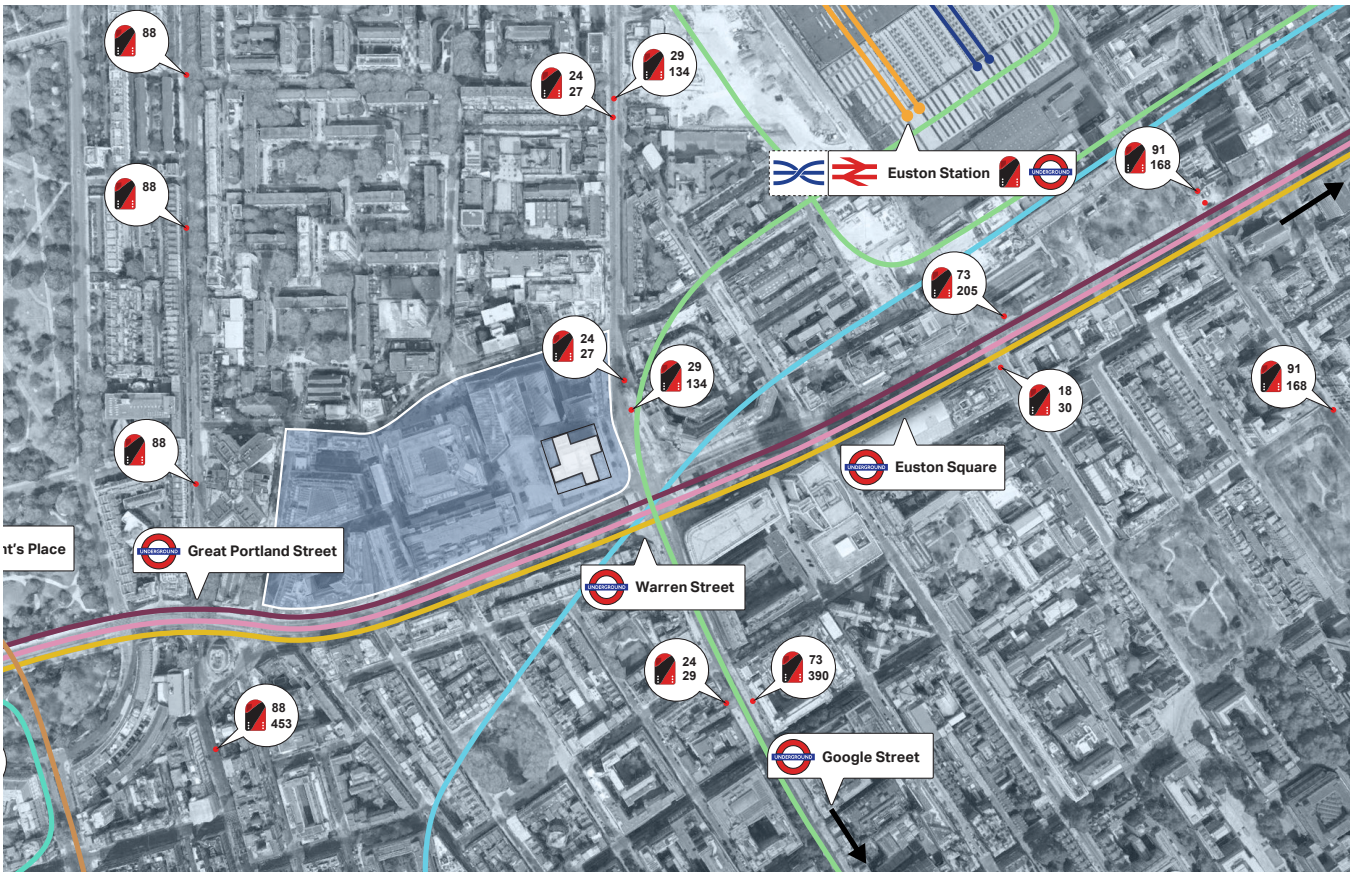


Figure 5.9 Transport links around Euston Tower

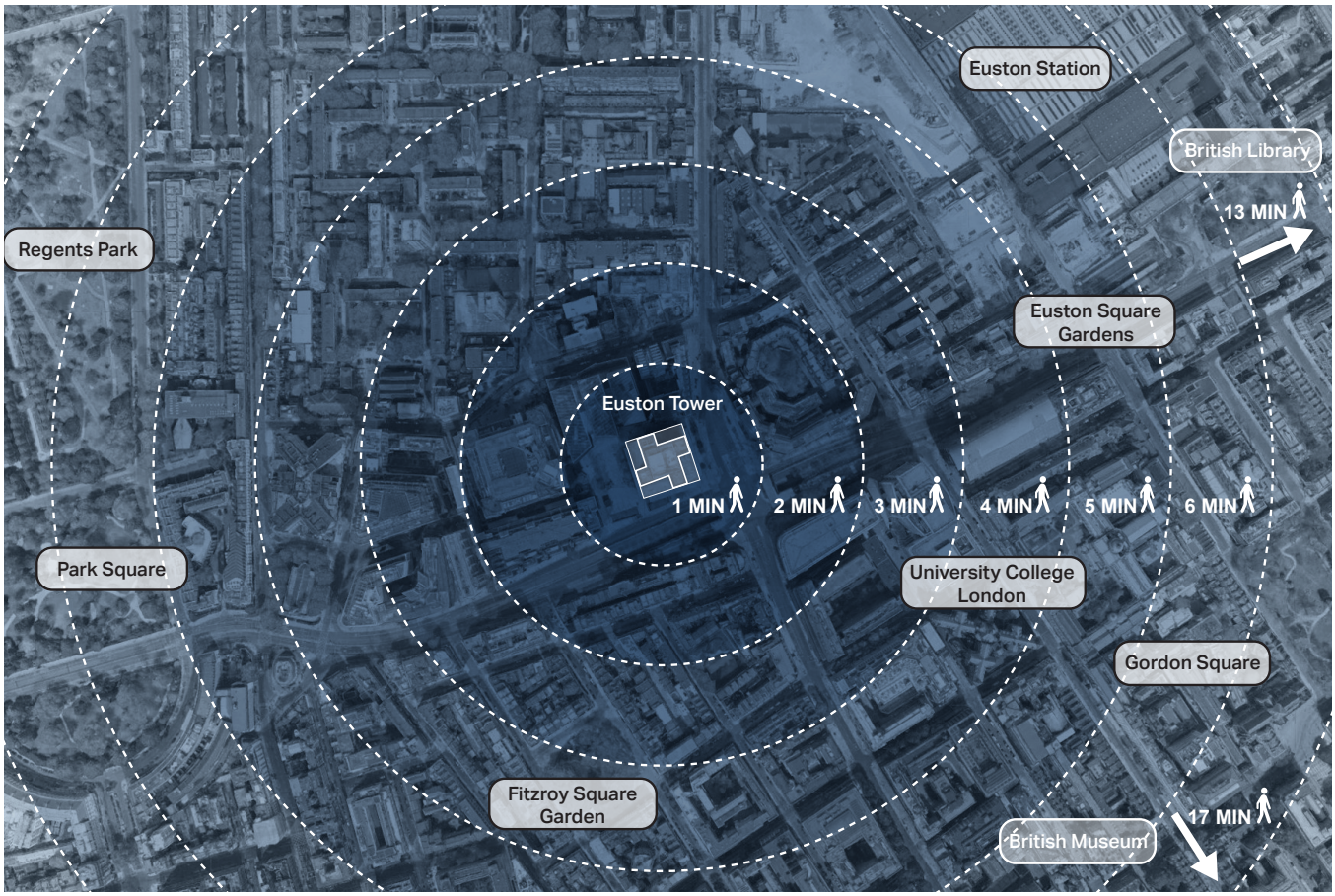


Figure 5.10 Key locations within a short walk from Euston Tower

Figure 5.11 Key pedestrian routes around Euston Tower

5.2.3 The Knowledge Quarter

The Euston Tower, and the surrounding Regent's Place Campus, sit within the new London Knowledge Quarter. As demonstrated in the image below, the Euston Road spine is home to prestigious cultural and educational institutions, giving rise to what is known as the 'Knowledge Quarter'. The Knowledge Quarter is a consortium of organisations who all hold the joint mission to actively engage in advancing the dissemination of knowledge.

The partners come from across academia, culture, research, science and media, ranging from the British Library and Francis Crick Institute, to Google and Universal Music. The range of fields from which these members come, the scope of organisational size, and the proximity to the Regent's Place Campus mean that Euston Tower has a fantastic opportunity to be a key player in the neighbourhood's vision for the future.

106	8%	30,000	316,907	32.3 km	20.6 km	£2bn	8m
Organisations and counting	Population increase of Camden by 2023	Knowledge Quarter Workers	Workers within 1 mile walking distance	Average commute to work in Regent's Place	Average commute to work in Camden	Knowledge Quarter Turn over	Visitors annually

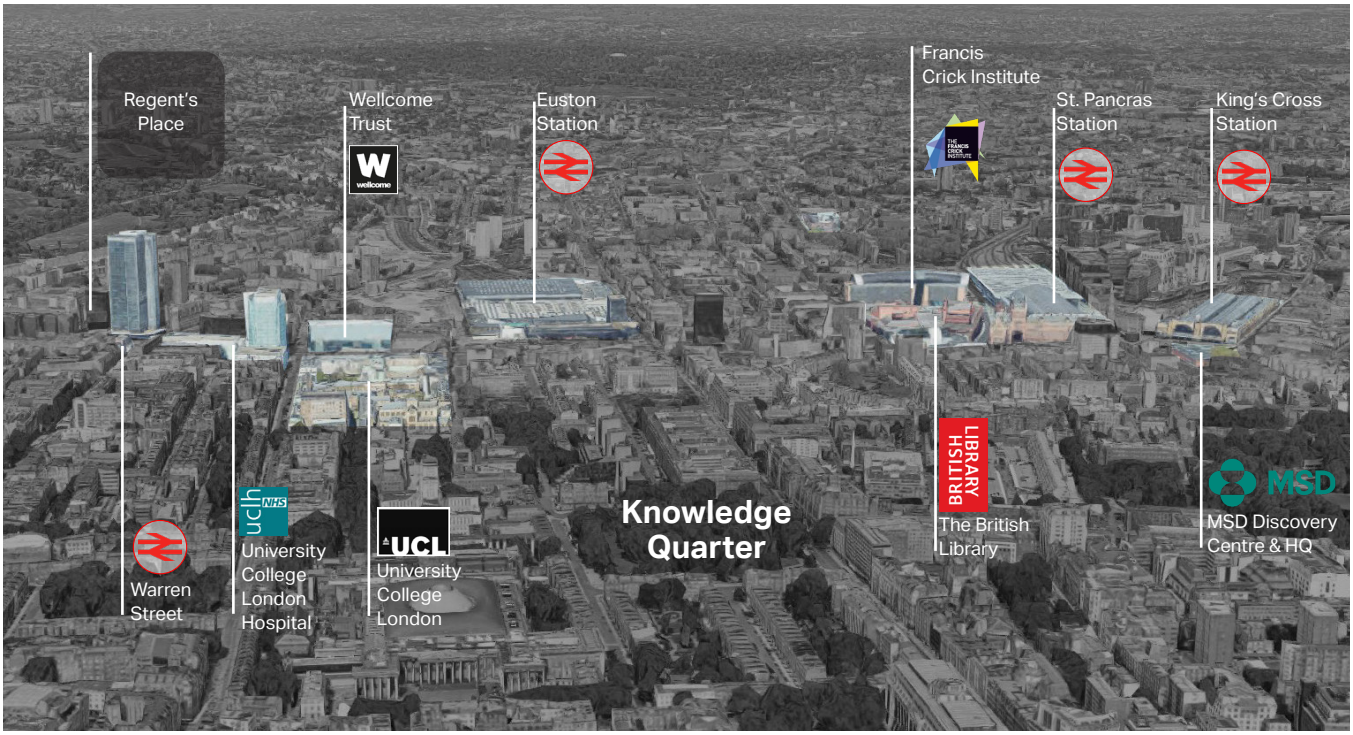


Figure 5.12 Regent's Place sits in close proximity to several world class institutions that form the Knowledge Quarter

Figure 5.13 Euston Tower as seen from the BT Tower

The life science boom in London was taking root before the emergence of Covid-19, but the pandemic accelerated the ascent.

Of the emerged and emerging life science clusters within London, the Knowledge Quarter centred around King's Cross and Euston is the most developed. The Knowledge Quarter benefits from the existence of several long-established institutions in close proximity, including University College London, University College Hospital and the Wellcome Trust. The opening of the Francis Crick Institute in 2016, located between St Pancras Station and the British Library significantly enhanced the area's credential as a leading life science hub. In addition to the anchor institutions, the Alan Turing Institute in the British Library and the London BioScience innovation Centre at the Royal Veterinary College act as innovation hubs for the Knowledge Quarter.

The geographic fundamentals of the Knowledge Quarter favour the life sciences industry, with excellent transport links both to the rest of London and to the rest of the golden triangle; Cambridge, Milton Keynes and Oxford (CaMkOx). Many life science occupiers have been attracted to the area, and are able to benefit from the cross pollination of ideas with the many tech companies located within the area. Life science / medtech occupiers in the Knowledge Quarter include: GSK AI, Gyroscope Therapeutics, IQVIA; Unilabs, BenevolentAI, and, Deep Mind. The up-coming construction of MSD's multi-billion-dollar campus will add to the occupier mix in the Knowledge Quarter.

Although the Knowledge Quarter is seen as the leading life science market in London, there are several other emerging competing markets. Their attributes are detailed in Figure 5.14.

	KEY ATTRIBUTES	ANCHOR INSTITUTIONS	ANCHOR INNOVATION	ANCHOR OCCUPIERS
LONDON BRIDGE	+ Leading research capabilities + Central and well-connected location across London and to CaMkOx - Limited commercialisation of research to date - No commercial lab space available - No certainty on development pipeline for Life Sciences workspace	Guy's Hospital Guy's Cancer Centre King's College London King's Health Partnership	BRC, incl. Cell and Gene Therapy Catapult, Phase 1 Clinical Trials Unit, GMP facilities. Advanced Therapies Accelerator, Centre for Stem Cells and Regenerative Medicines	Spark Therapeutics, Viapath, Verona Pharma, Escala Therapeutics
WHITE CITY	+ Growing cluster built around the Imperial West campus + Proximity to Hammersmith Hospital + Established incubators helping early stage startups grow + More affordable commercial space and availability than King's Cross - Office space requires adaptation to lab-enabled specification - Not as well connected as some other clusters	Imperial College Imperial NHS Trust (Hammersmith Hospital)	Scale Space i-Hub OpenCell Imanova	Novartis, Autolus, GammaDelta Therapeutics, Engitix Therapeutics, Synthace, DNA Electronics
WHITECHAPEL	+ Co-location with existing healthcare, academia and research and clinical trial capabilities + Recent proposals to develop a new Life Sciences campus would leverage on its existing assets + Currently benefits from competitive rents + Opening of the Elizabeth Line will significantly enhance connectivity - Limited commercial and lab space	Royal London Hospital Queen Mary University of London (QMUL) Barts Health NHS Trust The Blizard Institute	Queen Mary BioEnterprises (QMB) Innovation Centre	MediWiSe, Spirogen, hVIVO, BioMoti, Biorelevant, Roseway Labs
WATERLOO	+ Cluster built around King's College London's expertise in healthcare + the renowned clinical research at St Thomas' + Central and well-connected location - Limited number of commercial occupiers - Lack of commercial innovation workspace has limited ability to attract large occupiers and SME's - Poor mixed-use environment compared to other clusters	St Thomas' Hospital King's College London	The Health Foundry Genomics Medicine Centre South London	Lumeon Macusoft SXT Innersight Quiddity SurgiQ

Figure 5.14 Attributes of other emerging and competing life sciences markets. Source: CBRE Research

Looking ahead, there is a potential life science development pipeline of ca. 10.2m sq ft out to 2030. Even though 2.5m sq ft of the potential pipeline is located within the Knowledge Quarter, this implies that the vast majority of future life science space within London will be built in other markets.

Of the markets outlined as competitor markets, the markets south of the river (London Bridge and Waterloo) are set to see more development space than the Knowledge Quarter (2.7m sq ft), while White City also has the potential to develop 2.5m sq ft by 2030. Refer to Figure 5.15.

All of the space within the life science development pipeline will be delivered to the CL2 lab-enabled specification demanded by occupiers (see criteria in Figure 5.16).

Based on the existing floor to floor height alone, it is clear that the existing tower would not support CL2 lab-enabled spaces without significant intervention.

There are locations outside of the Knowledge Quarter within London that are developing a large quantum of high quality lab space. The implication for the Knowledge Quarter of this is that the Knowledge Quarter risks losing its status as the pre-eminent location for life science occupiers within London unless the supply of new lab space keeps up with the demands of the occupier community.

Life science potential development pipeline, selected markets, 2022-2030

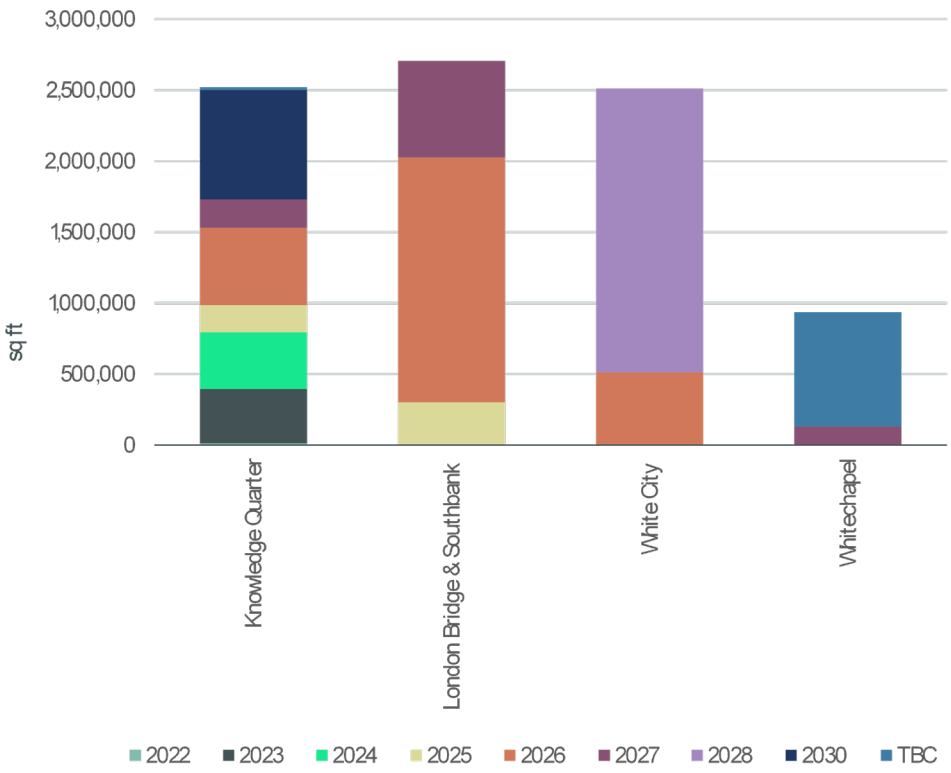


Figure 5.15 Life science potential development pipeline, selected markets, 2022-2030. Source: CBRE Research

DESIGN CONSIDERATION	CL2 LAB-ENABLED SPECIFICATION
CLEAR HEIGHTS	Generally 4m-4.5m clear Consider allowing for high-level services to be distributed
FLOOR STRUCTURE	Solid floor preferred over raised floor. Typically requirement is VC-A as a minimum for sensitive areas May require high-level services distribution
VENTILATION	Enhanced ventilation rates of between 6-15 air changes / hour
CIRCULATION AND LIFTS	Goods lifts servicing lab areas generally up to 2,000 kg, expected to be wider car widths Shared-tenancy buildings require separate restricted-access corridors / passenger lifts Containment labs to separate laboratory goods lifts from public access Lab tenant may specify required car widths / heights for specific machinery
OCCUPANT DENSITY (M^2 PER PERSON)	Generally 11 sqm – 18 sqm per person Could fluctuate dependant on tenant activity
PLANNING AND STRUCTURAL GRIDS	9m x 9m / 10m x 10m optimum structural grids for standard sized labs desks and other equipment Can vary for bespoke labs Vibration resilience needs to be considered
VIBRATION RESILIENCE	Response factor of 1 (eight times lower than office recommendations) Could be lower (0.5) dependant on tenant requirements Structural resilience to vibration needs to be greater than office, to sensitive machinery and activity
STRUCTURAL LOADING	4.0 kN/sqm Could be up to 5.0 kN/sqm for bespoke laboratories, dependant on internal activities and equipment

Figure 5.16 CL2 lab-enabled specification

5.3 Existing Building Operation

5.3.1 Previous Uses and Tenant History

As described in Section 5.1, the tower was designed as commercial office space above a two storey podium, with retail at grade.

Over the years the tower has seen multiple tenants (see list below), and has strong links to the music and broadcasting scene. From 1972 to 1984 it housed Scorpio Sound Studios, a recording studio, on the ground floor. It was here that Queen recorded parts of the album A Night At The Opera at the studio, including the lead vocals for the song Bohemian Rhapsody.

But perhaps the tower is most famously known as the home of Capital Radio. It was colloquially called "The Tower of Power". From 1973 the independent radio station had its headquarters in the tower, complete with studios and master control, broadcasting across London. With a prominent position on the ground floor, Capital Radio maintained its presence in the tower until 1997, when it moved its headquarters to its current space at Leicester Square.

Predominantly the tower was leased as a government building to both MI5 and HMRC, and details of the leasing arrangements are confidential.

It is thought that MI5 consolidated some of its facilities from across London in Euston Tower, taking the majority of the floor space. In 1978, the MI5 facility at 1-8 Barnard Road in Battersea was moved to Euston Tower, along with the "Watchers' Centre" from Clarence Terrace, Regent's Park. It may also have housed the MI5's POID (Levels 25-26), PO (Levels 17-40), and DSS (Levels 1-15, with Level 12 as plant floor) , and The Communications Control Centre (CCC) units. It is unknown when these facilities moved out of Euston Tower.

More recently, the Revenue and Customs Service (HMRC) used Euston Tower as office space, taking space on Levels 1-19, with an enquiry centre on the ground floor.

Notwithstanding its location in central London and connectedness, from circa 2010 the tower was never more than 70% occupied, as tenants slowly moved out.

Previous tenants are known to include:

- INMARSAT
- ACAS
- Atkins
- Atos Origin
- Capital Radio
- Elexon
- Faithful + Gould
- Google
- HMRC
- JP Morgan
- MI5
- Office Space in Town
- Santander
- Scorpio Sound Studios
- TomTom
- T-Systems.

Figure 5.17 A tenant directory at Euston Tower from around 2020

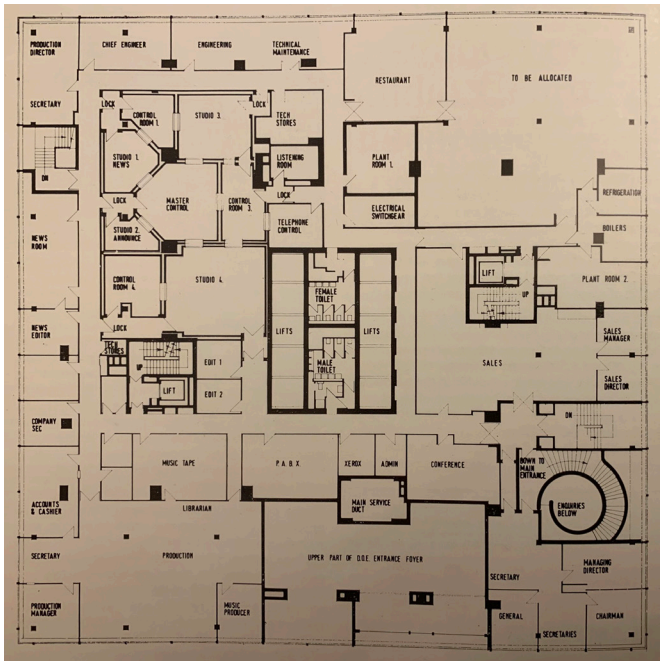


Figure 5.18 Famous previous tenants at Euston Tower include Capital Radio (top row) and Scorpio Sound (middle row). The capital radio original plan layout from Level 01 of the tower

5.3.2 Current Use

Vacant possession was taken in April 2021 and, with the exception of the retail on the ground floor which continues to function, the tower is vacant.

Current retail tenants at ground include:

- Amazon Fresh
- Pret A Manger
- Starbucks Coffee
- BloomsYard
- Nuvola
- Beany.

Pret A Manger

Nuvola

Beany

Starbucks Coffee

Amazon Fresh

BloomsYard

Figure 5.19 Images of current retail tenants on the ground floor

Figure 5.20 Regent's Place Plaza at night, photo 2022

5.3.3 Views on Building Operation

A Tenant's View
As the tower was let predominantly to government departments, specifically MI5 and HMRC, details of the leasing agreements and the building operation are confidential.

An Architectural View
From a space planning perspective, it is possible to comment on operational considerations by examining the existing floor layouts.

The existing layout is a hindrance to on-going flexibility, primarily driven by the existing structural grids and the location of the satellite cores. The existing column grid is irregular making it difficult to subdivide. This grid does not lend itself to a modular system. The four satellite cores impede circulation, resulting in a disconnected floorplate

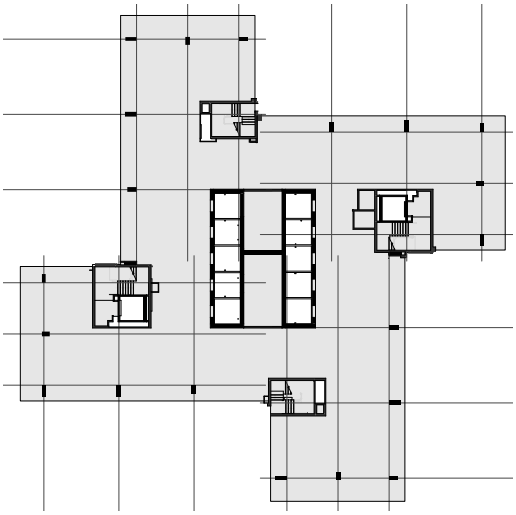
This disconnected floorplate can work in a single-tenant scenario, especially if the lifts open directly onto the floorplate. However the disconnection is exacerbated in a multi-tenanted scenario where, because the core is spilt into one central lift core and four satellite cores, main circulation takes up a significant portion of the floor plate. **Practically, this limits the existing building to single-tenant floors only, as evidenced by the photo of the tenant directory in Section 5.3 which shows no split floor occupancies.**

This limited flexibility is shown diagrammatically in Figure 5.21.

Finally, the low existing floor to floor height does not comply with current BCO guidelines for new-build and is on the low end for refurbishment, and restricts potential for future uses.

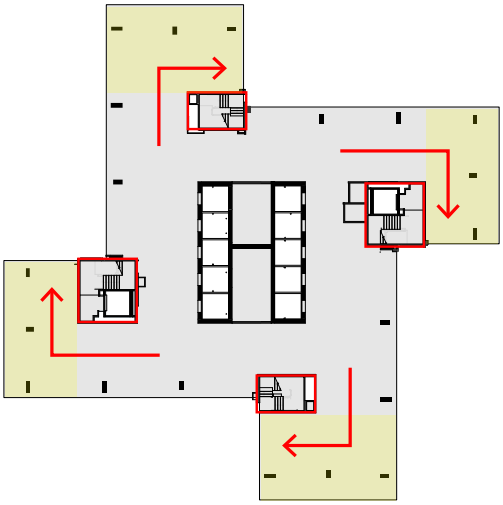
Grid

The existing irregular column grid is difficult to subdivide. This grid does not lend itself to a modular system.



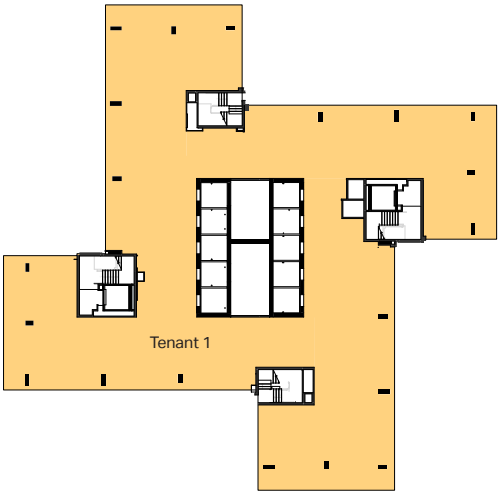
Satellite Cores

The four satellite cores impede circulation, resulting in a disconnected floorplate.



Space Planning

In a single-tenant scenario, the existing floor plate could work at reasonable efficiencies. Note that additional passenger, goods, and evacuation lifts would still needed.



Space Planning

In a multi-tenant scenario, main circulation takes up a significant portion of the floor plate. Note that additional passenger, goods, and evacuation lifts would still needed

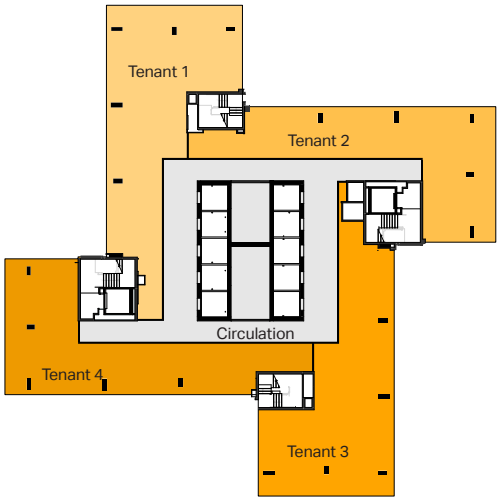


Figure 5.21 Diagrams showing how the existing floorplate limits flexibility

A Building Performance View

The façade does not comply with current codes and standards. Critically, it is has no fire stopping between floors, it is approximately 7x more air permeable than a contemporary building's, and has a U-value that is 2-3x worse than a modern, thermally insulated facade. Similarly solar gain is anticipated to be worse than a facade designed for low energy systems.

Notwithstanding that most of the services have already been stripped out, the central heating systems comprised oil and gas boilers with low efficiency compared to modern equipment. The original air handling plant was insufficiently sized to provide the fresh air ventilation required of modern codes and standards, let alone anything that exceeds this.

As one of the most important drivers of building energy performance, existing lighting is inappropriate for modern, efficient systems, lacking luminaires that are designed for energy efficiency and also their supporting control gear – switching, dimming, photocells.

The poor performance of the aging facade, previous central services, and outdated lighting, together result in operational energy and comfort performance that would be significantly worse than a contemporary, low energy building.

More detail on the MEP and facade performance is given in Section 6 and Section 7 respectively.

Figure 5.22 Facade and secondary glazing system

5.4 Optimising Site Capacity

5.4.1 General

The London Plan Policy D3 defines optimisation of site capacity as "ensuring that development is of the most appropriate form and land use for the site".

Developments should take a design-led approach “to determine the most appropriate form of development that responds to a site’s context and capacity for growth, and existing and planned supporting infrastructure capacity, and that best delivers the requirements set out in Part D”.

In response to the drivers of Policy D3, this Section sets out how a redevelopment would make significantly better use of the site than the status quo.

5.4.2 Land-use

Office floor space is protected under regional and local planning policy. Refer to Section 2.

5.4.3 Location

As described in Section 2, the site is adjacent to the Euston Opportunity Area, and located with the CAZ, Euston Area Plan and Knowledge Quarter. Opportunity Areas are identified as significant locations with development capacity to accommodate new housing, commercial development and infrastructure (of all types), linked to existing or potential improvements in public transport connectivity and capacity. The site has a PTAL score of 6b (best) meaning the location has excellent access to public transportation, with frequent and easily accessible services.

It is clear that the location is highly transit-orientated, and the infrastructure exists to support growth, making the site suitable for development and/or densification.

5.4.4 Form and Layout

The massing of the existing tower does not optimise its footprint due to the cutbacks that define its pinwheel shape. There is a significant opportunity to increase density on the site, along with the commensurate increase in job opportunities and public benefits.

While well connected, the existing building does not encourage active travel and lacks the amenities (e.g. sufficient bicycle parking, end of trip facilities, etc.) to support this. The ground floor experience is outdated and does not meet modern design and accessibility best-practices (refer to Experience below).

Significant opportunity exists in a redevelopment to better encourage active travel by providing the necessary amenities, and providing parity of experience to active travel users.

5.4.5 Experience

The existing building does not contribute positively to the street or public realm experience, due to its closed off unwelcoming podium. Except for the retail tenancies, the remainder of the ground floor frontage is opaque and inactive, with no communication of what happens inside the building, and no public access or programming.

The public realm experience is outdated and lacks the amenity and programming to make it attractive to users. The environment is polluted and noisy, and the landscaping and street furniture do little to mitigate this for users. The existing tower exacerbates the wind conditions at ground level, resulting in a public realm that is often uncomfortable.

A significant redevelopment would have the scope to significantly improve on the public realm experience. It would be able to offer public programming within and around the building, making the location attractive to a variety of users during typical working hours and beyond. It would allow for a significant improvement in the level of greenery and biodiversity, while providing open spaces for social interaction, and the like. Additionally, a re-designed tower has the capacity to better mitigate the wind conditions at ground level through design.

5.4.6 Quality and Character

The quality and condition of the existing tower and its sustainability standards are not commensurate with the potential of its location. An opportunity exists to significantly improve the quality and functionality of the tower through redevelopment. At the same time providing a building that is rooted in sustainability, with best-in-class energy efficiency, and circular economy principles embedded.

5.4.7 Summary

As is shown in Volume One (this document), the tower is vacant and the experience falls well short of a modern office expectation. There is little prospect of letting it in its current state due to the various technical and market considerations as set out in this study.

The public realm is outdated and uncomfortable and lacks the amenities to make it attractive to users.

The location and the existing building are not suited to the alternative (non-commercial) uses explored in Volume Two.

Supported by policy that protects commercial land uses, it is clearly demonstrated that the best use of the site is continued commercial, and that the tower and public realm, in their current state, are not maximising the capacity of the site. Only a significant redevelopment would have the scale to achieve optimised site capacity.

6

Euston Tower

Existing Servicing

6.1 General

Euston Tower is serviced with centralised MEP plant, most of which has already been removed as it was beyond its service life.

A detailed MEP condition survey was conducted in 2019. The study reviewed the condition of the MEP and lift services at Euston Tower, with a view to understanding what interventions were required to maintain said services on a short term and medium term outlook (3 and 10 years respectively).

It was assumed that the building would remain as an office building.

The short term outlook generally included a variety of refurbishment and overhaul projects. It did not consider for redesigning systems and may not meet British Land's carbon reduction aspirations. On the longer term outlook, the survey found that number of major MEP and lift services in the building would require full replacement.

The condition survey is included in Appendix H.

The Energy Performance Certificate (EPC) for the building as a whole was originally undertaken in April 2009, and expired in April 2019. The EPC achieved Band E with a 101 rating.

This Section sets out a description, status, and quality for each of the main services disciplines. Where relevant, it examines the performance of the existing systems, or inherent design aspects that impact how services would perform. Finally it describes the remaining service life, and outlines the pros and cons of upgrades.

The findings from this commentary inform the interventions that are needed to bring the building to market, which are explored in Section 7.4.

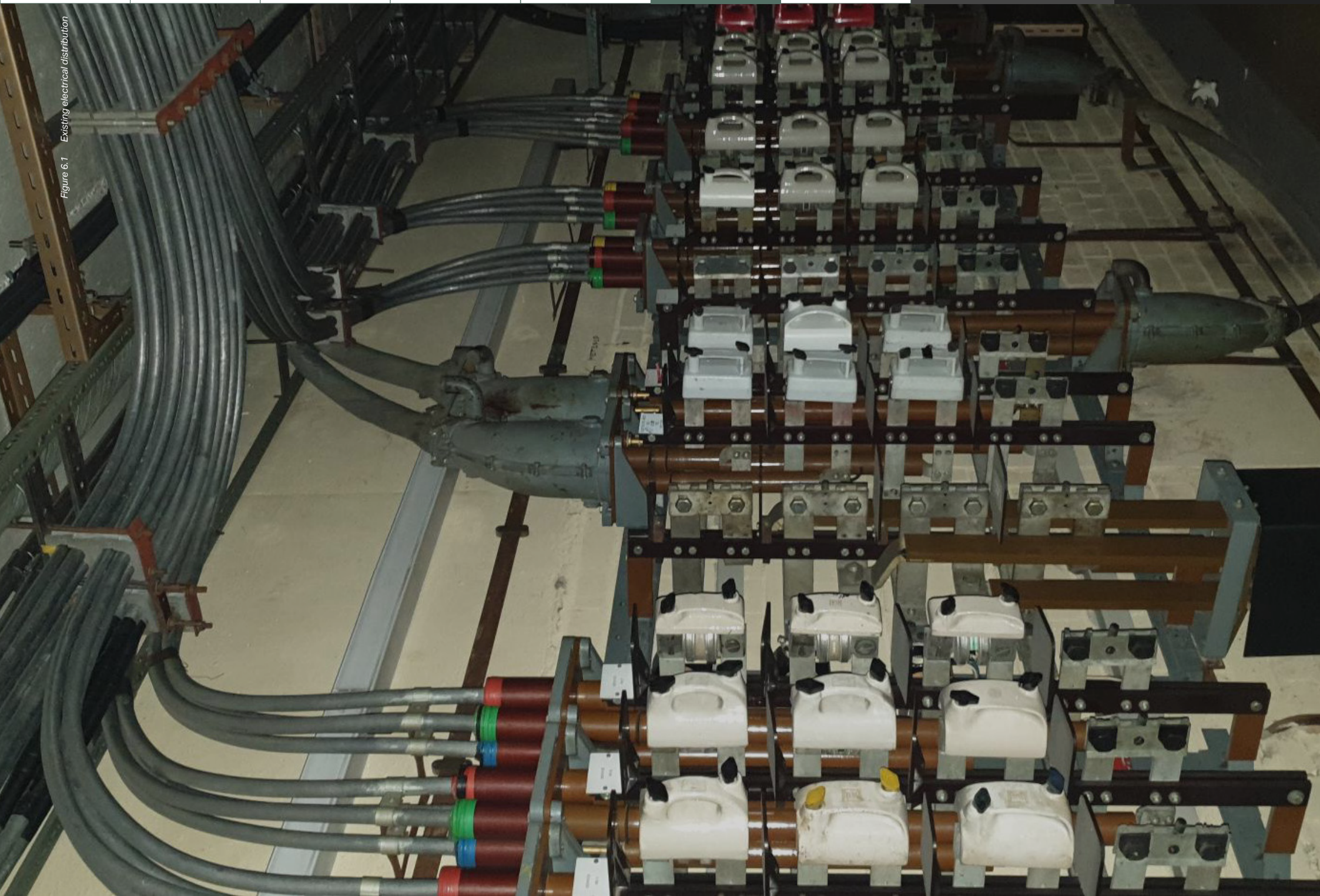


Figure 6.1 Existing electrical distribution

6.2 Mechanical Services

6.2.1 Description, Status, and Quality

Euston Tower was serviced with centralised heating, cooling, and ventilation plant.

Most of this equipment has already been removed as it was beyond its service life.

The existing floorplate section is modest in slab to slab height compared to more recent developments. Due to the original services strategy being located at the perimeter of the building. The resulting 100mm raised floor zone and very modest ceiling void depth do not provide enough space to support modern building services.

This spatial constraint places a significant restriction on the servicing strategy in particular. Ventilation was provided by centralised air handling units (AHUs) previously located on Level 12, serving Levels 2-22, and on Level 34 serving the remainder. Individual AHUs served each of the wings. Besides the centralised units are also localised AHUs on the first floor to supply retail units. These are still in place and reduce current office space and flexibility on this floor plate.

Heating was provided by oil and gas boilers, and cooling provided by water-cooled chillers, all previously located on Level 35. These units served terminal units on the floors located at the perimeter of the office floor plate.

It is believed that this was based on a minimum fresh air strategy with Euston Tower developed circa 1970 prior to the 1995 release of Approved Document Part F which recommended 8l/s/p which at a targeted occupancy of 1/8m2 is 6.4l/s/p – a 46% reduction in current building regulation requirement. **Euston Tower's ventilation was developed in 1970 pre Part F and, based on this and an appraisal of the riser sizes which are very small, it is suspected that the fresh air provision is lower than this outdated standard.**

	Workplace density (m2 per person)				
l/s per m2	10	9	8	7	6
0.8	8	7.2	6.4	5.6	4.8
1	10	9	8	7	6
1.2	12	10.8	9.6	8.4	7.2
1.4	14	12.6	11.2	9.8	8.4
1.6	16	14.4	12.8	11.2	9.6
1.8	18	16.2	14.4	12.6	10.8
2	20	18	16	14	12

Market leading offer proposed for Euston Tower

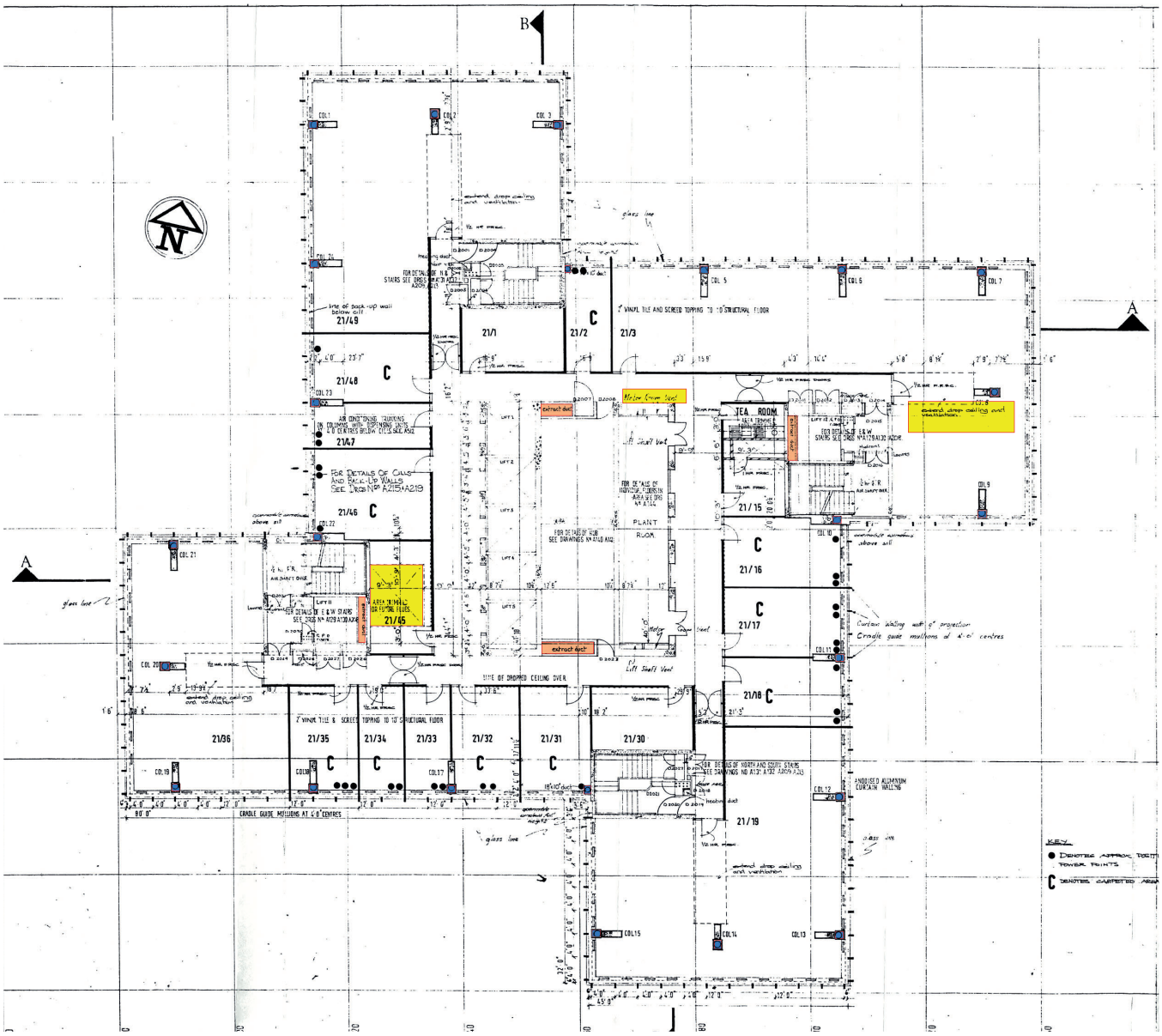
Satisfies BCO recommendation of 12l/s/p

Below BCO recommendation, above building regulations minimum

Below building regulations minimum

1995 Approved document Part F recommended 8l/s/p which at targeted occupancy level of 1/8m2/p is 6.4l/s/p a 46% reduction in current Building regulation requirements. Euston Tower ventilation developed in circa 1970 pre Part F requirements and it is suspected this level of fresh air may be reduced further. Existing AHU plant is beyond its serviceable life based on a 100% fresh air and would require updating to reflect modern building and energy regulation requirements.

Figure 6.2 Comparison of workplace density and fresh air rates required



Supply vent distributed around the perimeter columns. To enhance this, additional fresh air meaning larger risers and consequentially more demo of the existing structure.

Centralised extract (limited provision)

Area of extended drop ceiling and space reservations for flues and misc. vent risers

Figure 6.3 Original plan drawing showing principles of existing ventilation strategy

6.2.2 Performance and Efficiency

The original oil boilers and gas boilers had a poor operational efficiency compared with modern minimum requirements.

It is also believed that the AHUs were direct supply and exhaust with no heat recovery. This is a pre-requisite in current Approved Document Part L for energy conservation.

The plant is heavily impacted by the poor condition and outdated design of the façade which is not consistent with modern insulation, air tightness, solar gain.

An EPC was produced in 2009 and expired in 2019. This original EPC rating was Band E, scoring 101 rating. Overall energy performance is expected to be very poor relative to modern buildings.

Figure 6.5 Existing floor to floor height (left) is modest and original installation used perimeter services to accommodate this (right)

Figure 6.6 Existing MEP equipment

6.2.3 Remaining Lifespan

The existing MEP services have been stripped out as the existing equipment was typically at the end or over its serviceable life with some of it having been from the original install in 1970.

Figure 6.7 captures this in comparison with industry guidance CIBSE Guide M Appendix 12.A1 – Indicative economic life expectancy tables.

6.2.4 Pros and Cons of Upgrading

Ventilation, heating, cooling capacities would require extensive revision to support latest requirements for Part L, Part F which are only becoming more stringent and increasing the gap between the current systems capabilities.

The existing systems and distribution (incl. risers) are inappropriate and would require enlargement and relocation with corresponding impact on structure.

The existing 100mm raised floor zone and very modest ceiling void depth is not enough space to support modern building services. To modernise the services, the zone required in the floor and or ceiling would also need to increase.

In any future scheme, an all electric approach only should be considered requiring a wholesale change in central plant and riser provision bringing benefits in operational energy use, carbon emission and local air quality.

Equipment	Predicted Service Life*	Installed/Replaced**	Years in service	Years Until End of Life	Notes
Air handling units, external	15	1970	52	-37	
Air handling units, internal	20	1970	52	-32	During the survey the age of the AHUs was unable to be determined and therefore an estimate of original installation was assumed.
Ductwork	20	1970	52	-32	
Wet riser and landing valves	20	1970	52	-32	Electrical pump that serves wet riser is original, as well as the distriution pipework. Diesel driven unit was replaced in 2010.
Heating pipework, unvented	25	1970	52	-27	
Building Management System	10	2000	22	-12	
Oil fired burners	15	2000	22	-7	
Gas fired burners	15	2000	22	-7	
Heat exchangers, plate	15	2000	22	-7	
BMS Controls	15	2000	22	-7	
Motor Control Centres (MCC)	20	1997	25	-5	
Boilers, MTHW	20	1999	23	-3	During the survey no oil or water leaks were found in the boiler room. It was also noted there is limited spares available for items such as rope seals and gaskets from the boiler manufacturer.
Boilers, LTHW	20	2000	22	-2	The boiler age unable to be identified and was approximated as 19 years old (as of 2019).
Air cooled chillers	20	2000	22	-2	
Sprinkler pump set	20	2000	22	-2	
Water cooled chillers	20	2007	15	5	4 water cooled chillers in operation (1997, 2007, 2012 and 2018). It was noted that the oldest two chillers will require replcaement due to age and availbility of economic spare replacement parts.
Boiler flues, steel	30	2000	22	8	
Cooling towers, plastic coated metal	25	2005	17	8	Installed in 1993 however extensively refurbished in 2005/2006.
Sprinklers, pipework and heads	30	2000	22	8	
Pumpsets, MTHW, LTHW and CHW	20	2014	8	12	From the survey it was noted that pumps were replaced in the pst 5 years (as of 2019) with the pump condition being described as good.

Beyond end of life

Nearing end of life

Operating within economic life expectancy

**(Economic life) - Economic life guidance extracted from "CIBSE Guide M - Maintenance engineering and management - Appendix 12.A1: Indicative economic life expectancy"*

***(Installed /replaced) – Tabulated information based on SVMA Condition Survey 18/10/2019*

Figure 6.7 Table of anticipated remaining lifespan for mechanical services equipment

6.3 Electrical Services

6.3.1 Description, Status, and Quality

Main Distribution
The building is served by a number of 11,000(V) three-phase and neutral (TPN) supplies, which enter the property from the sub-basement area. These are divided into landlord's and tenants' 11,000(V) supplies feeding transformers on the 34th floor to serve tenant plant.

The 415(V), 400(A) TPN supplies to common parts, plant on the 1st, 12th , 33rd and 34th floors and other ancillary areas are routed via dedicated switch rooms to the different service risers throughout the property.

The tenants' supply risers are located in each wing, via a propriety type of busbar distribution system serving at every level a compartmented, single-phase distribution board. These are located within the fire escape stairwells, and serve small power to sockets, lighting and the fan coil units. Additional distribution boards are located within the floor plates and serve additional small power works.

Main LV Distribution Panels
The main LV distribution panels are located in a dedicated electrical switch room in the basement. The LV distribution panels consist of six individual sectional panels identified LV-1 to LV-6 serving the retail units, landlord's services and tenant's electrical services. With the LV essential power boards being fitted with automatic changeover switchgear

Tenant DBs and Busbar
The busbar distribution system is fed from the basement switchgear room and is supplied from several 400 (A), three phase isolators; the busbar systems are separated into four distinct systems per wing, based on floor levels, i.e. floors 2 to 11, 13 to 19 and 20 to 34.

Generally, the distribution boards and associated busbar distribution system serving floors 2 to 11 dates from the original construction of the building in the 1970s.

The distribution boards serving floors 12 to 19 date from approximately 2001, with the associated busbar distribution system still being original to the construction of the building. The distribution boards and associated busbar distributions system serving floors 20 to 34 having been replaced within the last 15 years.

Lighting
The general office lighting on the office floorplates is generally comprised of modular fluorescent luminaires laid in the suspended ceiling grid.

The plant rooms, staircases and general back of house area are illuminated with a mixture of surface mounted baton florescent light fittings and bulkheads. In general, these are in poor condition with many fittings damaged or not functioning.

Emergency lighting is provided by a combination of self-contained bulkhead luminaires distributed throughout the back of house areas, floor plates, and recessed luminaires fitted with emergency battery conversion packs.

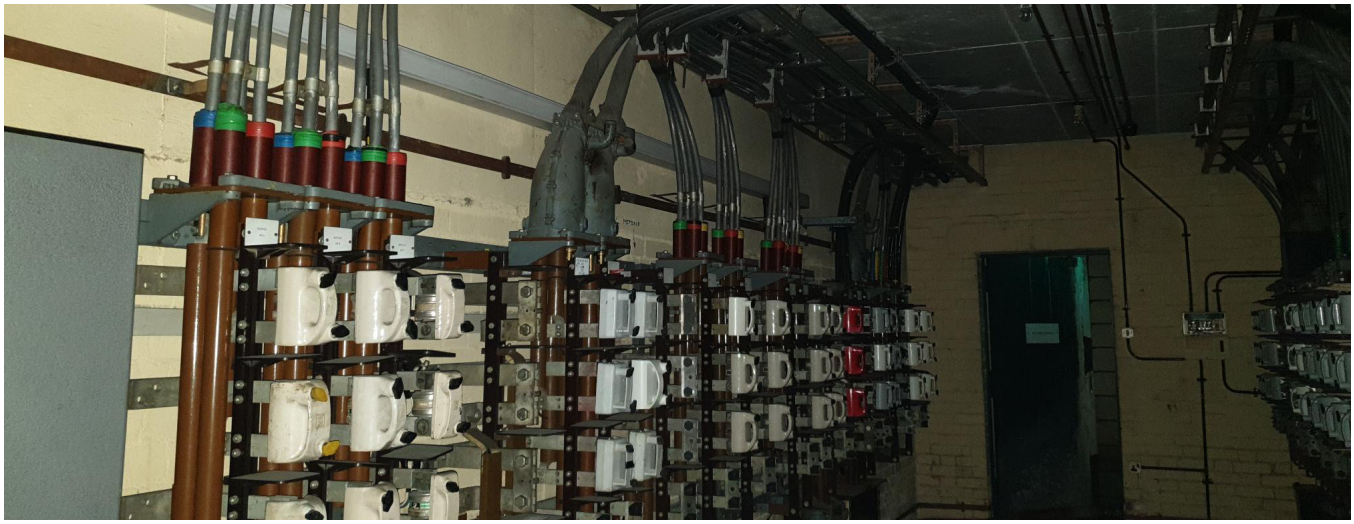
The directional exit signage throughout the back of house areas and floor plates comprises of a mixture of pictogram styles, including those with wording that has now been superseded by later standards.

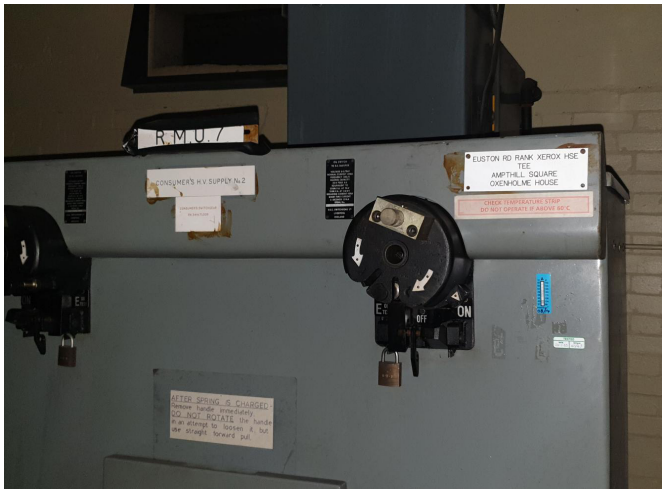
6.3.2 Performance and Efficiency

To support the emerging energy strategy requirement of Building Regulation Part L and Local Policy a future scheme would be an all electric building, which has a consequential implication for higher electrical demand.

There is a need to upgrade the infrastructure.
The infrastructure is generally Low Voltage. To support the change in energy strategy it is proposed to move to an improved High Voltage connection.

The lighting is inappropriate and needs to meet particular energy performance. This would require the selection of modern LED luminaires that are designed for energy efficiency and also their supporting control gear – switching, dimming, photocells





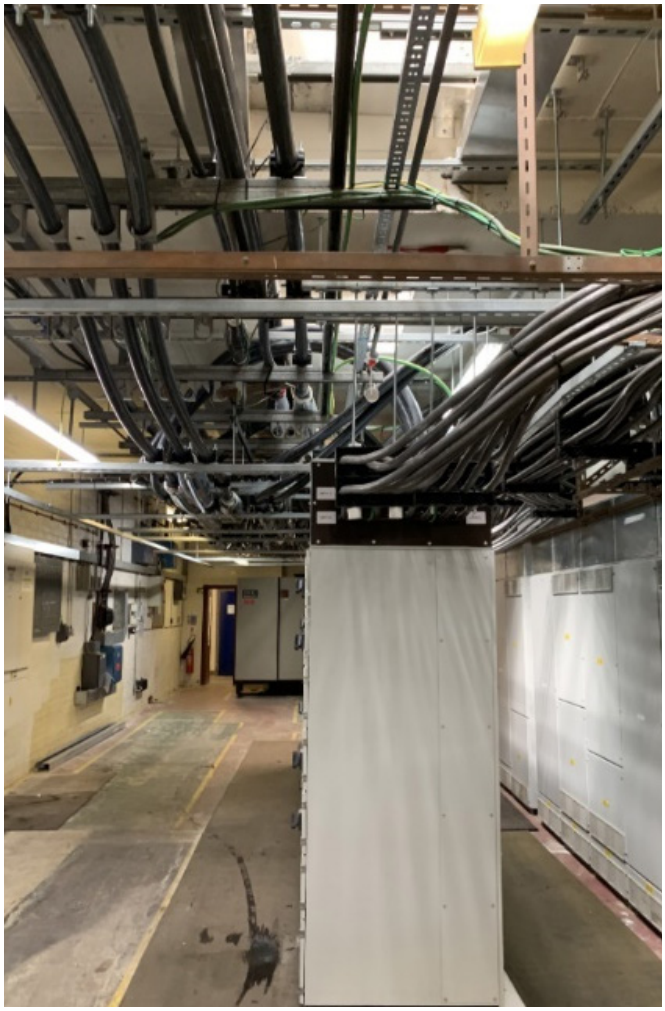


Figure 6.8 Existing electrical equipment

6.3.3 Remaining Lifespan

Equipment is typically beyond its serviceable life of 30 years having a large portion of the system originally installed in the 1970s.

Figure 6.9 captures this in comparison with industry guidance CIBSE Guide M Appendix 12.A1 – Indicative economic life expectancy tables.

6.3.4 Pros and Cons of Upgrading

Upgrades to electrical infrastructure would be driven around energy savings and a move to a more resilient electrical supply.

There is a need to upgrade the infrastructure.
The infrastructure is generally Low Voltage. To support the change in energy strategy it is proposed to move to an improved High Voltage connection.

There is no tenant standby generation at present, and we would propose to move to a more resilient incoming arrangement rendering the current arrangements inappropriate.

Equipment	Predicted Service Life*	Installed/Replaced**	Years in service	Years Until End of Life	Notes
Electrical Distribution	25	1970	52	-27	
Tenants Distribution Boards	25	1970	52	-27	
Bus Bars	35	1970	52	-17	
Chiller HV Electrical Power Supply	35	1970	52	-17	
Lifts	20	1990	32	-12	
Inverters	15	2005	17	-2	
Small Power	25	2001	21	4	
Standby Generator	30	2008	14	16	

Beyond end of life

Nearing end of life

Operating within economic life expectancy

**(Economic life) - Economic life guidance extracted from "CIBSE Guide M - Maintenance engineering and management - Appendix 12.A1: Indicative economic life expectancy"*

***(Installed /replaced) – Tabulated information based on SVMA Condition Survey 18/10/2019*

Figure 6.9 Table of anticipated remaining lifespan for electrical services equipment

6.4 Public Health Services

6.4.1 Description, Status, and Quality

Domestic Hot Water
The domestic hot water calorifiers (DHW) are in the 25th floor, three calorifiers, and the 12th floor plantroom, four calorifiers. The primary heating source to the calorifiers is from the MTHW system and they are provided with supplementary electrical heaters. The calorifiers are horizontal units and they date from the 2000 fit out of the building

In the 1st floor plantroom there is a gas fired water heater which provides domestic hot water (DHW) to the kitchen area.

Cold Water Services
The main water storage tanks are located on the 35th floor plantroom and in the basement water tank room. Typically, the tanks are GRP section units. The tanks appear to be sized for a 24 hour water storage capacity. It is now normal practice to size water tanks on a maximum storage capacity of 6 to 8 hours of usage.

The main cold water booster pumps are in the basement, cold water tank room. The booster pumps appear to have been replaced relatively recently.

Pipework
In general, most of the pipework is original with copper pipework being used on the hot and cold water services

Surface Water Attenuation
No allowance in existing building.

Sprinklers
Cold-water mains supplied sprinkler system serving the ground, 1st and 2nd floors of the building only.

6.4.2 Remaining Lifespan

A large portion of the pipework infrastructure is original and from approximately 1970 and is therefore beyond the end of its design life and would require replacement.

Figure 6.10 captures this in comparison with industry guidance CIBSE Guide M Appendix 12.A1 – Indicative economic life expectancy tables.

6.4.3 Pros and Cons of Upgrading

There is very limited cycle storage provision and associated showers in the building at present which would require extensive drainage and DHW modification to support the latest London plan and Camden policy requirements.

Sanitary ware would require a complete refurbishment on WC and WHBs to meet latest building regulation flow requirements.

The on floor toilet provisions would require updates to suit desired occupancy levels leading to significant changes needed to the core and risers to support this.

Sprinkler provision is currently only within the lower levels of the building. To meet the latest fire requirements this would need extensive revision to cover all levels with consequential central plant and riser impacts through existing structure.

Surface water attenuation would need to be introduced, for which there is no space in the basement. Rainwater intensity calculations have been updated and to account for increased rainfall intensities due to climate change the current system capacities are likely to be insufficient. Therefore, additional drainage capacity would be required which is not allowed for in the existing basement.

Equipment	Predicted Service Life*	Installed/Replaced**	Years in service	Years Until End of Life	Notes
Storage tanks, plastic/non-metallic	20	1970	52	-32	
Waste pipes, plastic	30	1970	52	-22	
Pipework distribution, stainless steel	35	1970	52	-17	
Waste pipes, ductile iron	40	1970	52	-12	
Storage tanks, galvanised steel	15	2000	22	-7	
Pipework distribution, copper	45	1970	52	-7	
DHW storage calorifiers, copper	25	2000	22	3	

Beyond end of life

Nearing end of life

Operating within economic life expectancy

**(Economic life) - Economic life guidance extracted from "CIBSE Guide M - Maintenance engineering and management - Appendix 12.A1: Indicative economic life expectancy"*

***(Installed /replaced) – Tabulated information based on SVMA Condition Survey 18/10/2019*

Figure 6.10 Table of anticipated remaining lifespan for PH services equipment

6.5 Fire Safety Services

6.5.1 Description, Status, and Quality of Services

Sprinklers
Cold-water mains supplied sprinkler system serving the ground, 1st and 2nd floors of the building only.

Smoke Clearance
Current provision for smoke clearance is via manual vents.

Smoke ventilation in the basement is currently provided via natural means only.

6.5.2 Pros and Cons of Upgrading

The building is currently not sprinklered with a small system serving the lower floors only. Sprinkler provision is required by BS EN 12845 throughout, as a minimum (LPC insurance requirements may also be required).

Current provision for smoke clearance is via manual vents. These would need to be replaced by mechanical ventilation due to the building height. This can be either a smoke extract system (demonstrating performance equivalent to a natural shaft) which is typically a 1m^2 shaft with openings to the lift lobby, or a pressurisation system in accordance with BS EN 12101-6.

Smoke ventilation in the basement is currently provided via natural means only. Given the size of the basement and the requirement to ventilate each individual space, it is highly likely that ventilation needs to be mechanical throughout (10ach each).

No additional stairs are required. Designing for a speculative office with an approximate floor area of 950m^2 and a 1:6 density (the density recommended in BS9999), the existing office floorplate would cater for approximately 159 persons. The existing stairs are all 1,300mm wide, and so would easily support this occupancy with the minimum of 2 no. stairs required.

The existing two fire-fighting shafts are to be upgraded:

- Smoke ventilation as described above
- The minimum structural performance of the shaft enclosure is 120mins structural fire rating.

The two fire fighting lifts are unlikely to be fully compliant to current standards and will require to be upgraded. Fire fighting lifts cannot be used as goods lifts, which appears to be the current provision. This therefore may require new goods lifts to be incorporated within the core.

Evacuation lifts are recommended (to comply with London Plan) but note this is not a Building Regulation requirement. However evacuation lifts are certainly expected now in any London new-build project. The lifts should be accessed from each stair core (passenger or goods lifts via protected routes). If evac lifts are not provided there is a significant reliance on building management to carry down occupants who require assistance. The fire-fighting lifts can be used initially but once the fire brigade arrive they have to be handed over, and carrying down the stairs is then the only option.

A building the height of Euston Tower requires 120minutes structural fire rating as per fire safety guidance. The existing structural fire rating is understood to be between 60 and 90mins when tested to current standards. Upgrades of the existing structure are likely required (refer to Section 7.2 and Section 7.4).

The existing façade does not have adequate compartment slab fire stopping provisions. Intervention is required in order to achieve an acceptable level of compartmentation between floors (refer to Section 7.3).

Figure 6.11 Euston Tower facade, no slab edge fire stopping is evident

6.6 Vertical Transportation Services

6.6.1 Description, Status, and Quality of Services

The existing lifting systems comprise the following:

- 5 high rise passenger lifts serving ground and floors 20 to 34 (1,590 kg 5 m/s) with motor room located on Level 36
- 5 low rise passenger lifts serving floors ground to 19 (1,425kg 3.5 m/s) with motor room split over two floors (Levels 21-22) and accessed via tenant areas i.e. office floor plate.
- 2 fire fighting / goods lifts serving all floors (1,360kg 2.5 m/s).

The lifts were installed when the building was originally built in 1970. A significant modernisation was undertaken in 1990 and further stabilisation works undertaken in 2017. Much of the equipment is the original design, including the guides, lift cars, counterweights, machines, divertors compensation and buffers.

In 1990, the controllers were replaced along with all car and landing signalisation. The generators were removed but the DC motors were retained.

In 2017, stabilisation works allowed for an overhaul of the lift machines, replacement door operators and significant health and safety upgrades, along with the provision of critical spares.

The landing doors have had some modification and improvements over their lifetime, including replacement rollers, lock components and air cords.

6.6.2 Performance and Efficiency

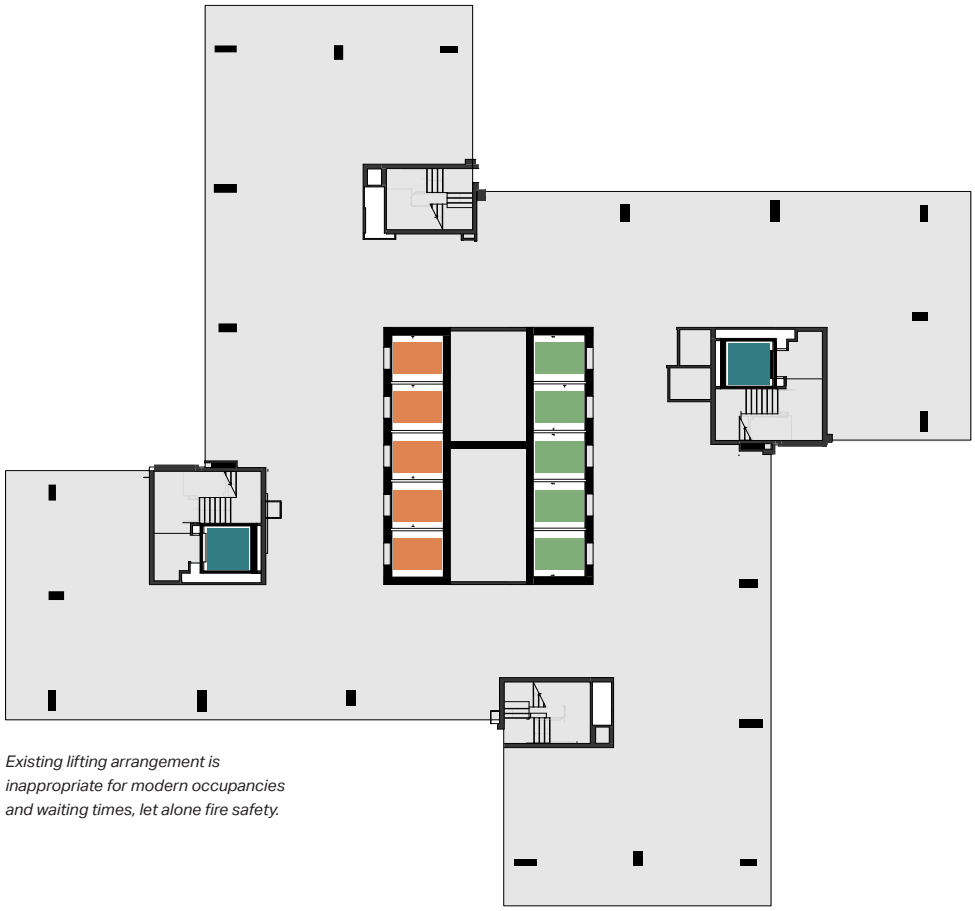
While parts of the lift systems have been modified and updated, some of the equipment is still the original 50 year+ old installation. In particular, the passenger lift motors are the original DC motors and are very energy inefficient compared to modern lift motors.

The existing passenger lifts can only support the following occupancy with reasonable waiting times:

- **High zone – one workstation per 16 m^2**
- **Low zone – one workstation per 14 m^2.**

This is equivalent to 50-70% of the occupancy that might be expected.

A typical current office would have the lift systems designed to suit an occupancy of one workstation per 8 or 10m^2 of net internal area.



Passenger high rise (HR A-E)

Passenger low rise (LR A-E)

Fire fighting / goods lifts

Figure 6.12 Diagram showing existing lifting arrangement

6.6.3 Remaining Lifespan

As noted, some of the major components of the main passenger lifts are original as installed, so now more than 50 years old. Even the two goods lifts, which have been completely replaced, are now more than 20 years old. While the SVMA Lift Dilapidation Report (refer to Appendix I) notes the equipment is good quality, availability of spares is likely to become a critical challenge to continued reliable long term service.

6.6.4 Pros and Cons of Upgrading

The existing passenger lifts are of a modest size when compared to modern office passenger lifts and were designed to meet a very different (and less onerous) demand than that expected by today's typical design benchmarks.

Fire-fighting lifts cannot be used as goods lifts. This approach is not normally permitted by current standards, particularly the code of practice BS 9999. Goods lifts that are currently doubling as fire-fighting lifts would need to be separated into distinct lifts.

Evacuation lifts are recommended (to comply with London Plan) but note this is not a Building Regulation requirement. However evacuation lifts are certainly expected now in any London commercial building by both occupiers and landlords. If evacuation lifts are not provided there is a significant reliance on building management to physically carry down occupants who require assistance. The fire-fighting lifts can be used initially but once the fire brigade arrives they have to be handed over, and then the only option is to be carried down the stairs.

The size and duty of the goods lifts is modest by today's standards. The current size and duty of 1,360kg is short of the BCO 2019 recommended duty of 1,600 kg to 3,000 kg.

Given the age of the equipment, particularly the passenger lifts, any modernisation strategy would see the majority of components replaced purely on an age basis and the availability of spare parts.

From an embodied carbon perspective one might consider retention of significant metal materials such as guide rails, doors and lift car slings and platforms however the fact that for an office use one would look to alter the size of the lift cars this would change the lift well size and relocate the guides and doors and replace the car.

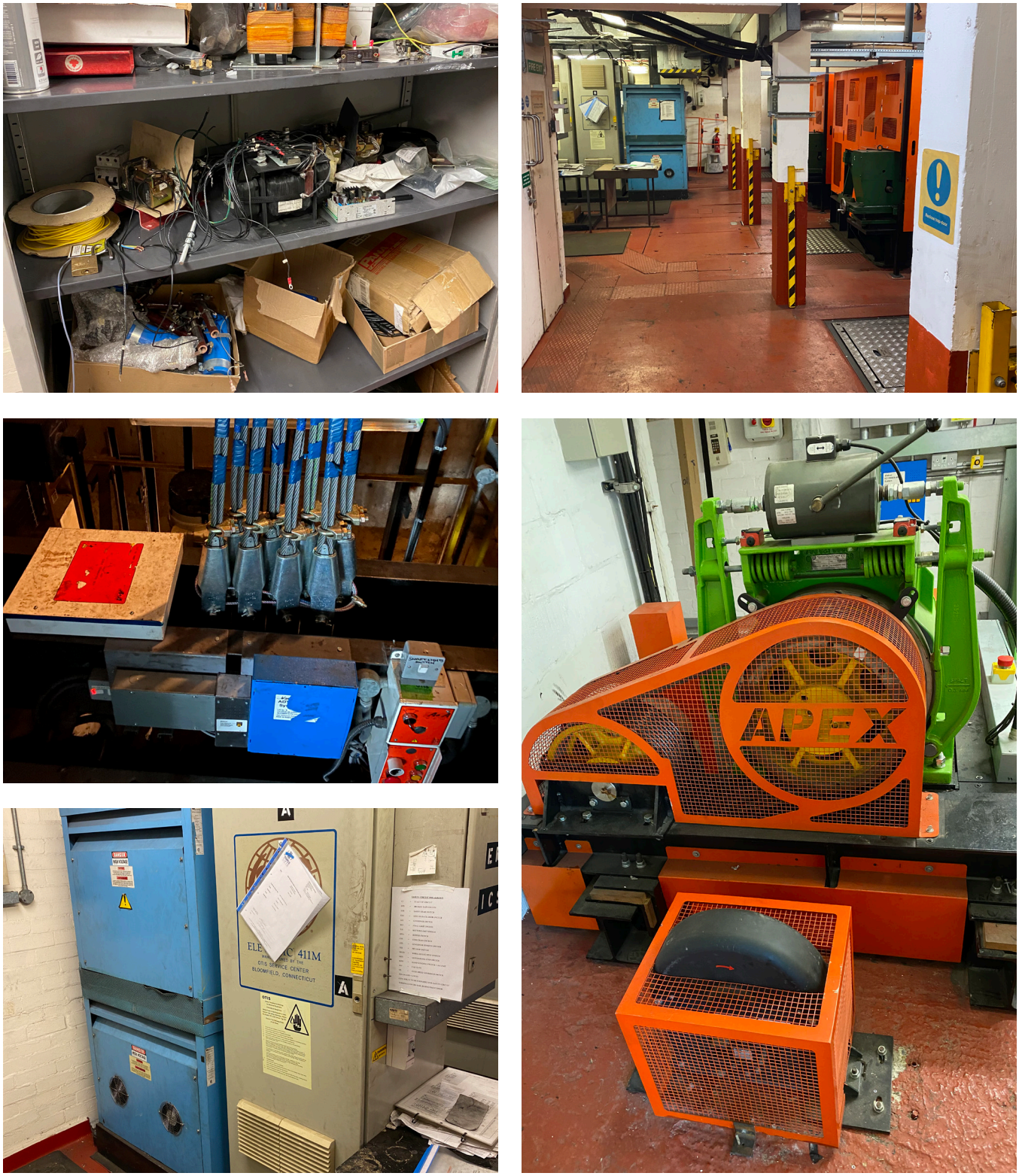


Figure 6.13 Existing VT equipment

7

Euston Tower

Technical Review

7.1 Architectural Summary

7.1.1 Floor Plans

The existing tower is over 100m tall comprising 36 storeys, with office accommodation over the 34 upper floors and retail space at ground floor. It shares a common basement with the rest of the campus, which is used for deliveries, waste removal and car parking.

The floorplate is laid out as a pinwheel with vertical transportation from a central lift core and four satellite cores. Figure 7.1 and Figure 7.2 show the typical floor layouts.

Figure 7.2 provides an illustration of a typical floorplate in the tower of Levels 03-19. From Level 20-34 the lifts in the right side of the central core drop off (Figure 7.1) and Level 35 and 36 are designed for plant space. For the retail space provided on Level 00-01, the floorplate is extended out to a square.

The collection of existing layouts is included in Appendix A.

The dimensions of the existing column grid can be read from Figure 7.1 and Figure 7.2. The grid is irregular and therefore does not lend itself to a modular system.

The current pinwheel layout restricts floorplate flexibility and the four satellite cores impede circulation, resulting in a disconnected floorplate.

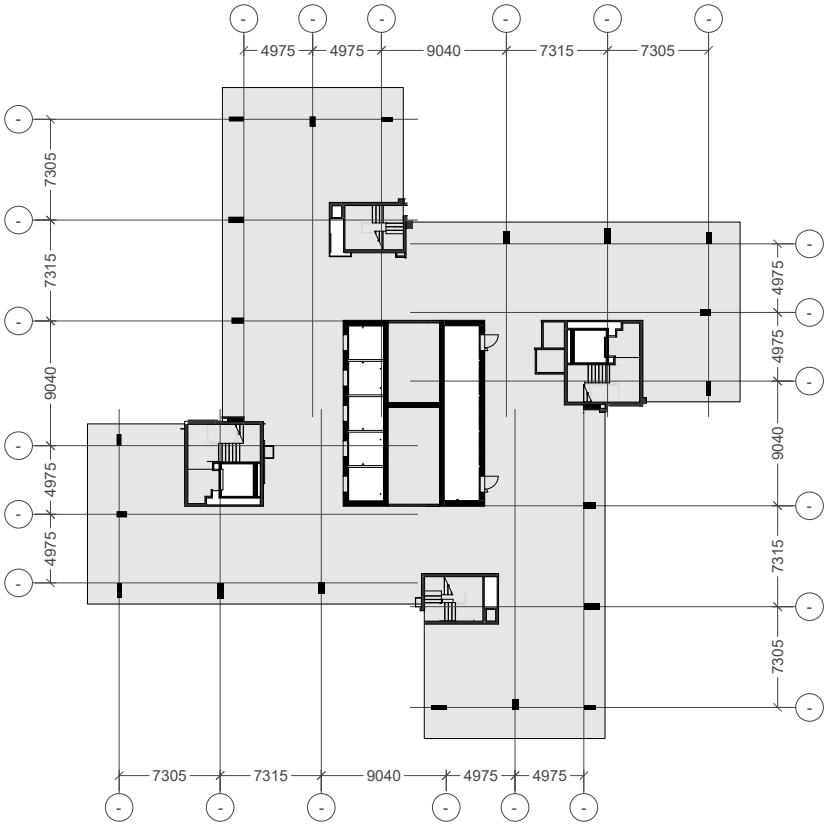


Figure 7.1 Typical existing floorplate level for upper office floors (Level 20-34)

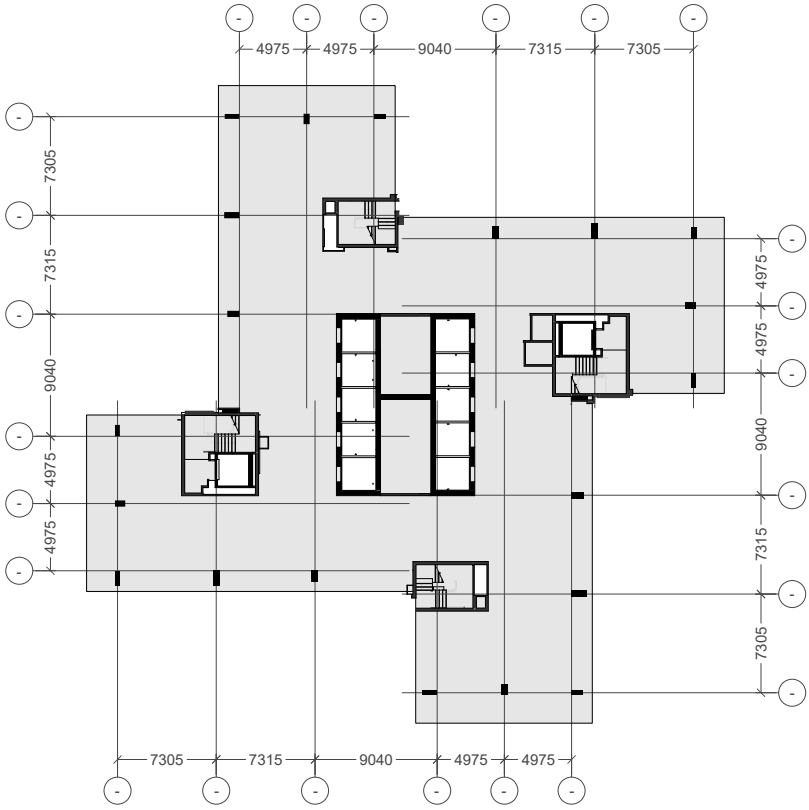


Figure 7.2 Typical existing floorplate level for lower office floors (Level 03-19)

7.1.2 Sections

The typical floor sections are shown in Figure 7.3 and Figure 7.4. The current structural design results in a clear height of 2,725 from floor to the underside of the ring beam and 2,825mm height from floor to the underside of the ribs.

Assuming the previously installed raised access floor and suspended ceiling, this provided a 2,550mm floor to ceiling height. The previously installed 100mm raised floor is not enough space for modern services and previous 225mm ceiling depth is minimal since the previously-installed services were located at the perimeter. To make room for modern services, the depth of the floor and ceiling would need to increase.

For full existing building sections and elevations refer to Appendix B and Appendix C respectively.

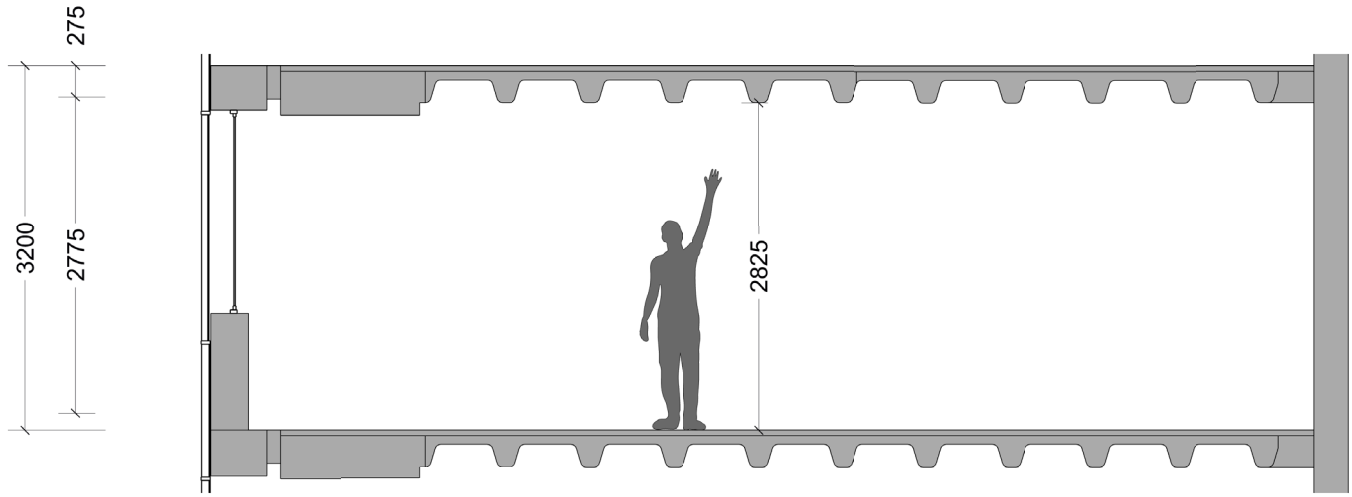


Figure 7.3 Internal structural floor section showing 2,825mm clear floor to underside of structure height. The height below the ring beam is 2,725mm.

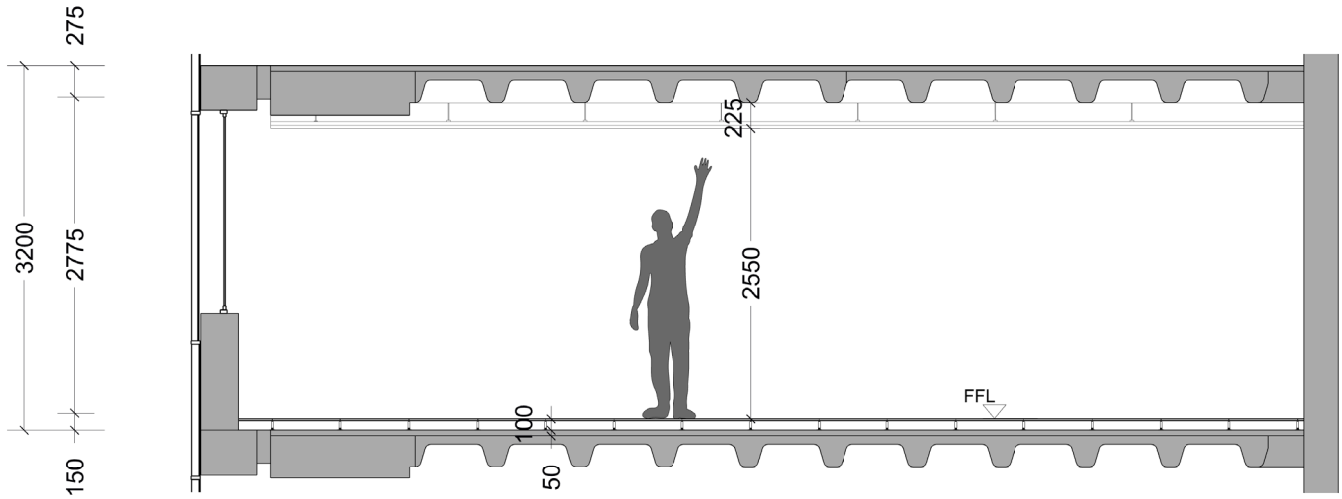


Figure 7.4 Internal on floor section showing 2,550mm clear floor to ceiling height

7.2 Structural Review

7.2.1 Existing Structure

Euston Tower is an in-situ concrete frame building designed and constructed in the late 1960s. It is understood that the building has generally been in use since its completion.

Generally the existing structural system is a reinforced concrete frame with a combination of ribbed and flat slabs for the decks. Lateral stability is provided by a central reinforced core, in combination with satellite cores at the extremities of the floorplate.

The building is cruciform shape on plan and constructed of reinforced concrete (RC). The perimeter vertical structure comprises RC columns. The internal vertical structure is comprised of RC walls containing lift shafts. At each of the four re-entrant corners of the plan, support is provided by one of the four satellite cores which contain escape stairs, services risers and goods lift shafts.

The floor plates for typical office floors comprise 10" (254mm) deep concrete ribs spanning onto beams or directly onto walls. The typical edge beams increase in depth to 15" (381mm).

Record data for the structure is sparse. An extensive search was conducted for records of the original structure including structural general arrangement drawings, reinforcement drawings and original calculations. These would be of great value in understanding the structural capacity and what modifications can be made to the structure with minimal strengthening.

The main design information obtained comprises original architect's plans by Lewis Solomon, Kaye and Partners, some structural general arrangement drawings and a few reinforcement drawings. Previous studies (by Arup) on Euston Tower in the 1990s contained extracts from original structural calculations, but are again very limited. A summary of the records searches carried out so far is shown in the table in Figure 7.5.

In addition, a series of surveys have been undertaken to understand the current condition and arrangement of the structure. Further surveys are planned to provide a complete set of information for design. An investigation into the condition of the foundations is complete, including caissons.

The findings suggest that the concrete and reinforcement is generally in reasonable condition, and has a high strength in walls, columns, and beams. Accordingly, the existing structure satisfies stability requirements with the arrangement as is.

A building the height of Euston Tower requires 120 minutes structural fire rating as per fire safety guidance. The existing structural fire rating is understood to be between 60 and 90 minutes when tested to current standards. Upgrades of the existing structure are likely required to some or all areas.

The structure appears to be in reasonable condition for its age and suitable for its intended purpose as an office space.

	Archive data	
John de Bremaeker & Partners	Original structural drawings. Only partial information available	1967
Lewis Solomon, Kaye and Partner	Partial information only. Some structural arrangement drawings and few reinforcentment drawings	1967
Ove Arup & Partners	Partial information only. Extracts from original drawings and original structural calculations	1968
Ware MacGregor	Partial information only. Set of architectural survey drawings	1973
ELS Consultants	Partial information only. Set of architectural survey drawings	1993
British Land	It is understood that existing building information was loaned to Arup for engineering studies in 1990s, and returned to British Land on competition. An initial search for this information has been unsuccessful, but should be continued further.	2022
	Archive photos	
Tavernor	Travenor Consultancy has been appointed to review archive data from various sources. A small number of photos during construction have been sourced from the London Metropolitan	2022
	Survey data	
Sandberg	Structural investigations performed between November 2019 and December 2020. Many floors were occupied at the time and access was restricted to vacant floors. The surveyed levels are the following: B1-GF-4-12-15-16-24-25-27-28-30-31-35.	2019
Plaowman Craven	Ful point cloud survey data of stripped tower completed in February 2022 and Imported into Revit. Some structural elements (notably columns and core) hidden due to finishes.	2021
McGee	Ongoing fundation invstigation to understand arrangement and condition of existing piles and pile cap. Expected completion April 2022.	2022
	Miscellaneous	
First hand iformation	It is understood that a relative of a JF Hunt (current strip-out contractor) employee was directly involved in the construction of the tower. A meeting has been proposed to discuss.	2022

Figure 7.5 Record searches have been conducted to understand the existing structure

7.2.2 Foundation

To understand the strength, condition, and make-up of Euston Tower's foundations, extensive intrusive research was undertaken. See Figure 7.7.

Piles are arranged in groups beneath the columns and the structural cores (including the four satellite cores). They are typically formed of 610mm diameter, 20m long straight shafted reinforced concrete sections. Intrusive investigations have found that they are reasonably well reinforced to full depth.

A 2.4m deep pile cap covers the entire footprint of the existing tower. This is used to spread the load from individual columns into the pile groups. The pile cap appears to be in reasonable condition for its age, although is sparsely reinforced when compared to modern standards. The concrete appears to be of high compressive strength and no corrosion of the reinforcing steel has been observed.

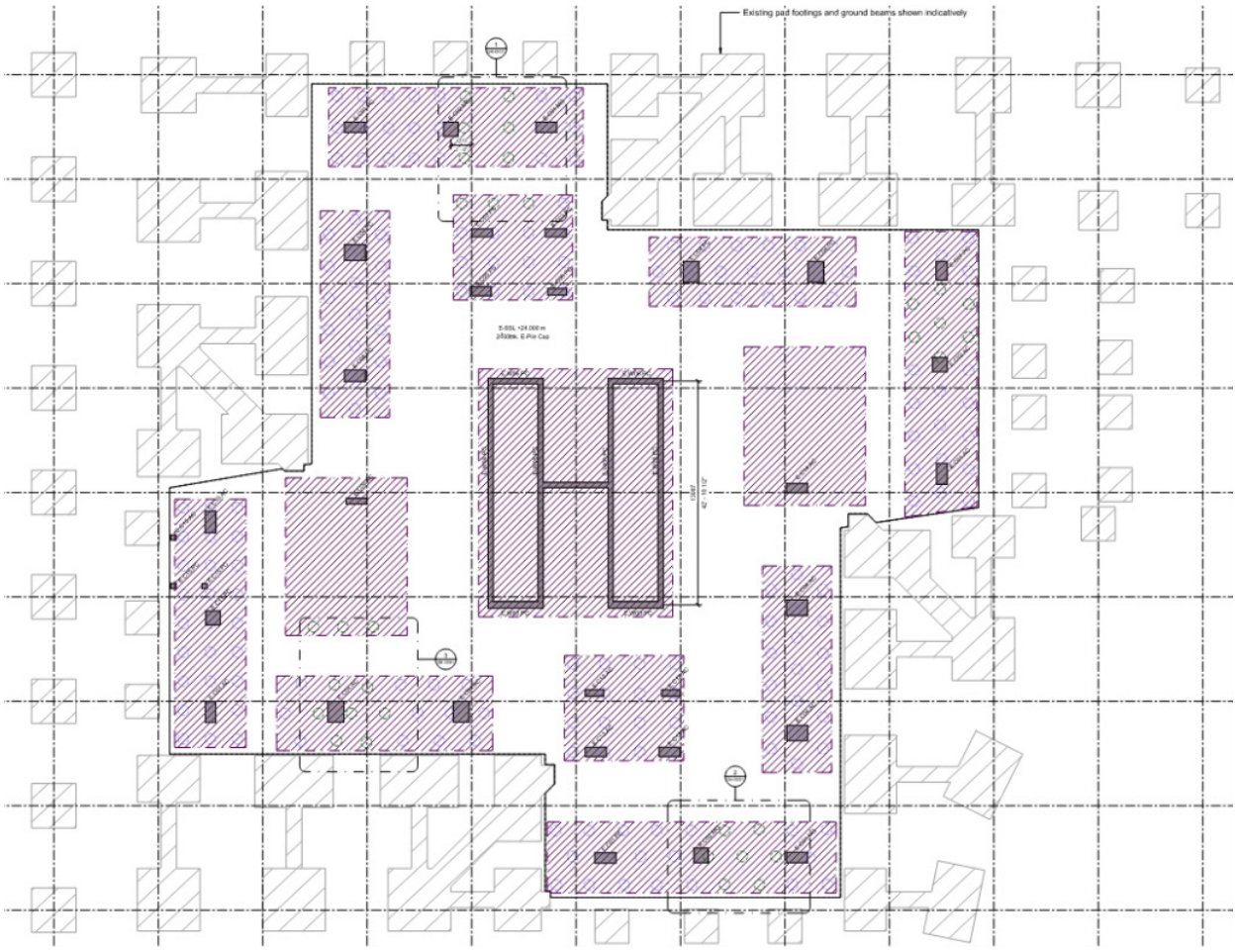


Figure 7.6 Existing foundation plan with pile zones

Figure 7.7 Intrusive investigations on the foundations were completed in 2022

7.2.3 Basement

The basement of Euston Tower is shared across the majority of Regent's Place – it is currently used as delivery and loading access, car parking, mechanical plant and back of house use. Refer to Figure 7.8.

A UKPN substation is located to the east of the basement space. The basement structure is typically formed of in-situ concrete. Modifications are visible in the basement, including local steel strengthening for tree pits and openings in the ground floor slab.

Little information is currently known about the perimeter retaining wall or waterproofing details, though surveys are proposed to investigate further.

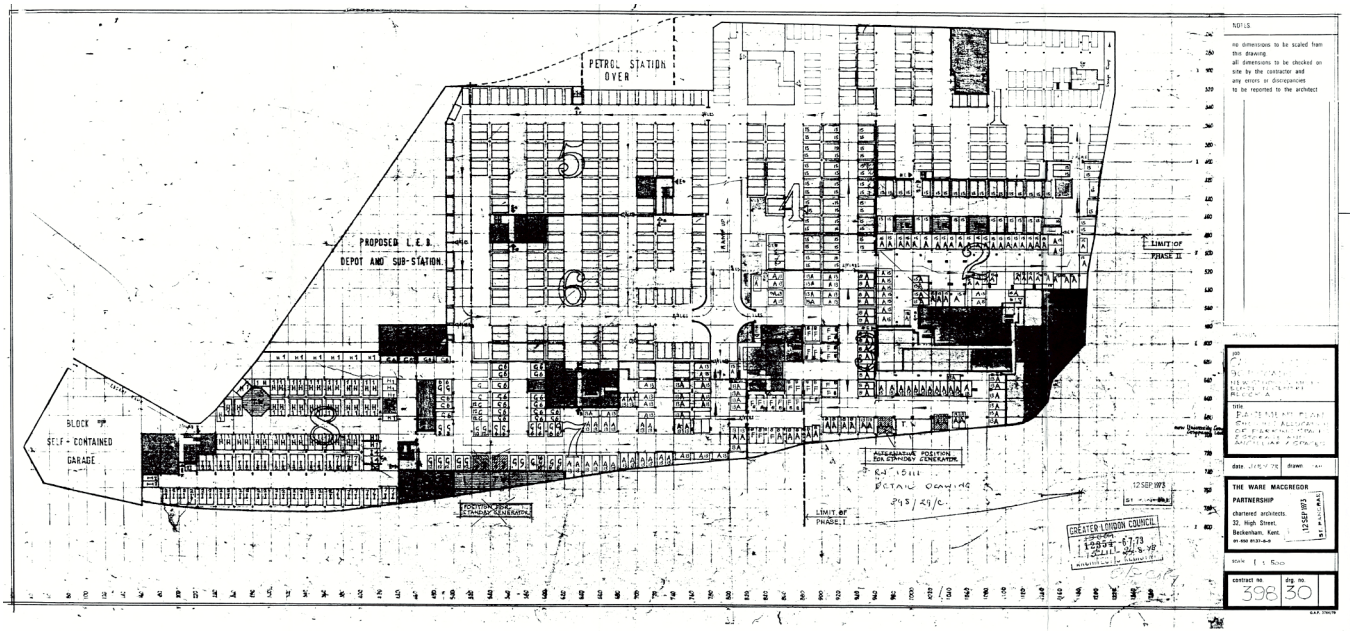


Figure 7.8 Basement plan for Regent's Place superbasement

Figure 7.9 Photos from shared basement at Regent's Place

7.2.4 Primary Frame

Columns are arranged around the perimeter of the structure and are constructed of in-situ concrete. They form part of the gravity system, but do not form part of the stability system. They appear to be in reasonable condition for their age, are densely reinforced and have a high design strength. The columns do not appear to have been significantly adapted.

Structural walls are arranged around the central lift shafts and the four perimeter "satellite" cores. They are typically formed of 300-400mm in-situ reinforced concrete. It is understood that the central core provides the majority of the lateral stability, with a minor contribution from the four satellite cores. The walls appear to be in reasonable condition for their age, are reasonably reinforced and have a high design strength. Refer to Figure 7.10 - Figure 7.13.

The walls appear to have been significantly adapted over time and further investigations to all floors are required to fully understand the current arrangement. Of particular importance is the central wall linking the two halves of the central lift shaft, which appears to have a number of unexpected voids throughout its height.

Figure 7.13 Reinforcement bars in walls

Figure 7.12 Reinforcement bars in columns

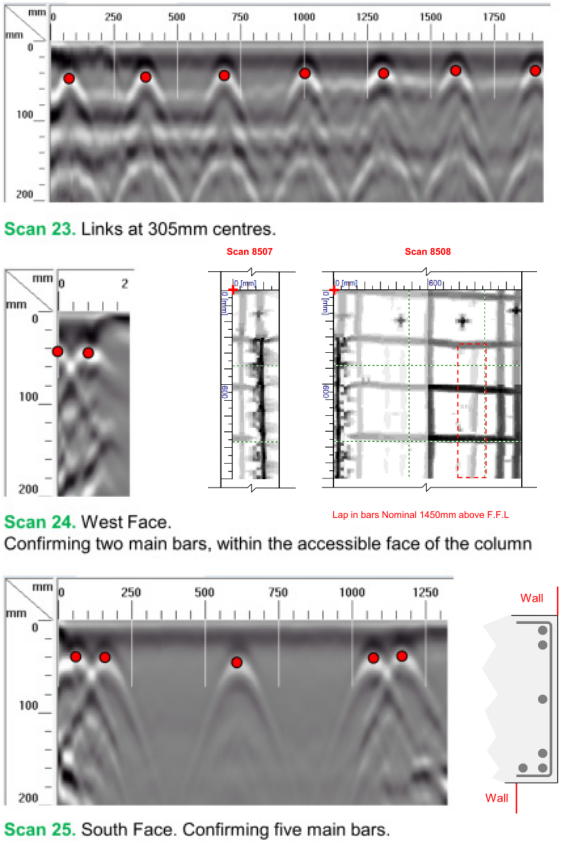


Figure 7.11 Results from non-intrusive scans at columns

Vertical Bars	Horizontal Bars	Condition	Finishes (mm)	Concrete cover (mm)	Carbonation (mm)
15.0 Square twist	12.9 Square twist	Slight patchy surface corrosion	0	25	5

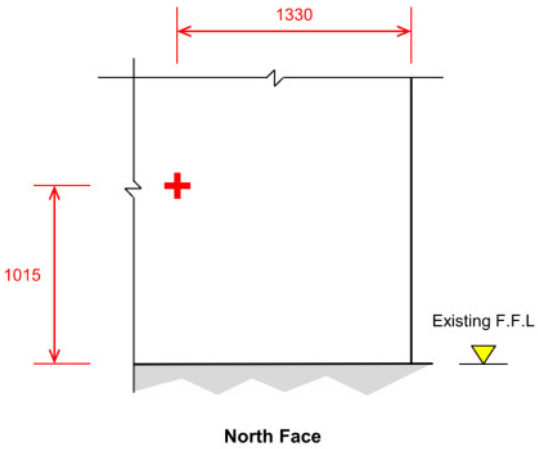


Figure 7.10 Results from intrusive investigations at the core

7.2.5 Slabs

The existing slab system comprises three primary components: a wide ring beam at the perimeter, a ribbed slab, and areas of in situ flat slab. These are shown respectively in light green, blue, and grey in Figure 7.14. Spans range from 5m to 7.5m, with thicknesses ranging from 250mm to 375mm.

Existing slabs appear to be in reasonable condition, although many appear to have undergone modification since construction, with the addition of steel strengthening and retrofit voids. The thin slabs are known to contain small diameter (~6mm) mesh reinforcement. Provision of shear links within beams is unknown. Some ribs appear to include shear reinforcement, though it is not known how well these are anchored.

The fire performance of the slab is understood to be below the 90 or 120 minutes required today, and would require additional protection to provide the necessary rating. This is already included as cementitious spray in the lower portion of the tower.

A bonded screed layer is provided on the office floors. i.e. not easy to remove in isolation. This is understood to be a non-structural build up.

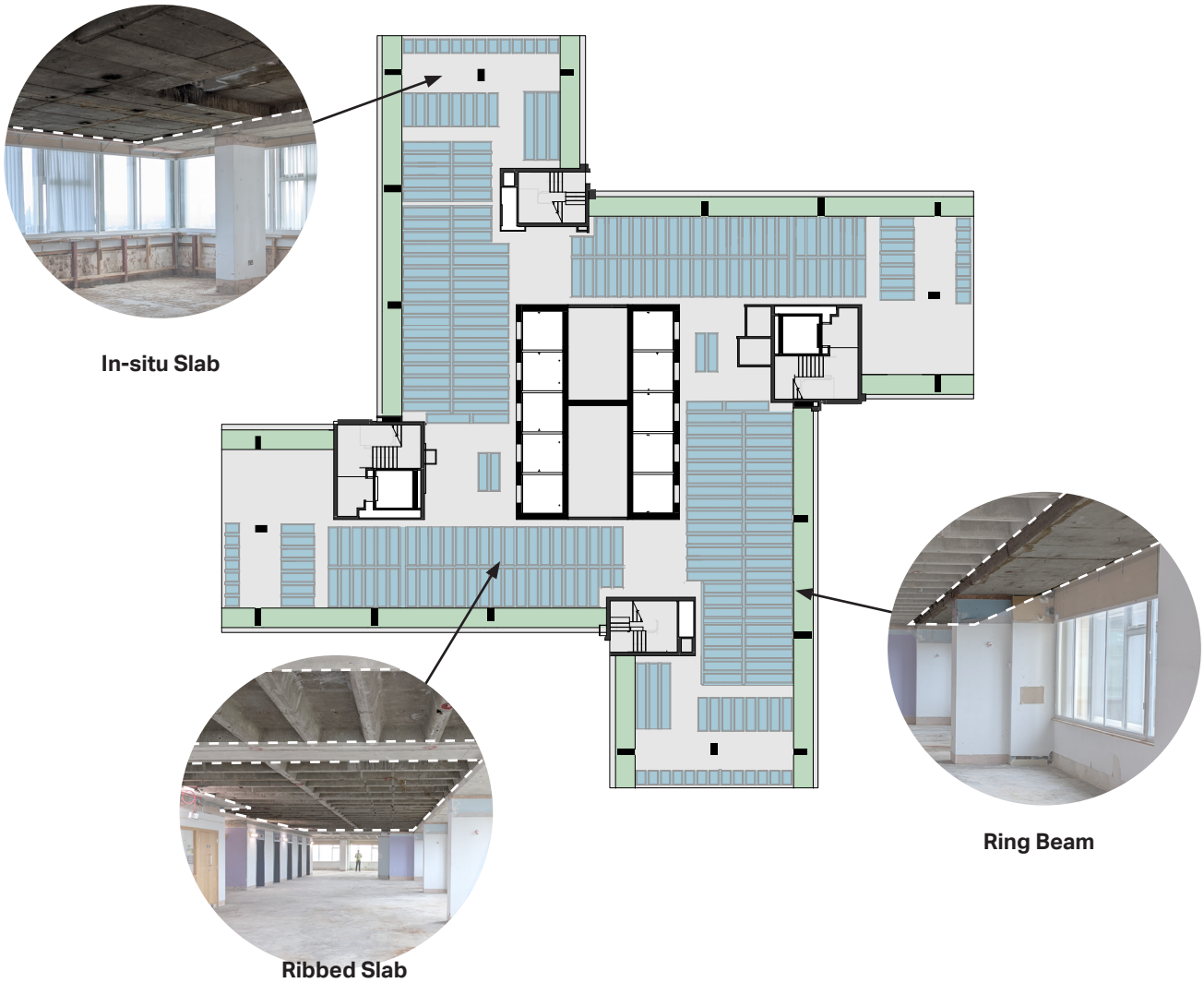


Figure 7.14 The existing slab system comprises three primary components

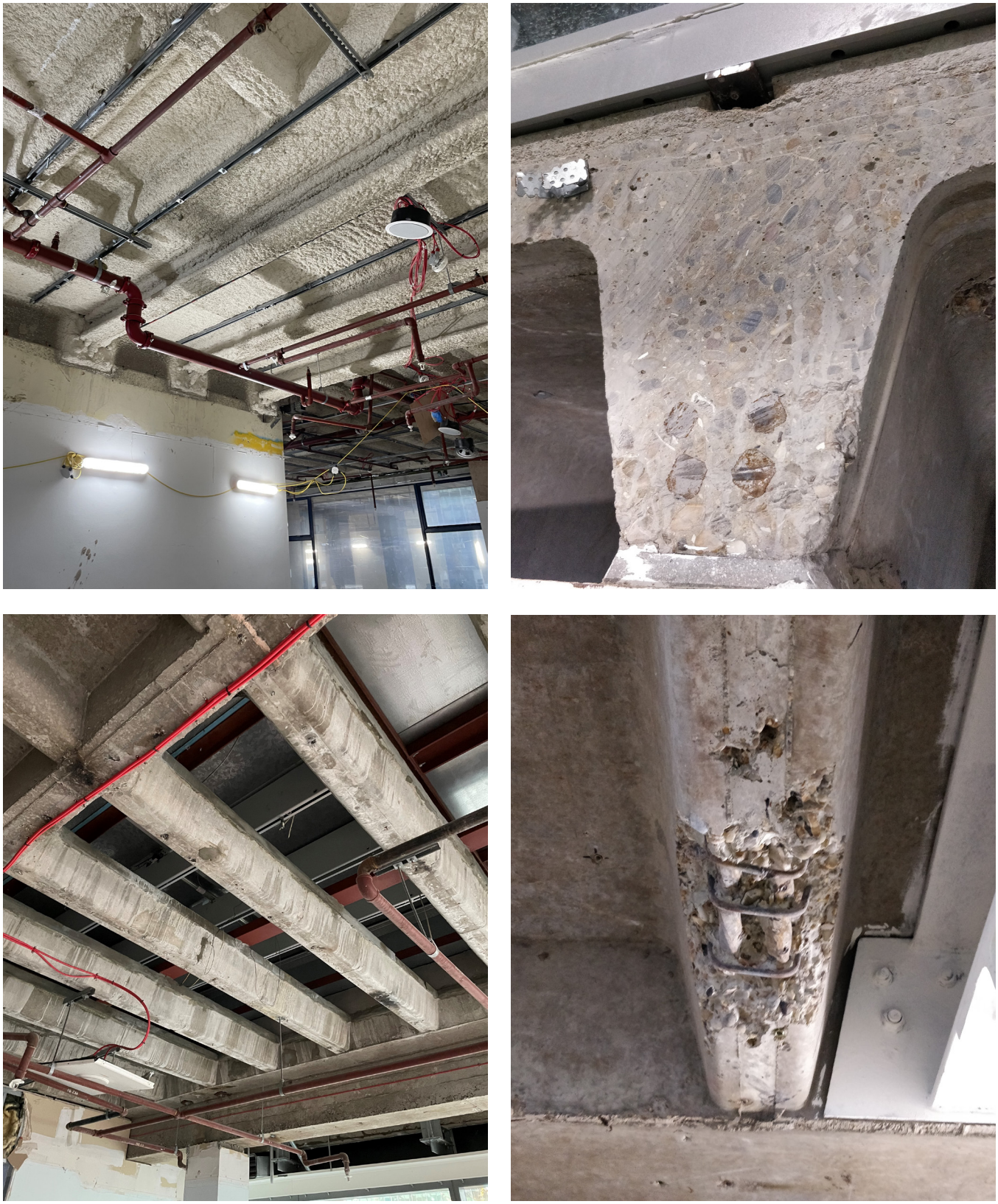


Figure 7.15 Photographs of the existing slab system and fire protection (top left)

7.2.6 Adaptability to Modern Offices

Loading

The original tower was designed as an office space. The original live load for the floor us understood to be 2.9kN/m^2 + 0.96kN/m^2 for partitions. The superimposed dead load was taken as 1.15kN/m^2 + 0.29kN/m^2, giving a total ultimate load capacity of 7.7kN/m^2. This is larger than the minimum recommended live load allowance of 2.5kN/m^2 + 0.5-1.2kN/m^2 for partitions provided in the BCO, and as such, is suitable for use as an office.

Based on available information, the capacity of the existing columns for reuse has been assessed considering potential additional load (allowing for potential future floor plate expansion). The results are shown in Figure 7.17, where the majority of columns (75%) would require minor or no strengthening whatsoever. It is anticipated that allowing for no additional load, all columns would have sufficient capacity.

Floor vibration

The existing floor performs well in terms of vibration comfort. Measurements taken by Arup in 2019 show an average response factor (R) of between 1 and 5. This is compliant with the BCO recommended value of <6 or <8 for a high specification office.

Previous adaptations

A number of previous adaptations have been made throughout the life of the building, for example voids in the central wall linking the two halves of the central lift shaft, and cutting out stairways between floors. It should be expected that some of these modifications will require remedial work to fully utilise the potential of the building, though these won't be known until a full study has been undertaken.

Openings in existing slab

Existing slab adaptability plays a large part in determining the feasibility of retaining the slabs.

The ribbed slab areas provide a reasonable location to penetrate the floor for additional risers or vertical circulation. However, given that the ribs span in one-direction, the entire rib must be demolished if it is disrupted. This effect is that small demolition results in larger portions of the ribbed slab needing to be removed.

If cutting through flat-slab areas, additional structure will be required to support the floor slab around the void.

The diagrams in Figure 7.18 - Figure 7.21 highlight the additional area of slab that is required to be removed to accommodate new openings in the areas of ribbed slabs. The diagrams are shown on a reflected ceiling plan.

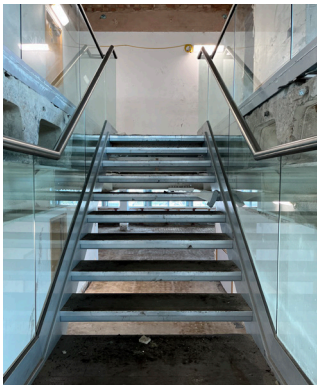


Figure 7.16 Example of stair cut through existing slab (left) and steel support (right)

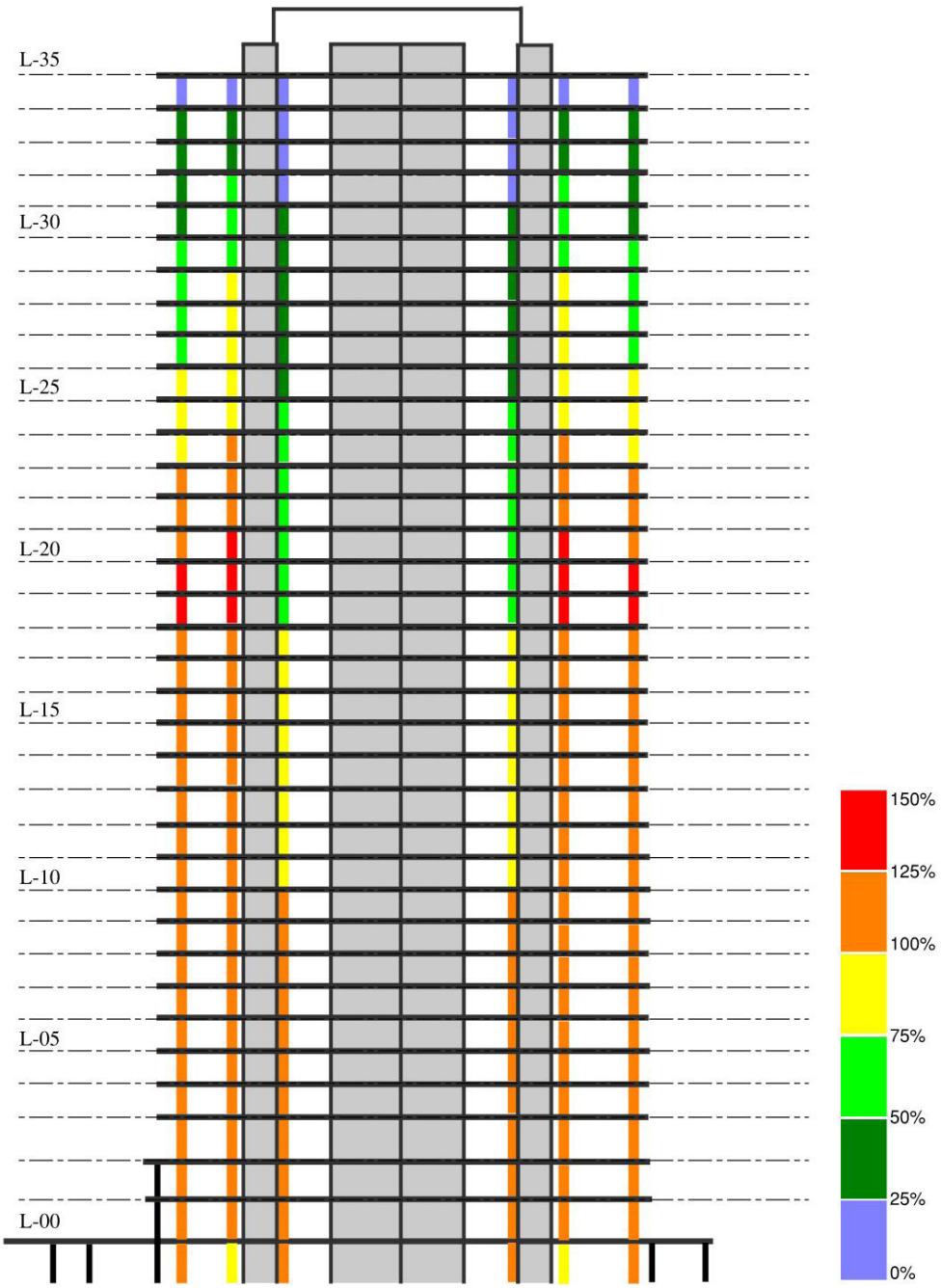


Figure 7.17 Typical structural section (north-south) showing utilisation of existing columns under additional loading factored at ULS with the Eurocode.

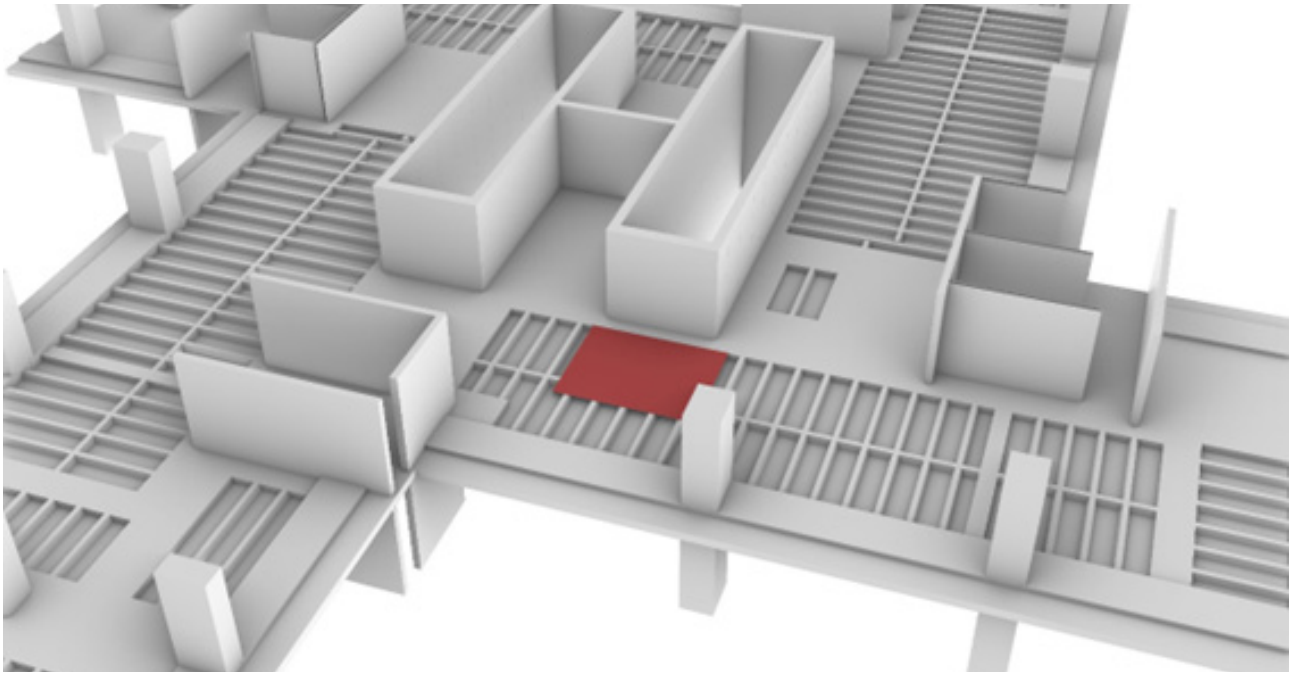


Figure 7.18 Areas to be demolished to accommodate new MEP or VT openings in existing slab (shown indicatively)

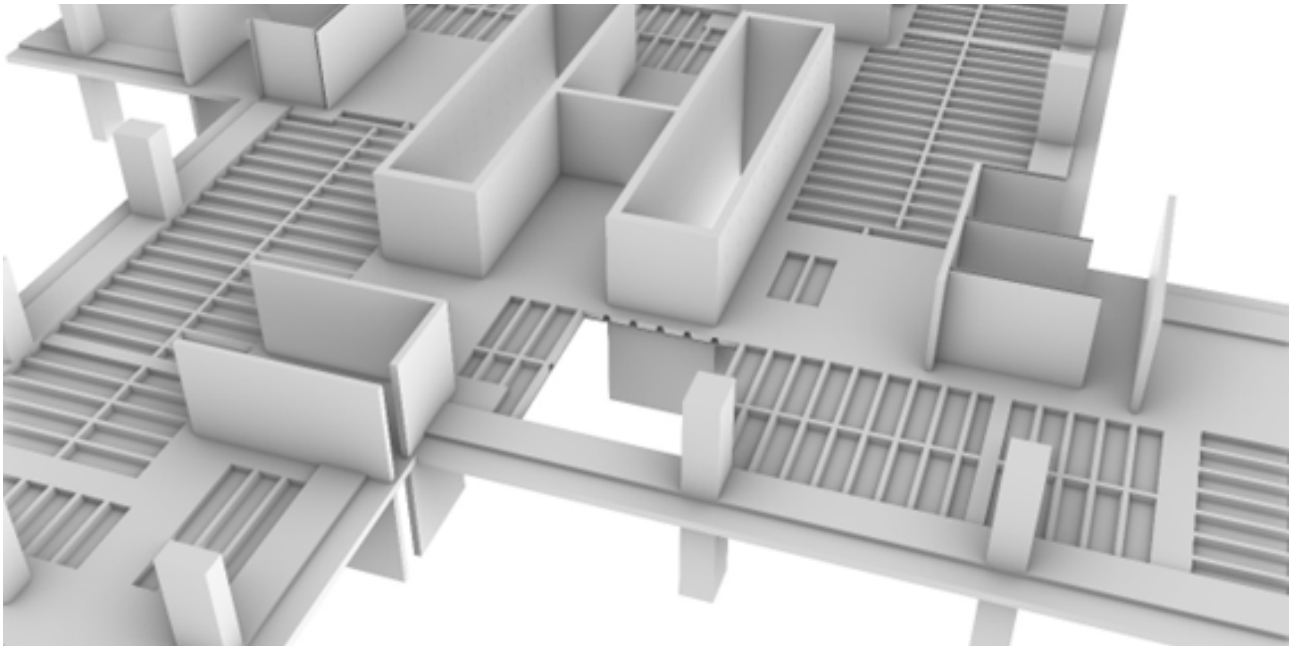


Figure 7.19 Whole section span of ribbed slab to be removed – i.e. section of slab removed is greater than extent of void required

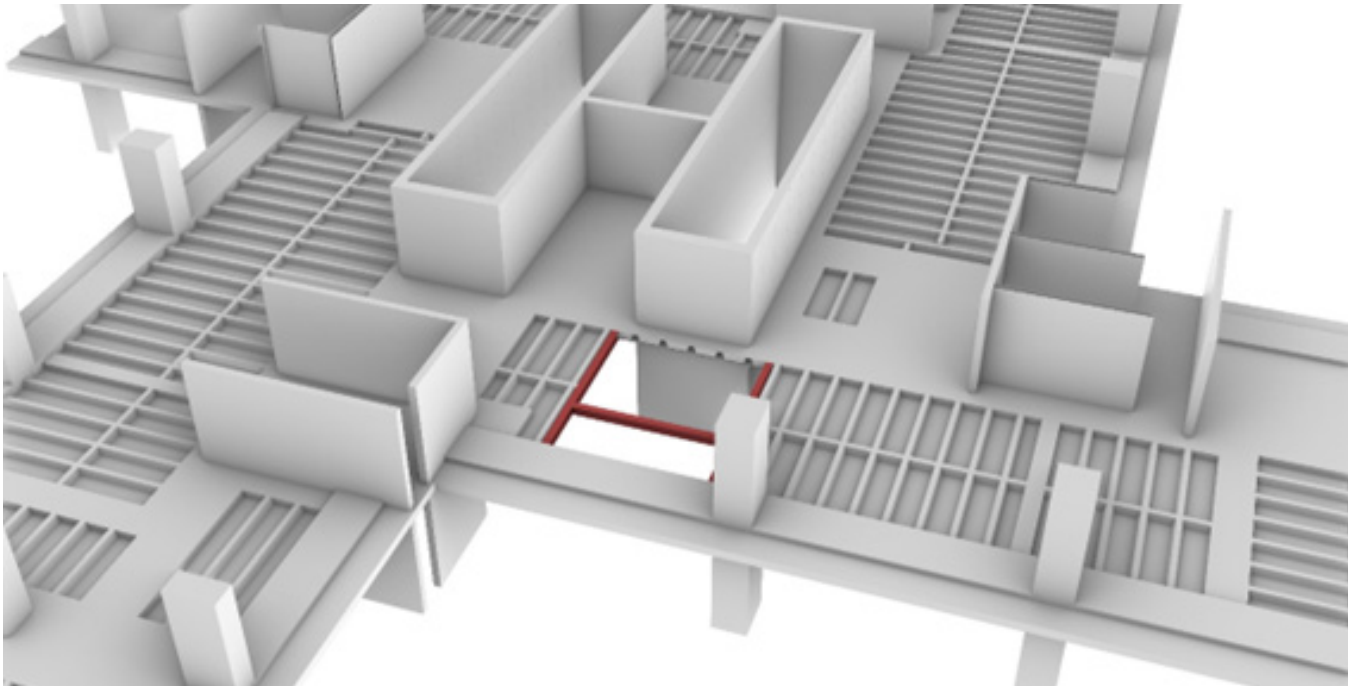


Figure 7.20 New framing added to trim opening of new void. Likely solution involves steel beams sat within depth of existing structural ribs (250mm)

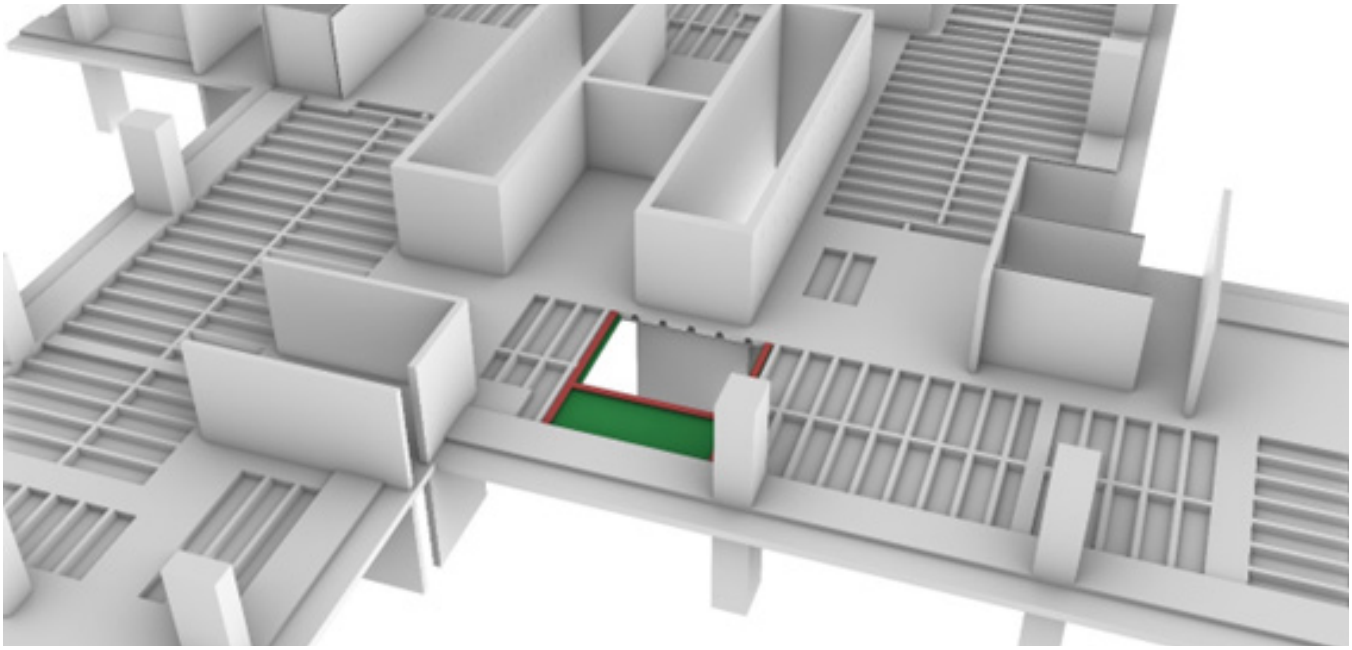


Figure 7.21 New slab areas infilled

7.3 Facade Review

7.3.1 Description, Status, and Quality of Facade

The main facade system is an anodised aluminium stick system with the structural mullions on the outside of the building creating the vertical pin stripes. The facade is the original 1970s system, and relatively recently, has been upgraded with the addition of reflective solar film for internal comfort and secondary glazing for acoustic and thermal comfort.

The facade is nearing the end of its design life and, due to the condition and design, it cannot be realistically upgraded further.

The mullions and transoms are not thermally broken, and thermal performance is very poor compared to modern day standards.

The main system comprises single glazed vision glazing and a red back-painted and toughened glass spandrel panel. The transparent panel has a solar coating film post-applied on the inner side. The spandrel panel has had a security film applied to it approximately ten years ago following spontaneous breakages from NiS inclusions. None of the glass is laminated.

The mullions span floor to floor and are jointed at the slab edge but there is no allowance for movement at the joint as would be typically expected.

The secondary façade system comprises a single glazed transparent panel and an opaque insulated wall.

The glass is externally beaded and can be removed from the outside. It should be noted that the security film is structurally bonded to the frames at least on the spandrels.

For more details on the current status and quality of the facade refer to the Vertex Access Euston Tower Inspection in Appendix D.

Figure 7.23 Internal elevation with upstand and dropped ceiling taking up large portion of elevation

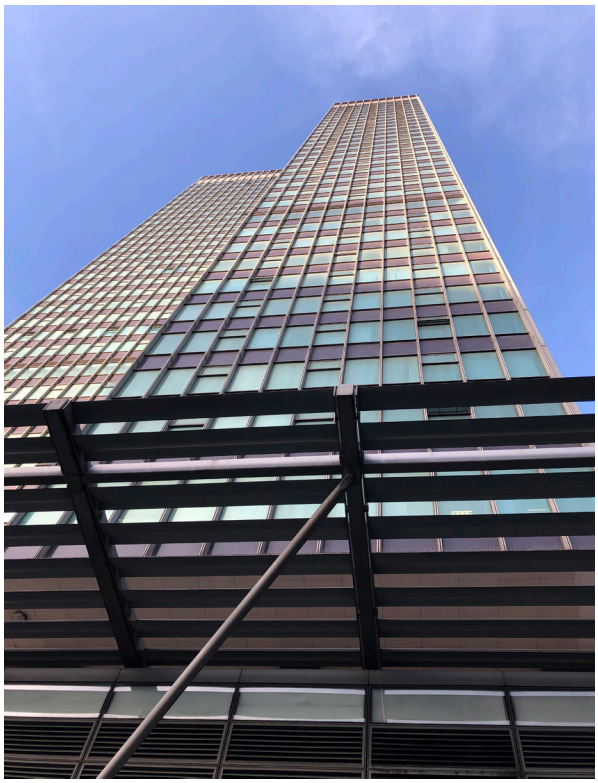
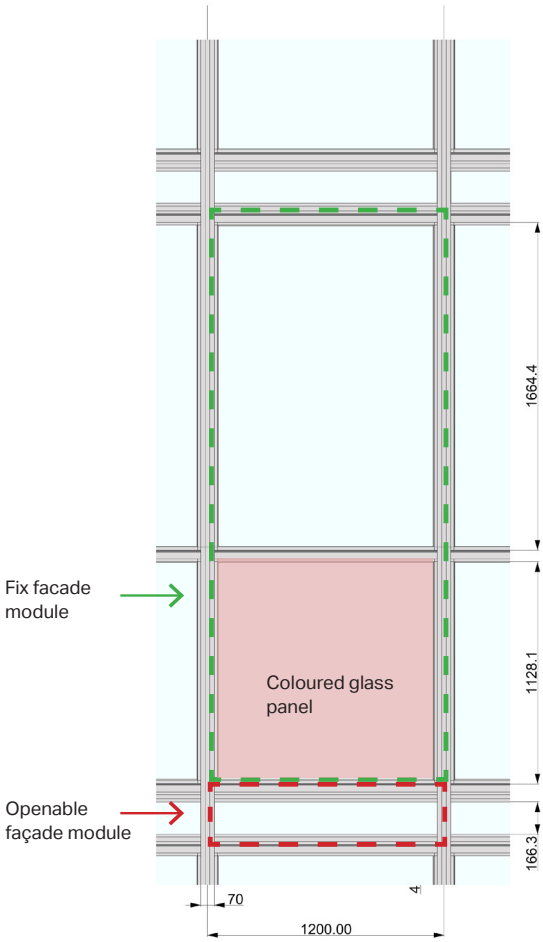


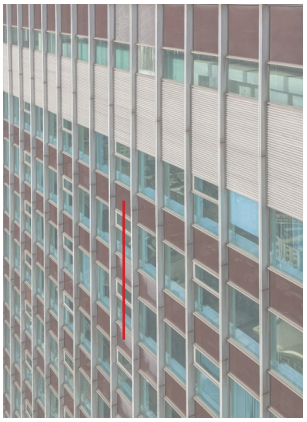
Figure 7.22 View of facade and sketch alongside



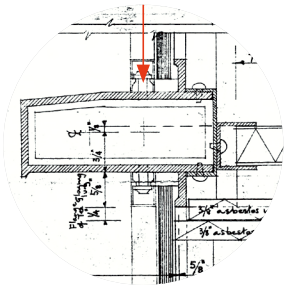
7.3.2 Construction Build-up

The construction and build-up of the facade system is shown in the sketch and schematic in Figure 7.24 and Figure 7.25.

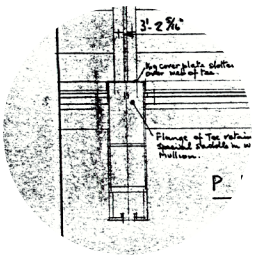
Overleaf in Figure 7.26 - Figure 7.33 are photographs from site visits showing the primary and secondary facade systems, as well as supporting structures.



Removable beads



Existing façade supporting system
The mullion and bracket shown.
Mullion split is located near slab level. No slab edge deflection are accommodated in this detail.



Horizontal section through typical mullion

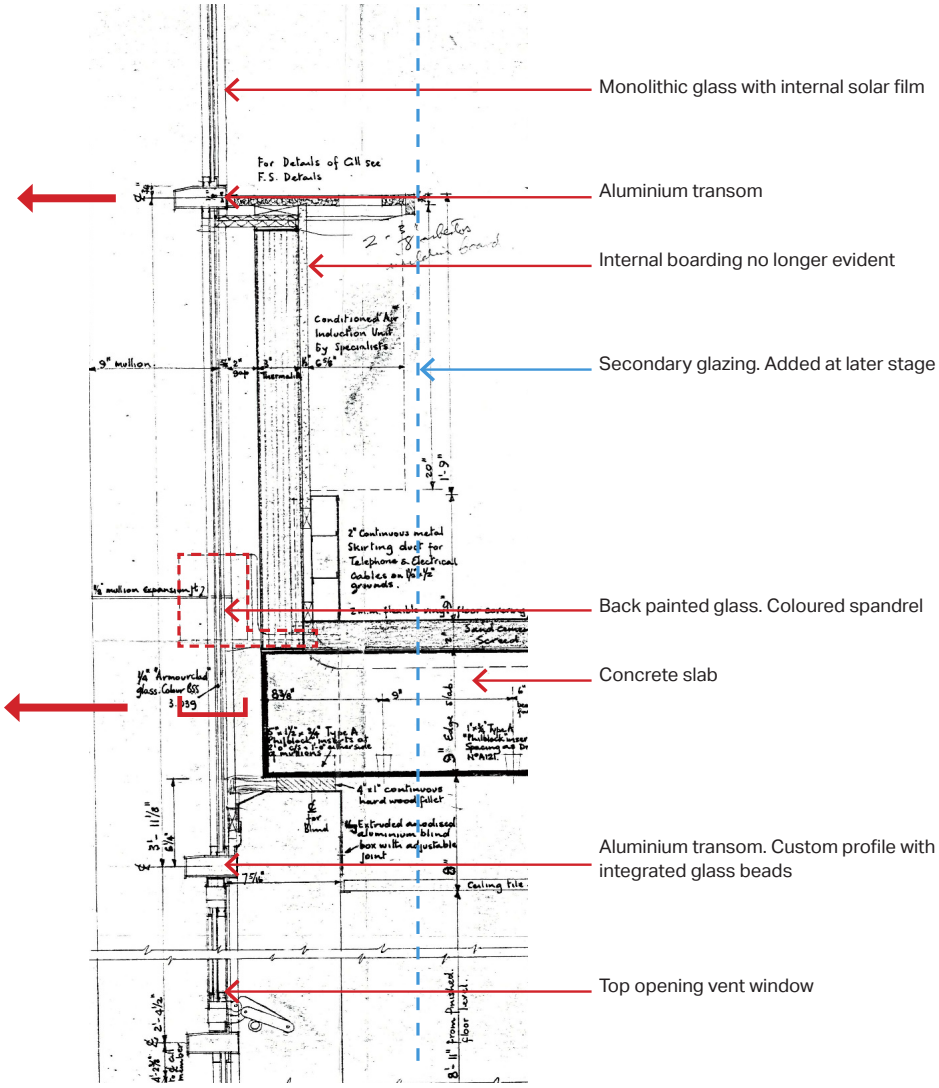
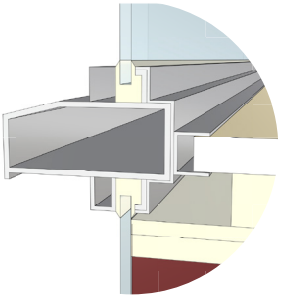
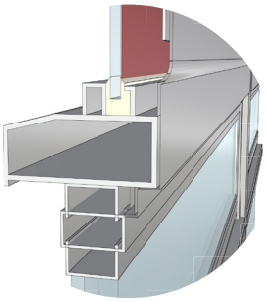


Figure 7.24 Vertical section of existing facade system and detail call-outs



Vertical section aluminium transom sill detail



Vertical section aluminium transom bottom detail

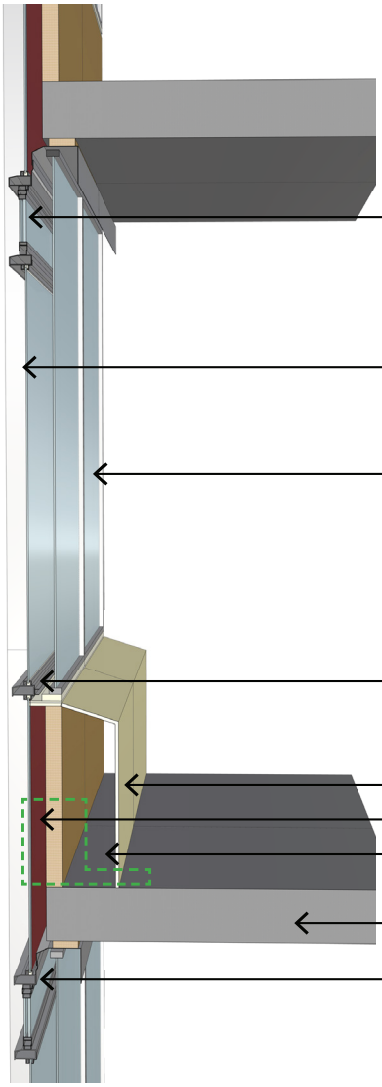


Figure 7.25 Schematic representation of vertical section of existing facade

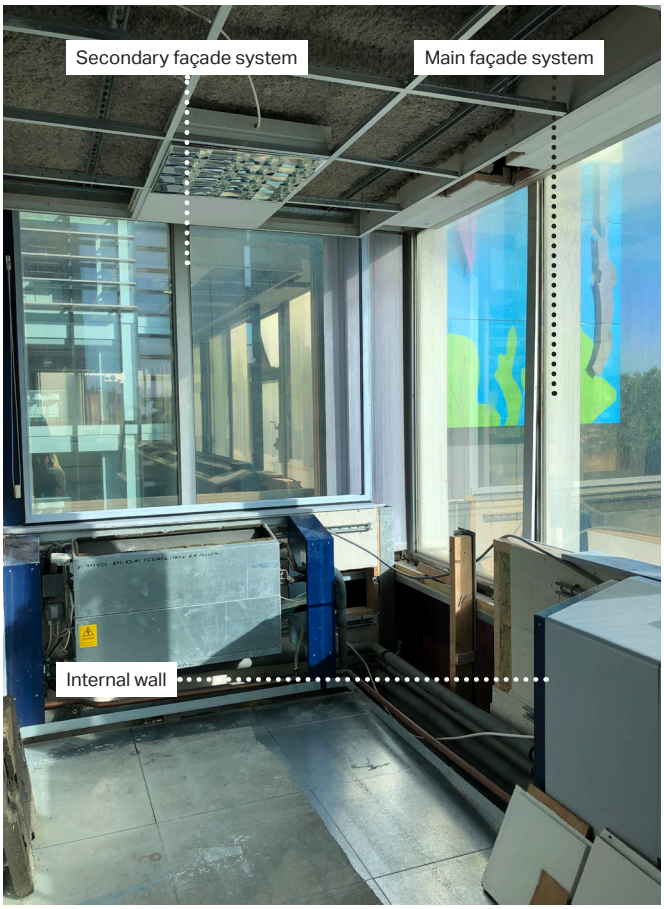


Figure 7.26 Main facade and secondary facade system - L04

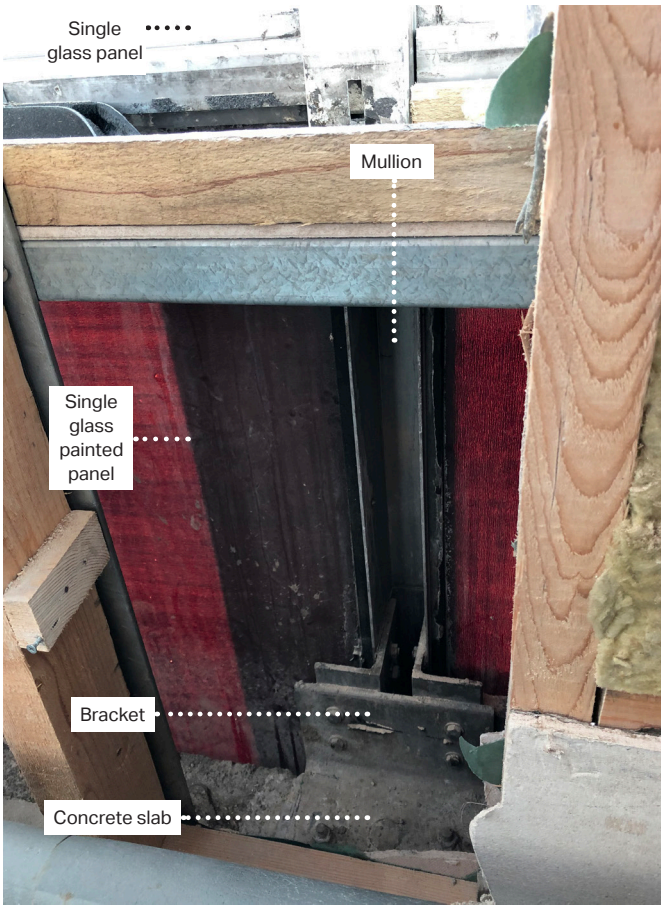


Figure 7.27 Main facade - L04 Supporting system

Figure 7.28 Main facade system L04

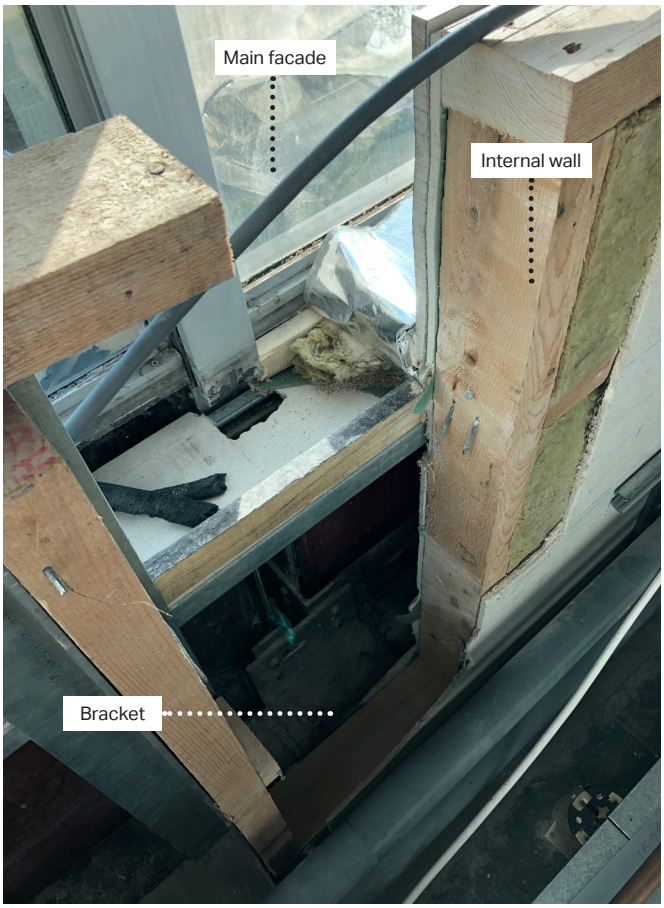


Figure 7.29 Main facade and secondary facade - L04

Figure 7.30 Secondary facade and main structure system - L04

Figure 7.31 Secondary facade and main structure system - L16

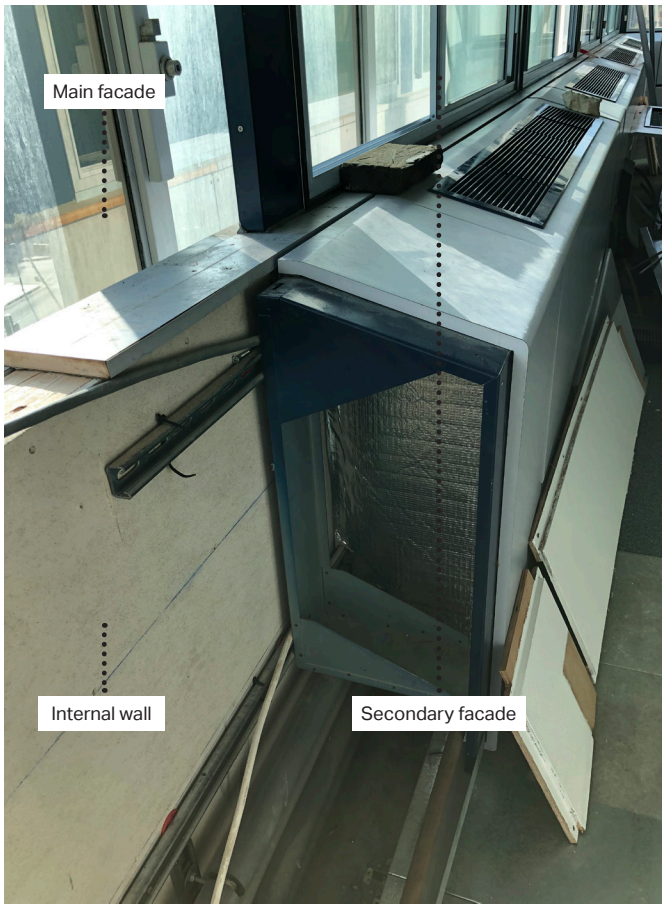


Figure 7.32 Main facade and secondary facade - L04

Figure 7.33 Secondary facade - L04

7.3.3 Energy performance of facade

The energy performance of the existing facade is described through the current condition of the technical solution to address solar gain, thermal performance, airtightness and glass coating.

Refer to Figure 7.34 for an illustration of where the technical solutions are addressed in the facade build up.

1. Solar gain
The original design of Euston Tower showed a clear glazing. A reflective film has been added at a later date to address the radiation and improve the internal comfort.

Solar gain is anticipated to be higher than that compatible with a low-energy building.

2. Thermal performance
The U-value is 2-3x worse than a contemporary facade.

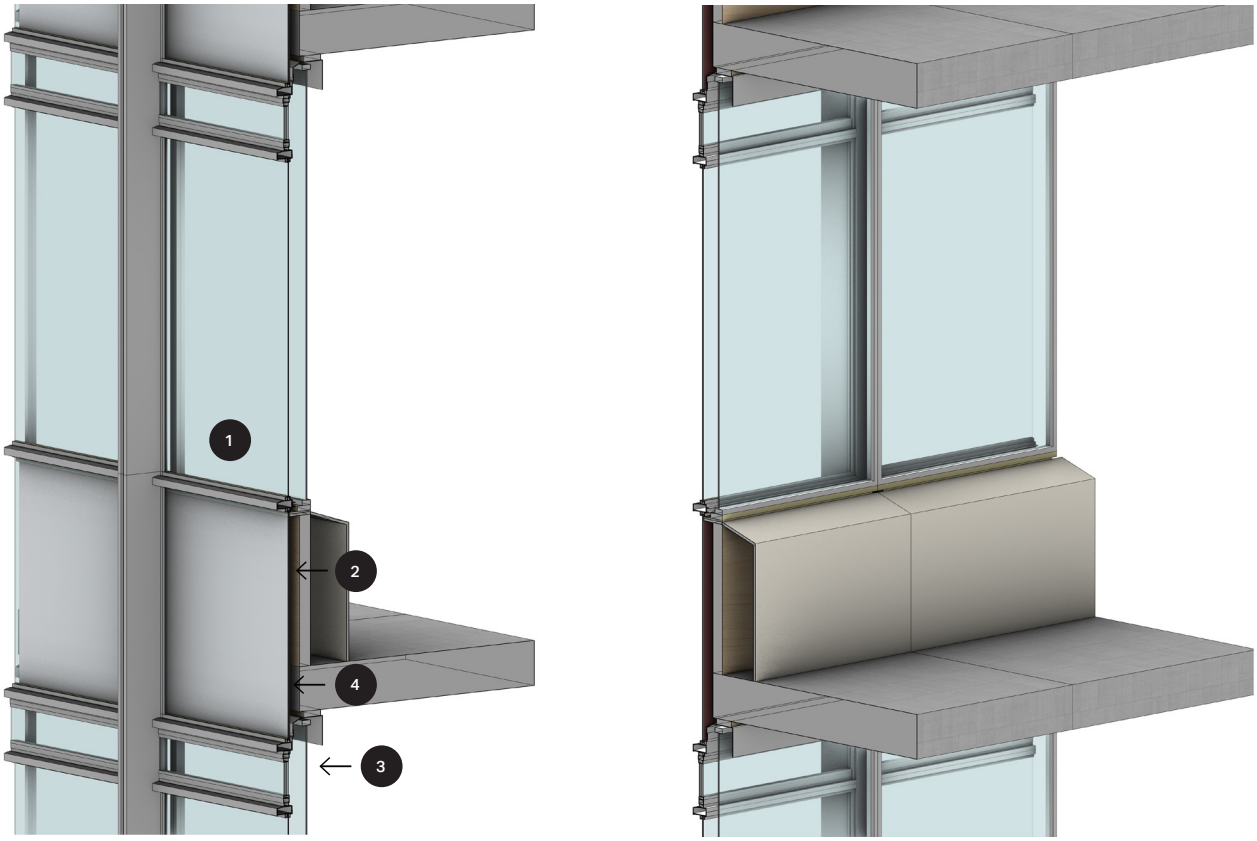
Without the secondary glazing, or if the secondary glazing is open, the overall U-value is 4.2 W/m^{2}K. With the secondary glazing closed, the U-value is 2.4 W/m^{2}K.

The actual U-value will be within this range, depending how the secondary glazing is operated by the users.

3. Airtightness
CIBSE Guide A recommends to assume an air permeability of 20 m3(hr m2) @ 50Pa for buildings that were not expected to comply with Part L 2002.

This is approximately 7x worse than what a contemporary building is expected to achieve.

4. Fire
Fire stops are not evident. The existing facade does not have adequate compartment slab fire stopping provisions. Adaptations are required in order to achieve an acceptable level of compartmentation between floors.



1 *Clear glazing with retrospectively added reflective film leading to higher solar gains*

2 *Heat loss through the facade is 2-3x worse than modern façades*

3 *Air leakage is ca. 7x worse than modern façades*

4 *Slab edge fire stops are absent which is not acceptable in terms of the fire regulations*

Figure 7.34 Sketch of existing facade system from outside (left) and inside

7.3.4 Remaining Lifespan

Euston Tower's facade is the original 1970 facade. The only change is the addition of a solar film to the vision glazing and a security film to the spandrel glazing to deal with spontaneous breakages due to NiS inclusions in the toughened glass.

Secondary glazing has also been added to the inside.

Figure 7.35 shows a table of the service life of the existing components compared to their expected life. **It is clear that the majority of components have long exceeded their design life, or will imminently do so.**

7.3.5 Pros and Cons of Upgrading

In its current state, the existing façade cannot achieve the level of performance required by current building regulations and standards.

Even if the single glazing would be replaced by thin double glazing of vacuum insulated glazing, this would introduce a condensation risk that would not be acceptable. It is unlikely that the existing building fabric could be re-sealed to achieve the level of air-tightness required to control the thermal performance or occupant comfort required in the refurbished state for any of the building uses currently being considered.

Some of the materials used in the existing façade would not be considered suitable under current good practice and regulations, such as the extensive use of monolithic toughened glass and timber.

It is evaluated that the façade system is nearing the end of its design life and due to the condition and design, it cannot be realistically upgraded.

Refer to the Thornton Tomasetti expert commentary in Appendix L.

Item	Predicted Service Life*	Installed/Replaced**	Years in service	Years Until End of Life	Notes
Gaskets external	25	1970	52	-27	
Silicone	25	1970	52	-27	
Gaskets internal	30	1970	52	-22	
Glass film solar	15	1990	32	-17	
Glass film security	15	2010	12	3	Installed due to security issues in spandrel glazing
Aluminium frames and profiles	60	1970	52	8	Current aluminium frames are non thermally broken, not achieve U-value required
Structural steel elements and brackets	60	1970	52	8	
Monolithic glass - Vision glazing	60	1970	52	8	Monolithic glass can not be integrated in a DGU system and can not achieve U-value required
Monolithic glass - Coloured spandrel	60	1970	52	8	Several toughened glass panels have suffered some issues which required to apply a security film on its surface
Flashings	60	1970	52	8	

Beyond end of life

Nearing end of life

Operating within economic life expectancy

**(Economic life) - Based on the EPDs from suppliers when available and otherwise estimated based on facade consultant's previous experience*

***(Installed /replaced) – Tabulated information based on SVMA Condition Survey 18/10/2019*

Figure 7.35 Table of anticipated remaining lifespan of existing facade components

7.4 Upgrades Required

7.4.1 General

The current Euston Tower as it stands today is no longer fit for its original purpose of an office building. Since the building was completed in 1970 various standards and building codes have been introduced which makes the current building non-compliant.

The preceding analysis establishes that, not only does the existing building fall well-short of the standards expected for a contemporary, high-end office building, but it fails even in respect of the minimum requirements from current Building Regulations.

As demonstrated in Section 6, nearly all services equipment is beyond its reasonable service life. The oil and gas boilers dating from 1970s would not comply to current standards for energy or fossil fuel use. The tower has insufficient ventilation and fresh air supplied, and its LV electric infrastructure from 1970s is dated and wouldn't support a modern all-electric building. WC and wash hand basins do not meet latest standards for flow requirements resulting in water waste.

With regards to fire services, sprinklers are only provided to the lower floors which would not comply with current Part B of the Buildings Regulations. It has no evacuation lifts provision contrary to the London Plan and the goods lifts double as fire fighting lifts which are no longer compliant with Part B. Manually openable vents provide ventilation and smoke clearance to fire fighting shafts and the basement, which is also not compliant with the current standards.

The lift systems are outdated and inefficient being mostly from the original install. Notwithstanding their poor energy efficiency, the would only provide 50-70% occupancy in a modern building.

The façade as demonstrated within this Section does not comply with current standards and codes contained within the approved documents of the Buildings Regulations as it has no fire stops between floors, is approximately 7x more air permeable than a contemporary building, its U-value is 2-3x worse than contemporary façades, and many of the facade elements (gaskets, silicone, glass unit) are beyond their service life.

The low floor to floor height makes it difficult to comply with BCO guidelines and restricts potential for future uses.

The structure on the other hand is possibly sounder than façade and services. Existing concrete in the sub- and super-structure generally appears to be in reasonable condition and with good strength. Existing columns would be able to withstand current loads.

However critically, a building of this height would need a 120minute structural fire rating, and it appears that the current structure would achieve only 60-90minutes. The existing pinwheel layout also restricts floorplate flexibility, and the current structural layout of ring beam and ribbed slab limit the flexibility of any new structural openings required to comply to current standards with services and lifts.

Clearly significant action is needed. This Section sets out the interventions that would be required for the building to comply with current legislation and guidance.

The following summarises the minimum requirements for compliance with current Building Regulations:

- **Structural fire performance upgraded to 120 minutes**
- **Sprinkler provision added throughout**
- **Fire compartmentation added to facade**
- **Mechanical smoke ventilation added**
- **Dedicated fire fighting lifts required (not shared with goods lifts)**
- **Fire fighting lifts upgraded to current standards**
- **New air handling plant with higher fresh air rates to meet ADF, and heat recovery to meet ADL**
- **New central plant provisions with energy efficiency to meet ADL**
- **Facade thermal performance upgraded to meet energy efficiency requirements in ADL.**

Figure 7.36 Euston Tower looking down Tottenham Court Road towards Regent's Park

7.4.2 Fire

The building needs to comply with Building Regulations Part B, its associated guidance, and other codes of practice like BS 9999, among others. Additionally, the tower should adhere to local policies like the London Plan. Refer to Section 4.2.

The following upgrades are required for fire safety. Refer to the analysis of Section 6.5 for more detail.

- Sprinkler provision is required by BS EN 12845 throughout, as a minimum (LPC insurance requirements may also be required).
- Existing natural smoke clearance to be replaced by mechanical ventilation to building height. This is either a smoke extract system, or a pressurisation system in accordance with BS EN 12101-6.
- Basement natural smoke ventilation to be replaced with mechanical ventilation (10ach to each individual space).
- Existing structural fire performance of fire fighting shafts to be upgraded to 120minutes structural fire rating
- Existing structural fire performance understood to be 60-90minutes. Upgrades required to achieve 120minutes structural fire rating.
- Fire fighting lifts unlikely to be fully compliant to current standards and will require to be upgraded.
- Fire fighting lifts cannot be shared with goods lifts requiring provision of new goods lifts.
- Evacuation lifts are recommended (to comply with London Plan) but this is not a Building Regulation requirement. Evacuation lifts are certainly expected now in any London high-end project.
- Existing façade does not have adequate compartment slab fire stopping provisions. Intervention is required in order to achieve an acceptable level of compartmentation between floors.

For continued office use, only 2 no. escape cores are required. As shown in Figure 7.38, the east and west satellite cores are acting as escape cores, and this configuration is suitable for up to four tenants (it would always be desirable to be able to sublet floors), noting that the floorplate efficiency is reduced due to the increased circulation area around the cores. However, if any other uses are included in the tower, they will require an 2 no. independent escape cores. It may therefore be prudent in the upgrades, to include a total of 4 no. escape cores to enable flexibility for change of future use. The resulting floorplate is shown in Figure 7.38.

Figure 7.37 2 no. escape cores works for single tenancies

Figure 7.38 2 no. escape cores works for up to four tenancies

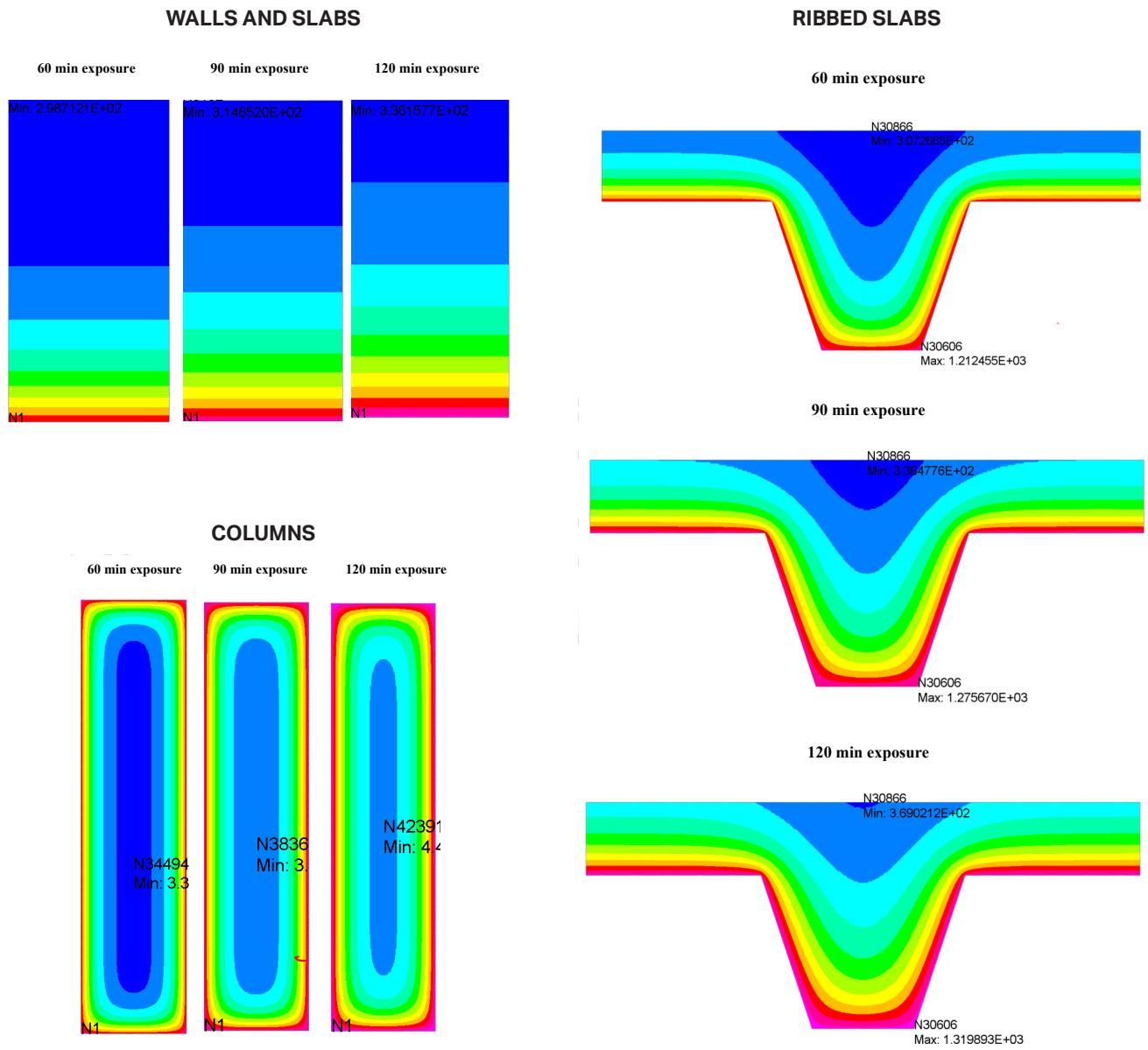


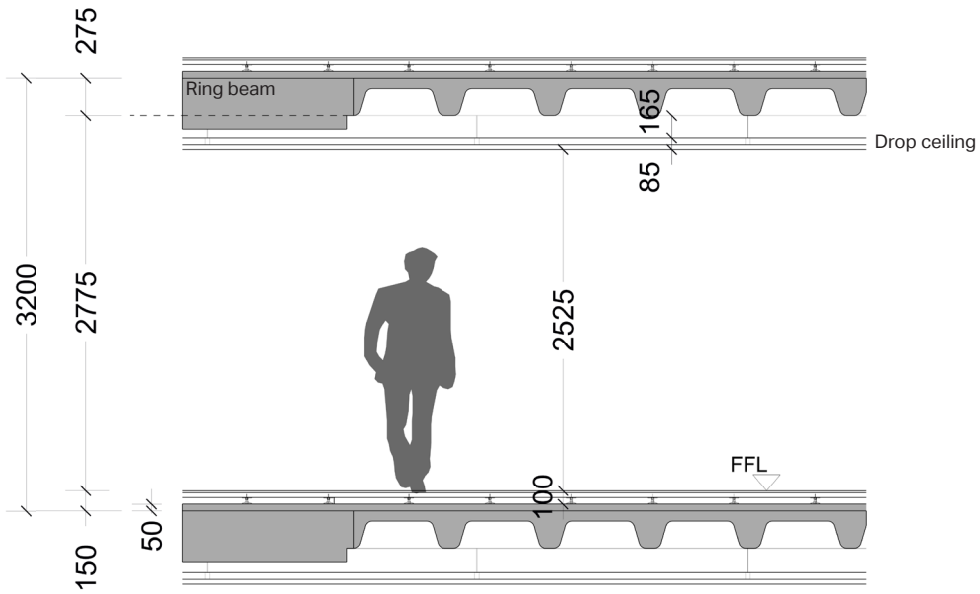
Figure 7.39 Thermal response of existing walls, slabs, columns, and ribbed slabs at 60min, 90 min, and 120 min Standard Fire exposure as part of loadbearing and integrity assessment. Existing structural fire performance understood to be 60-90 minutes

7.4.3 Energy and Ventilation

The building needs to comply with Building Regulations Parts L and F for energy and ventilation respectively, along with its associated guidance, and other codes of practice. In addition, the building is expected to meet market-demanded guidance and certifications like LETI, NABERS UK, and the WELL Building Standard. Refer to Section 4.2.

The following upgrades are required for energy and ventilation. Refer to the analysis of Section 6.2 and Section 7.3 for more detail. Note that most of the existing MEP equipment has been stripped out and the following concerns the structural interventions necessary to support modern codes and guidance.

- Existing ventilation based on fresh air rates possibly below ADF 1995 (less than 6.4l/s/p). New provision would be at 16l/s/p, requiring larger risers.
- New air handling plant complete with heat recovery (prerequisite in ADL) and significantly larger ventilation rates requiring larger plant space.
- Existing energy performance is heavily impacted by the poor condition and outdated design of the façade which is not consistent with modern insulation, air tightness, solar gain.
- Existing raised floor zone and ceiling depth to be increased to support modern building services. Clear heights are generally below the BCO recommendations. Refer to Figure 7.41 to Figure 7.44.
- New central plant to be all-electric (in line with London Plan requirements for air quality) resulting in revised riser and plant space requirements including upgrading electrical infrastructure to HV.
- After upgrades, daylight performance is expected to be relatively good due to the narrow floorplate and double aspect facade.

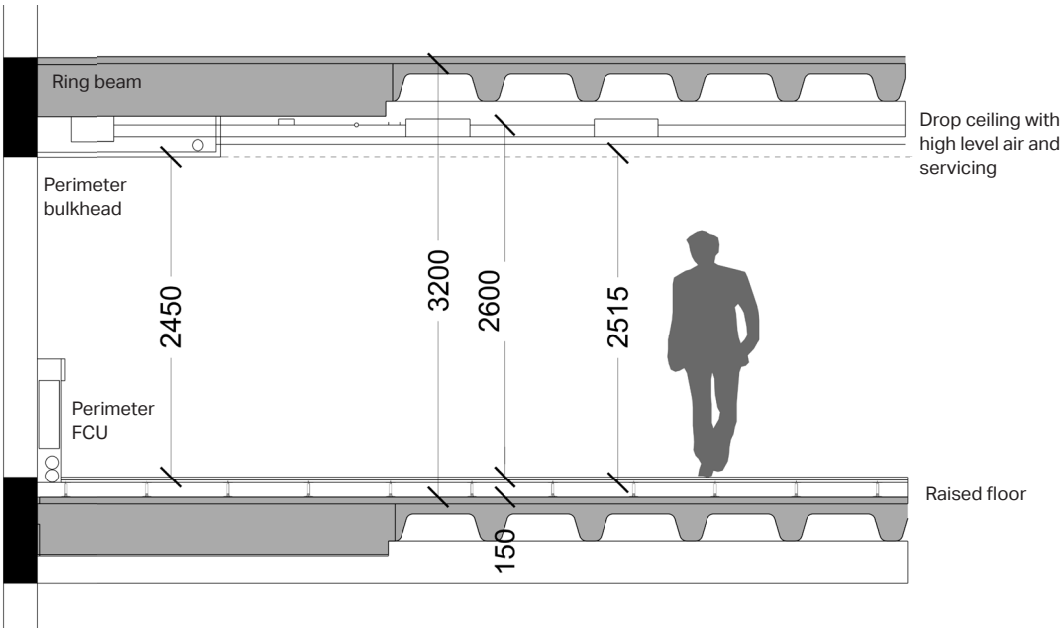


Existing Condition

The 100mm raised floor is not enough space for modern services. The 250mm ceiling depth is minimal since services are located at the perimeter. To make room for modern services, the depth of the floor and ceiling would need to increase. The minimal ceiling build-up and services zone under the ring beam will require compromises in the fitout.

Figure 7.40 Existing floor to ceiling height

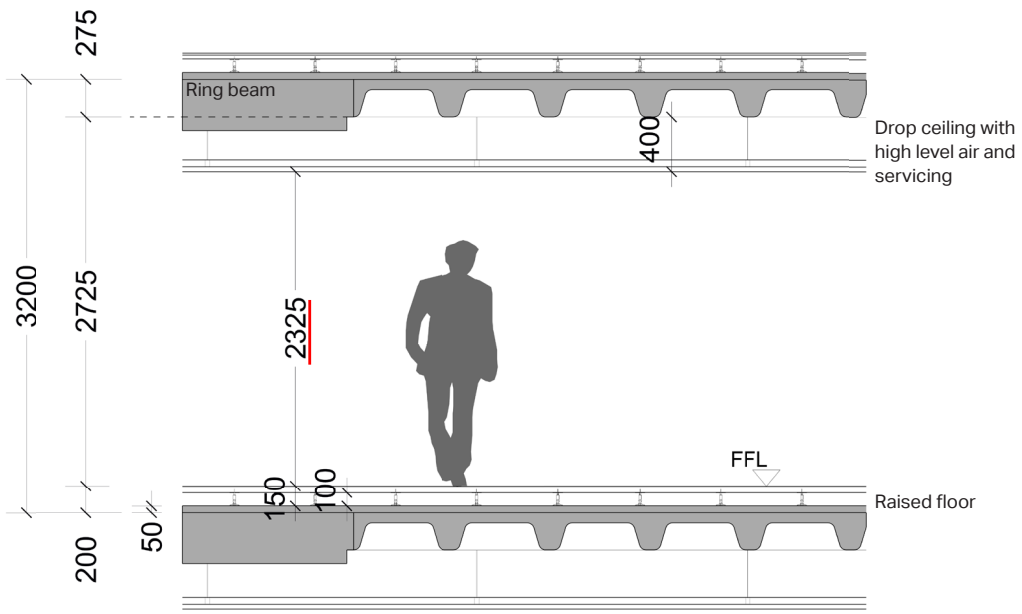
Room Section Options
Several options are considered to provide floor and/or ceiling zones that support modern services (refer to Figure 7.41 - Figure 7.44).



Modernising Option 1
One strategy is to have perimeter servicing with a drop ceiling with high level air and a servicing bulkhead. The floor is raised to allow 100mm clear (150mm total build up). Clear height is at the low end of the BCO recommendation for refurbishments.

In Option 1 a modernised, perimeter servicing strategy is proposed as this was the strategy for the existing building. All major services are provided at high level (ventilation, heating and cooling, fire sprinklers, lighting). Ventilation is provided from perimeter, on-floor AHUs and distributed in a bulkhead at the perimeter. In this case the ceiling void at the bulkhead needs to be ca. 4000mm, but it steps up ca. 2,000mm away from the facade to deliver increased floor to ceiling height. Subject to more detailed coordination, the bulkhead may have to be widened locally to avoid existing perimeter columns, further compromising the floorplate. Facade heating and cooling would be delivered by low-level fan coils at the perimeter. It is assumed that cooling will be delivered by slimline, in-ceiling fan coil units, so that the raised floor is used for power and data reticulation only requiring 100mm clear. Allowing for the thickness of ceiling construction throughout, the resulting clear floor to ceiling height is 2,515mm over an extensive portion of the floorplate. Clear height of 2,450mm would be achievable below the bulkhead, which would just comply with the lower end of the BCO guidance, but would still not meet occupier requirements.

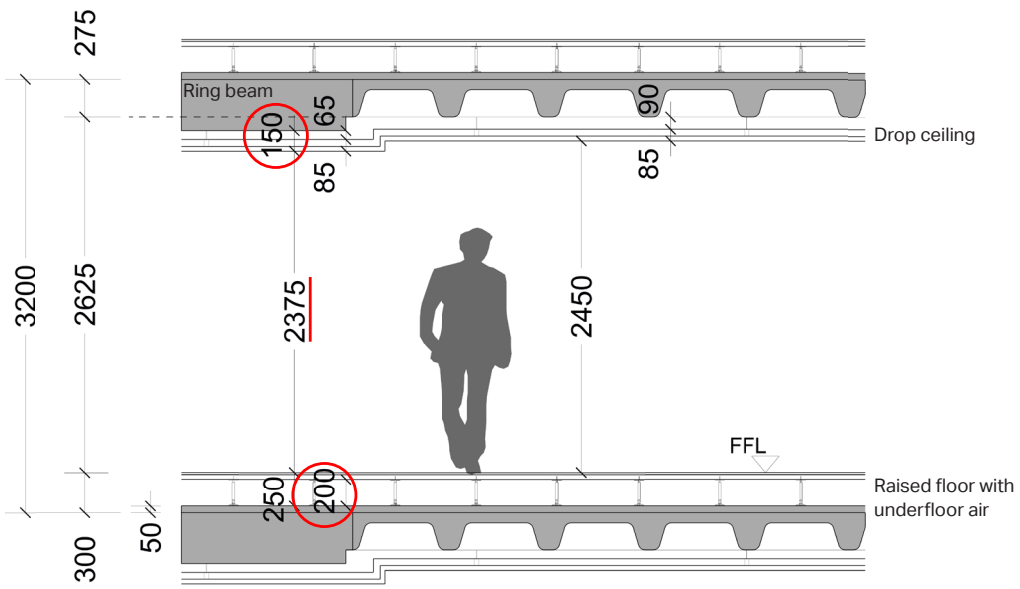
Figure 7.41 Servicing modernisation option with perimeter servicing strategy



Modernising Option 2
One strategy is to have a drop ceiling with high level air and servicing. The floor is raised to allow 100mm clear (150mm total build up). Clear height is below BCO recommendation.

In Option 2 all major services are provided at high level (ventilation, heating and cooling, fire sprinklers, lighting). In this case the ceiling void needs to be ca. 400mm deep, and the floor is raised slightly to provide 100mm clear to support power and data reticulation. Allowing for a ceiling construction, **the resulting clear floor to ceiling height is 2,325mm which is below the BCO minimum for refurbishments of 2,450mm, and would not meet occupier requirements.** This option accepts that the ceiling void is reduced to 150mm at the perimeter under the ring beam.

Figure 7.42 Servicing modernisation option with dropped ceiling and all high level servicing

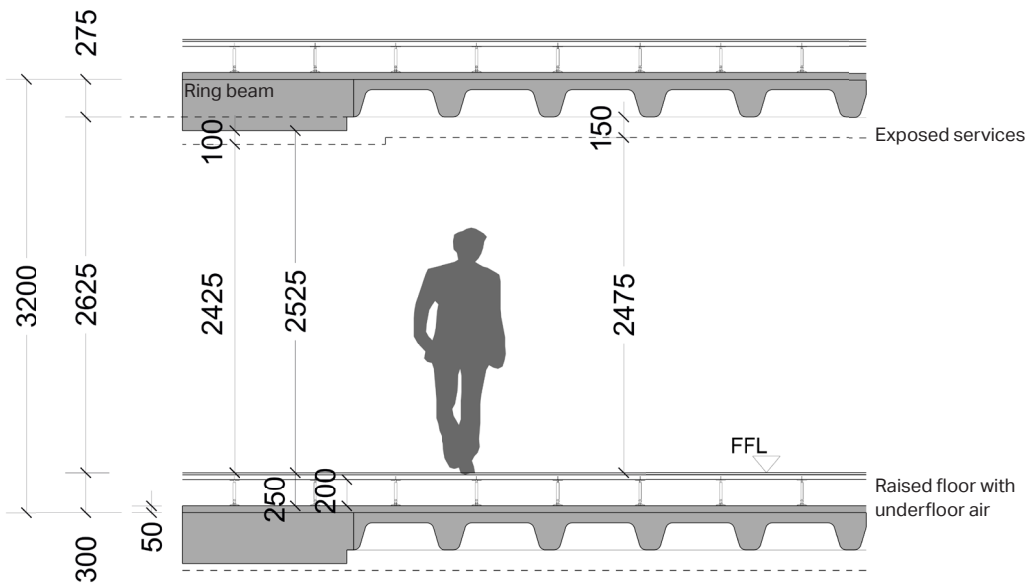


Modernising Option 3a

Another option is to have minimal services in the ceiling (lighting, sprinklers) and to provide a taller raised floor with underfloor air. Floor trunking is not desired as it limits flexibility. Clear height is 2,375mm, below BCO recommendation, over an extensive area of the floor plate. The minimal ceiling build-up and services zone shown would be subject to detailed co-ordination and integration of the services as well as require compromises in the fitout. This option assumes 4 no. AHUs per floor. Fewer AHUs results in a taller raised floor.

Option 3a is the opposite of the previous Option 2, where there are minimal services provided at high level (fire sprinklers, lighting). Instead, the major services are pushed into the floor and ventilation as well as heating and cooling is delivered via underfloor air. This requires a taller raised floor of 200mm clear (assuming 4 no. local AHUs per floor, see Figure 7.46), but can accommodate a shallower ceiling void of 150mm below the ring beam and 175mm below the ribbed slabs, including ceiling structure. **The resulting clear floor to ceiling height is 2,375mm below the ring beam, below the BCO minimum for refurbishments of 2,450mm over an extensive portion of the floorplate. Clear height of 2,450mm would be achievable below the ribbed slabs, which would just comply with the lower end of the BCO guidance, but would still not meet occupier requirements.** The minimal ceiling build-up and services zone would be subject to detailed co-ordination and integration of the services as well as require compromises in the fitout.

Figure 7.43 Servicing modernisation option with dropped ceiling



Modernising Option 3b

Another strategy is to expose the ceiling with sprinklers, lighting, etc. This may not be to every tenants liking. The raised floor provides underfloor air. A minimum 100mm services zone results in a compromised servicing strategy, though less so than in modernising option 3a. There is an option to step the services up to achieve a clear height of 2,475mm to underside of services, though this would only be possible under the ribbed areas of slab.

Option 3b is the Option that offers the tallest clear floor to ceiling height. It is the same as Option 2 except the high level services are left exposed, though it would require slightly deeper service zones. **In this case, the resulting clear floor to underside of services height is 2,425mm below the ring beam, below the BCO minimum for refurbishments of 2,450mm over an extensive portion of the floorplate. Clear height of 2,475mm would be achievable below services in the ribbed slab areas, which would just comply with the lower end of the BCO guidance, but would still not meet occupier requirements.** Areas between services would achieve taller floor to soffit heights. This Option does not offer tenants the flexibility to install a dropped ceiling if desired.

Figure 7.44 Servicing modernisation option with exposed soffit

Decentralised Ventilation Options
To minimise disruption to the existing cores, it is proposed that new air handling plant would be provided locally to the floorplates.

Two options are considered with the initial aim of providing maximum net floor area. These are shown in Figure 7.45 and Figure 7.46.

In AHU Option 1, 2 no. local AHUs per level are provided located at the north and south satellite cores. This frees up area around the east and west satellite cores, and reduces the impact on the overall floor layout. However, the AHUs must overcome a relatively large pressure drop in providing air across half the floorplate, and are therefore ducted within the floor plenum. The ducted floor plenum necessitates a larger floor void (350 mm clear). The result is a saving on net floor area, but a reduction in the clear floor to ceiling height. See Figure 7.45. Net to gross achieved is 70%.

In AHU Option 2, 4 no. local AHUs per level are provided located at each of the satellite cores. Conversely to AHU Option 1, this requires more on floor plant area for the additional AHUs, but because the individual units are working less hard, this results in a reduction of the floor void required (200 mm clear in this case). Due to the marginal size decrease of the local AHUs, the local plant rooms in this option are no smaller than those in AHU Option 1. Net to gross achieved is 67%.

While AHU Option 1 results in a higher floor efficiency (net to gross 70%), it is clear from the room section that the clear floor to ceiling height of 2,225mm is unacceptably low, and well below the BCO minimum for refurbishments of 2,450mm, and would not meet occupier requirements. Even with the additional 150mm of clear height enabled in AHU Option 2, the clear floor to ceiling height of 2,375mm (below the ring beam) is still below the BCO minimum for refurbishments.

Accordingly, it is not possible to support the combination of modern room-side services, desired clear floor to ceiling heights, and offer tenants a degree of fitout flexibility within the current structural floor to floor height.

While the wholesale overhaul and upgrade of the MEP systems will improve energy performance, the new systems will be compromised by the poor condition and outdated design of the existing facade. Accordingly, it is anticipated that ultimately new facade would be delivered with performance (airtightness, insulation, solar gains, and light transmittance) commensurate with modern facade systems.

AHU Option 1

2 no. local AHUs per level are provided located at the north and south satellite cores (marked up). Only the east and west satellite cores are acting as escape cores. Overall net to gross is 70%. The AHUs are ducted in the floor void, resulting in a larger floor void (350 mm clear).

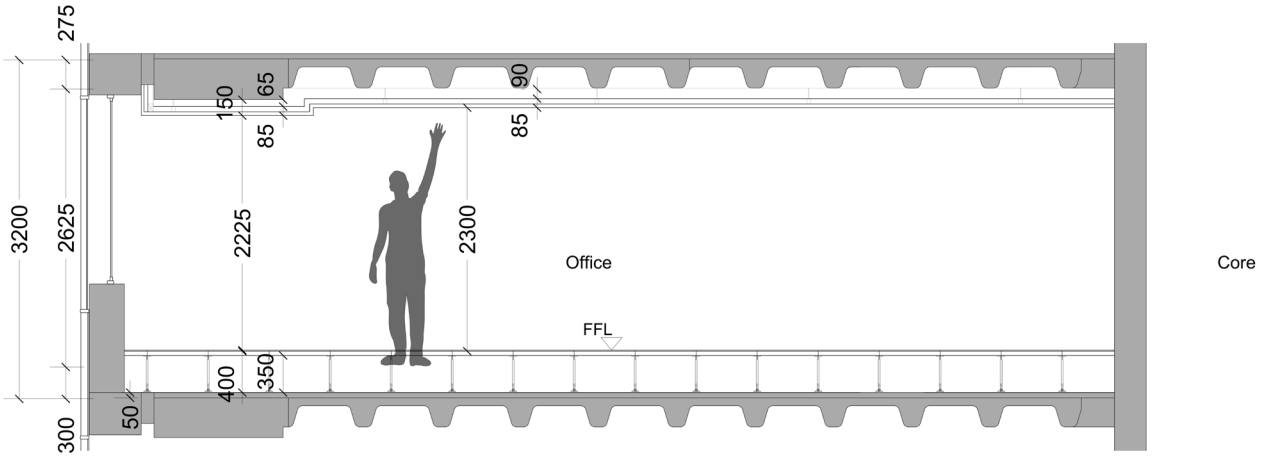


Figure 7.45 Typical office plan layout (above) and room section (below) for option with 2 no. local AHUs per floor.

AHU Option 2

4 no. local AHUs per level are provided located at all the satellite cores (marked up). Only the east and west satellite cores are acting as escape cores. Overall net to gross is 67%. The AHUs are not ducted in the floor void, resulting in a smaller floor void (200 mm clear) and larger clear floor to ceiling height.

Owing to the larger floor to ceiling height, this is the option taken forward in this study.

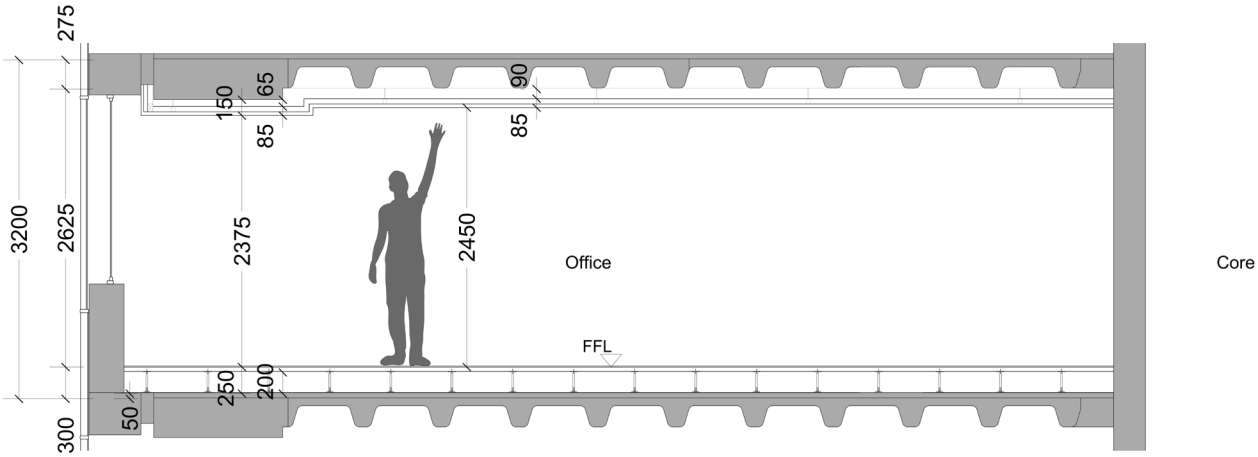


Figure 7.46 Typical office plan layout (above) and room section (below) for option with 4 no. local AHUs per floor.

7.4.4 Vertical Transport

Beyond implications due to fire safety and energy, VT generally needs to adhere to the performance requirements of the BCO.

The existing passenger lifts can only support the following occupancy with reasonable waiting times:

- High zone – one workstation per 16 m^2
- Low zone – one workstation per 14 m^2.

This is equivalent to 50-70% of the occupancy that might be expected.

A typical current office would have the lift systems designed to suit an occupancy of one workstation per 8 or 10m^2 of net internal area.

The following upgrades are required for VT. Note that much of the existing VT equipment is dated and has been recommended for replacement and the following concerns the structural interventions necessary to support modern codes and guidance. Refer to the analysis of Section 6.6 for more detail.

- Existing passenger lifts do not support modern occupancies and wait times. To be upgraded with 4 no. new passenger lifts (2 no. low-rise + 2 no. high rise).
- Fire-fighting lifts cannot be used as goods lifts. Existing goods lift shafts to become fire fighting lift shafts, and new goods lift shafts appended to core.
- Goods lift duty to be upgraded to comply with BCO recommendations.

The new goods lifts cannot be taken to basement level without interfering with the existing pile cap. Accordingly it is proposed that a separate goods lift is used from basement to ground, and then transferred to the new goods lift above ground.

7.4.5 Facade

As outlined in Section 7.3, the existing façade cannot achieve the level of performance required by current building regulations and standards.

Due to the condition and design, it cannot be realistically upgraded, and therefore a new facade is required. Replacing the façade with a new construction is feasible, however this will have several implications on the design.

Constructibility
The new facade would likely comprise an aluminium unitised façade system which would be fabricated in modules off-site. These units would then be transported to site, with minimum fabrication on-site. Installation would typically be carried out using a mini crane where the units are stored on slabs and then installed one by one. Installation could also be carried out using a tower crane, particularly if it is necessary to reach challenging areas of the site or to lift large modules due to their dimension or weight.

A challenge with this system is that additional space would be needed to fit the façade mullions and fire stopping beyond the line of the existing slab. This would shift the outer perimeter of cladding outwards from the existing glass line. An alternative would be to use a window-wall system that starts and stops at each slab level. This would increase installation time and the amount of work required on site, and would therefore be at disadvantage on a tall building. Bespoke detailing would also be necessary to ensure the fire compartmentation at each slab level. But an advantage of such a system is that installation can be readily carried out from the inside of the building using a glass manipulator.

Loading
The existing facade loads have not accurately calculated, but the primary system is understood to be mostly single glazed with monolithic glass, with a secondary window installed in most locations. The loading from this façade would be expected to range between 0.25 - 0.5kN/m^2. This is below the preliminary allowance for new system (either unitised, or window-wall system), which would be at least 1kN/m^2 for the facade self-weight.

This increased loading has a minor impact on the primary structure. It would increase foundation loads by <10% for the columns around the perimeter, which should be justifiable on a global basis. This small load increase would not significantly affect the edge beam, other than a slight increase in deflections, which it is anticipated could be accommodated within the façade build up itself.

Thermal performance
In a commercial office, emphasis is likely to be on g-values, with higher performance glazing selection and potentially darker glass and/or external shading. The U-values will be significantly better than those achieved by the existing façade, and these are likely to be achieved with double glazed systems.

7.4.6 Impact on Existing Floorplate

The diagrams in Figure 7.50 test the impact of the preceding interventions on the existing structure. The aim is to be as unintrusive on the existing structure as possible.

In general the spatial actions required are:

- Additional risers
- On floor AHUs
- Upgraded passenger lifts
- Distinct goods and fire fighting lifts.

The requirement for dedicated fire fighting lifts means new goods lifts are required. These goods lifts are pushed out and appended to the existing cores, with the existing shafts being used for dedicated fire fighting lifts. **However, limited by the length of the floorplate in these locations, these goods lifts would be undersized for a modern goods lifts.** The appended shaft is approximately 2,400 (w) x 3,200mm (d), while a modern goods lift would typically would have a 2,500kg rating and a well of 2,900 (w) x 3,600mm (d), in line with BCO recommendations.

The existing passenger lifts are too slow and don't support the desired occupancy. Fully-new low-rise and high-rise passenger lifts are required. These are added within the existing passenger lift banks in the central core.

Finally **additional risers and on-floor air handling units would be needed to make the floor plate functional for energy and ventilation.** The AHUs are housed in dedicated on-floor plant rooms adjacent to the cores, and a new riser is appended to each of the cores, to supplement existing riser provision.

Large portions of the floor slab would be impacted by these interventions cutting through the existing slab. This is exacerbated by the existing ribbed slab system, where **entire slab zones need to be removed if any portion of it is overlapped by the new vertical penetrations.**

It is clear in the diagrams that large areas of the existing floor slab would need to be removed to bring the existing building up to code and current standards. **The resulting floorplate is spatially inefficient with a net to gross efficiency of 67%.** This decreases further if a lift lobby is added, and falls below 60% in a multi-tenanted scenario due to circulation space.

STRUCTURAL ACTIONS REQUIRED

	Current Status	Action Needed
Fire Safety	60-90 min structural fire rating	Required 120 min structural fire rating achieved through applying intumescent coatings or fire boarding
Performance	Substructure appears to be in reasonable condition	Continue to investigate potential for reuse. Apply a structural load balance principle to justify load on the existing foundations
	Ribbed slab appears to be in reasonable condition	Small demolition results in larger portions of ribbed slab needing to be removed. Apply framing principle as per to diagrams in Figure 7.51
	Columns built to withstand current load	Strengthening of columns only required if load increases. Apply a structural load balance principle to justify load on the existing columns. Columns with increased load or length to be strengthened using steel or concrete jacketing

Figure 7.47 Summary of actions need for structural upgrades

FACADE ACTIONS REQUIRED

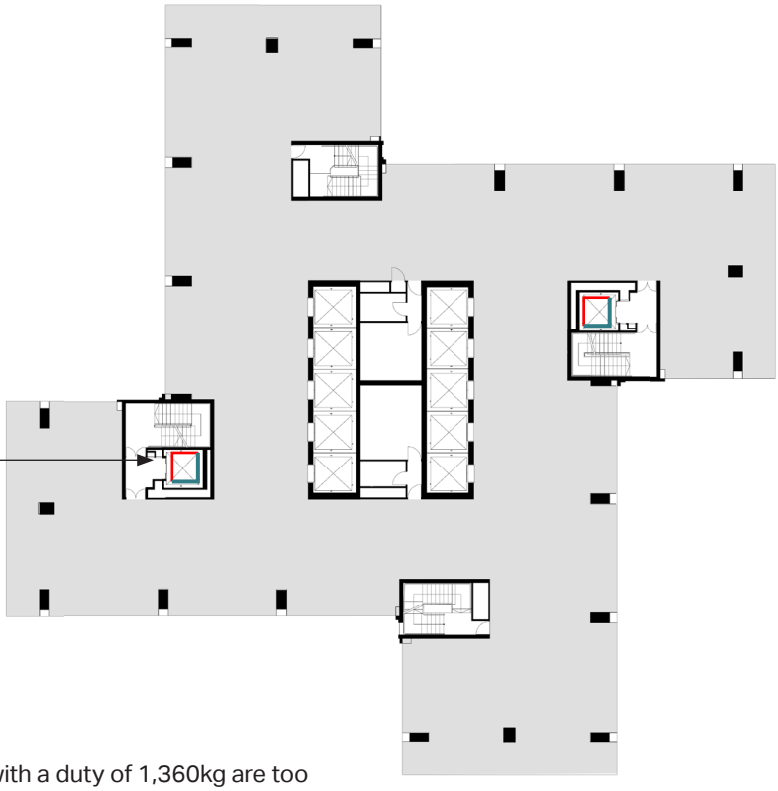
	Current Status	Action Needed
Fire Safety	Fire stops between floors not evident	Compliant fire stops needed between floors through facade replacement
Performance	7x worse air permeability than contemporary building	Facade air tightness to be improved through facade replacement
	U-value 2-3x worse than contemporary facade	Facade thermal performance to be improved through facade replacement
	Many facade elements (gaskets, silicone, glass unit) are more than 2x beyond service life	Service life renewed through facade replacement
	Solar gains too high for low energy building systems	Facade solar performance to be improved through facade replacement

Figure 7.48 Summary of actions need for facade upgrades

SERVICES ACTIONS REQUIRED

	Current Status	Action Needed
Fire Safety	Sprinklers only on lower floors	Sprinklers to be installed on every floor complete with associated sprinkler tanks and pumps
	Goods lifts double as fire fighting lifts	Separate fire fighting and good lifts to be provided
	No evacuation lifts	Evacuation lifts to be provided
Performance	Nearly all equipment beyond service life	All MEP equipment to be replaced
	Oil and gas boilers dating from 1970s	To be replaced with modern all-electric system in MEP equipment overhaul
	LV electric infrastructure from 1970 is beyond service life	Full upgrade of electric infrastructure and lighting in MEP equipment overhaul
	Outdated lift system is inefficient and provides for 50-70% of modern occupancy standards	All lift machinery to be replaced with modern, low energy lift systems
Well-being	Insufficient ventilation and fresh air supplied	Enlargement & replacement of existing systems and distribution (with associated impact on structure)

Figure 7.49 Summary of actions need for building services upgrades



Lifts in satellite cores doubling as goods and fire fighting lifts

Required Actions:

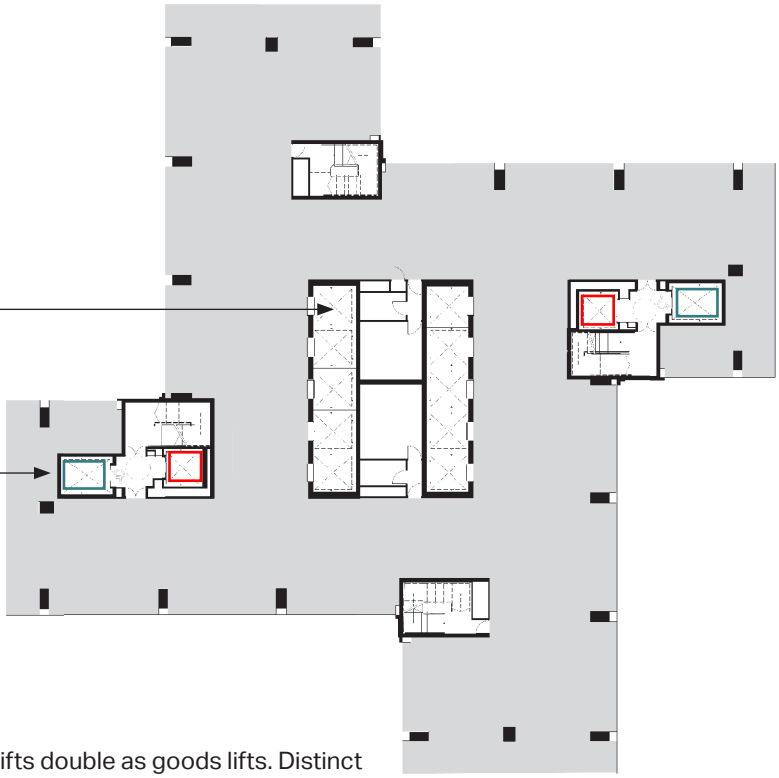
- Additional risers
- On floor AHUs
- Upgraded passenger lifts
- Distinct goods lifts
- Dedicated fire fighting lifts

Fire-fighting lift

Good lifts/ Evacuation lifts

Goods Lifts

The existing goods lifts with a duty of 1,360kg are too small, BCO 2019 recommends a duty of 1,600kg to 3,000kg. New goods lifts will need to be provided.



The existing lift capacity does not meet such demand

Distinct goods lifts added

Required Actions:

- Additional risers
- On floor AHUs
- Upgraded passenger lifts

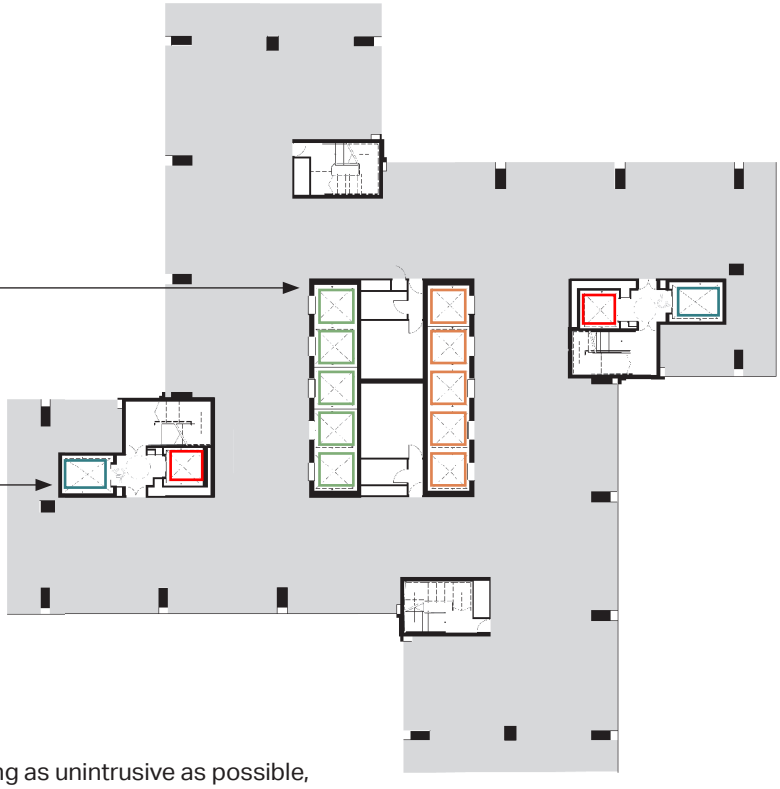
Fire-fighting lift

Good lifts/ Evacuation lifts

Fire Safety

The existing fire fighting lifts double as goods lifts. Distinct goods lifts would need to be added to allow for dedicated fire fighting lifts.

Figure 7.50 Impact of changes on existing floorplates



New lifts required in the existing 10 lift shafts.

Insufficient risers and missing AHUs for fresh air provision

Required Actions:
- Additional risers
- On floor AHUs

Fire-fighting lift

Good lifts / Evacuation lifts

Passenger high-rise

Passenger low-rise

Lift Provision

With the aim of being as unintrusive as possible, this demand can be met using the existing 10 no. passenger lift shafts, but with new machinery.

Sufficient riser space provided

AHUs added to provide sufficient fresh air

Fire-fighting lift

Good lifts / Evacuation lifts

Passenger high-rise

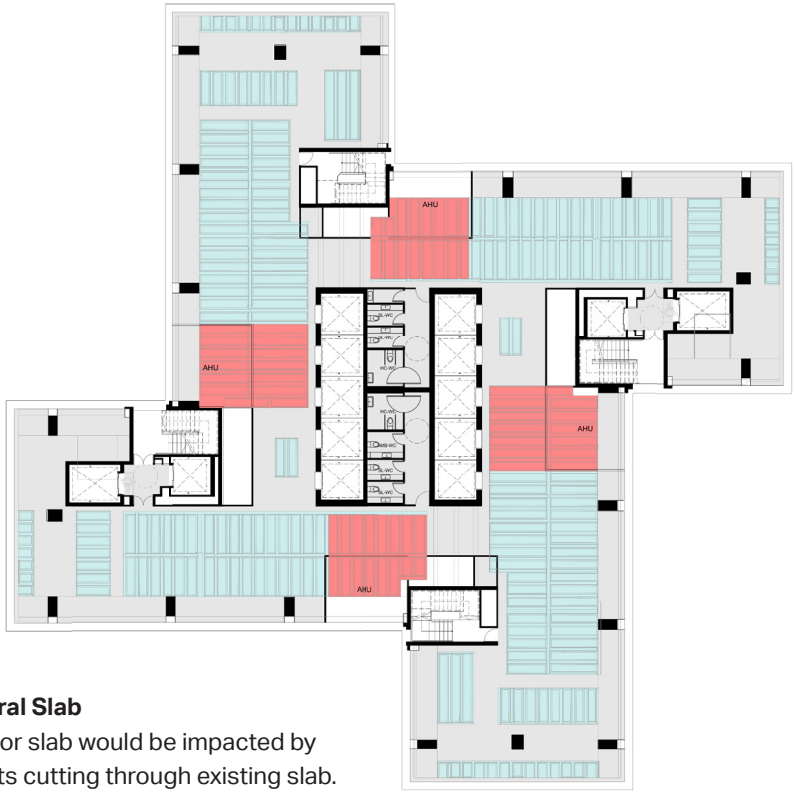
Passenger low-rise

Risers

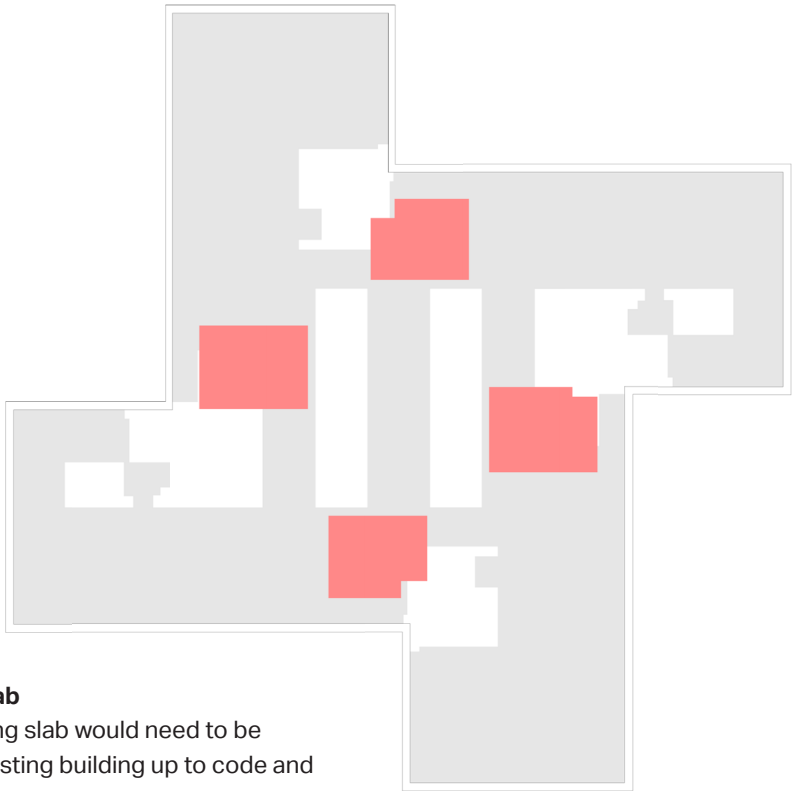
AHUs

Mechanical Services

Additional risers and on-floor air handling units would be needed to provide sufficient fresh air. They are provided decentralised to minimise disruption to the existing core.

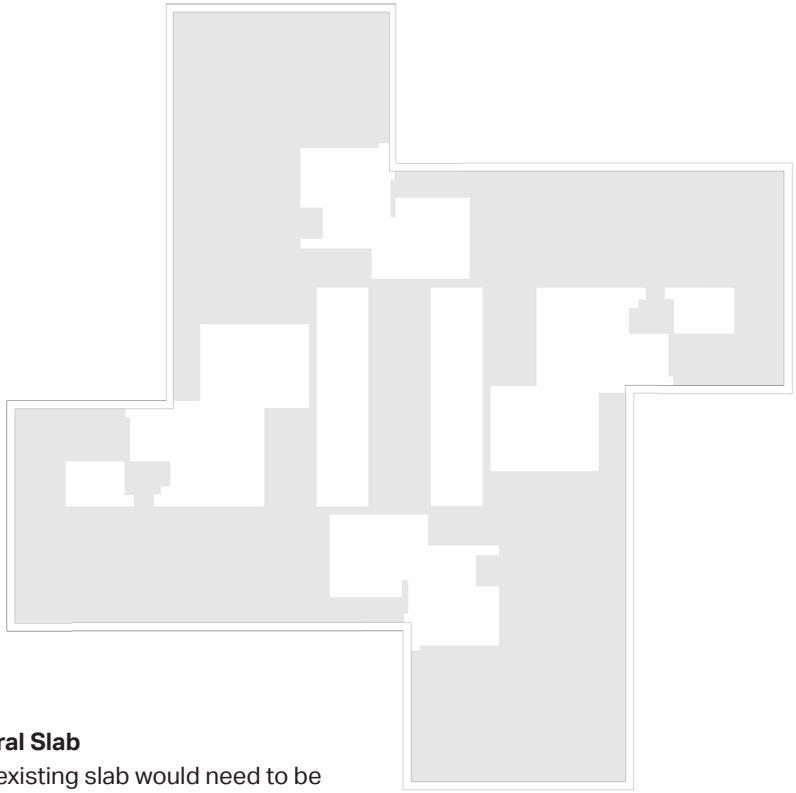


Implications to Structural Slab
Large portions of the floor slab would be impacted by these additional elements cutting through existing slab. Entire ribbed slab zones would need to be removed if overlapped with new vertical shafts.

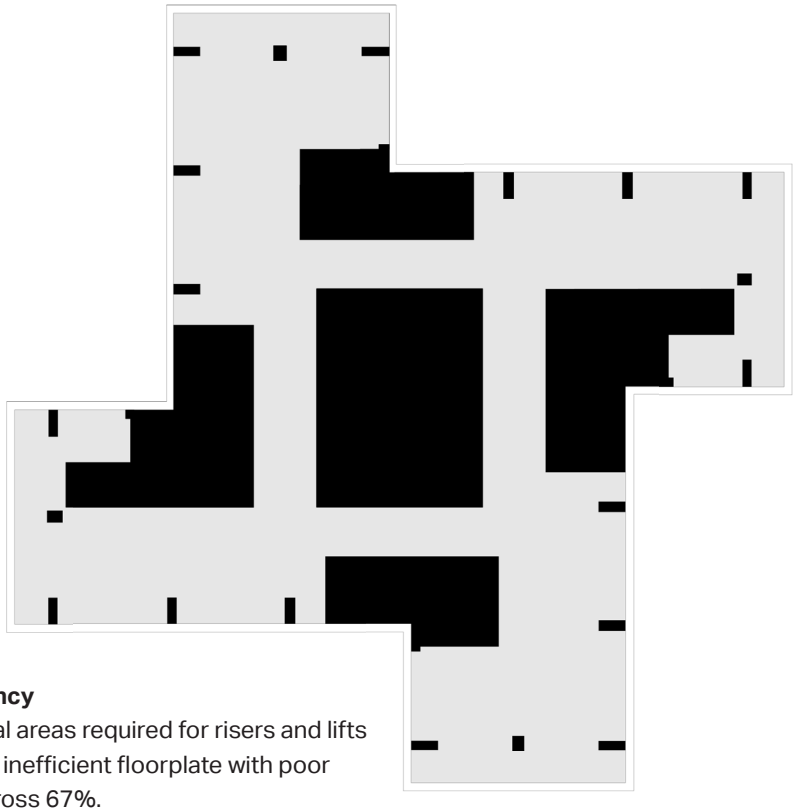


Resulting Structural Slab
Large amounts of existing slab would need to be removed to bring the existing building up to code and current standards.

Figure 7.51 Impact of changes on existing floorplates



Resulting Structural Slab
Large amounts of existing slab would need to be removed to bring the existing building up to code and current standards.



Floorplate Efficiency
The large additional areas required for risers and lifts would results in an inefficient floorplate with poor efficiency net to gross 67%.

7.4.7 Resulting Floorplates

Following the upgrades the resulting floorplates are shown in Figure 7.52 and Figure 7.53. It assumed that Level 01 would be an amenity level. The floorplates have 2 no. escape cores (therefore suitable for single use only), and 4 no. local AHUs to maximise floor to ceiling height.

Level 00
The resulting floor layout for the ground floor (overleaf). The floorplates have 2 no. escape cores and are therefore suitable for single use only.

The additional goods lift is intended as a shuttle between basement and ground, as it is not possible to take the new goods lifts at the satellite cores down to basement without interfering with the existing pile cap.

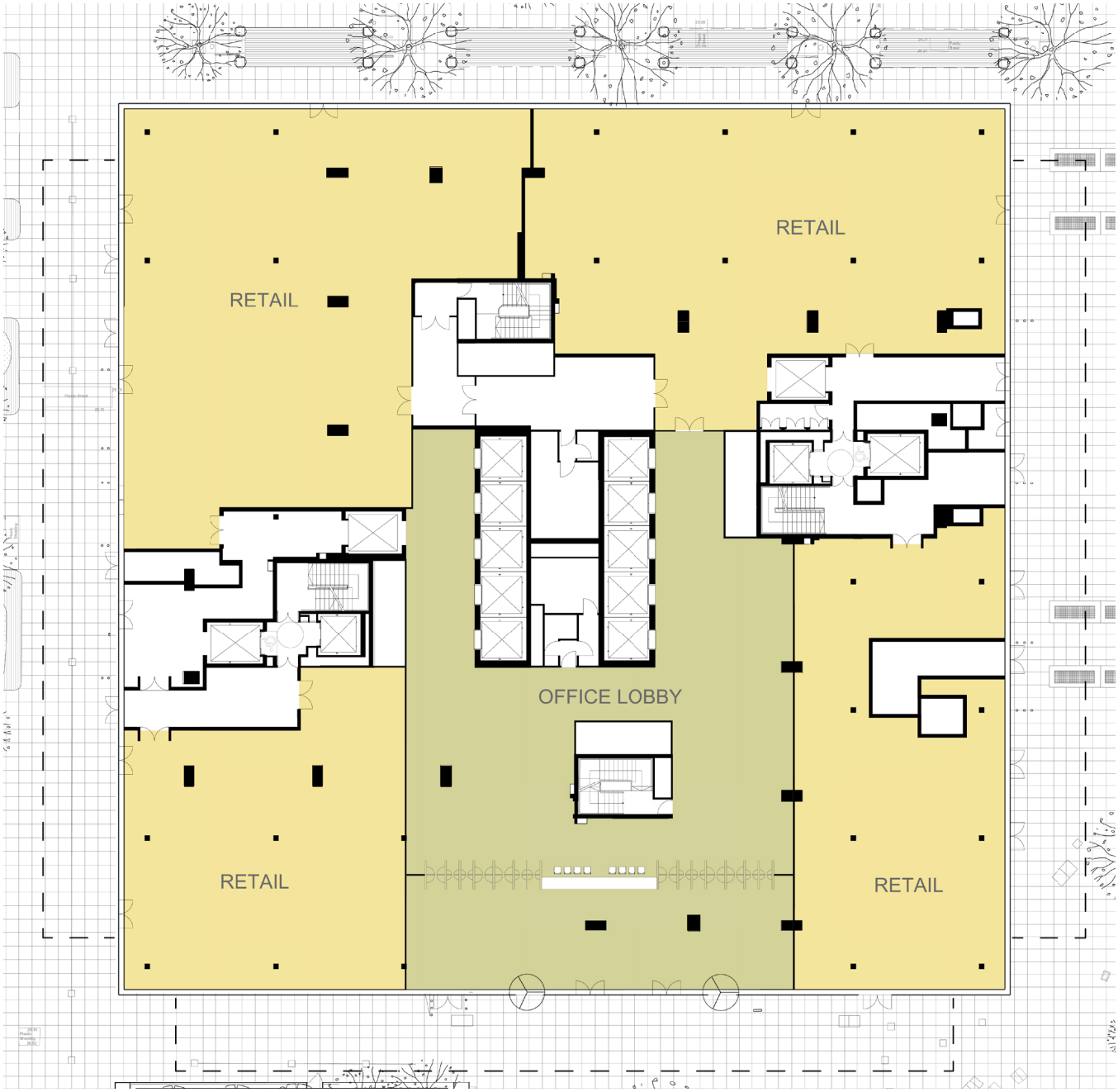


Figure 7.52 The resulting layout for Level 00

Typical Tower Level
The resulting office floor layout for a typical tower level. The floorplates have 2 no. escape cores (therefore suitable for single use only), and 4 no. local AHUs to maximise floor to ceiling height.

Figure 7.53 The resulting layout for the typical tower levels

7.4.8 Multi-tenanted Layouts

This resulting floorplate can work in a single-tenant scenario, especially if the lifts open directly onto the floorplate. However the floorplate is significantly compromised in a multi-tenanted scenario where, because the core is spilt into one central lift core and four satellite cores, main circulation takes up a significant portion of the floor plate.

This limited flexibility is shown on the test-fits in Figure 7.54.

Single Tenant
In a single-tenant scenario, the existing floor plate could work at possibly-reasonable efficiencies.

Two Tenants
In a multi-tenant scenario, main circulation takes up a significant portion of the floor plate.

Four Tenants
In a multi-tenant scenario, main circulation takes up a significant portion of the floor plate.

Figure 7.54 Test-fits showing how the existing floorplate limits multi-tenanted scenarios

7.5 Material Inventory and Carbon

7.5.1 Pre-demolition Audit

A pre-demolition audit has already been undertaken of the existing building. It details the quantities and quality of the materials in the building. The diagram below illustrates quantity in tonnage of the various materials in the tower. The largest material quantities are bricks, concrete, steel, glass, aluminium of which concrete makes up 99% of the total 40,303 tonnes.

The audit provides an inventory for the potential opportunities for reuse, upcycling and recycling of the existing materials, and is a framework for applying waste as a resource.

The full pre-demolition audit report is attached in Appendix M.

reusefully

Report From:

Katherine Adams and Gilli Hobbs
Circular Economy and Waste Specialists
Reusefully Ltd

Report Prepared For:

GXN

Pre-demolition audit of Euston Tower

24th August 2022

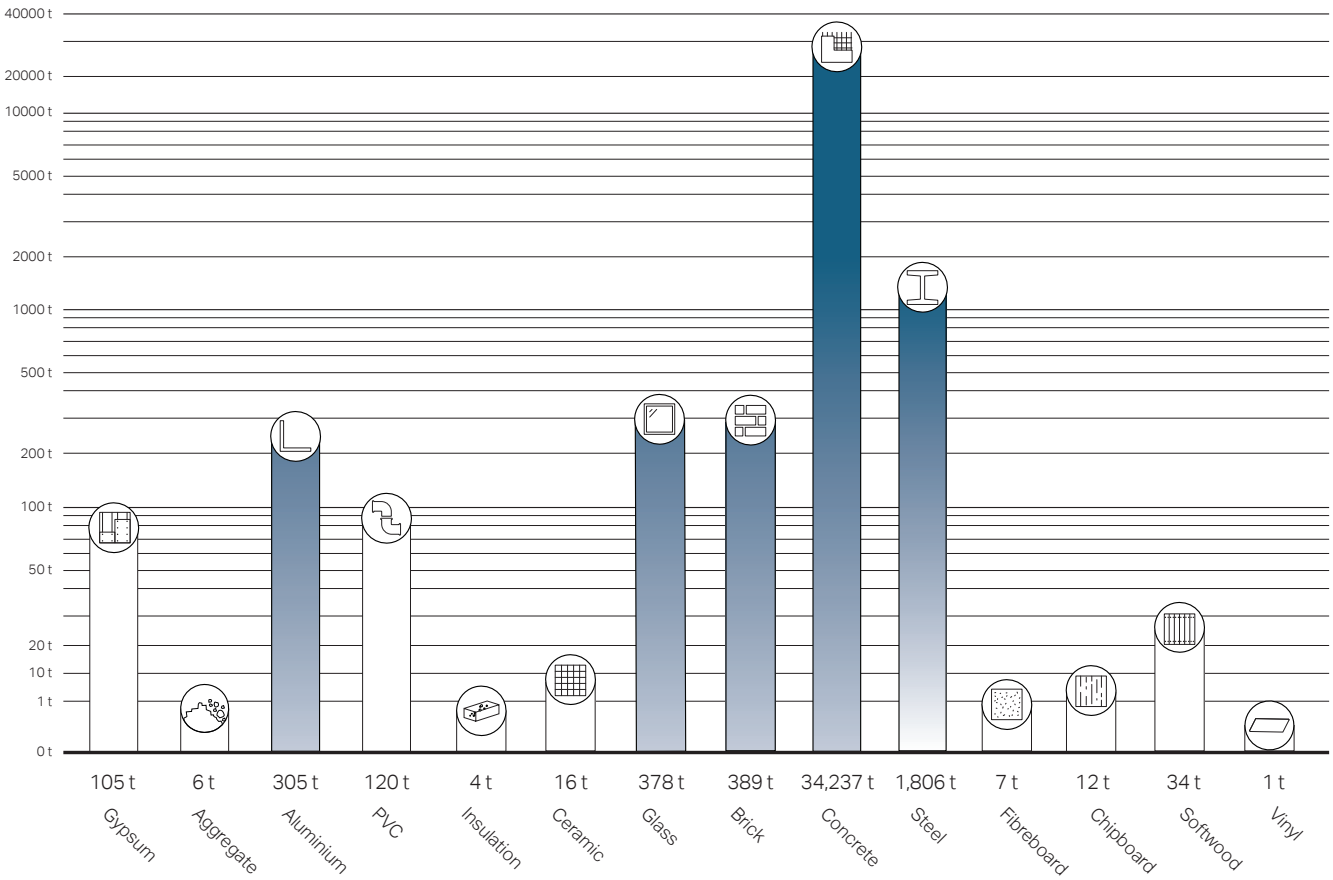
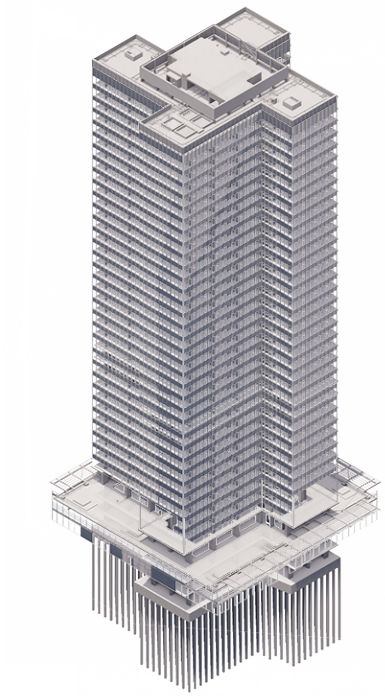


Figure 7.55 Material quantities in the existing building

The top 5 materials in the existing building make up over 99% of all existing materials (by mass). A short description of each of these materials is given below. More detail is will be provided in the Circular Economy Statement and Upcycling Catalogue as part of the planning application.



Concrete

Concrete is the largest material quantity identified in the tower, estimated to be approximately 36,981 tonnes. This is primarily from the concrete floor slabs (17,613 tonnes), the columns (4,355 tonnes), precast concrete walls (9,488 tonnes) and beams (1,086 tonnes).

Steel

Steel accounts for 1,942 tonnes of material arising from the demolition. This comes from a variety of sources, but the majority is as reinforcement in the structure (1,871 tonnes). Reinforcing bar is difficult to reuse as it is embedded within the structure, but it can be effectively recycled.

Aluminium

There is an estimated 305 tonnes of aluminium. Most of the items are panellised and as such may be suitable for reuse though may need to be cut and cleaned. This includes the cladding and the canopy. Aluminium should be prioritised as it is a carbon intensive material.

Glass

Glass is estimated to be 378 tonnes, the majority arising from the windows (façade) (169 tonnes) in the tower and the associated secondary glazing (161 tonnes). There is potential for the newer facades on the lower floors to be reused and also some internal partitions, as these are relatively new and of good quality.

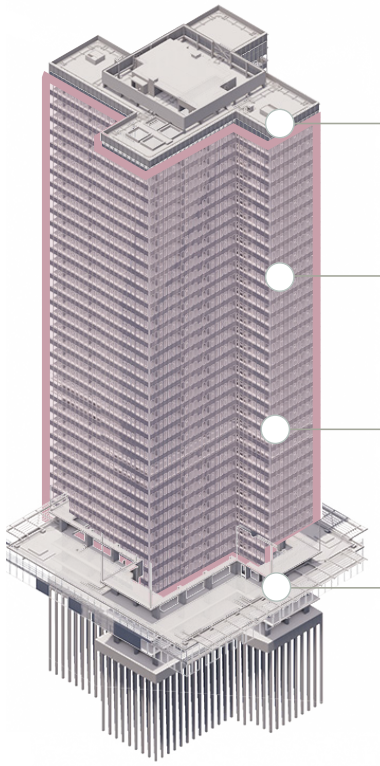
Brick

Brick is estimated at 388 tonnes from the internal walls from the demolition. It thought that a mix of brick types would have been used. The mortar type will determine the potential for brick reuse, but they can always be crushed and recycled into fill materials or recycled aggregate.

7.5.2 Facade Upcycling

As noted in Section 7.4.5, an upgraded Euston Tower would require a full facade replacement. Accordingly, a significant amount of demolition product will be generated when the existing facade is deconstructed.

The Pre-demolition Audit shows the main materials to come out of the façade is glass and aluminium. Most of the glass arising from the tower comes from the vision glazing and associated secondary glazing. The quality of the glazing varies greatly throughout the tower.

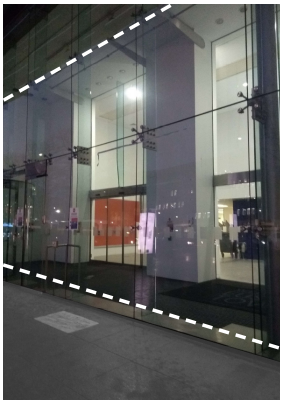


Elements	Materials	Quantity (Tonnes)
Panels/ Canopy/ Mullions	Aluminium	216.07
Windows	Glass	213.46
Frames	Aluminium	11.17
	PVC	120.00
Secondary Glazing	Glass	160.69
	Aluminium	77.90
	Gypsum	43.73
	Softwood	26.09
	Steel	16.55

Figure 7.56 Material arisings from facade deconstruction

Good Quality

Atrium glass

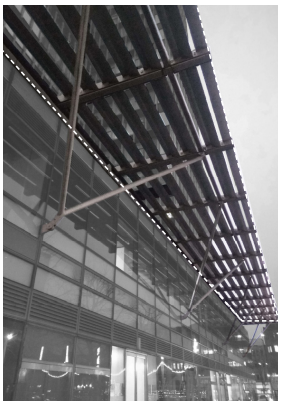


Location
External atrium ground

Quality
Excellent

Reuse potential
High

Canopy panels / fins



Location
First floor

Quality
Good

Reuse potential
High

Façade mullions

Location
All Facades

Quality
Good

Reuse potential
High

Façade smaller windows

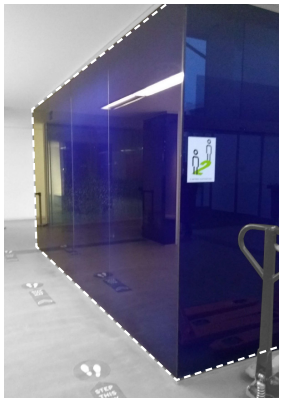
Location
Exterior — floor 1

Quality
Good

Reuse potential
High (depending on fixing and signage removal)

Poor Quality

Internal Blue Glass

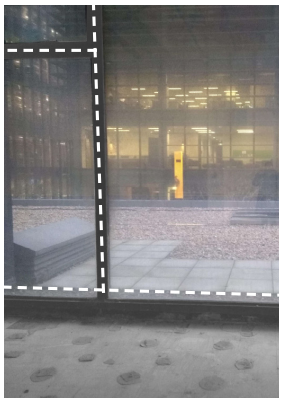


Location
Ground Floor

Quality
Good

Reuse potential
Medium—High

Facade panels



Location
Second floor

Quality
Good

Reuse potential
Low—Medium

Façade glazing

Location
Floors 2-33

Quality
Average

Reuse potential
Low

Secondary glazing

Location
Floor 3-33 (assumed)

Quality
Average

Reuse potential
Low

Best practice opportunities - Glass

There is an estimated 378 tonnes of glass arising from the demolition. Due to the mixed quality of the glass products, some of it is suited for reuse whereas other treatment could be necessary for other parts of the glass. An ambition is to trial recycling the existing building back into flat glass, these trials are currently being undertaken on site.

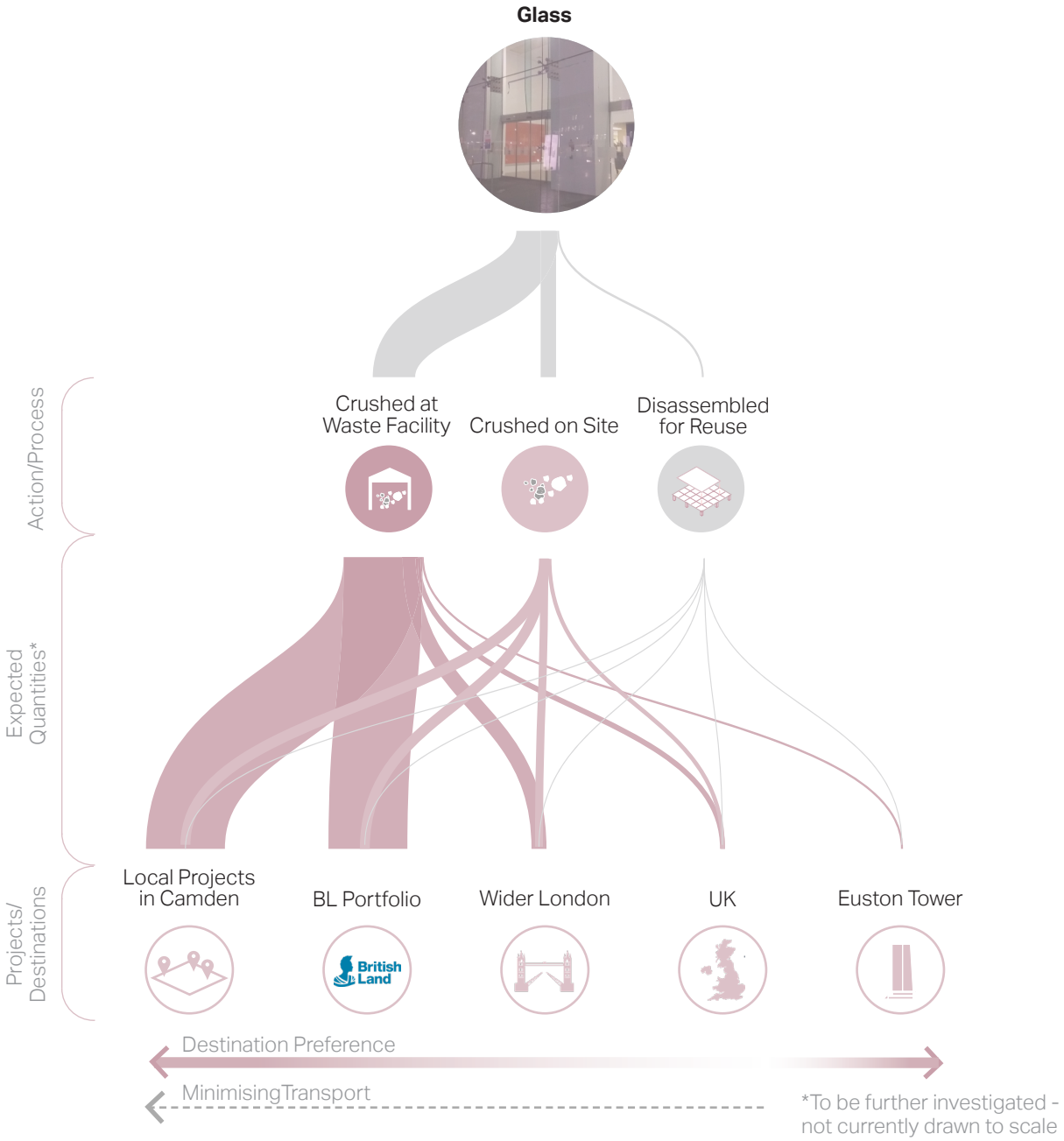
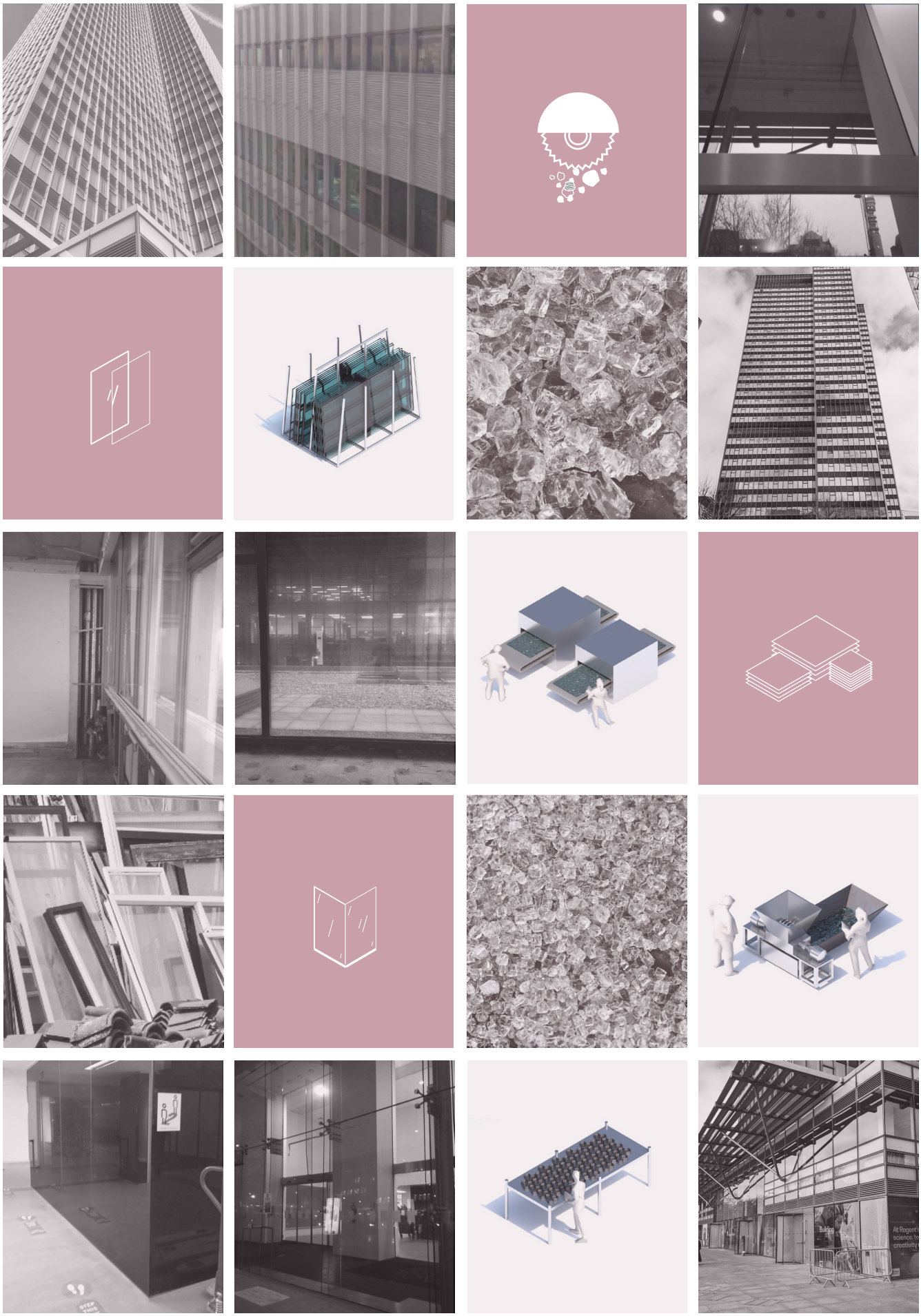


Figure 7.57 Possible routes for glass reuse and recycling



Best practice opportunities - Aluminium

There is an estimated 305 tonnes of aluminium arising from the demolition. The standard practice of treatment of aluminium is to recycle it as scrap on the open market. The ambition however is to pursue the best practice route of treating the aluminium through either reuse or closed loop recycling as scrap and identifying local projects or scrap merchants that take on the material.

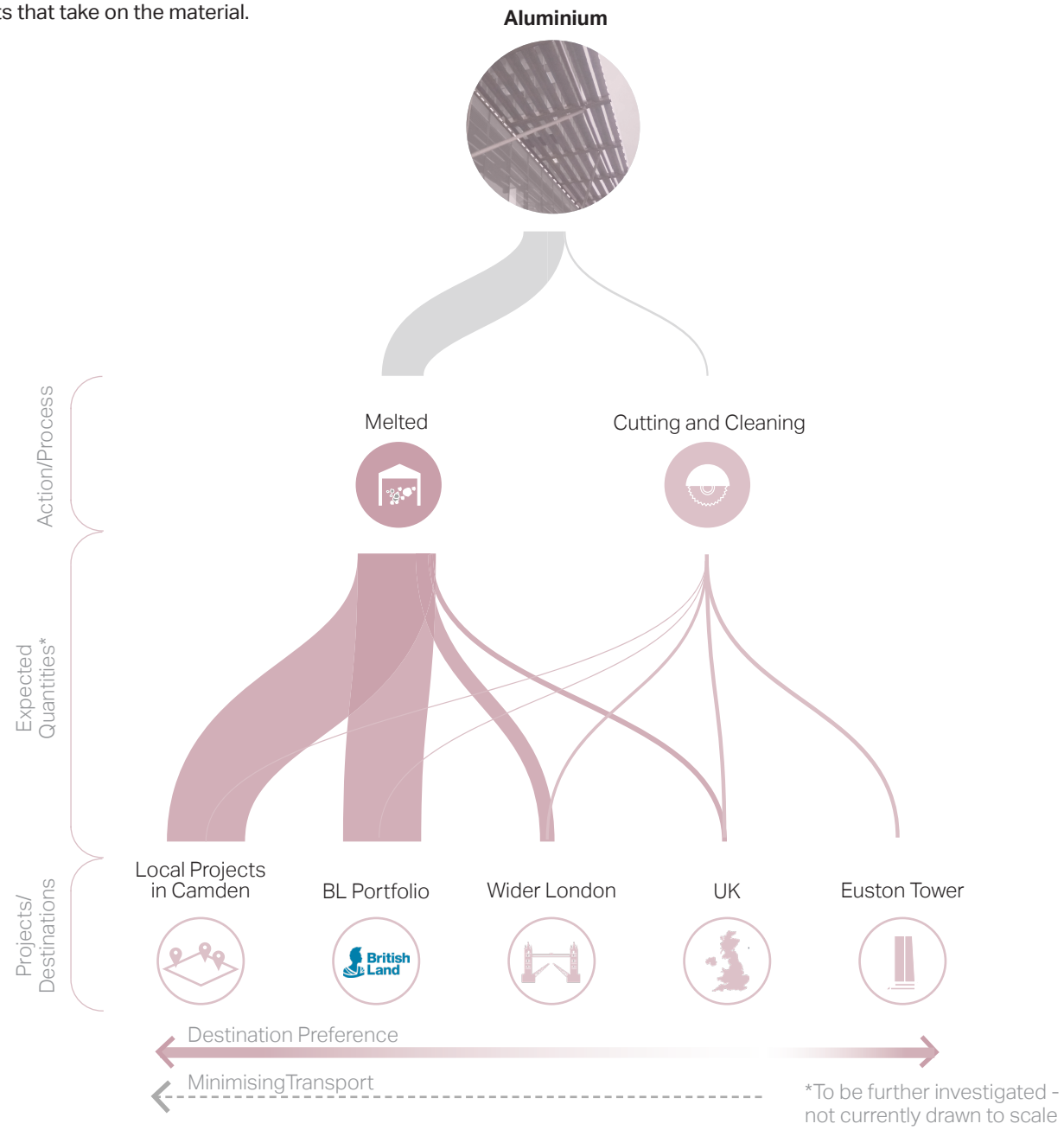
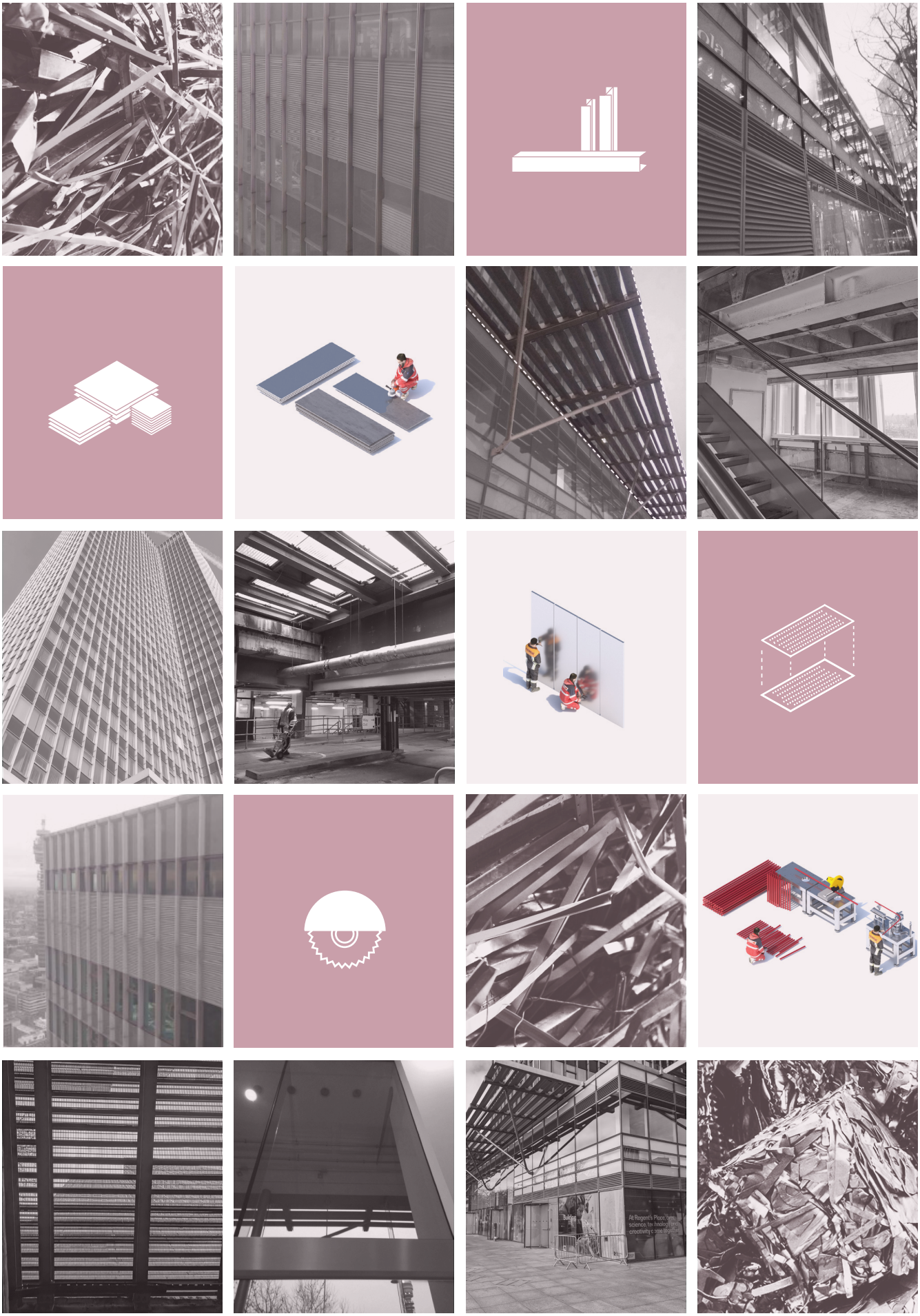


Figure 7.58 Possible routes for aluminium reuse and recycling



7.5.3 Existing Embodied Carbon

The embodied carbon contained within the existing building was estimated as part of the pre-demolition audit, in response to CPG Paragraph 9.4.

The audit did not cover the existing substructure. The embodied carbon estimate is based on input from Arup.

Noting some of the building elements had already been stripped out by the time the pre-demolition audit was undertaken, most notably MEP services, the estimate represents the embodied carbon within the remaining materials. This comprises primarily the superstructure and façades, which would account for approximately 64% of embodied carbon in typical office building (LETI breakdown).

While required in policy, there is no agreed methodology for calculating historical embodied carbon emissions. The ICE database has been used to establish a baseline estimate, as it is an widely-used, singular dataset. Given the decarbonisation of the electrical grid, in the period between Euston Tower's construction and the development of the ICE database, it is acknowledged that the estimate may underestimate the carbon emissions associated with the original manufacture of these materials. As such it may be "optimistic" to used said database, noting that this is a secondary issue (the emissions are long since emitted), and the focus should be on limiting carbon emissions going forward.

The embodied carbon assumptions are listed in the pre-redevelopment audit in Appendix M.

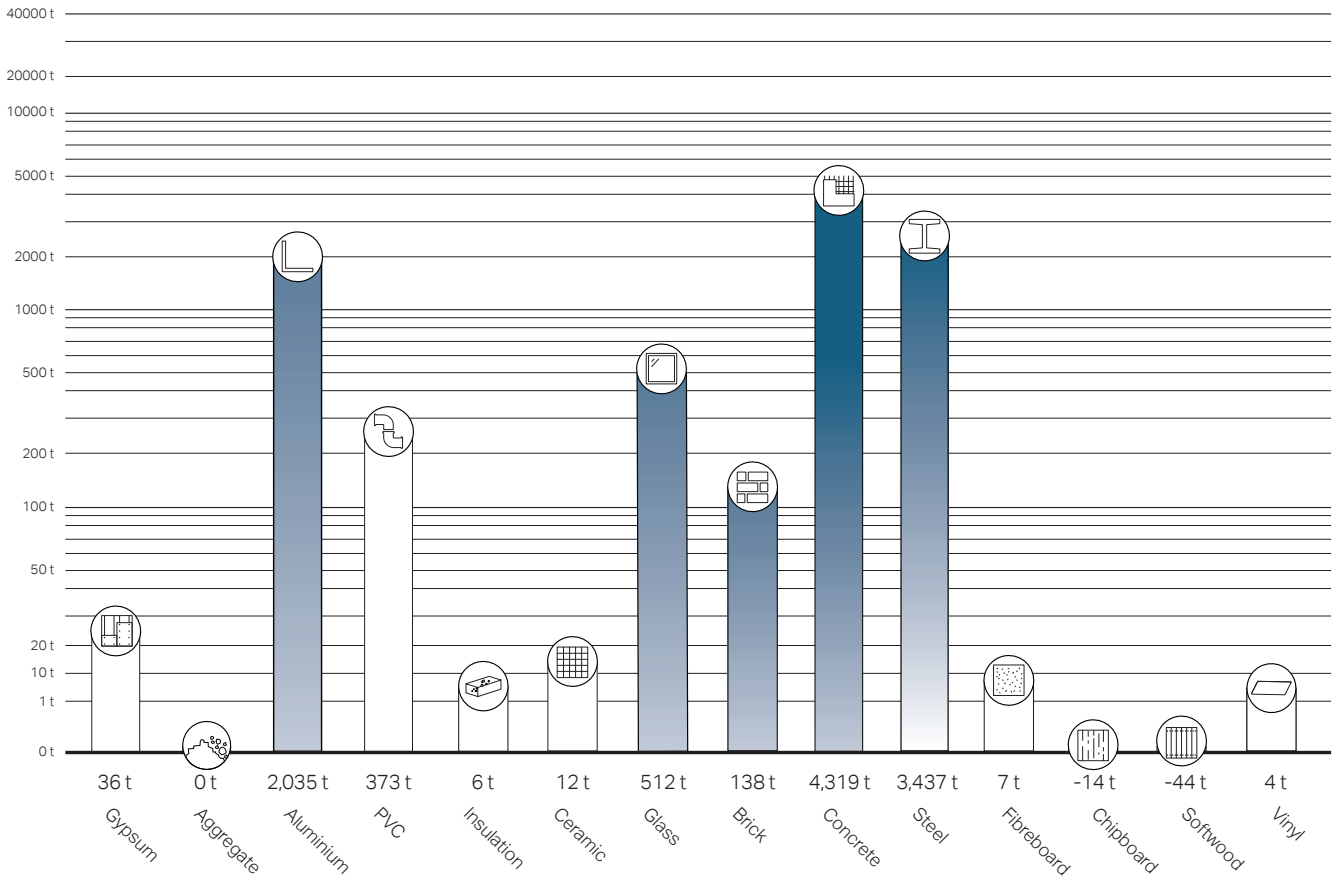
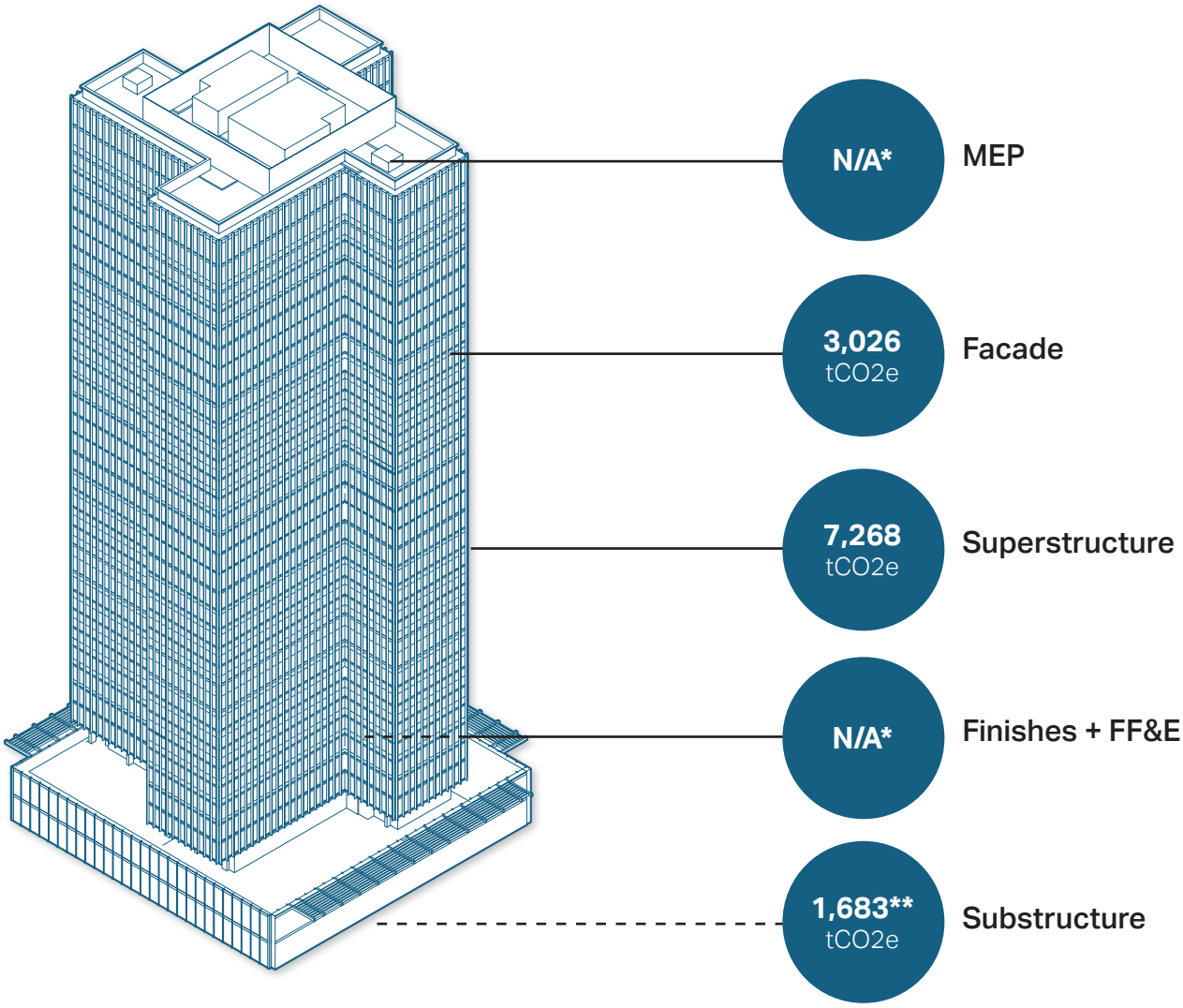


Figure 7.59 Estimated embodied carbon in the existing building split by material



* Mostly already stripped out prior to pre-demolition audit

** Not estimated based on pre-demolition audit

Figure 7.60 Estimated embodied carbon in the existing building split by building element

7.6 Viability and Conclusion

The preceding sections have shown the extent of upgrades that are required to bring the existing tower up to the requirements of current Building Regulations and standards, assuming continued use of commercial office.

The following summarises the minimum requirements for compliance with current Building Regulations:

- Structural fire performance upgraded to 120 minutes
- Sprinkler provision added throughout
- Fire compartmentation added to facade as part of facade replacement
- Mechanical smoke ventilation added
- Dedicated fire fighting lifts required (not shared with goods lifts)
- Fire fighting lifts upgraded to current standards
- New air handling plant with higher fresh air rates to meet ADF, and heat recovery to meet ADL
- New central plant provisions with energy efficiency to meet ADL
- Facade thermal performance upgraded to meet energy efficiency requirements in ADL via facade replacement.

The cost of undertaking these upgrades relative to the quality of office space created and therefore the consequential economic payback over time is very challenging. A developer would be forced to outlay a minimum amount of expenditure with the out-turn building remaining highly compromised – effectively a safe version of its original 1967 structure. That is not to say the building would be completely unlettable, but **it would have a limited rental value and likely to suffer a particularly long leasing void, there is a good chance it would never become fully occupied.**

While the space could be acceptable for small or start-up businesses it would not attract the fast growing, intellectually-rich businesses that Camden is targeting for the Knowledge Quarter. The most significant challenge would be the quantum of space – due to the overall quality and physical compromises the building would not appeal to larger occupiers therefore limiting leasing activity to a high volume of small businesses on shorter, more flexible terms. In some circumstances this could be a successful letting strategy, but here there is simply too much floor space to reasonably consider that strategy.

Accordingly the next step proposed is to explore changes of use for the tower, including different commercial use (e.g. lab-enabled spaces), and also away from commercial use entirely. These alternative uses are studied in Volume Two of this feasibility assessment.

A

Euston Tower

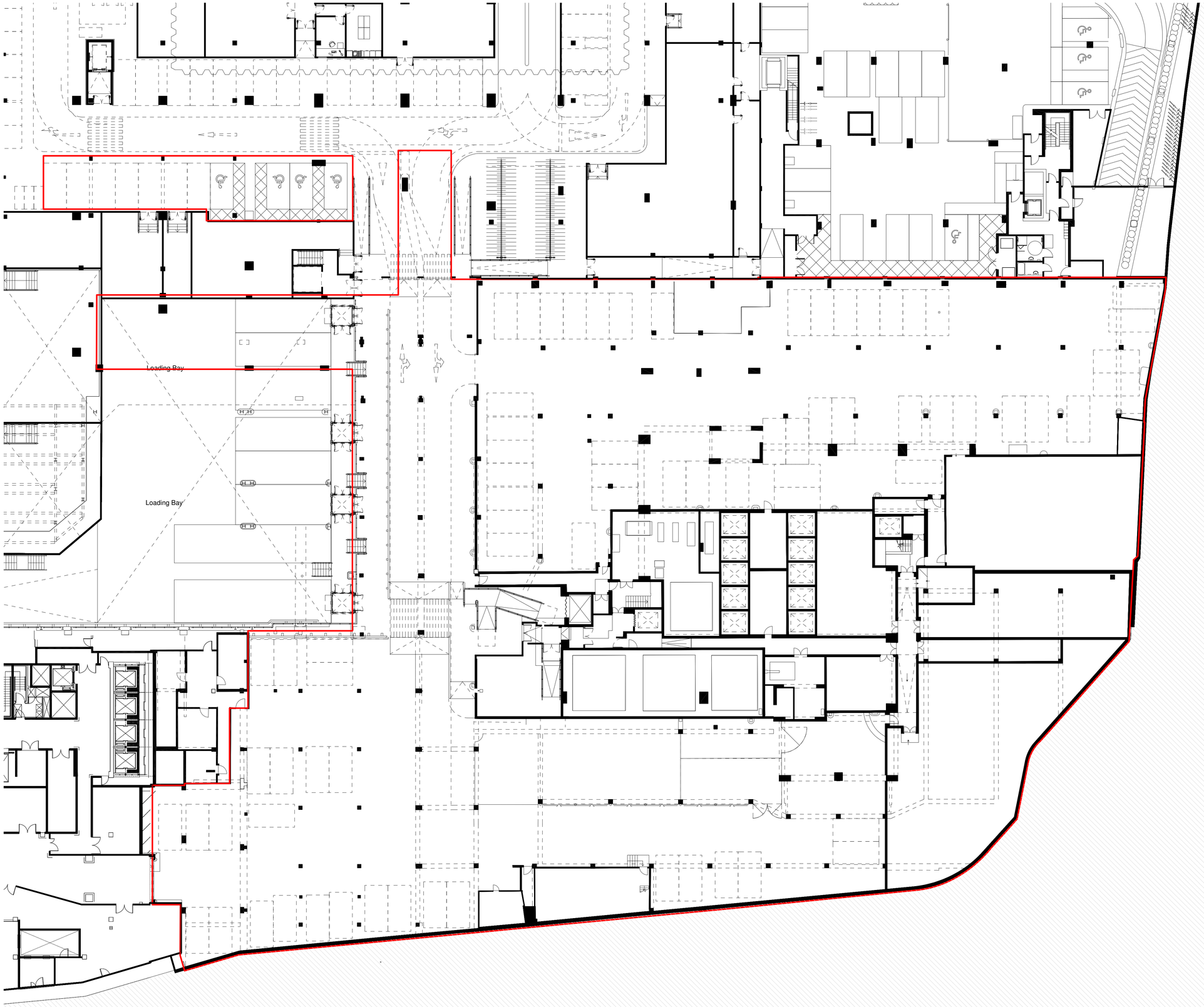
Appendices

Appendices

List of Appendices

A Existing Building Layouts
B Existing Building Sections
C Existing Building Elevations

D Vertex Access Euston Tower Inspection (Facades)
E Sandberg and McGee Structural Investigation Reports (Structure)
F AC Fire Safety Fire Risk Assessment2020 (Fire)
G PFP Specialists Investigation of an Existing Spray Fire Resistive Material Applied to Concrete Structural Elements (Fire)
H SVMA Condition Survey Euston Tower, London (MEP and VT)
I SVMA Lift Dilapidation Report (VT)
J William Martin asbestos Report
K D2 Fire Report
L Thornton Tomasetti Facade Commentary
M Pre-demolition Audit



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Key:

Proposed Red Line Boundary

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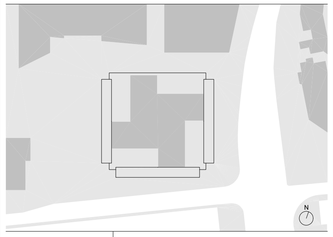

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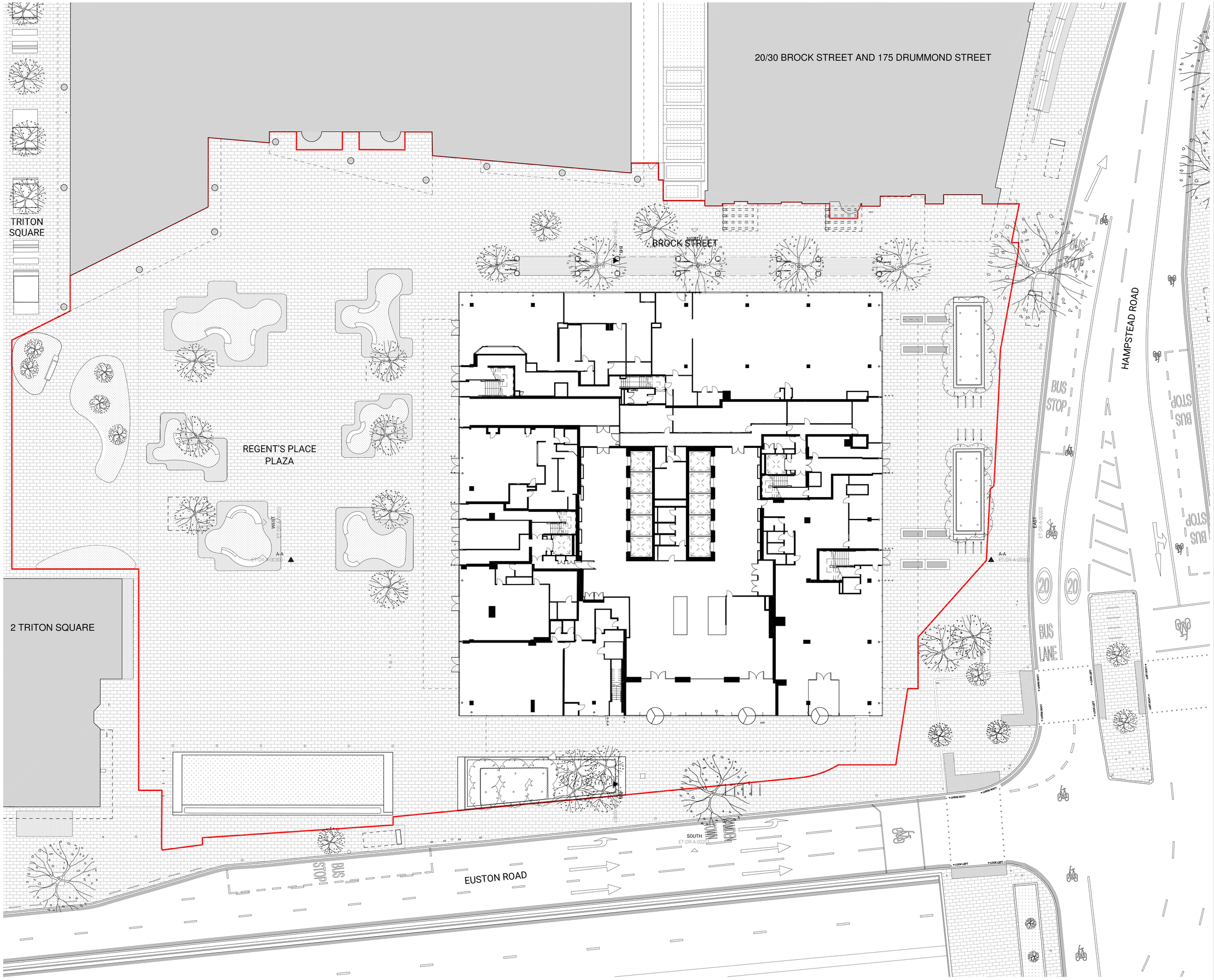

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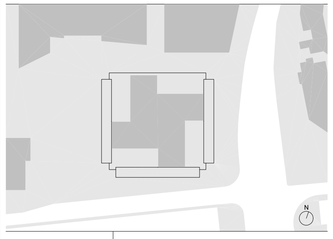

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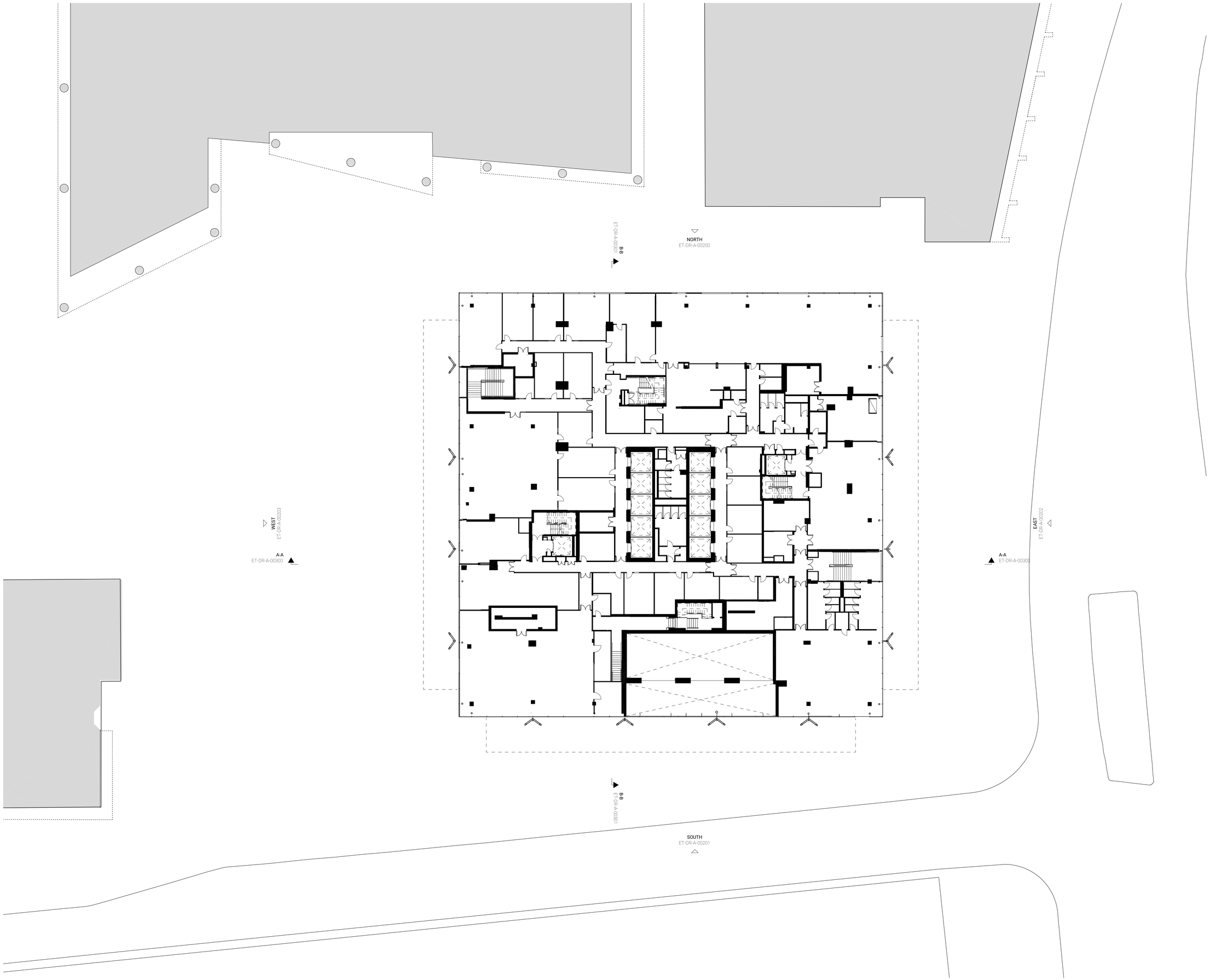

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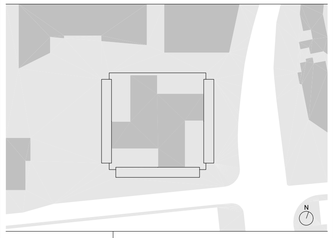

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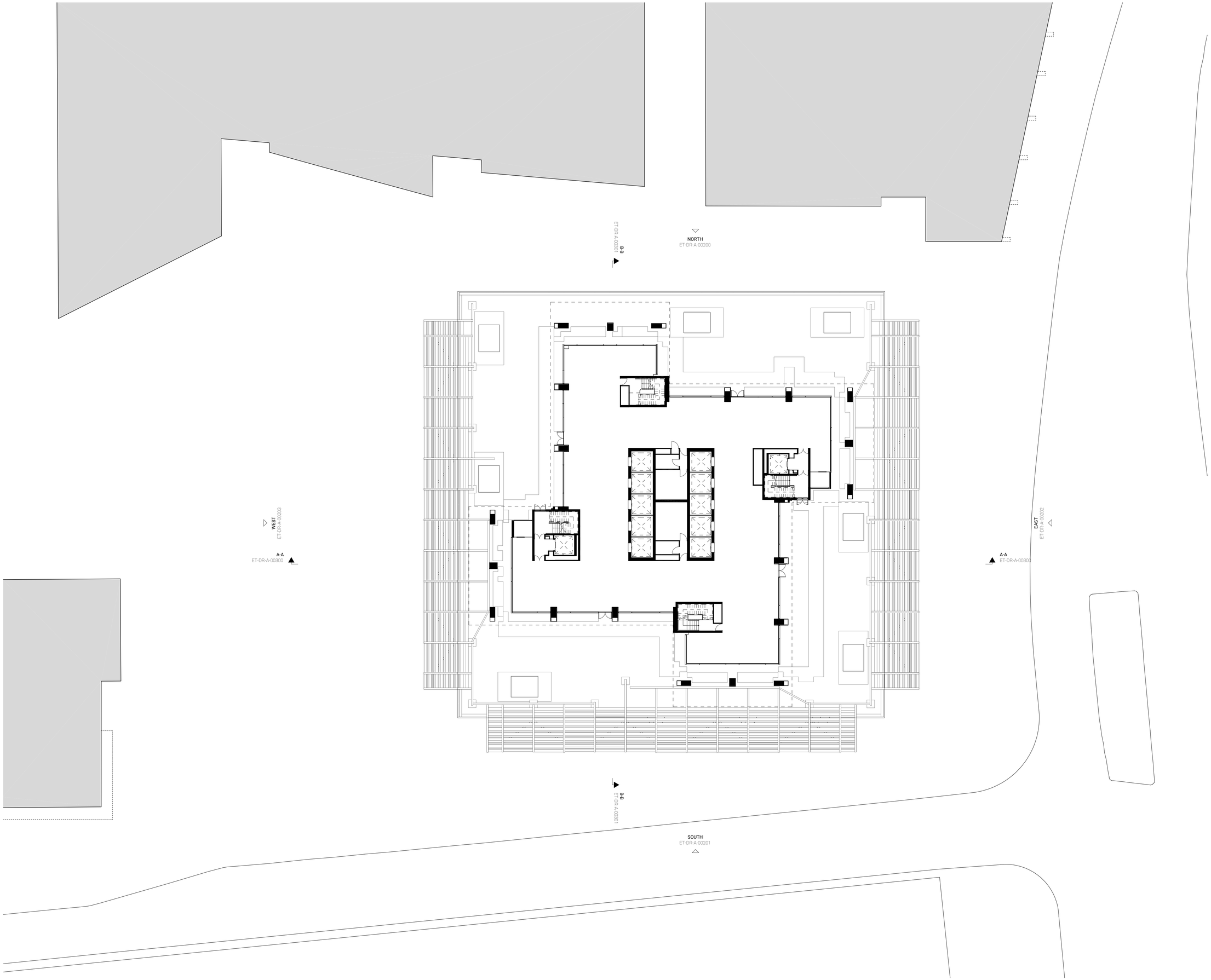

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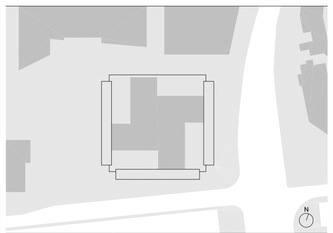

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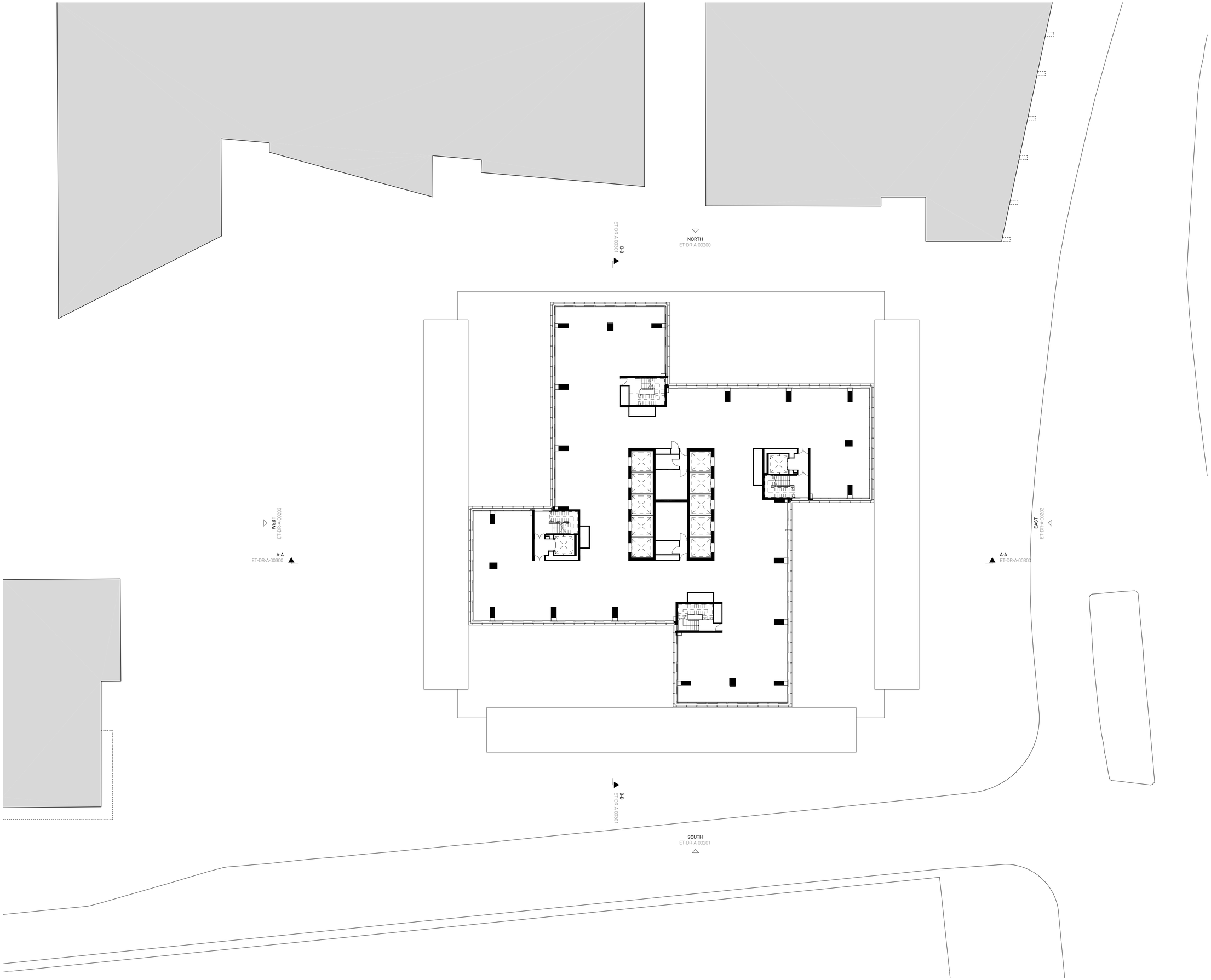

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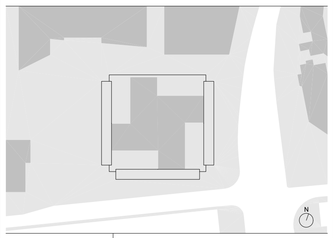

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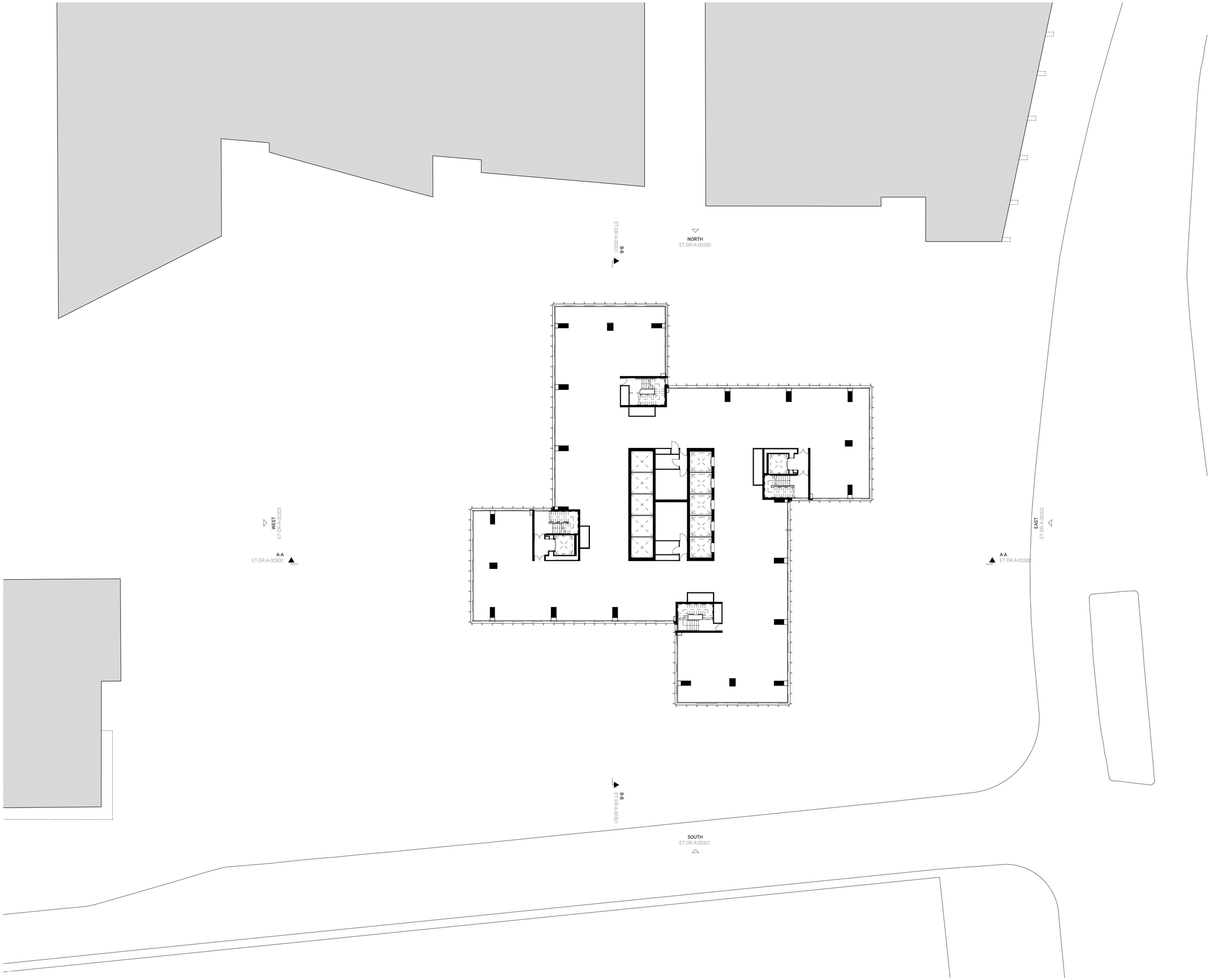

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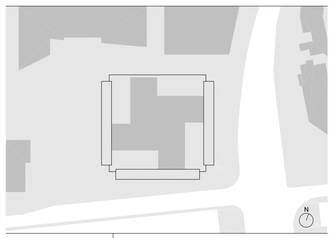

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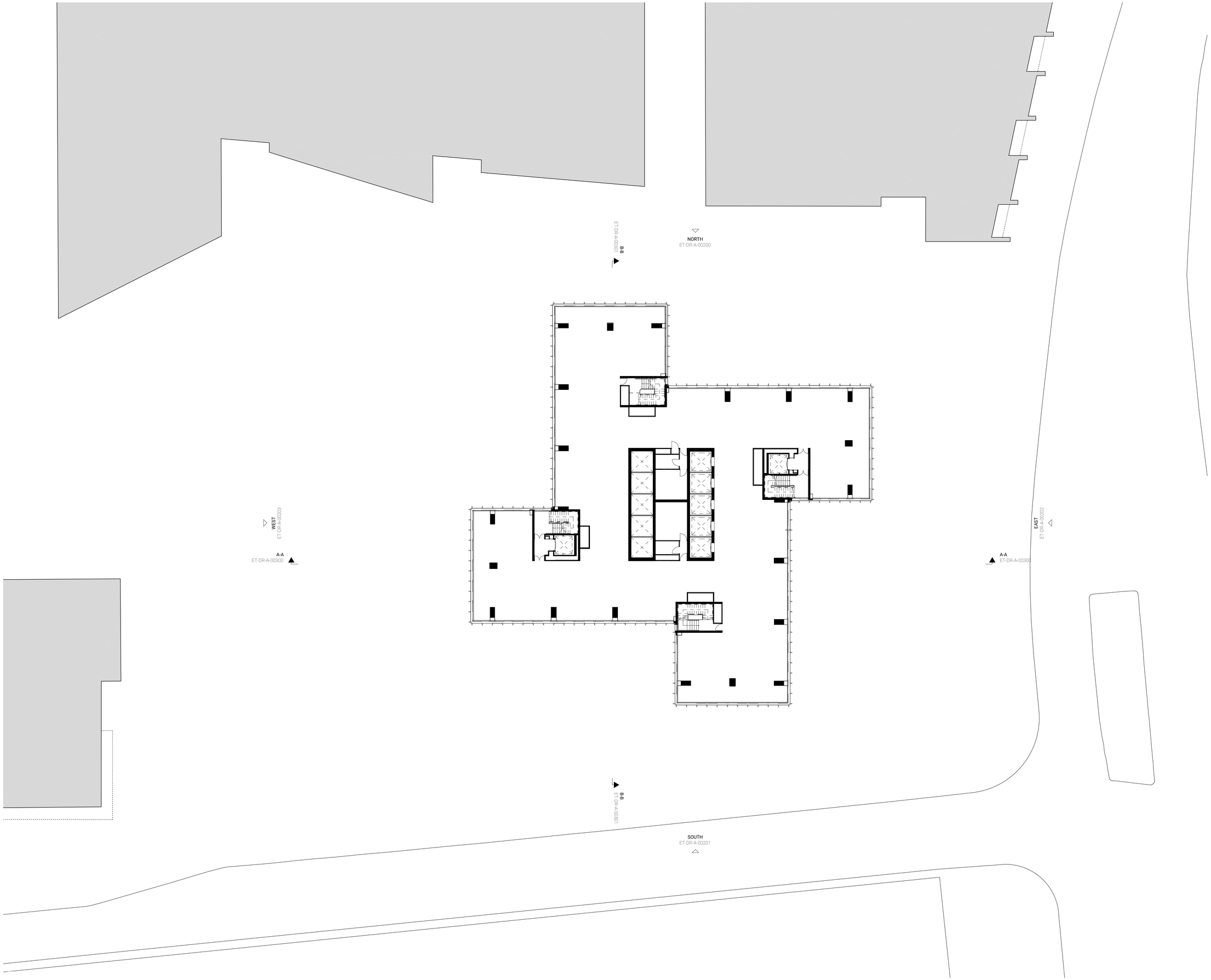

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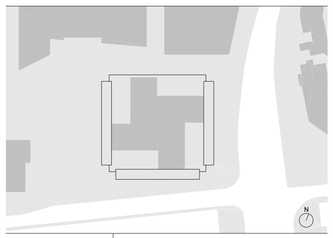

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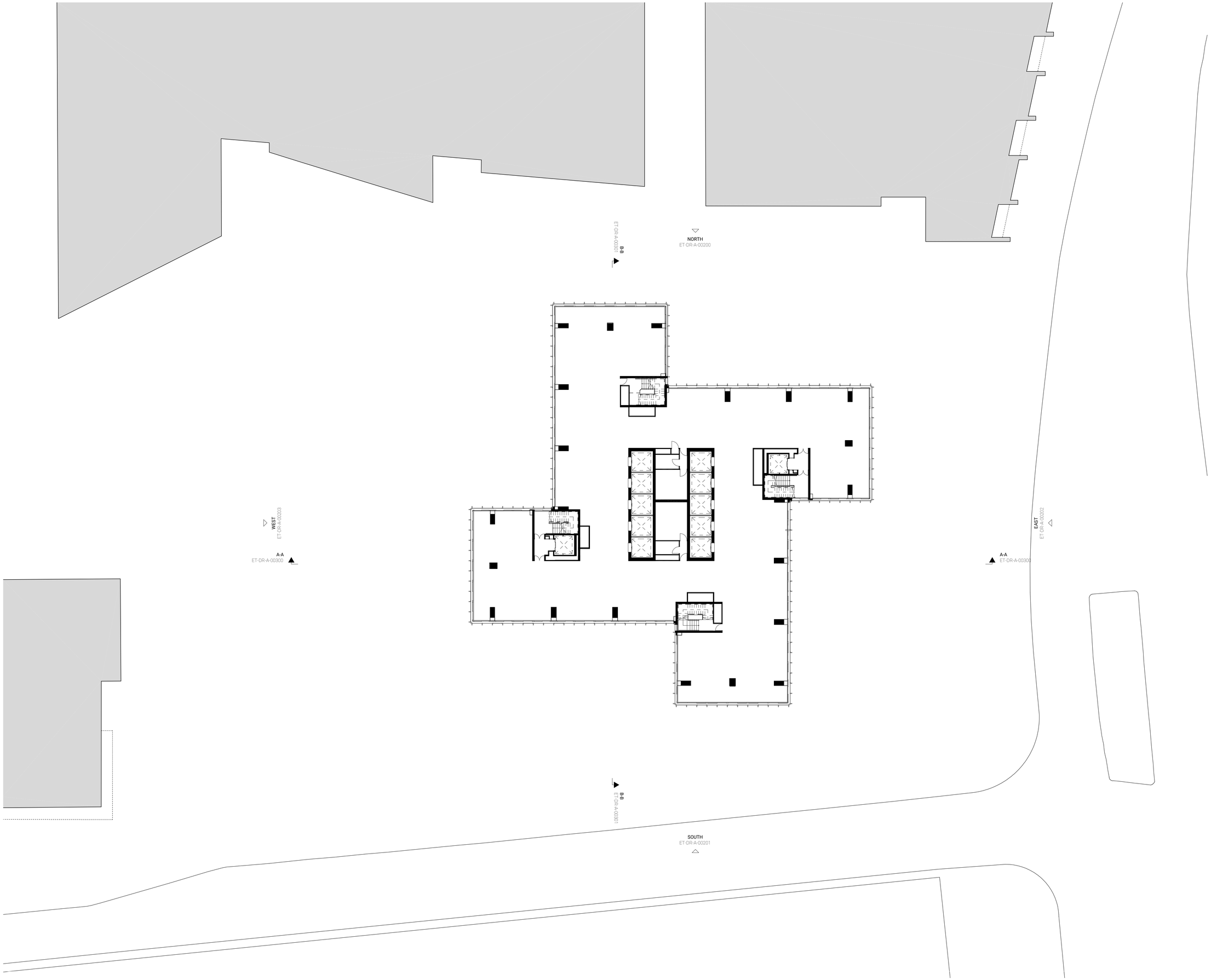

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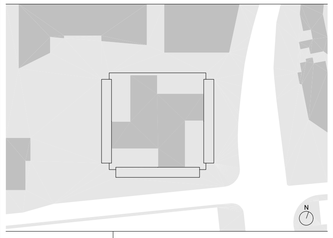

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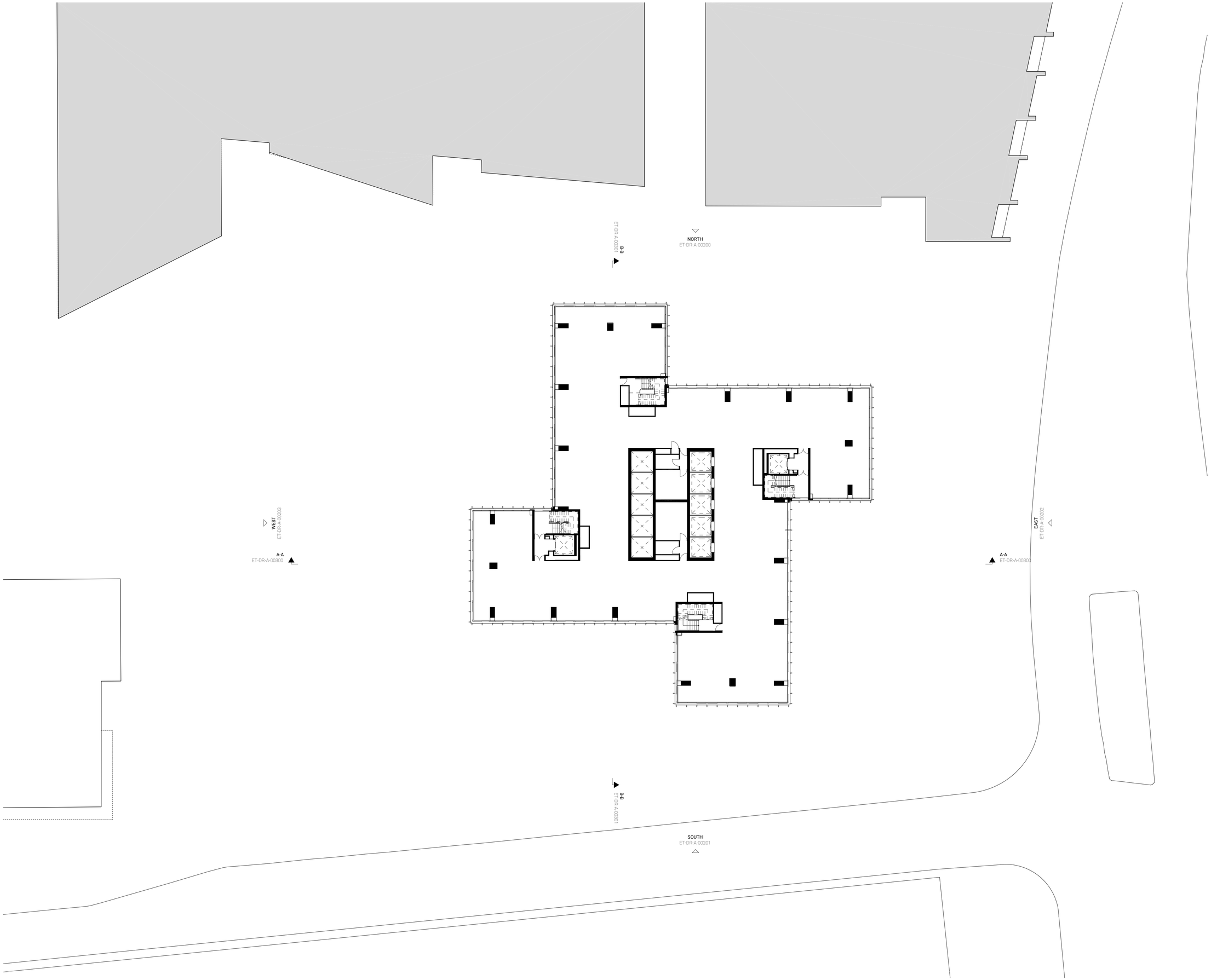

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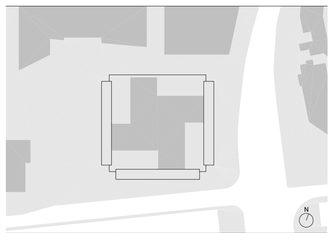

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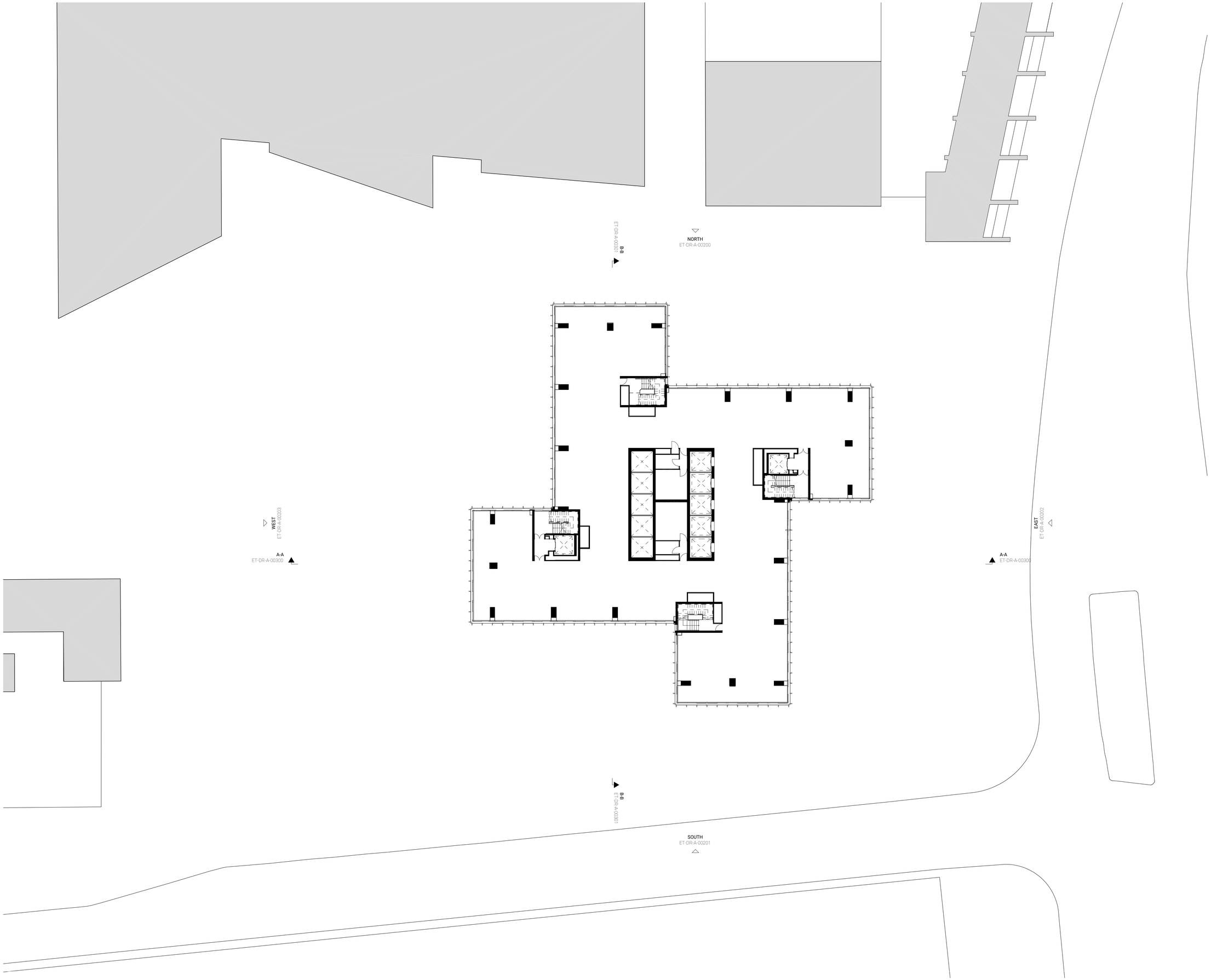

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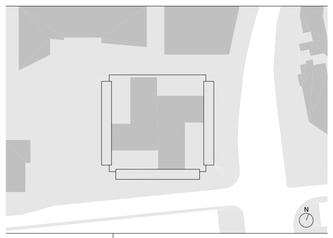
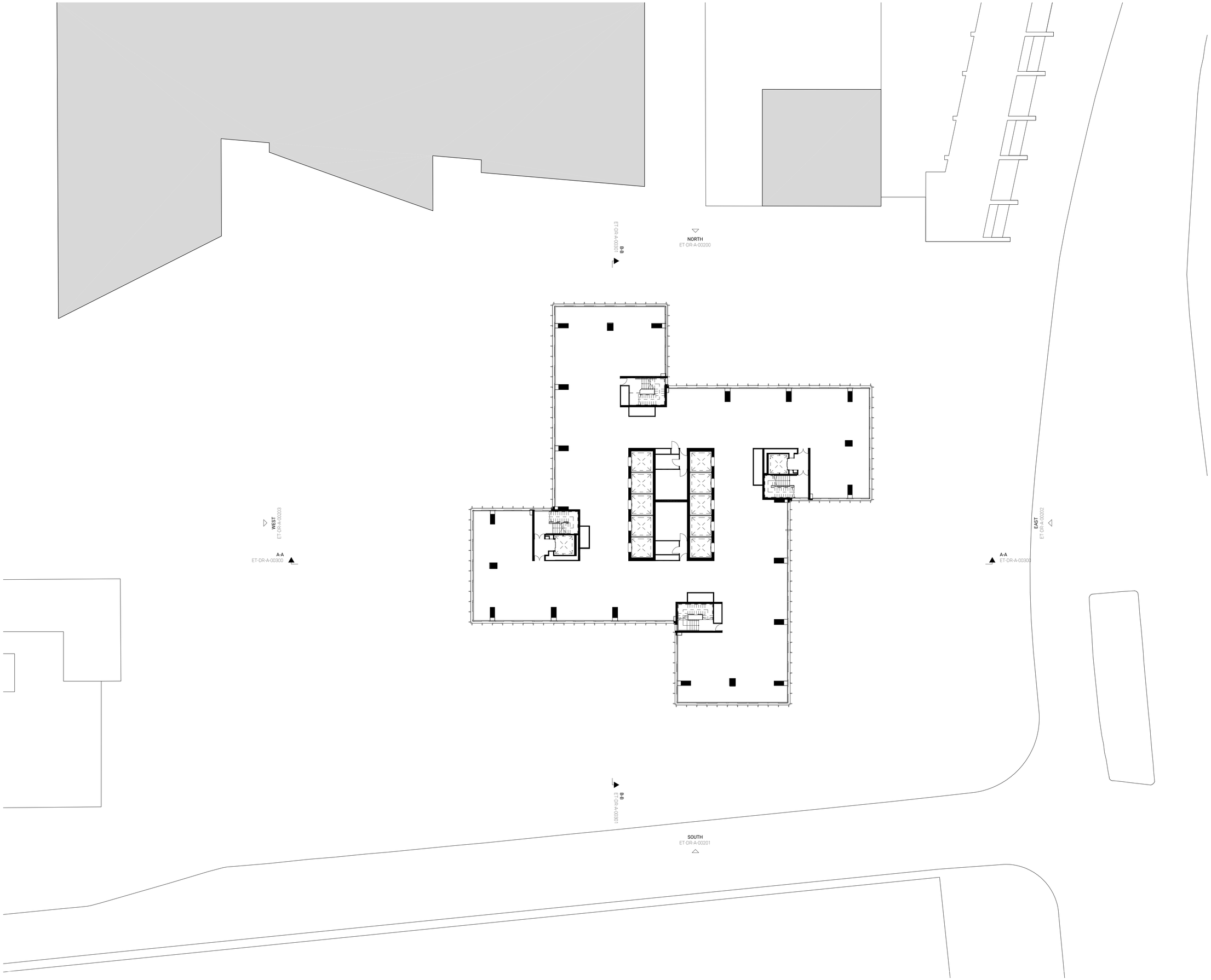


GRAPHIC SCALE	0 2M 4M 10M
SCALE	1 : 200 (A1)
AUTHOR	3XN
REVISION	P1
ISSUE DATE	**01/12/2023**
DRAWING TITLE	**Level 08 Plan - Existing**
DRAWING NUMBER	ET-DR-A-00108



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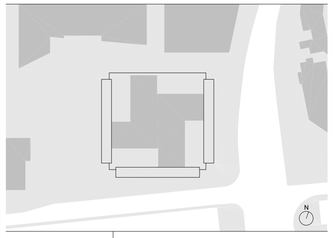
PROJECT NAME	EUSTON TOWER
AUTHOR PROJECT NUMBER	1312
PROJECT PHASE	**PLANNING APPLICATION**
CLIENT	
	British Land Property Management Limited
	York House 45, Seymour Street, London. W1H 7LX
	info@britishland.com / Tel: +44 20 7486 4466



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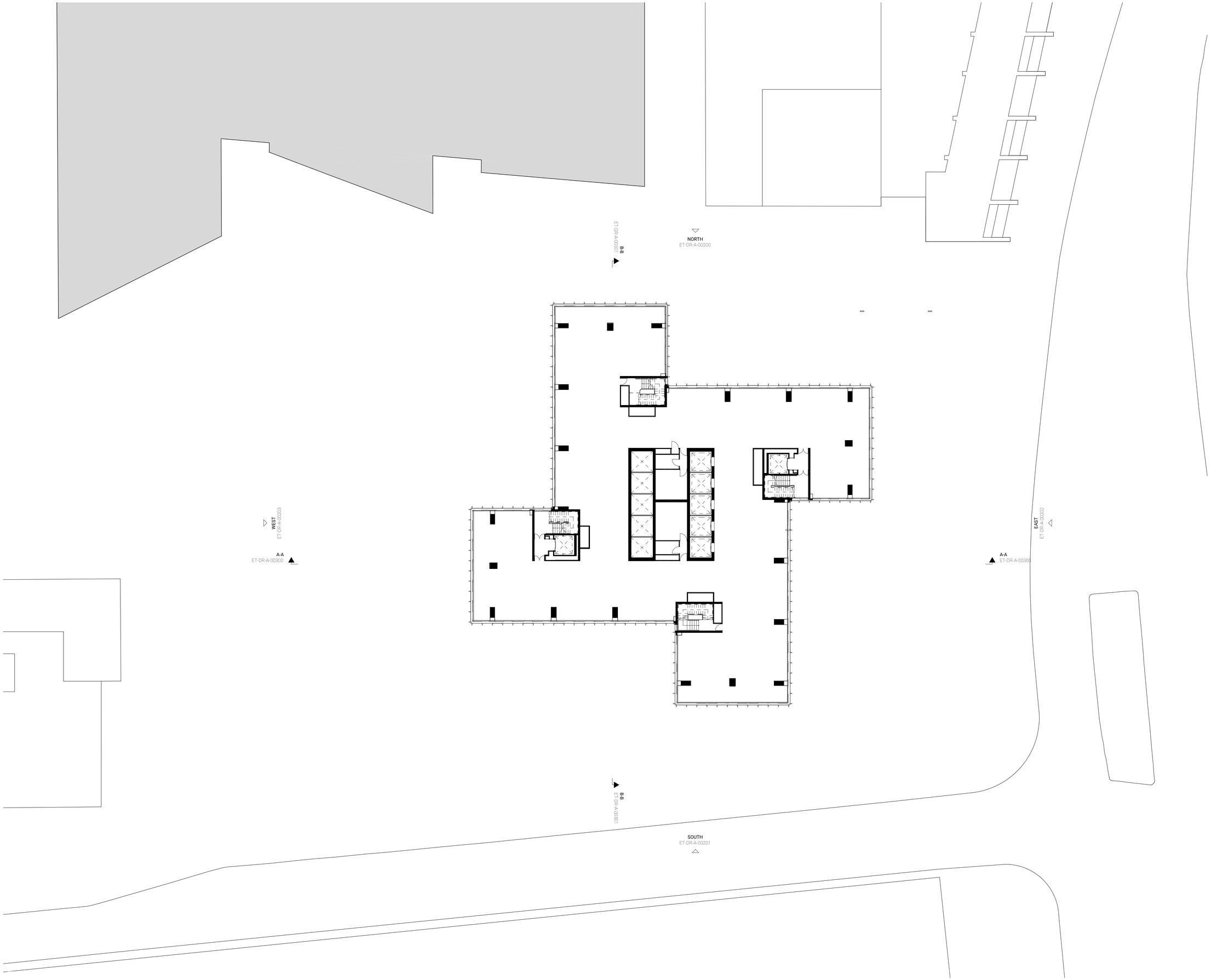
AUTHOR	3XN
REVISION	P1
ISSUE DATE	**01/12/2023**
DRAWING TITLE	**Level 09 Plan - Existing**
DRAWING NUMBER	ET-DR-A-00109



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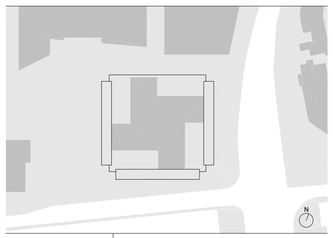

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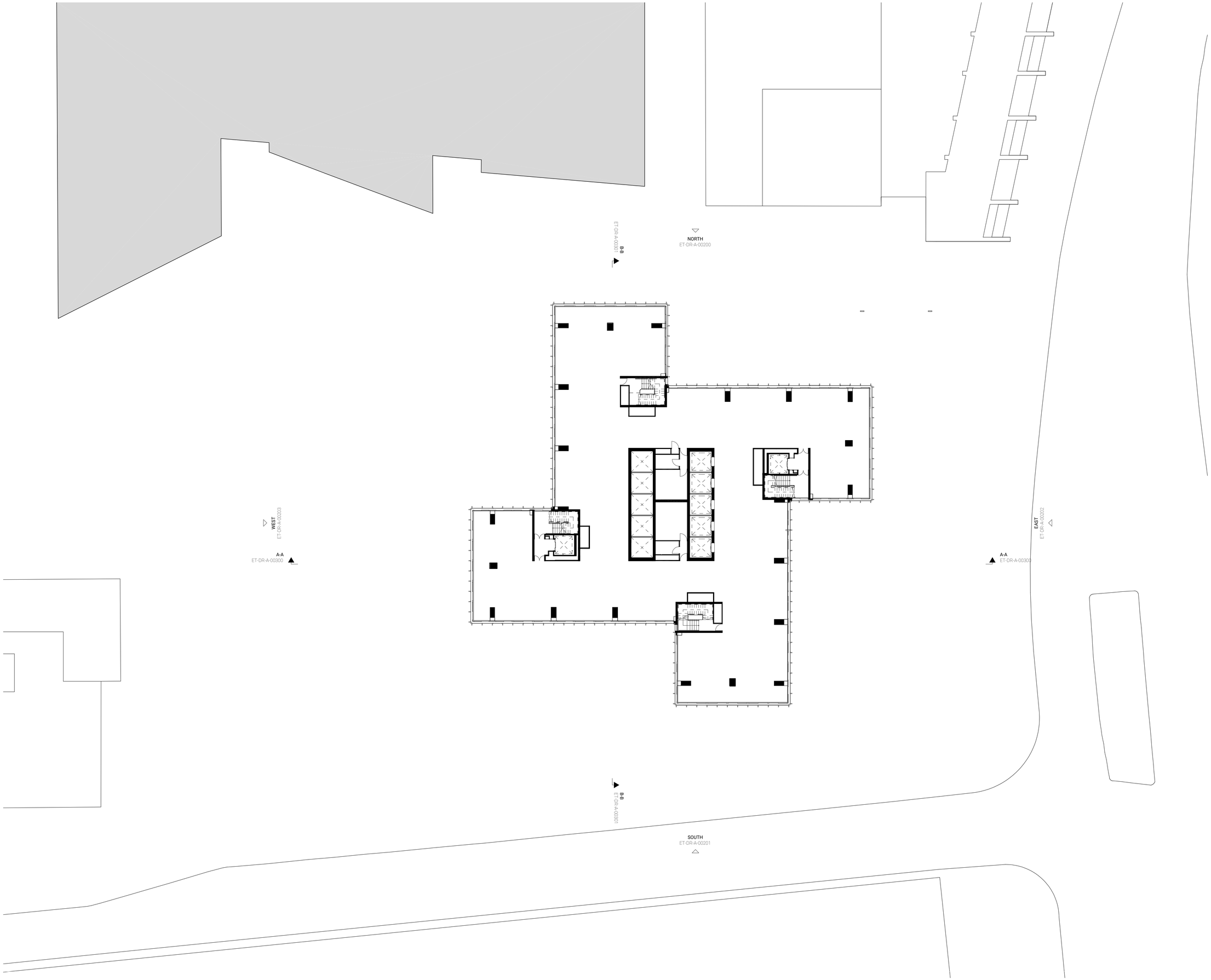
AUTHOR	3XN
REVISION	P1
ISSUE DATE	**01/12/2023**
DRAWING TITLE	**Level 10 Plan - Existing**
DRAWING NUMBER	ET-DR-A-00110



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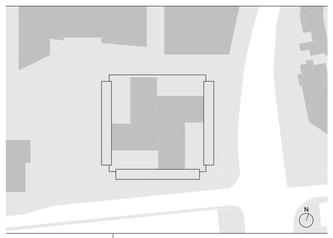

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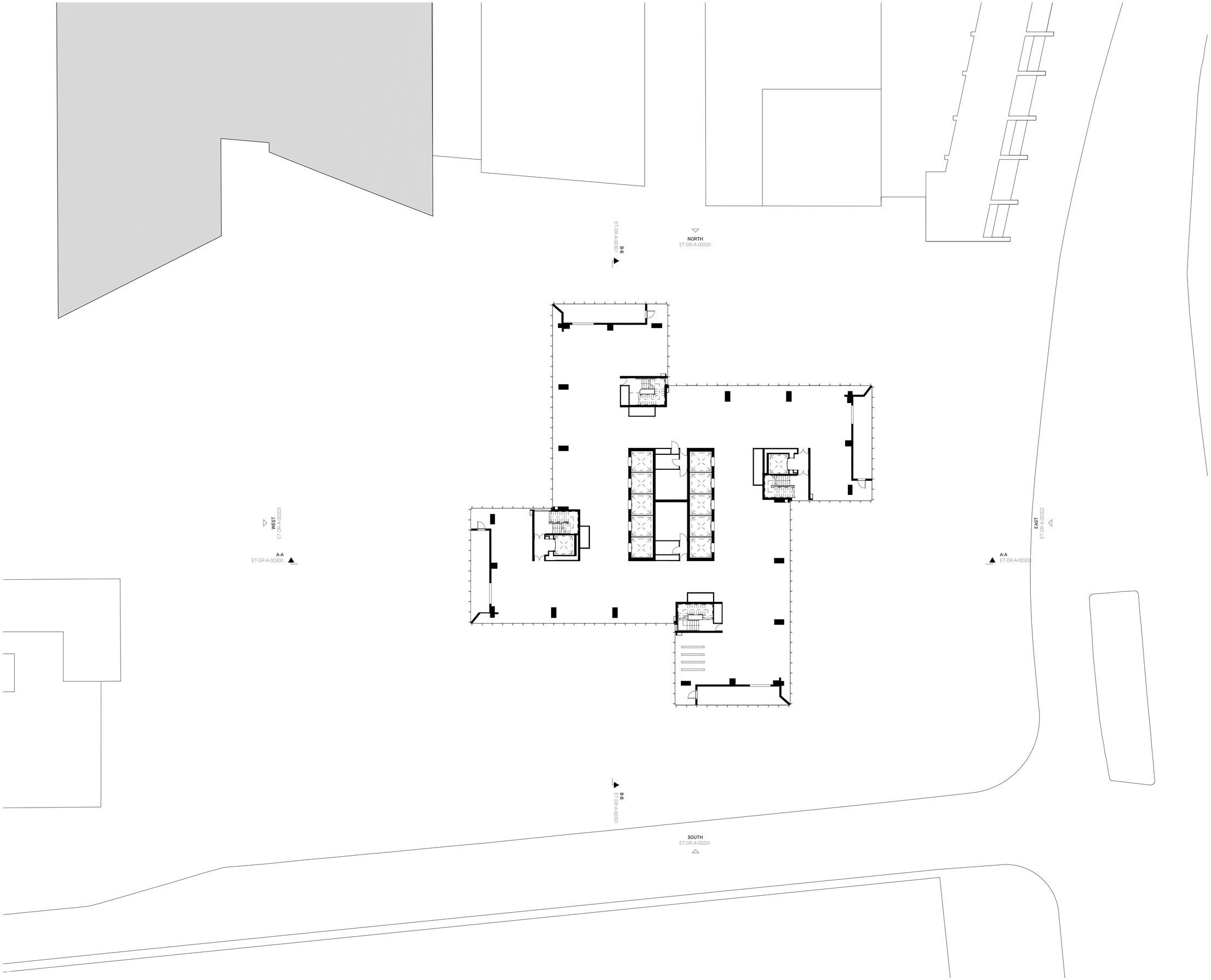
SCALE	1 : 200 (A1)
AUTHOR	3XN
REVISION	P1
ISSUE DATE	**01/12/2023**
DRAWING TITLE	**Level 11 Plan - Existing**
DRAWING NUMBER	ET-DR-A-00111



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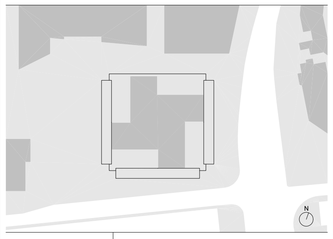

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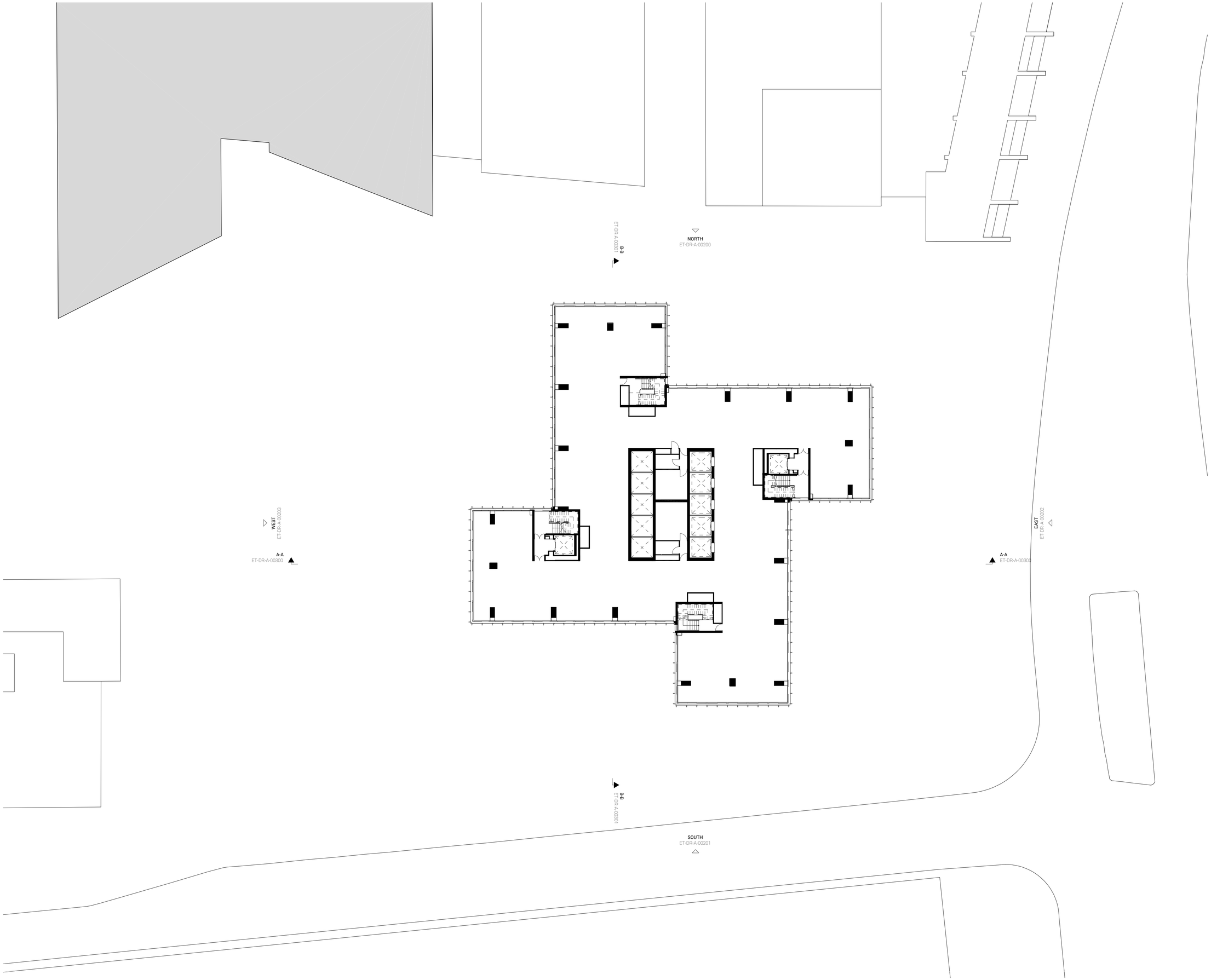
AUTHOR	3XN
REVISION	P1
ISSUE DATE	**01/12/2023**
DRAWING TITLE	**Level 12 Plan - Existing**
DRAWING NUMBER	ET-DR-A-00112



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	British Land Property Management Limited
	York House 45, Seymour Street, London. W1H 7LX
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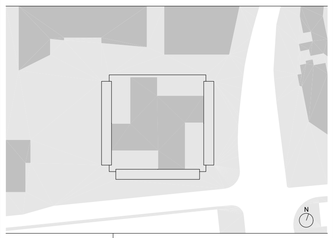
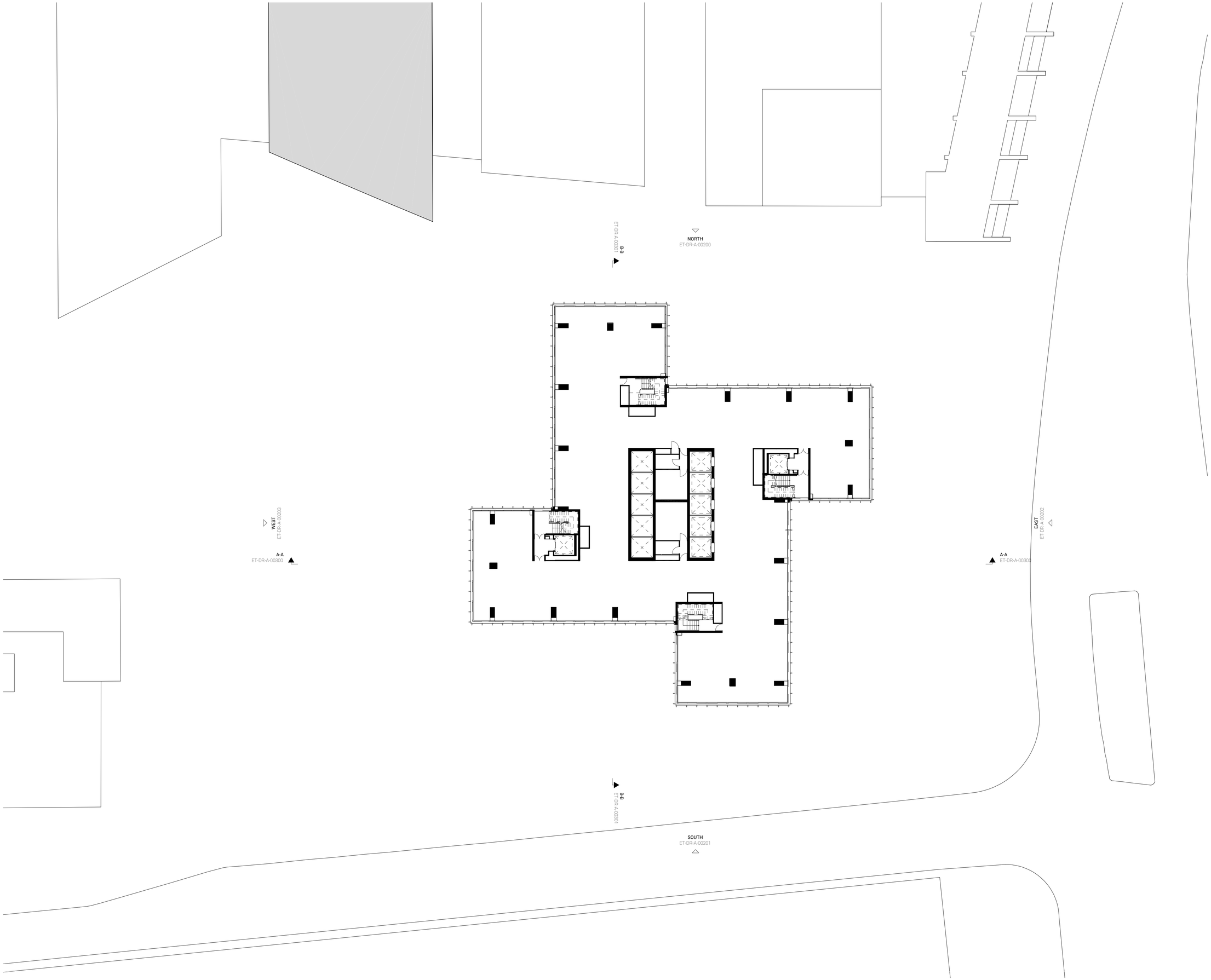


GRAPHIC SCALE	0 2M 4M 10M
SCALE	1 : 200 (A1)
AUTHOR	3XN
REVISION	P1
ISSUE DATE	**01/12/2023**
DRAWING TITLE	**Level 13 Plan - Existing**
DRAWING NUMBER	ET-DR-A-00113



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	British Land Property Management Limited
	York House 45, Seymour Street, London. W1H 7LX
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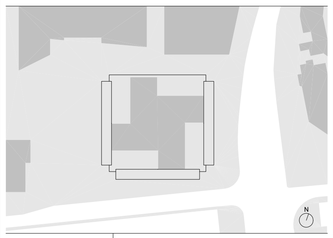
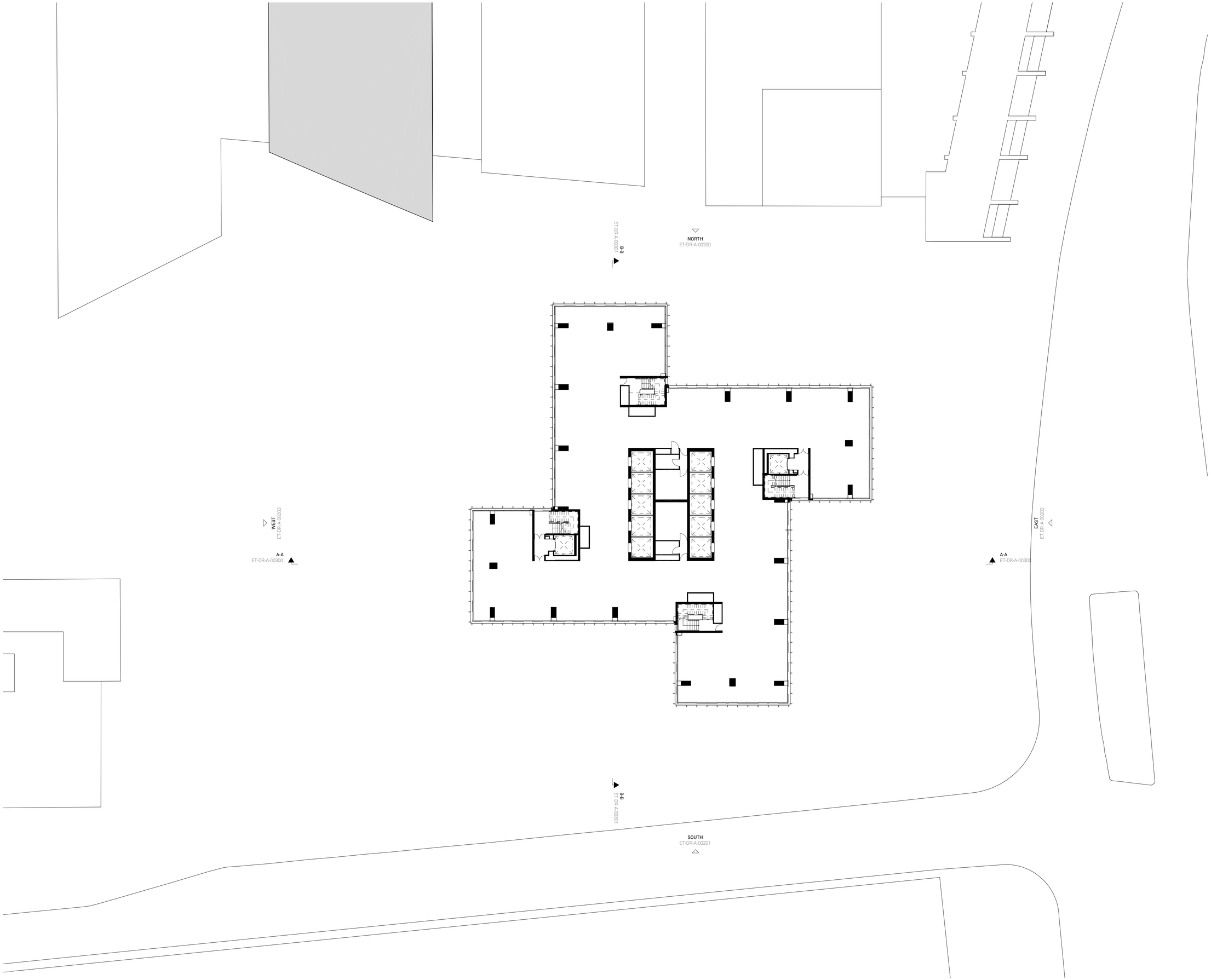


GRAPHIC SCALE	0 2M 4M 10M
SCALE	1 : 200 (A1)
AUTHOR	3XN
REVISION	P1
ISSUE DATE	**01/12/2023**
DRAWING TITLE	**Level 14 Plan - Existing**
DRAWING NUMBER	ET-DR-A-00114



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British Land Property Management Limited
York House 45, Seymour Street, London. W1H 7LX
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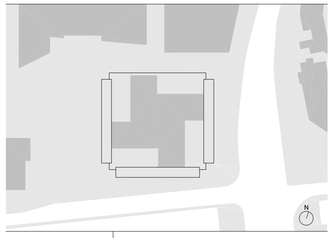

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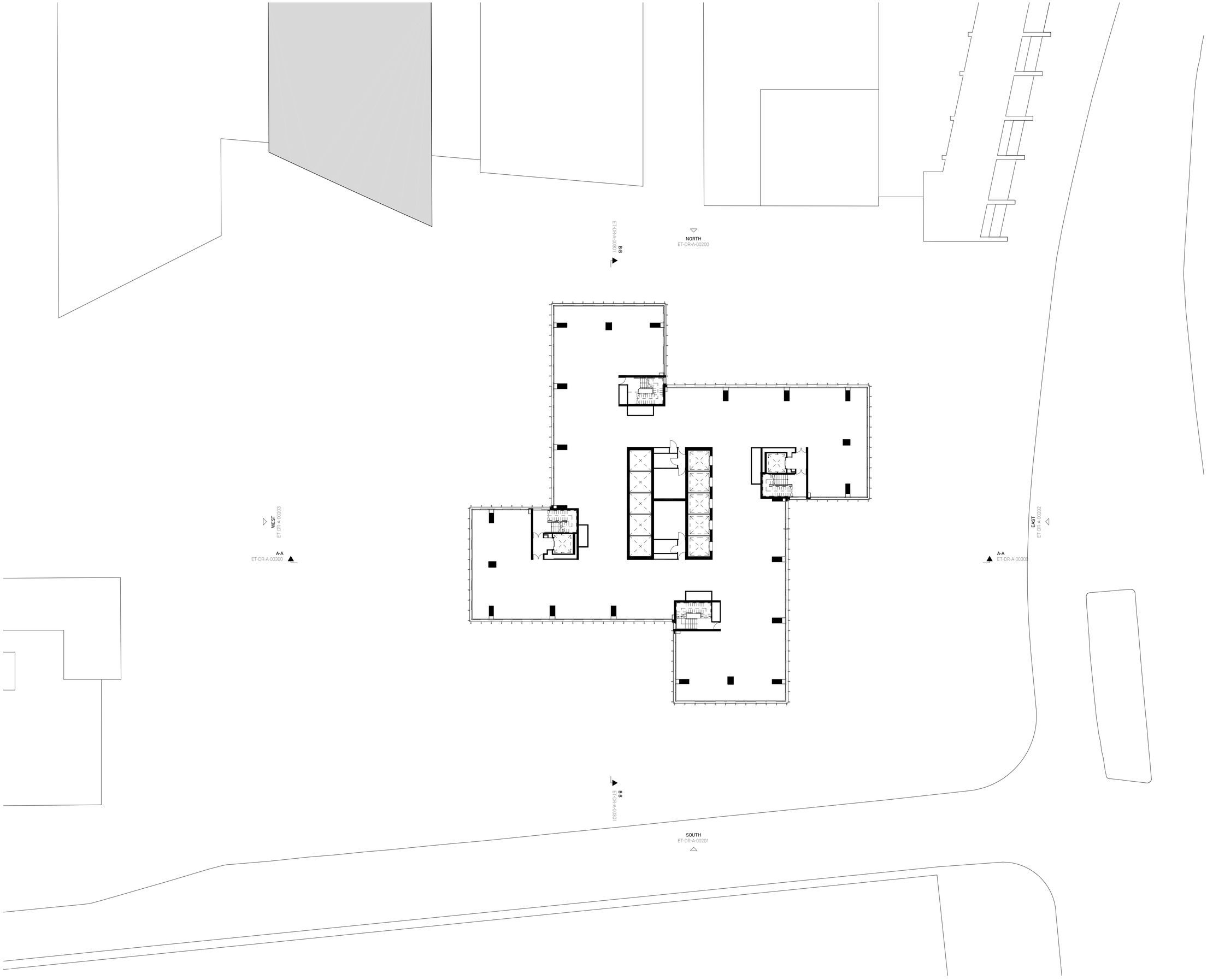
SCALE	1 : 200 (A1)
AUTHOR	3XN
REVISION	P1
ISSUE DATE	**01/12/2023**
DRAWING TITLE	**Level 15 Plan - Existing**
DRAWING NUMBER	ET-DR-A-00115



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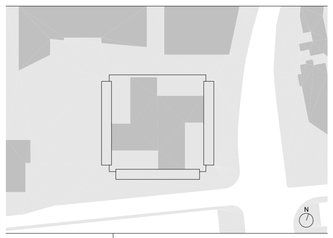
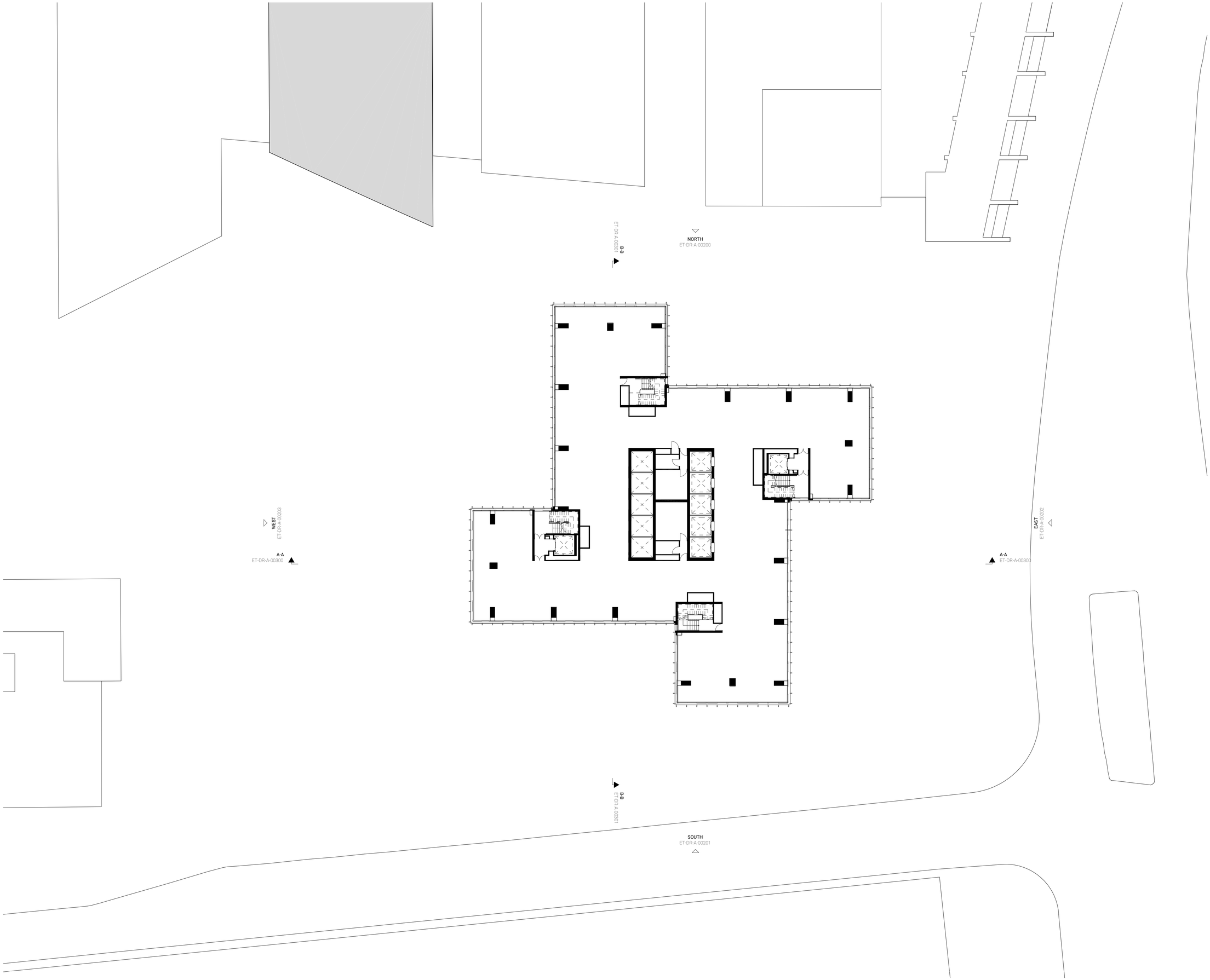


GRAPHIC SCALE	0 2M 4M 10M
SCALE	1 : 200 (A1)
AUTHOR	3XN
REVISION	P1
ISSUE DATE	**01/12/2023**
DRAWING TITLE	**Level 16 Plan - Existing**
DRAWING NUMBER	ET-DR-A-00116



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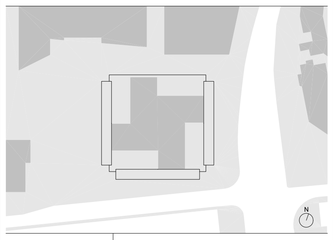

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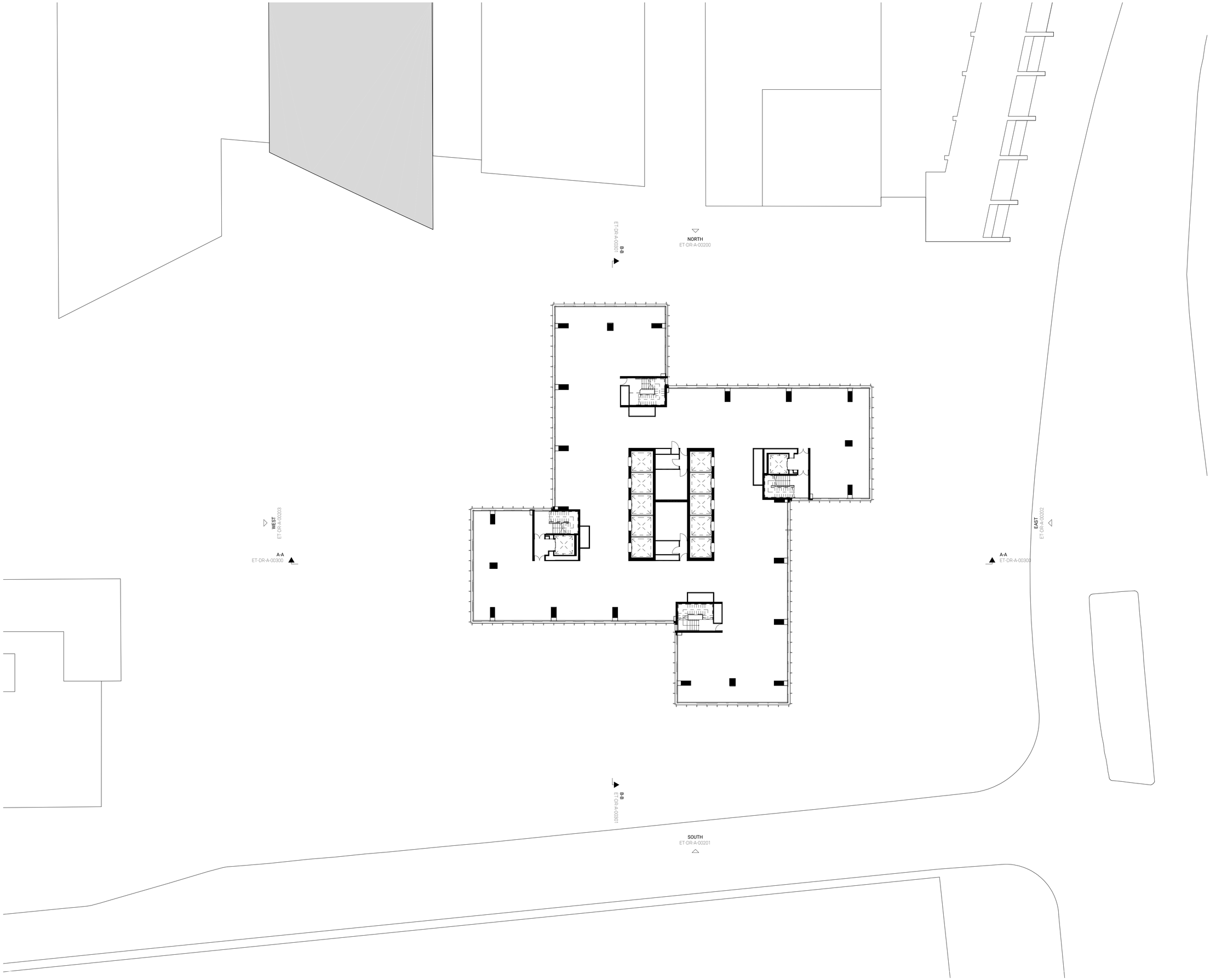
AUTHOR	3XN
REVISION	P1
ISSUE DATE	**01/12/2023**
DRAWING TITLE	**Level 17 Plan - Existing**
DRAWING NUMBER	ET-DR-A-00117



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CLIENT	

British Land Property Management Limited
York House 45, Seymour Street, London. W1H 7LX
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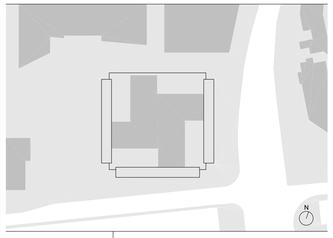

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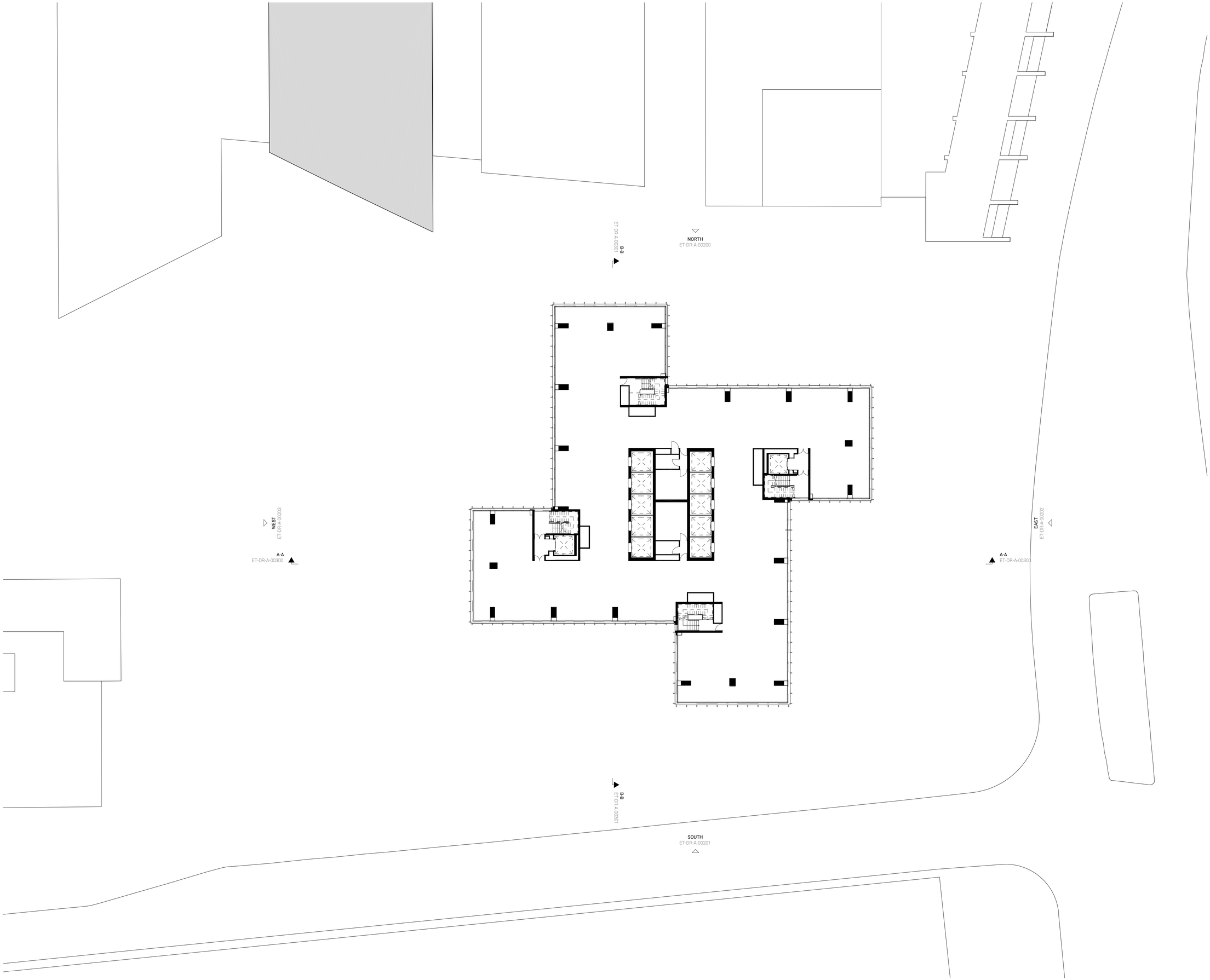
AUTHOR	3XN
REVISION	P1
ISSUE DATE	**01/12/2023**
DRAWING TITLE	**Level 18 Plan - Existing**
DRAWING NUMBER	ET-DR-A-00118



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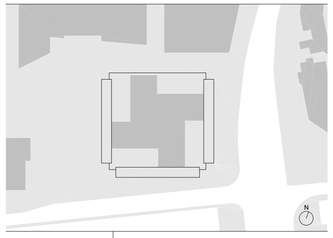

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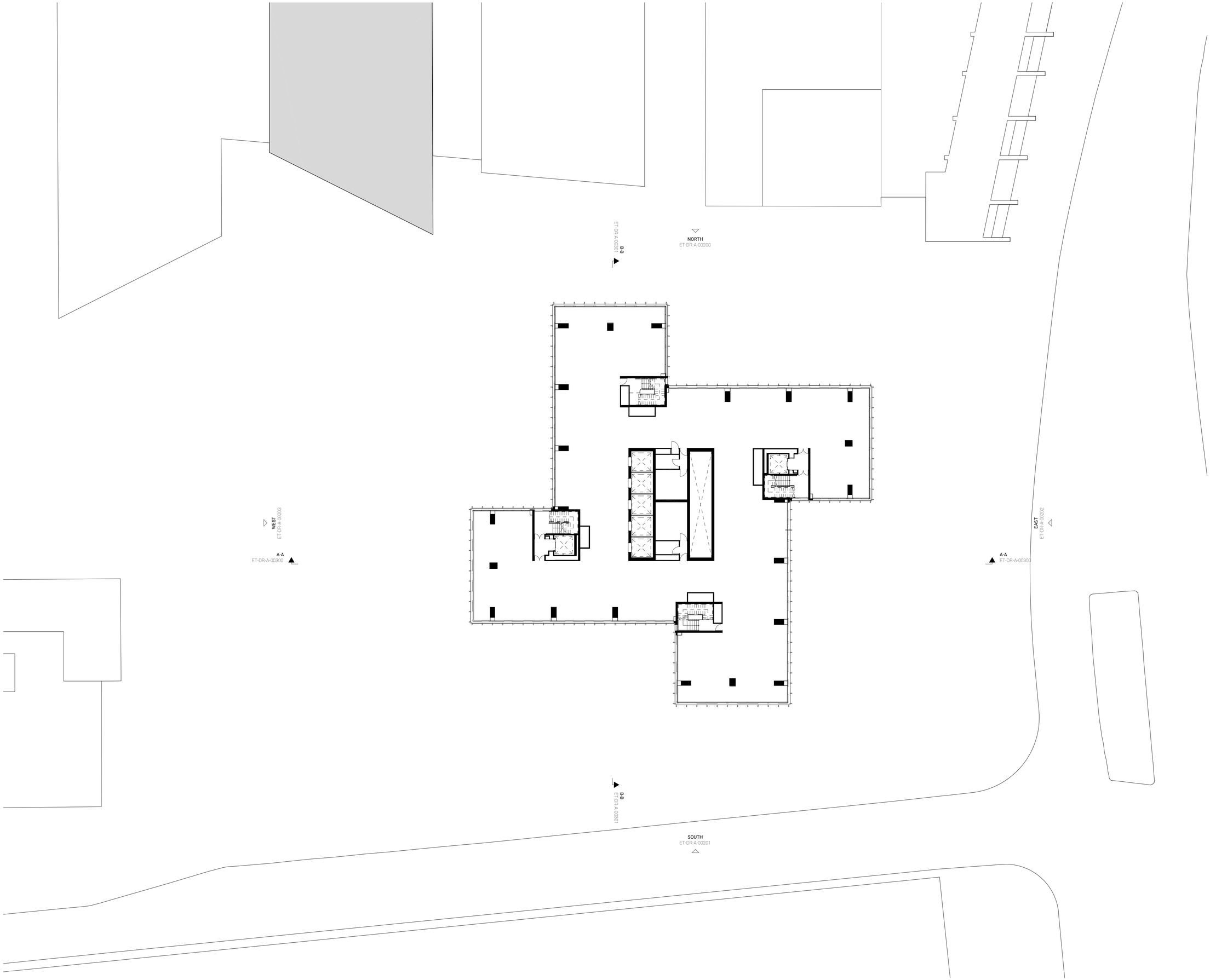
AUTHOR	3XN
REVISION	P1
ISSUE DATE	**01/12/2023**
DRAWING TITLE	**Level 19 Plan - Existing**
DRAWING NUMBER	ET-DR-A-00119



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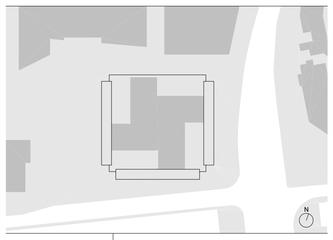

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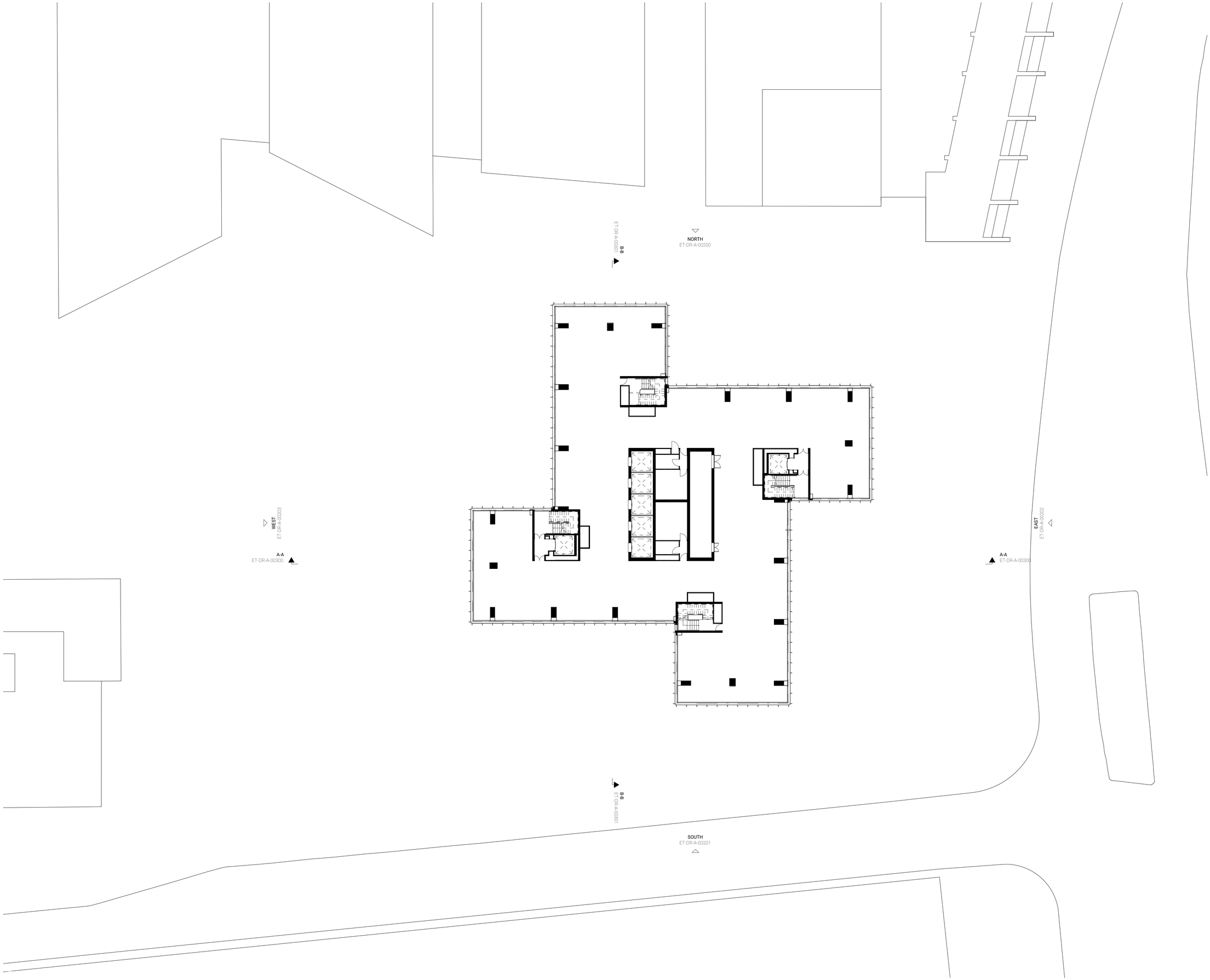
SCALE	1 : 200 (A1)
AUTHOR	3XN
REVISION	P1
ISSUE DATE	**01/12/2023**
DRAWING TITLE	**Level 20 Plan - Existing**
DRAWING NUMBER	ET-DR-A-00120



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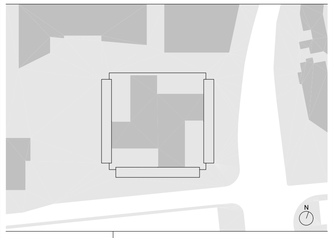
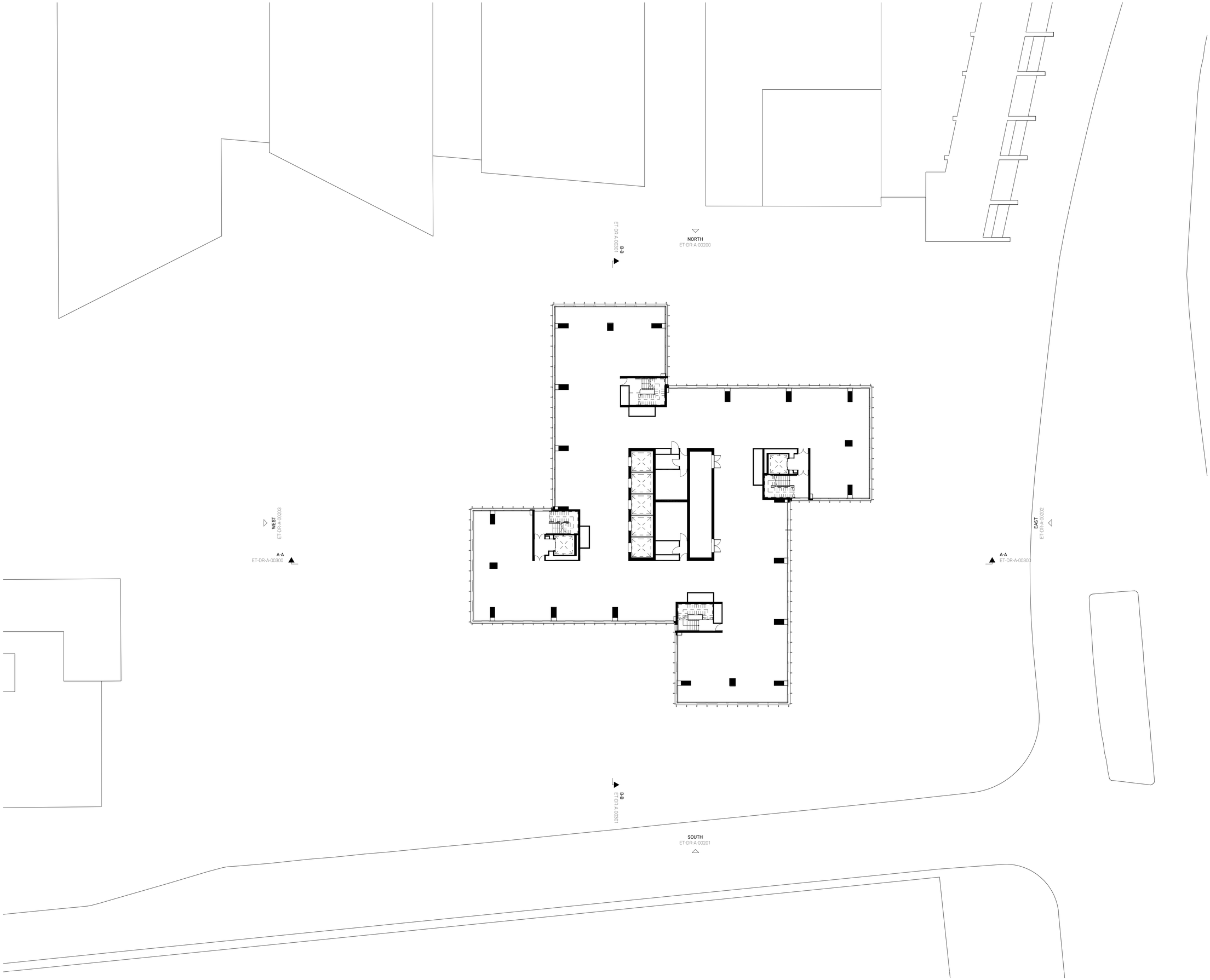


GRAPHIC SCALE	0 2M 4M 10M
SCALE	1 : 200 (A1)
AUTHOR	3XN
REVISION	P1
ISSUE DATE	**01/12/2023**
DRAWING TITLE	**Level 21 Plan - Existing**
DRAWING NUMBER	ET-DR-A-00121



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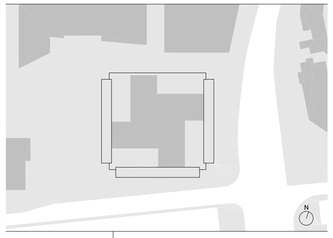
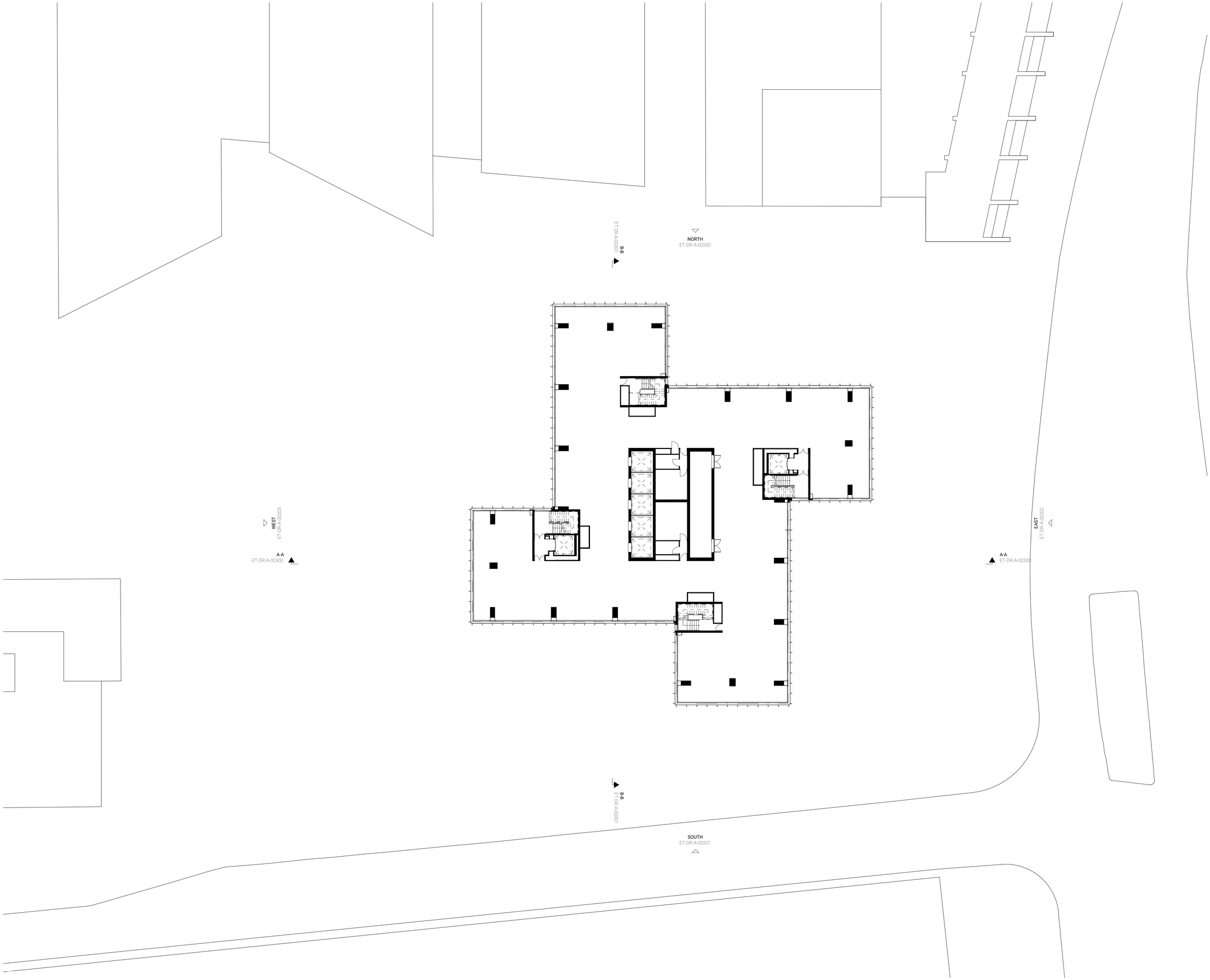


GRAPHIC SCALE	0 2M 4M 10M
SCALE	1 : 200 (A1)
AUTHOR	3XN
REVISION	P1
ISSUE DATE	**01/12/2023**
DRAWING TITLE	**Level 22 Plan - Existing**
DRAWING NUMBER	ET-DR-A-00122



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Notes

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P1: Planning Submission

PROJECT NAME	EUSTON TOWER
AUTHOR PROJECT NUMBER	1312
PROJECT PHASE	**PLANNING APPLICATION**
CLIENT	

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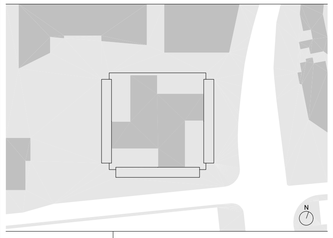
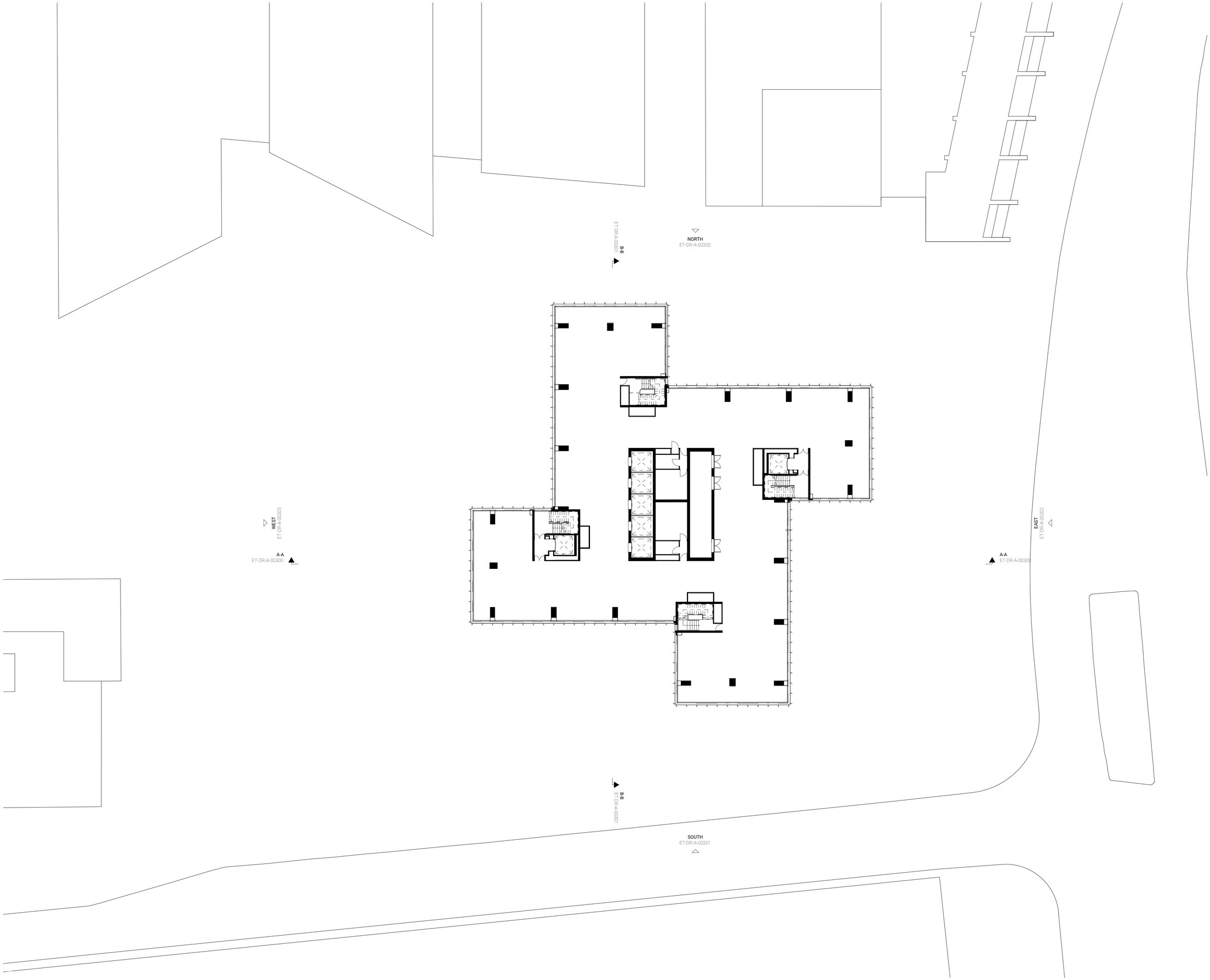


GRAPHIC SCALE	0 2M 4M 10M
SCALE	1 : 200 (A1)
AUTHOR	3XN
REVISION	P1
ISSUE DATE	**01/12/2023**
DRAWING TITLE	**Level 23 Plan - Existing**
DRAWING NUMBER	ET-DR-A-00123



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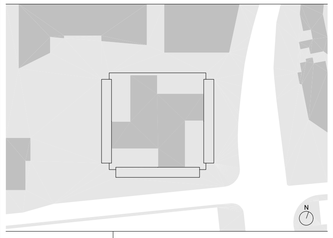
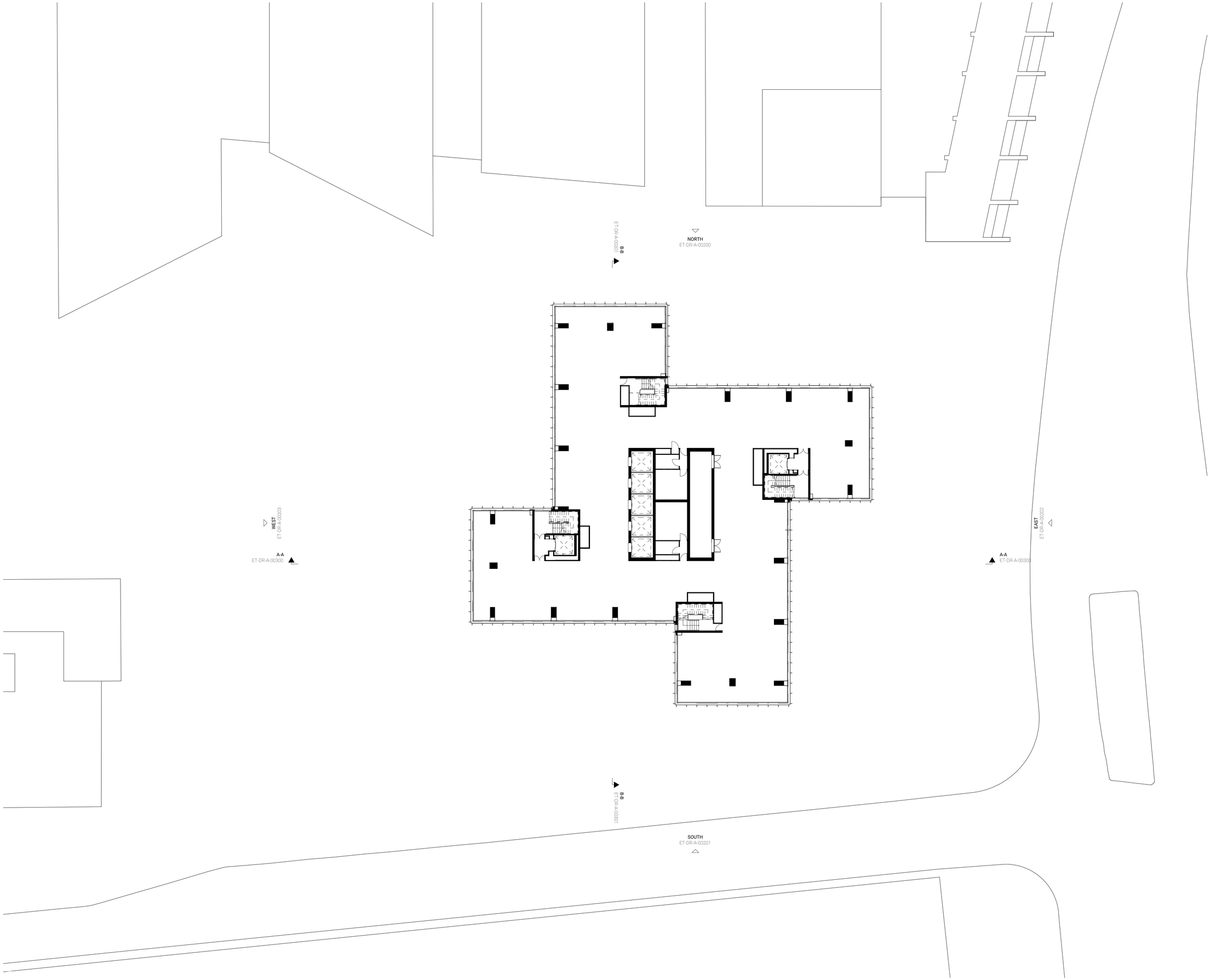


GRAPHIC SCALE	0 2M 4M 10M
SCALE	1 : 200 (A1)
AUTHOR	3XN
REVISION	P1
ISSUE DATE	**01/12/2023**
DRAWING TITLE	**Level 24 Plan - Existing**
DRAWING NUMBER	ET-DR-A-00124



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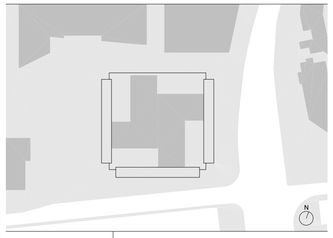
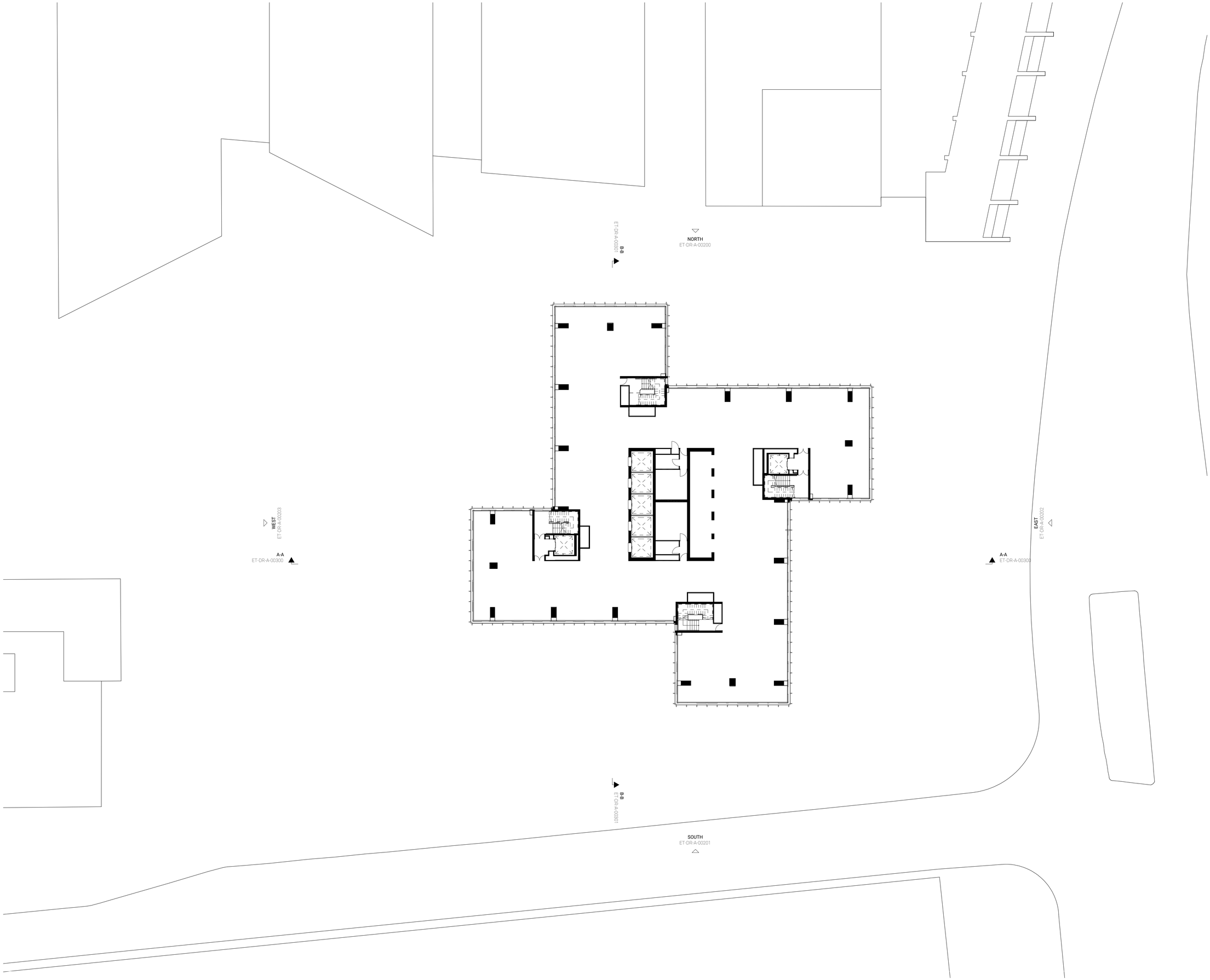


GRAPHIC SCALE	0 2M 4M 10M
SCALE	1 : 200 (A1)
AUTHOR	3XN
REVISION	P1
ISSUE DATE	**01/12/2023**
DRAWING TITLE	**Level 25 Plan - Existing**
DRAWING NUMBER	ET-DR-A-00125



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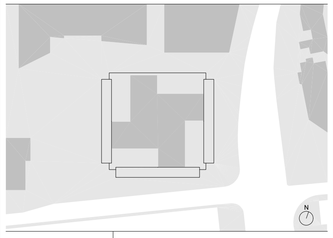
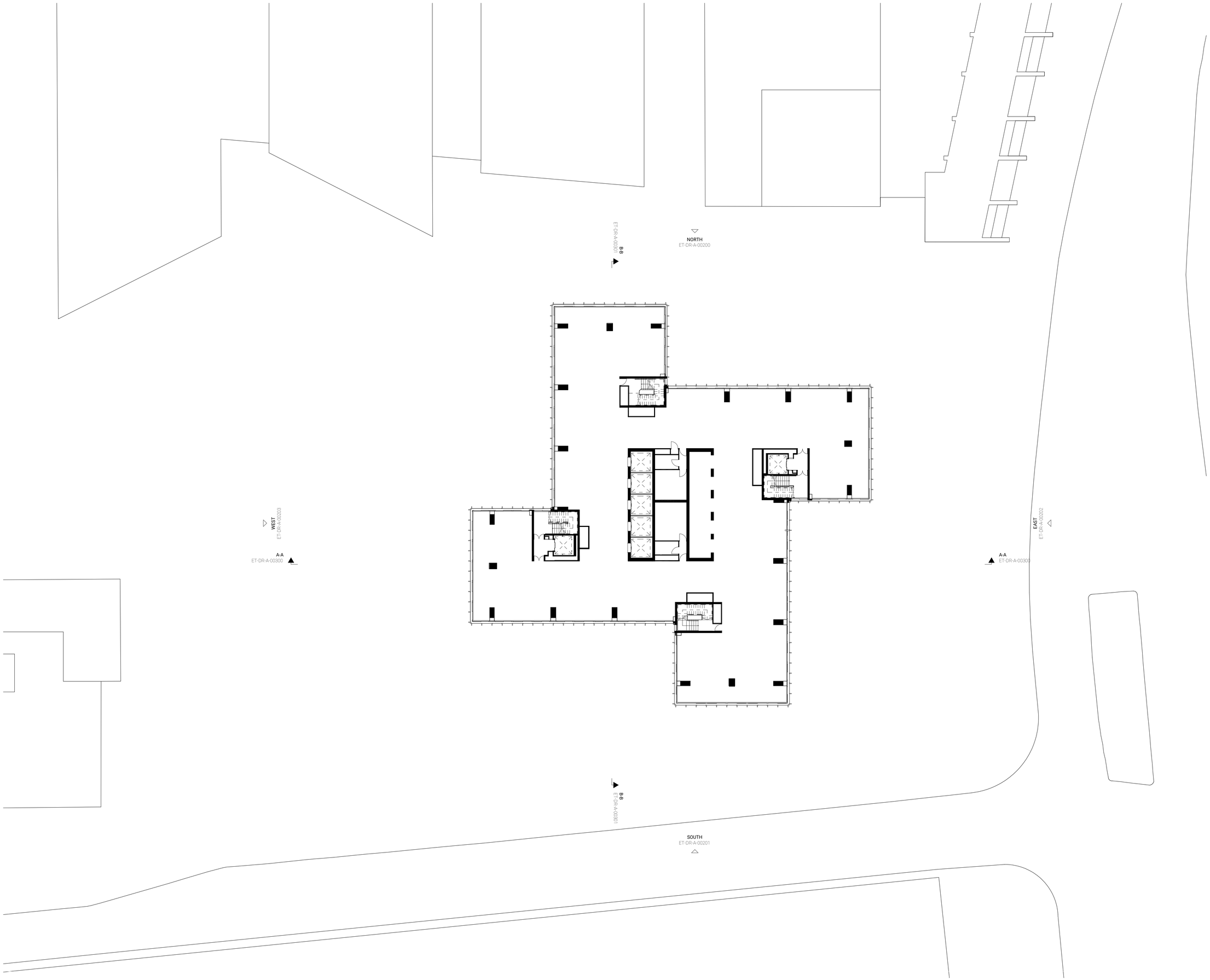


GRAPHIC SCALE	0 2M 4M 10M
SCALE	1 : 200 (A1)
AUTHOR	3XN
REVISION	P1
ISSUE DATE	**01/12/2023**
DRAWING TITLE	**Level 26 Plan - Existing**
DRAWING NUMBER	ET-DR-A-00126



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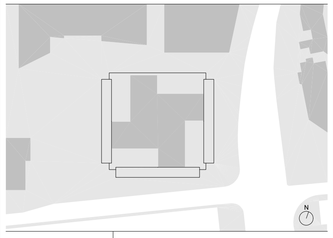

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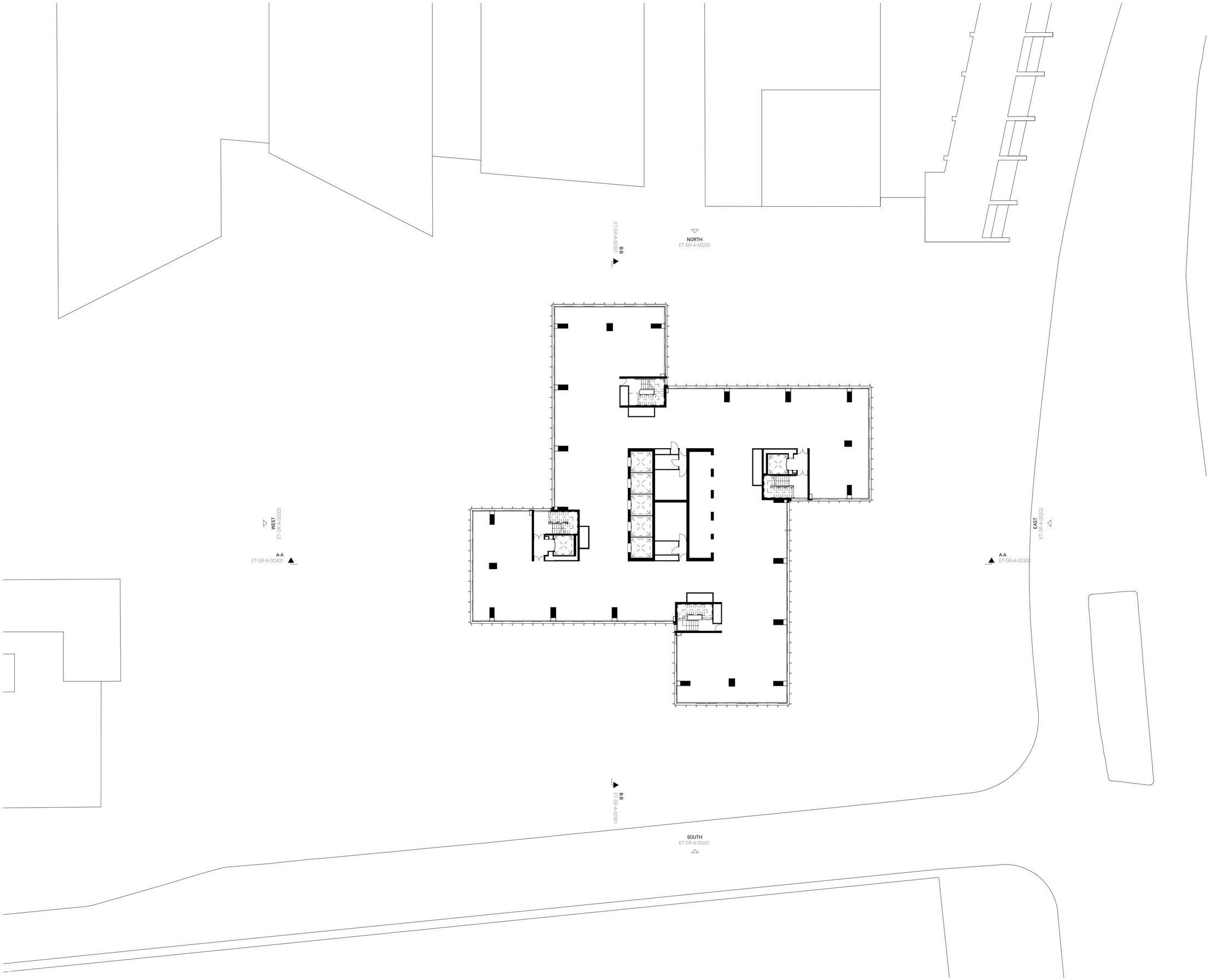
AUTHOR	3XN
REVISION	P1
ISSUE DATE	**01/12/2023**
DRAWING TITLE	**Level 27 Plan - Existing**
DRAWING NUMBER	ET-DR-A-00127



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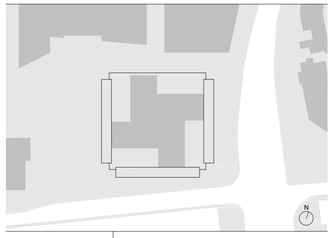
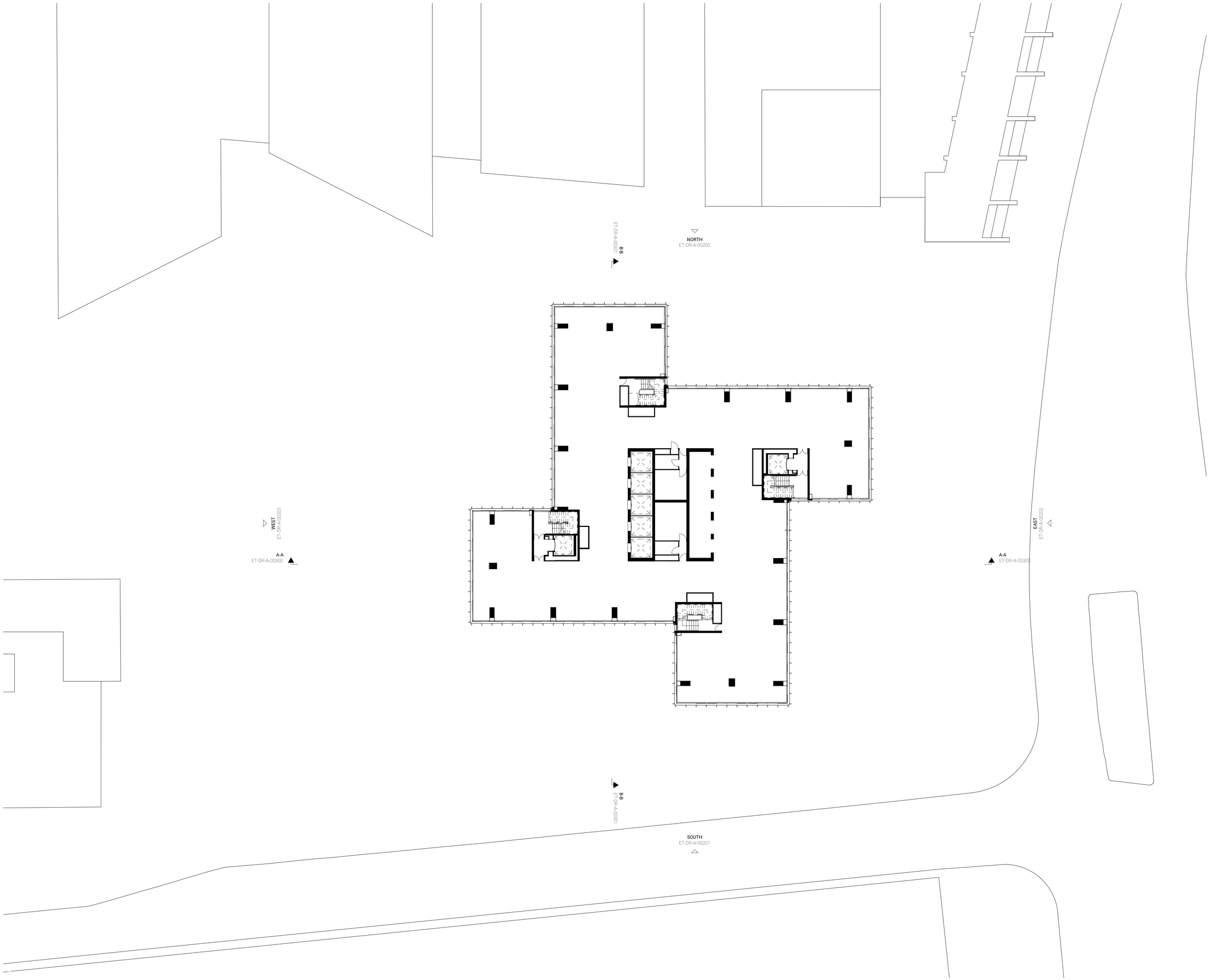


GRAPHIC SCALE	0 2M 4M 10M
SCALE	1 : 200 (A1)
AUTHOR	3XN
REVISION	P1
ISSUE DATE	**01/12/2023**
DRAWING TITLE	**Level 28 Plan - Existing**
DRAWING NUMBER	ET-DR-A-00128



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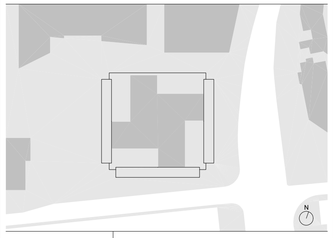

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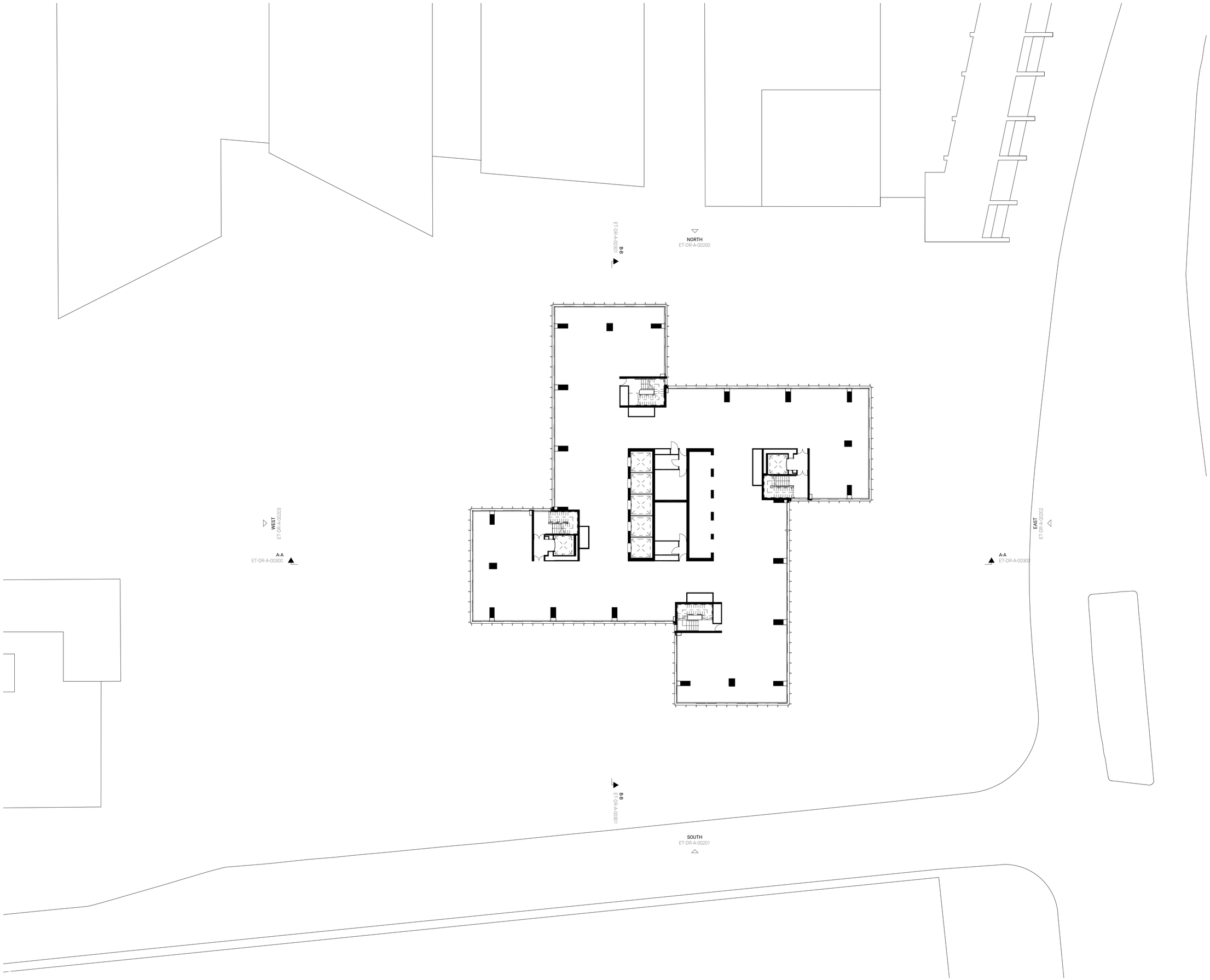
SCALE	1 : 200 (A1)
AUTHOR	3XN
REVISION	P1
ISSUE DATE	**01/12/2023**
DRAWING TITLE	**Level 29 Plan - Existing**
DRAWING NUMBER	ET-DR-A-00129



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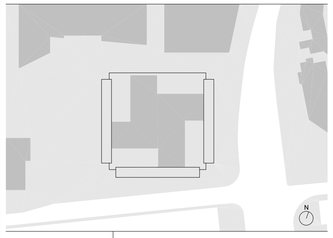
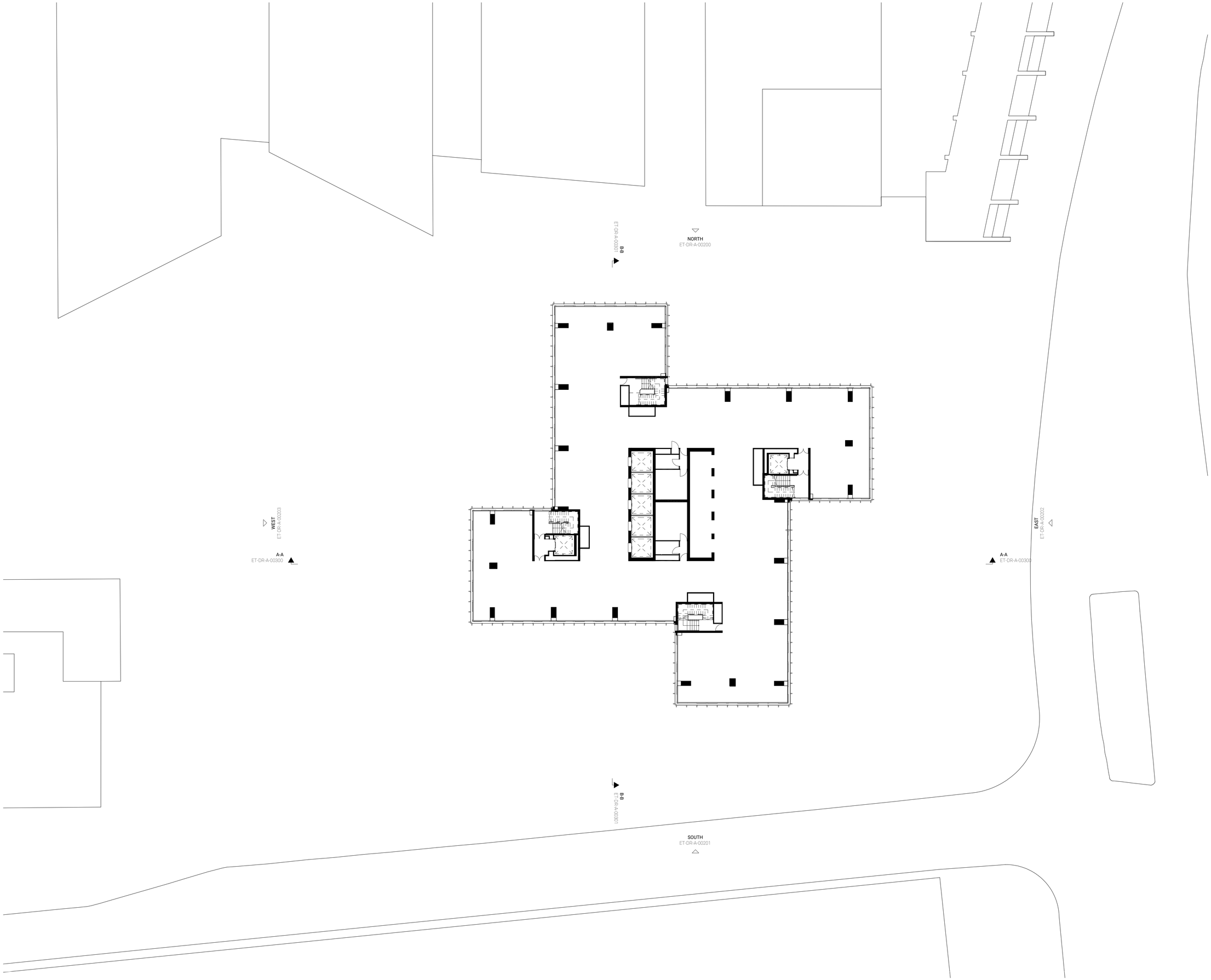


GRAPHIC SCALE	0 2M 4M 10M
SCALE	1 : 200 (A1)
AUTHOR	3XN
REVISION	P1
ISSUE DATE	**01/12/2023**
DRAWING TITLE	**Level 30 Plan - Existing**
DRAWING NUMBER	ET-DR-A-00130



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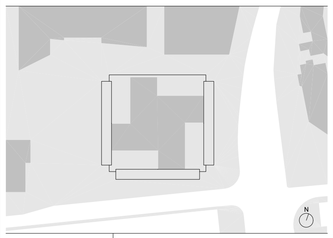

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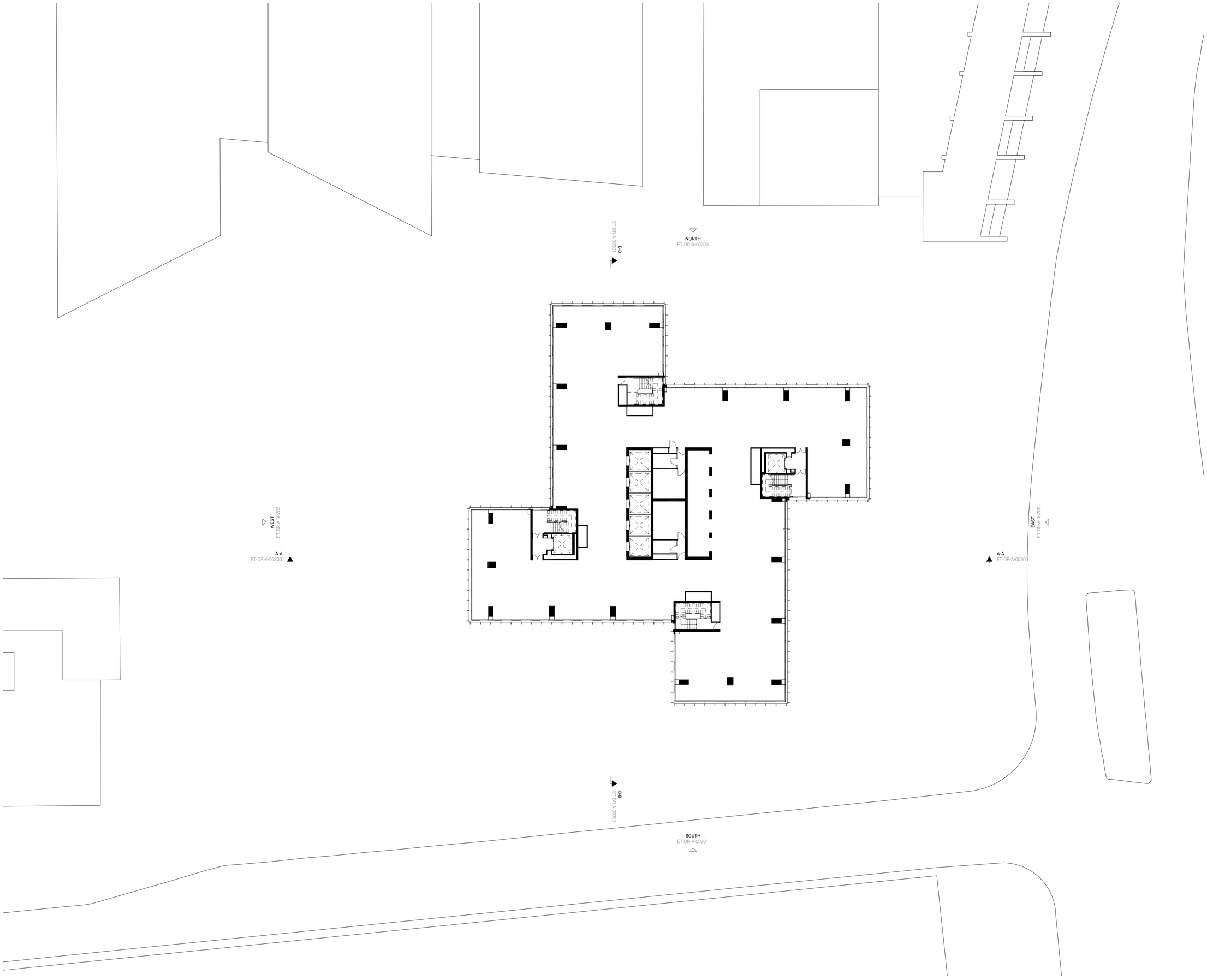
SCALE	1 : 200 (A1)
AUTHOR	3XN
REVISION	P1
ISSUE DATE	**01/12/2023**
DRAWING TITLE	**Level 31 Plan - Existing**
DRAWING NUMBER	ET-DR-A-00131



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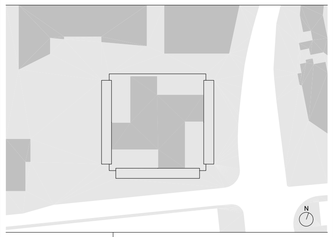

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SCALE	1 : 200 (A1)
AUTHOR	3XN
REVISION	P1
ISSUE DATE	**01/12/2023**
DRAWING TITLE	**Level 32 Plan - Existing**
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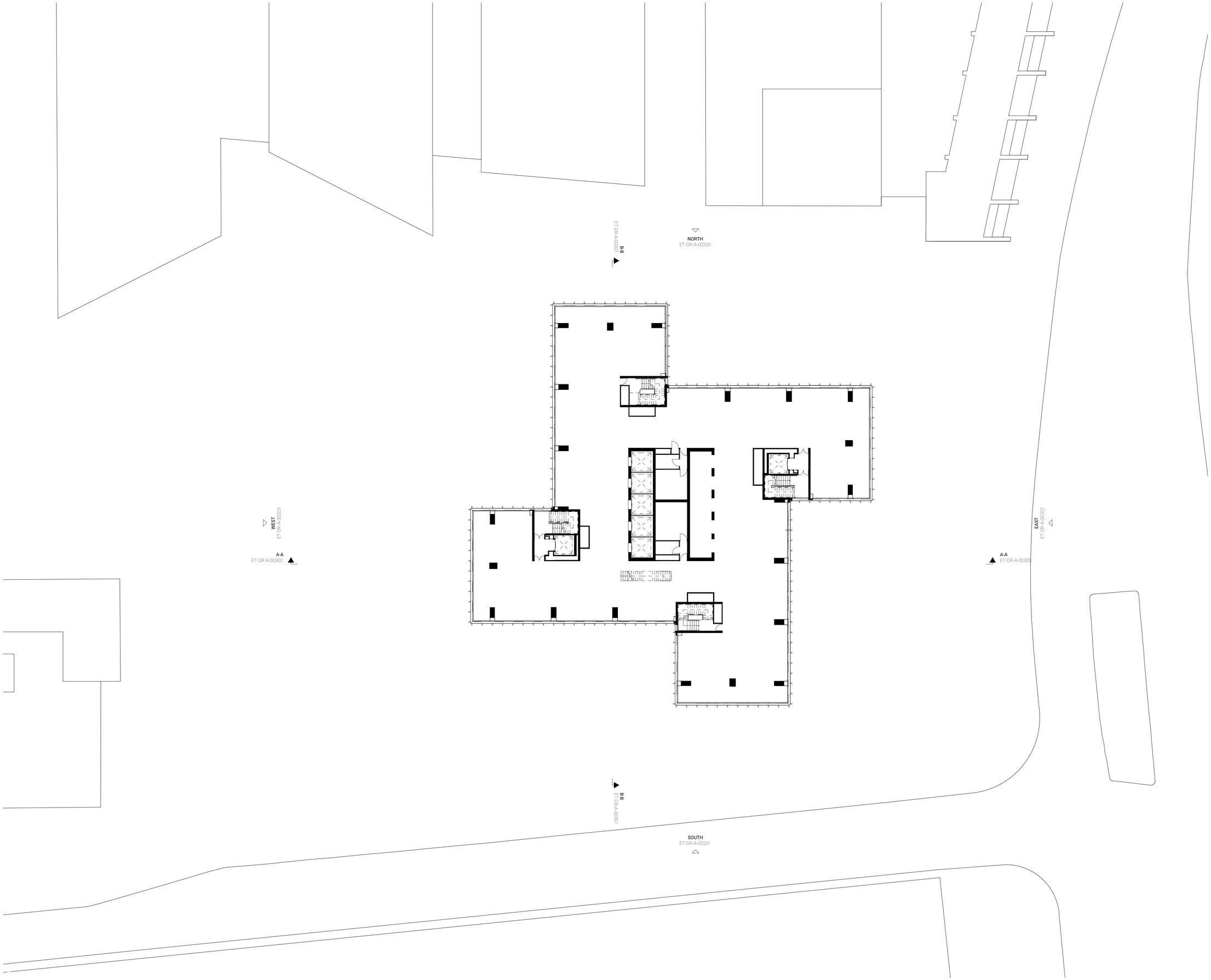

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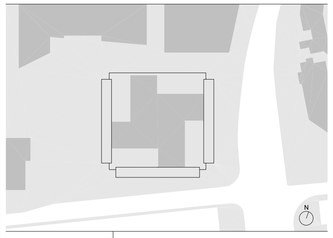

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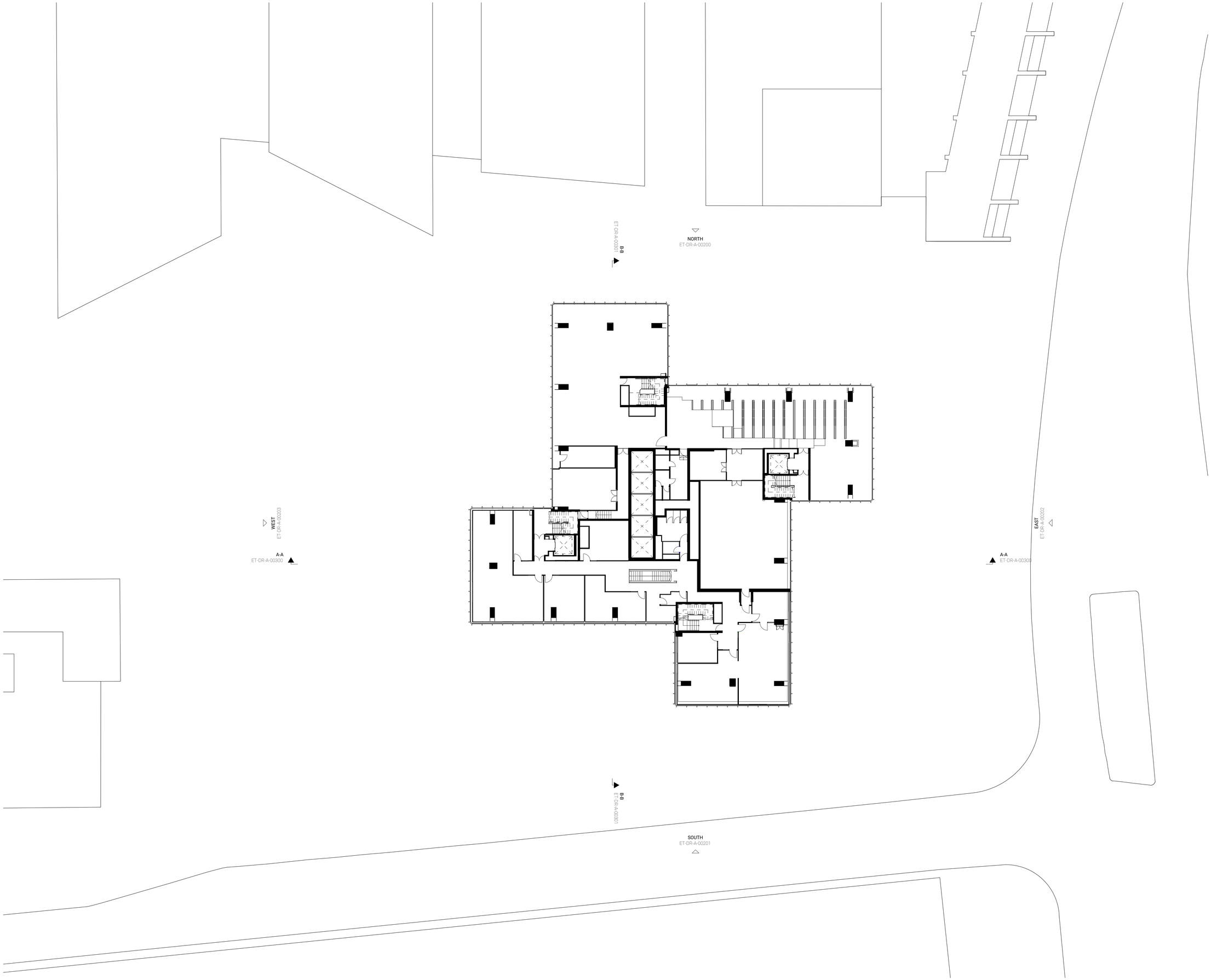
REVISION	P1
ISSUE DATE	**01/12/2023**
DRAWING TITLE	**Level 33 Plan - Existing**
DRAWING NUMBER	ET-DR-A-00133



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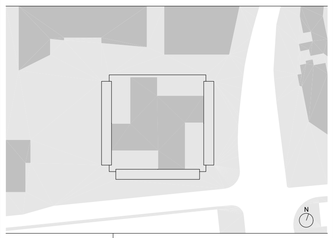

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SCALE	1 : 200 (A1)
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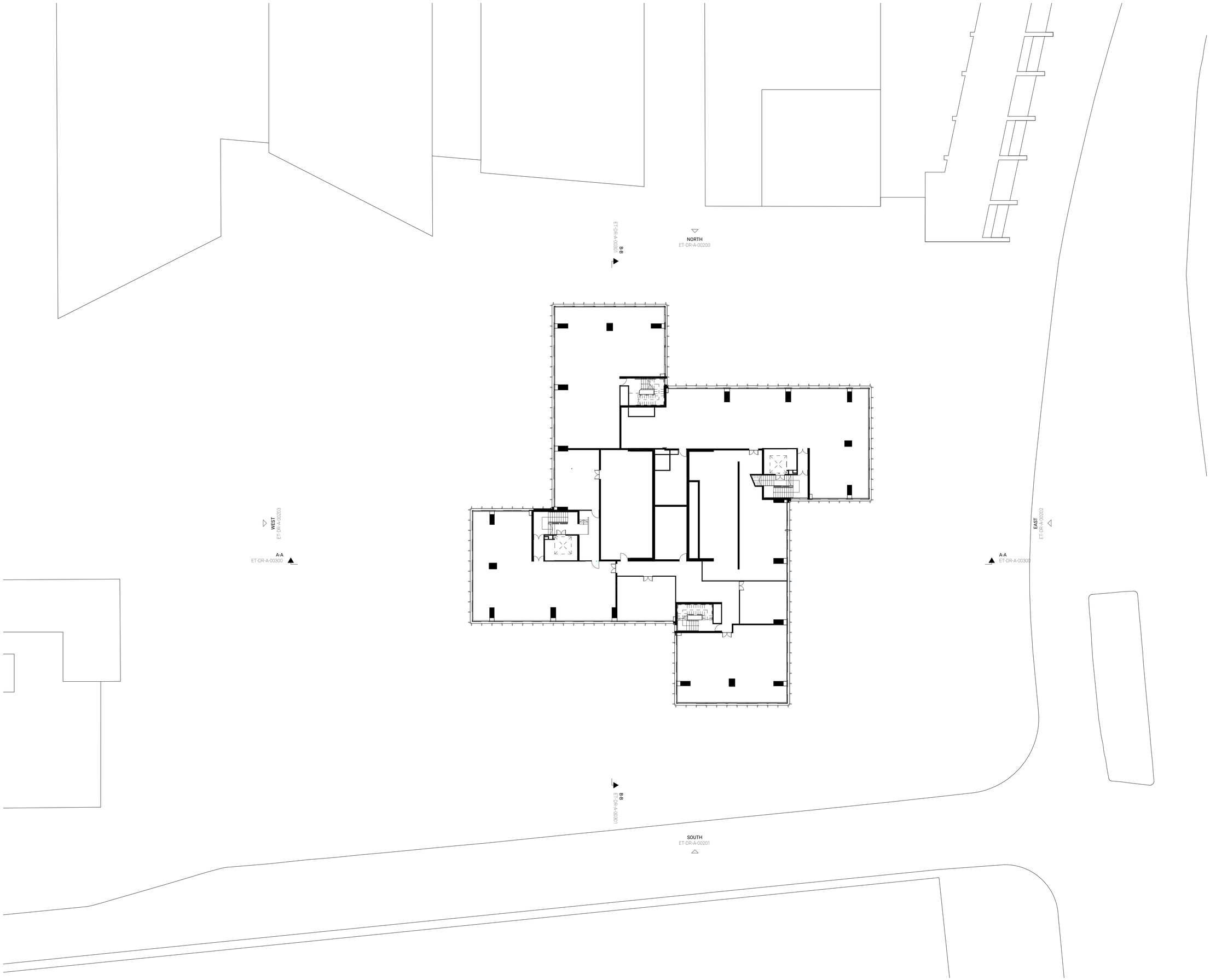
REVISION	P1
ISSUE DATE	**01/12/2023**
DRAWING TITLE	**Level 34 Plan - Existing**
DRAWING NUMBER	ET-DR-A-00134



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PROJECT PHASE	**PLANNING APPLICATION**
CLIENT	

British Land Property Management Limited

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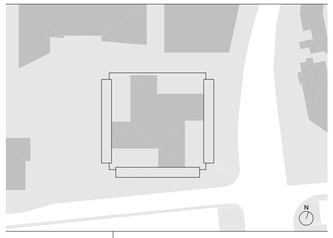
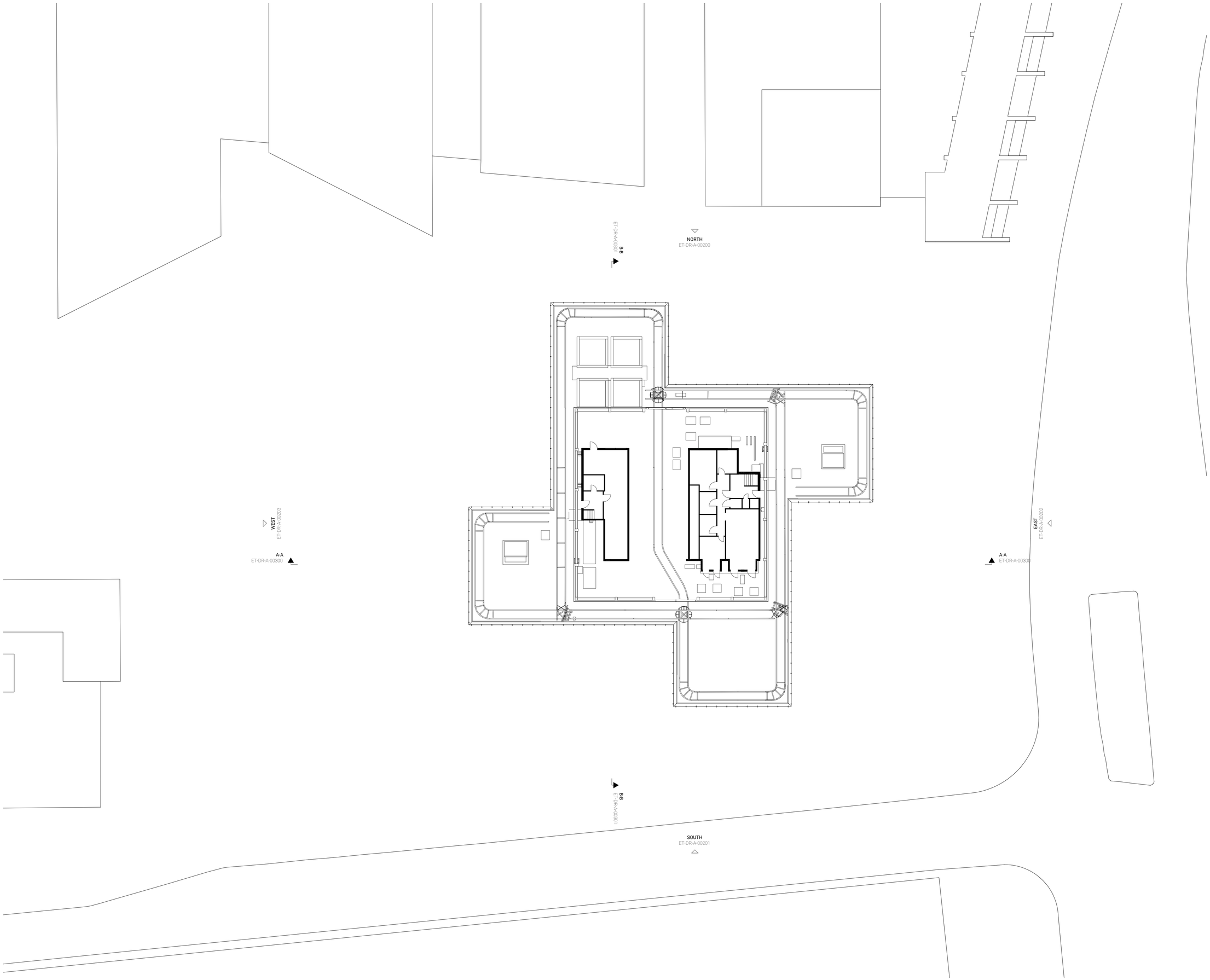


GRAPHIC SCALE	0 2M 4M 10M
SCALE	1 : 200 (A1)
AUTHOR	3XN
REVISION	P1
ISSUE DATE	**01/12/2023**
DRAWING TITLE	**Level 35 Plan - Existing**
DRAWING NUMBER	ET-DR-A-00135



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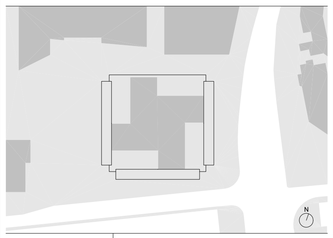
PROJECT NAME	EUSTON TOWER
AUTHOR PROJECT NUMBER	1312
PROJECT PHASE	**PLANNING APPLICATION**
CLIENT	
	British Land Property Management Limited
	York House 45, Seymour Street, London. W1H 7LX
	info@britishland.com / Tel: +44 20 7486 4466



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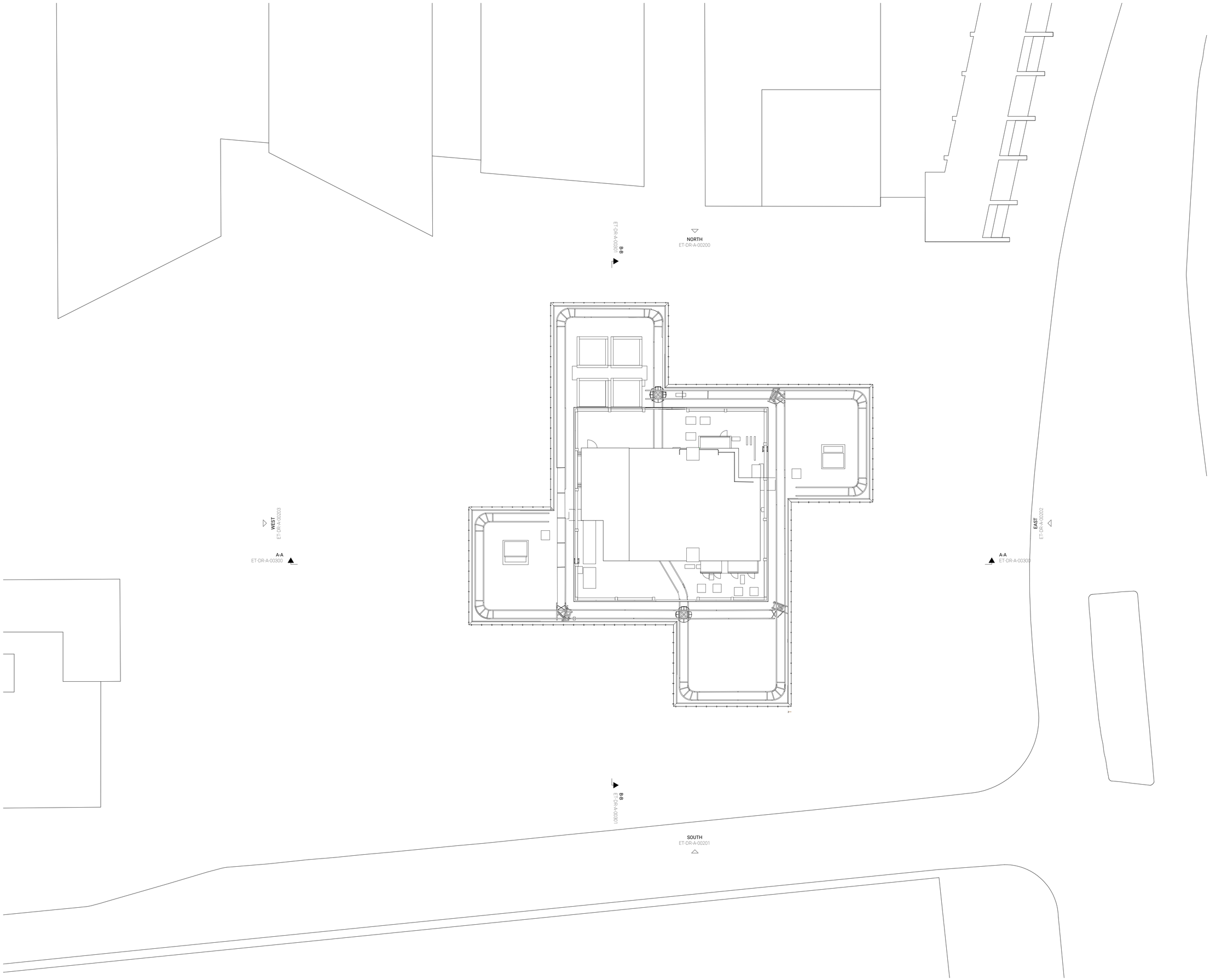
AUTHOR	3XN
REVISION	P1
ISSUE DATE	**01/12/2023**
DRAWING TITLE	**Level 36 Plan - Existing**
DRAWING NUMBER	ET-DR-A-00136



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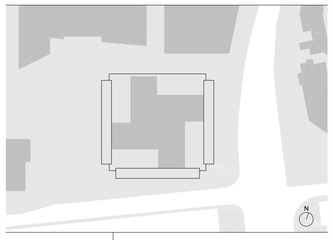

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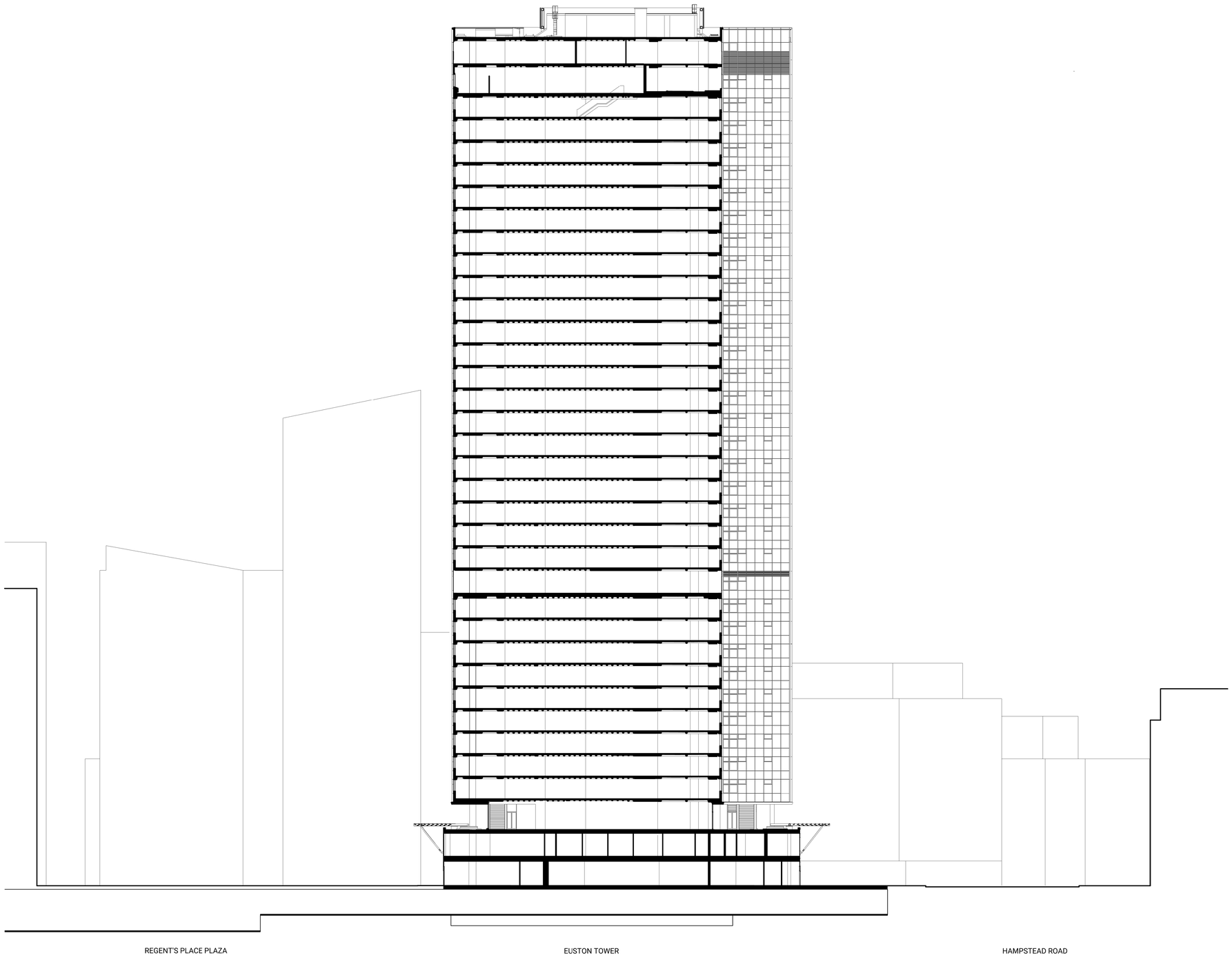
DRAWING NUMBER	ET-DR-A-00137



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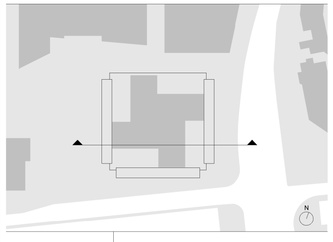

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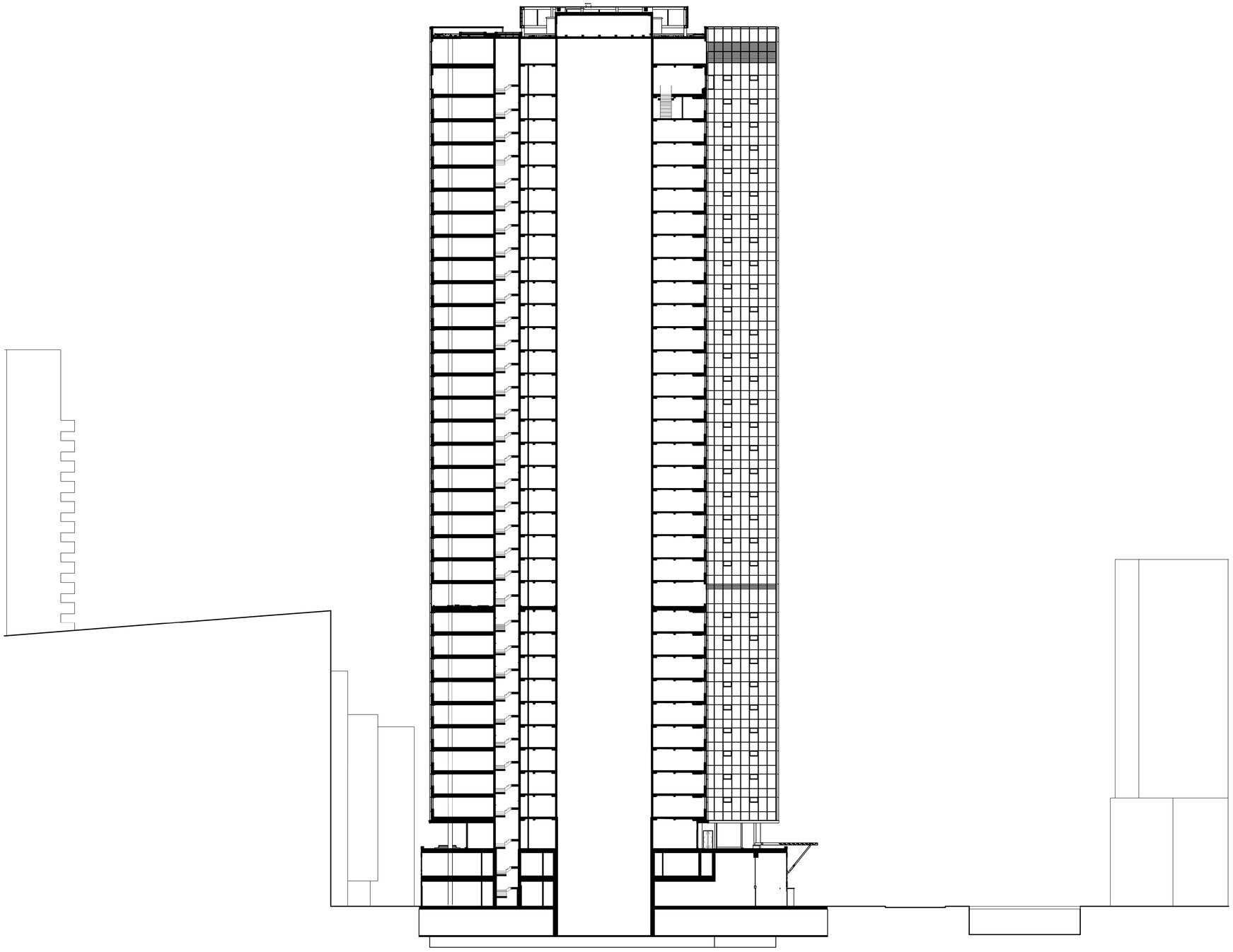
AUTHOR	3XN
REVISION	P1
ISSUE DATE	**01/12/2023**
DRAWING TITLE	**Section AA - Existing**
DRAWING NUMBER	ET-DR-A-00310



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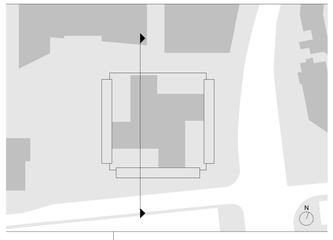

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REVISION	P1
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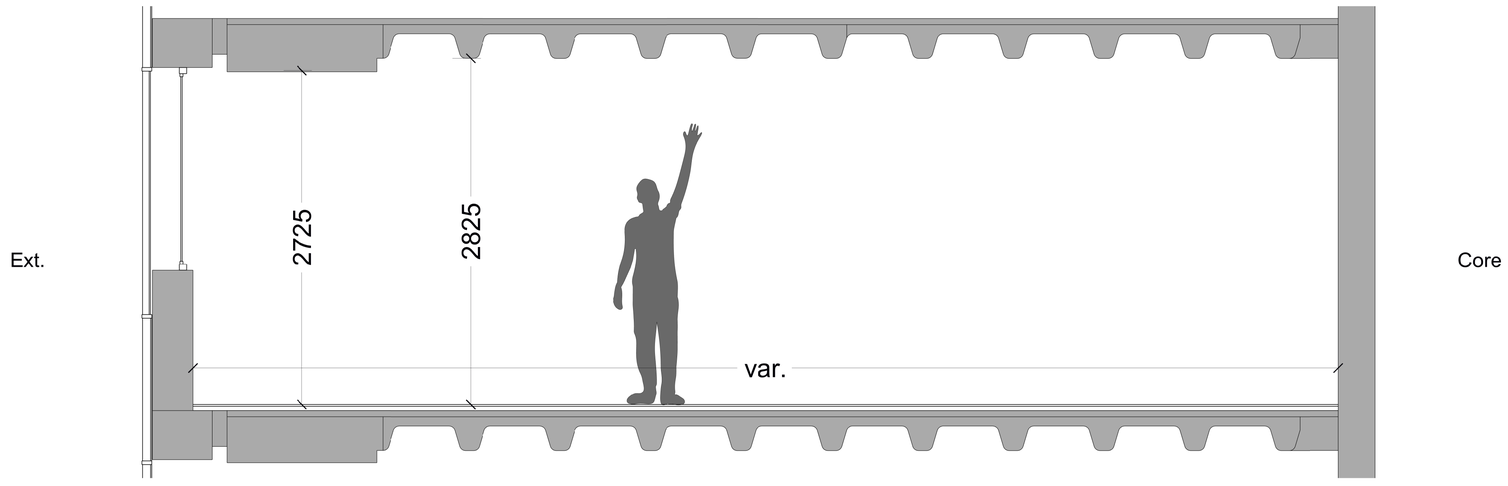
DRAWING NUMBER	ET-DR-A-00311



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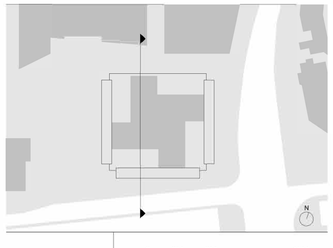

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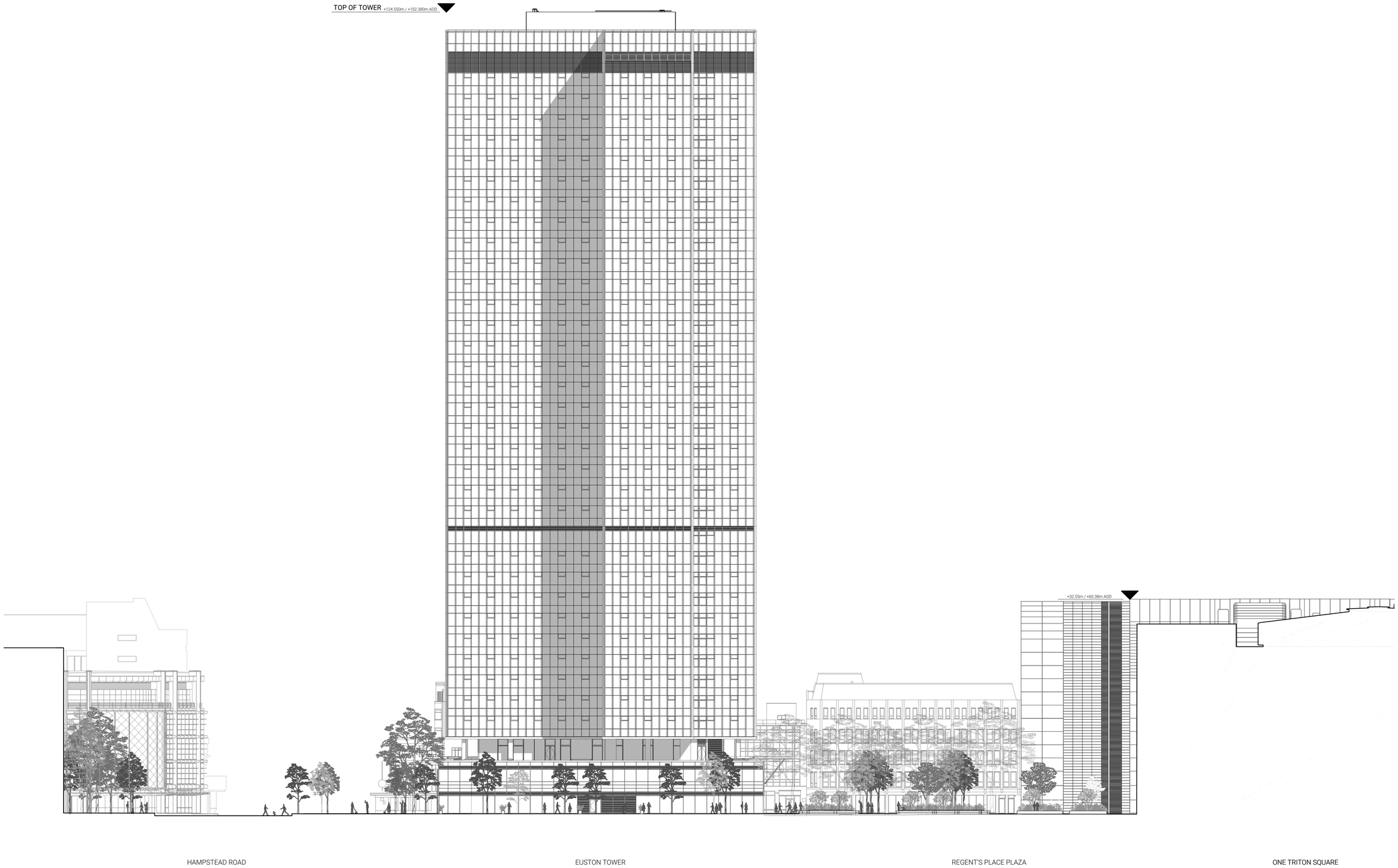
AUTHOR	**3XN**
REVISION	**P1**
ISSUE DATE	**01/12/2023**
DRAWING TITLE	**Room Section - Existing**
DRAWING NUMBER	



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York House 45, Seymour Street, London. W1H 7LX

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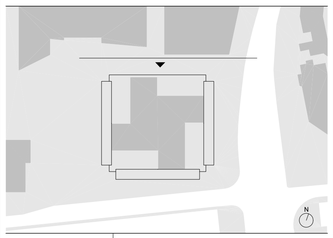

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REVISION	P1
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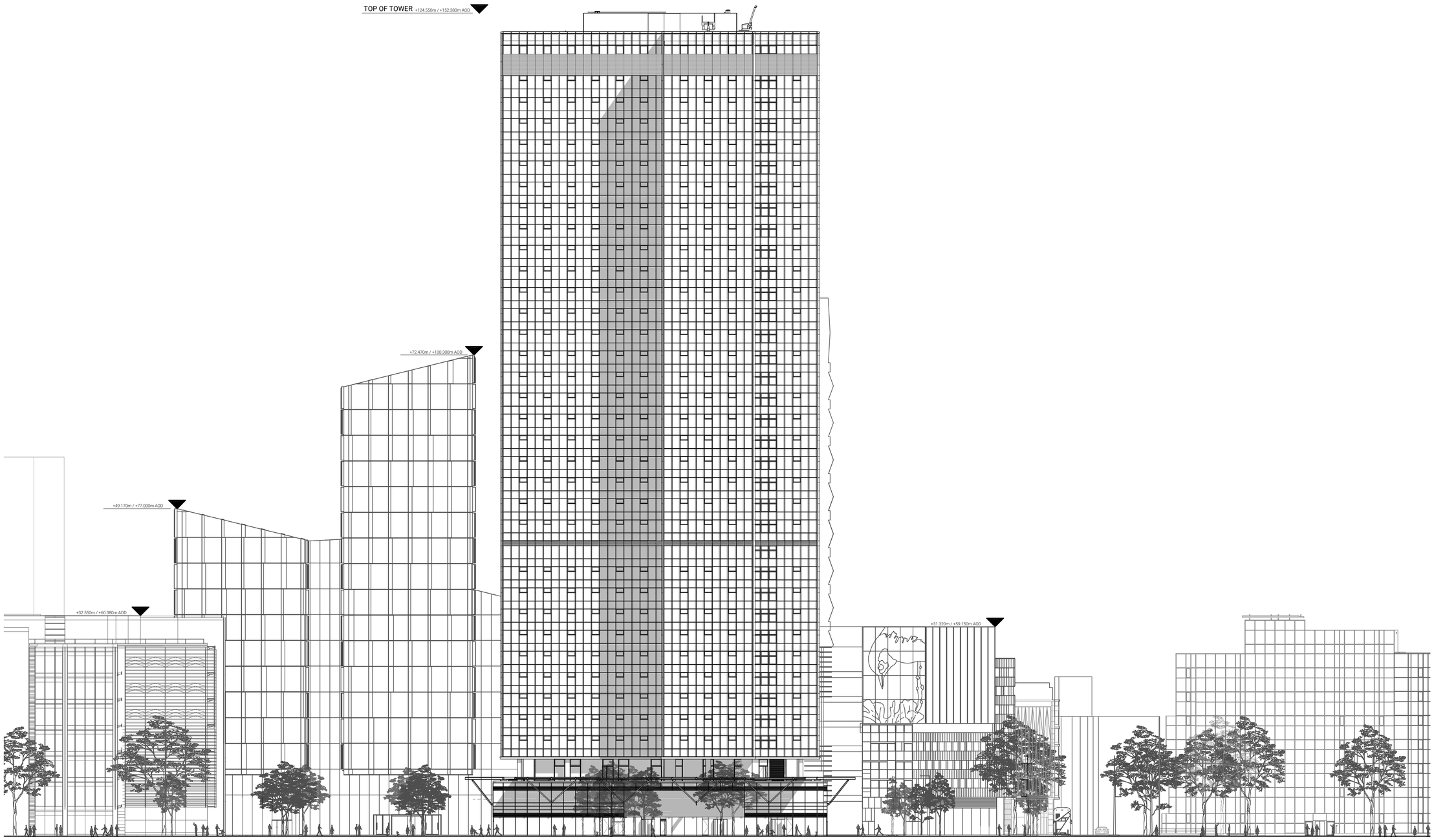
DRAWING NUMBER	ET-DR-A-00200



2 TRITON SQUARE

REGENT'S PLACE PLAZA

EUSTON TOWER

HAMPSTEAD ROAD

UNIVERSITY COLLEGE LONDON HOSPITAL

Euston Tower

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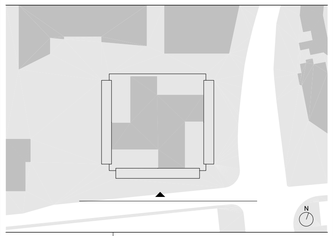

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AUTHOR	3XN
REVISION	P1
ISSUE DATE	**01/12/2023**
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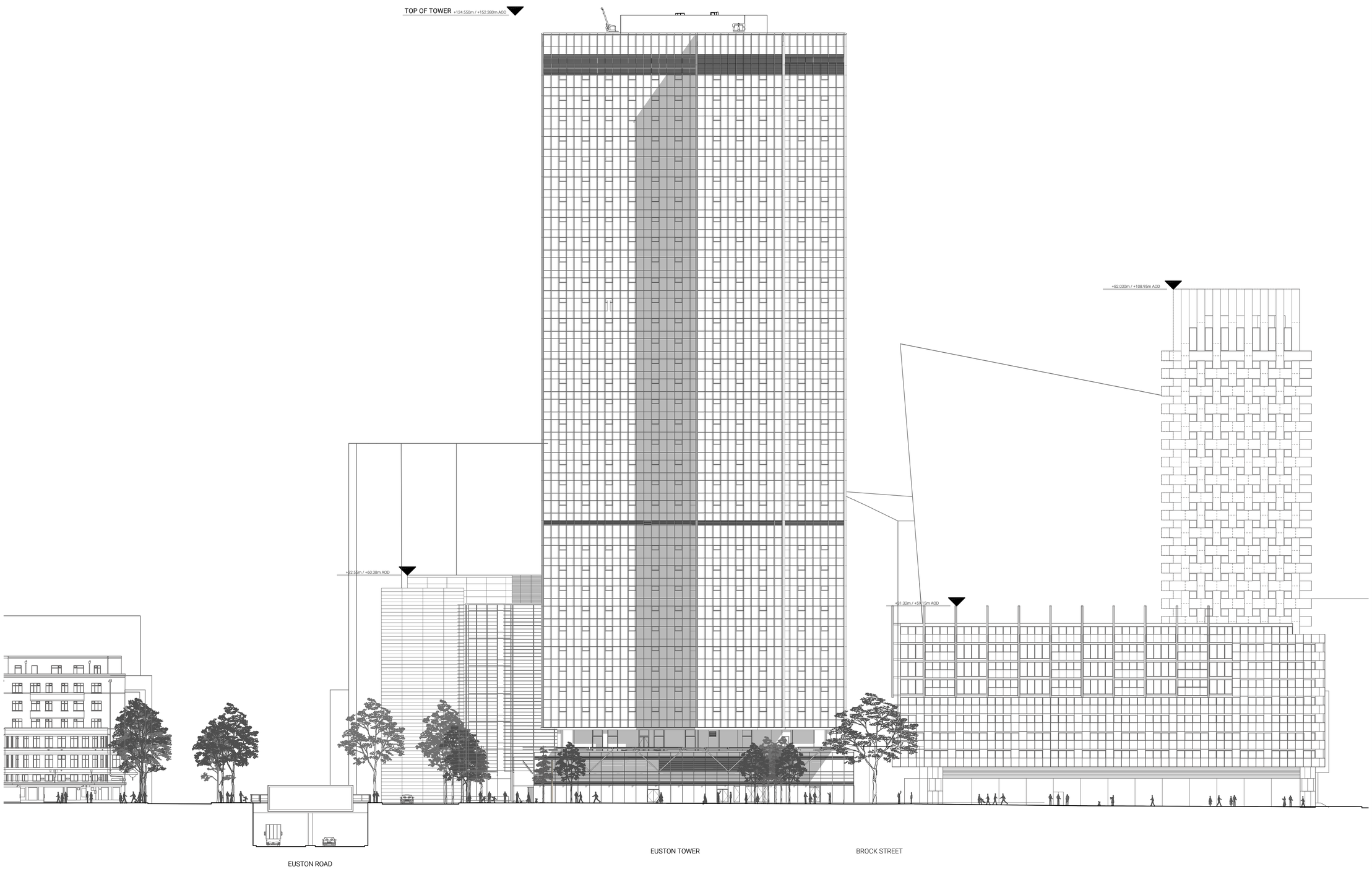
DRAWING NUMBER	ET-DR-A-00201



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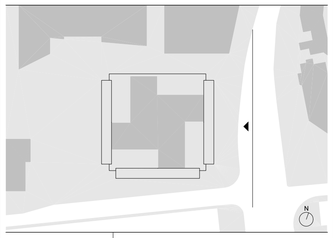

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REVISION	P1
ISSUE DATE	**01/12/2023**
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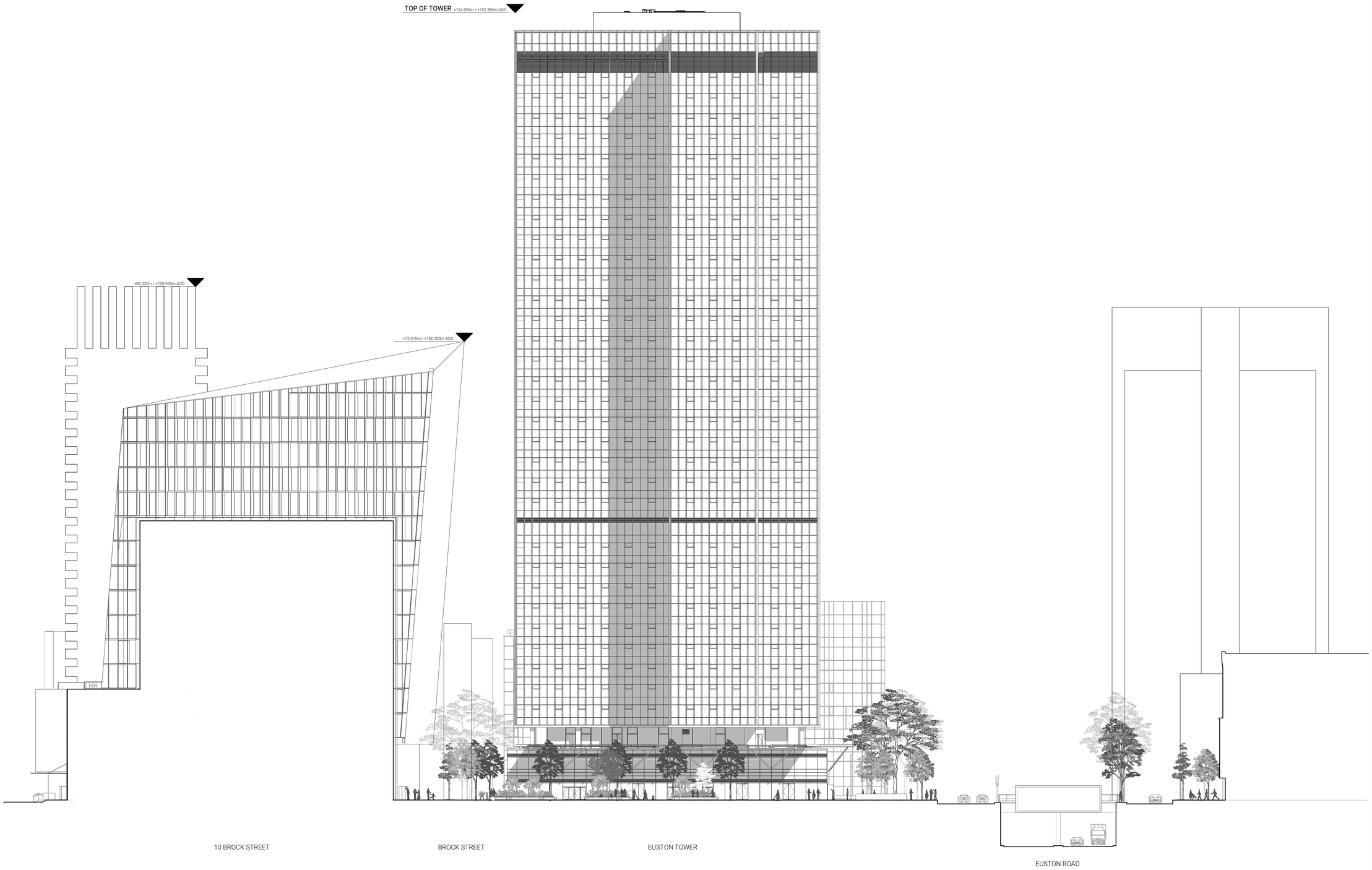
DRAWING NUMBER	ET-DR-A-00202



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York House 45, Seymour Street, London. W1H 7LX

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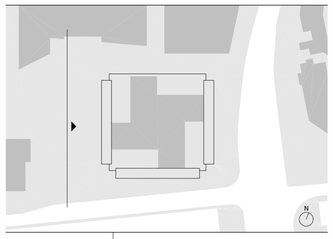

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AUTHOR	3XN
REVISION	P1
ISSUE DATE	**01/12/2023**
DRAWING TITLE	**West Elevation - Existing**
DRAWING NUMBER	ET-DR-A-00203

101721 – Euston Tower Inspection

October 2018

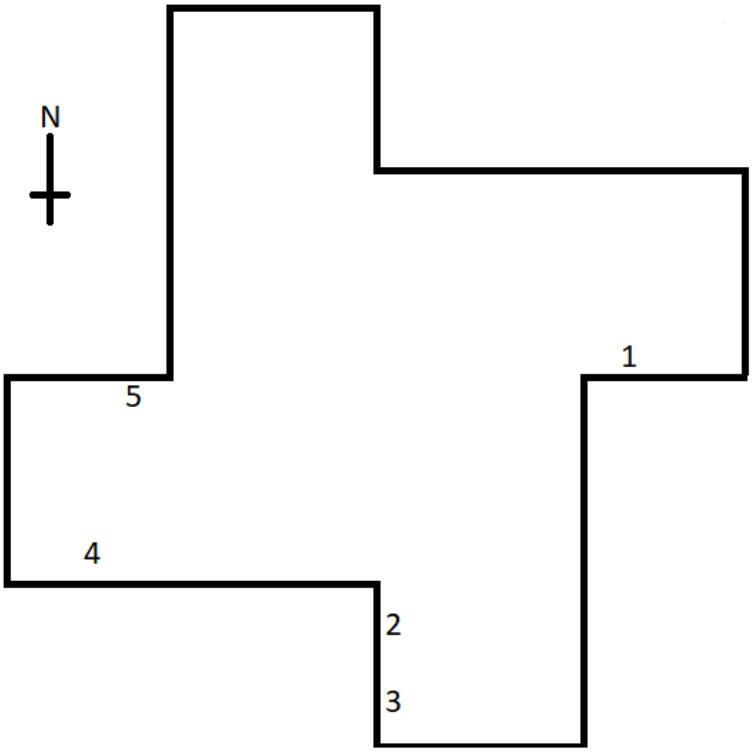


Figure 1. Approximate abseil drop locations, as specified by Diego Alves of the CBRE

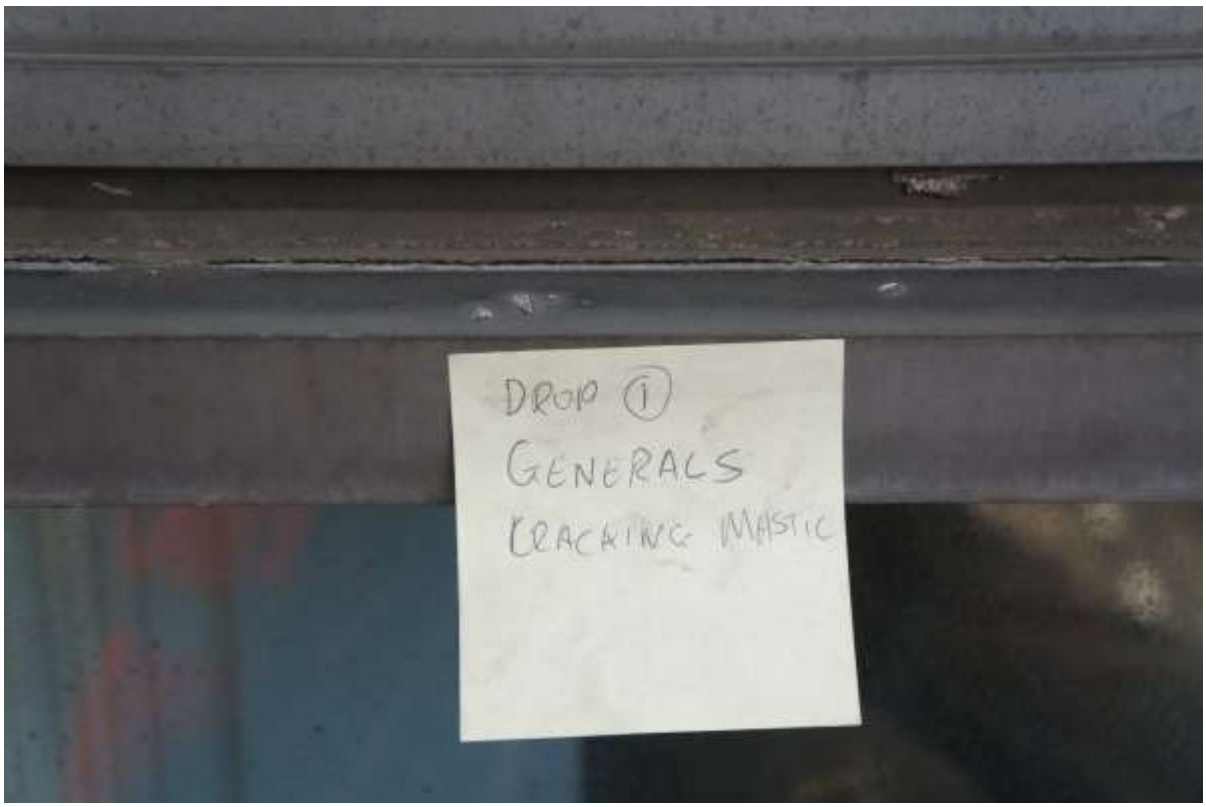
Drop 1 – South Facing East Return

Fault Number	Floor Number	Defect	Photo Number
1	33	Perished Mastic to 20% of Louvre seal	Drop 1 -1/2/3
2	31	Perished Mastic to 25% of window seal	Drop 1 - 4/5/6
3	30	Delaminating Mastic to 15% of window seal	Drop 1 – 7/8
4	28	Delaminating Mastic to isolated patch on window seal (100mm)	Drop 1 - 9
5	26	Delaminating Mastic to 10% of window seal	Drop 1 - 10/11
6	24	Delaminating Mastic to 20% of window seal	Drop 1
7	22	Delaminating Coating to Spandrel panel (approx. 2m in length)	Drop 1 – 12/13

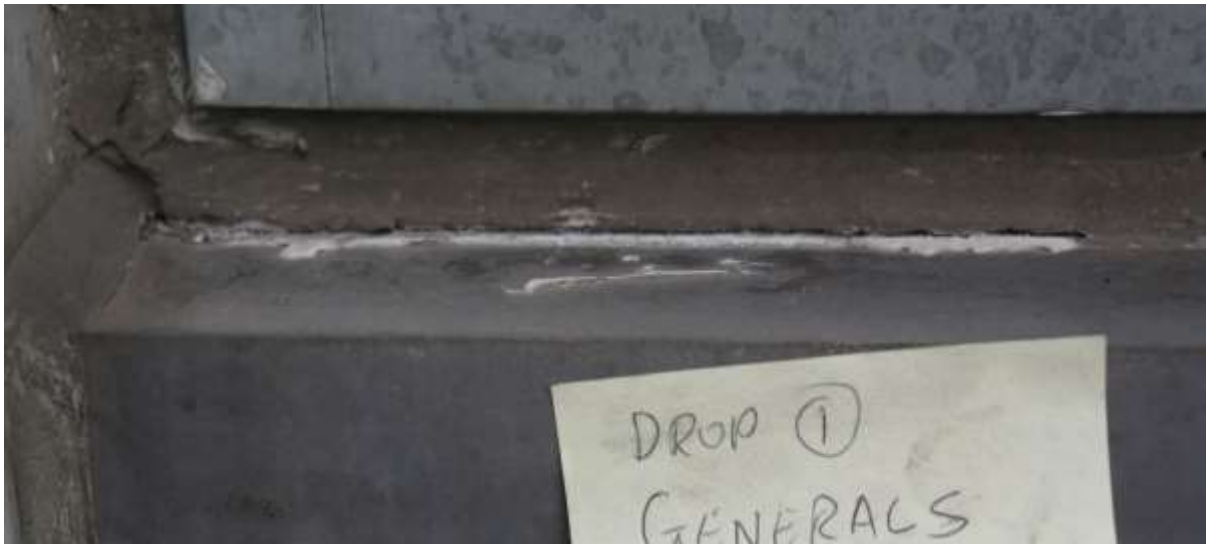
8	10	Delaminating Mastic to 15% of window seal	Drop 1 – 20/21

Overall summary – 90% of the glazing seals are heavily Perished or delaminating.

15% of the sealant on the spandrel panels overbead is heavily Perished or delaminated.



Example of perished mastic above viewing panels



Vertex Access

Perished mastic to louvre

Perished mastic to viewing panels

Perished Mastic – vision unit

Drop 2 – West Facing South Return

Fault Number	Floor Number	Defect	Photo Number
9	34	Mastic heavily Perished at the parapet seal – 90% of seal	Drop 2 - 23/24
10	23	100% of the mastic is missing to the stairwell Viewing panel	Drop 2 - 9/10/11/12/13
11	1	2no Fractures in spandrel panel – both full width (approx. 1100mm)	Drop 2 - 21/22

Overall summary – 95% of the glazing seals are heavily Perished or delaminating.

25% of the sealant on the spandrel panels overbead is heavily Perished or delaminated.

Example of perished mastic on viewing panel

Vertex Access

Example of perished parapet seal

Example of cracking to spandrel panel

Vertex Access

Drop 3 - West Facing South Return 2 – (Additional investigative drop)

Fault Number	Floor Number	Defect	Photo Number
12	32	Historic Residue to both sides of cradle guides/mullions approx. 1500mm x 200mm each side of glazing panel	Drop 3 – 1/2/3/4

Historic residue marking to cradle guides/mullions

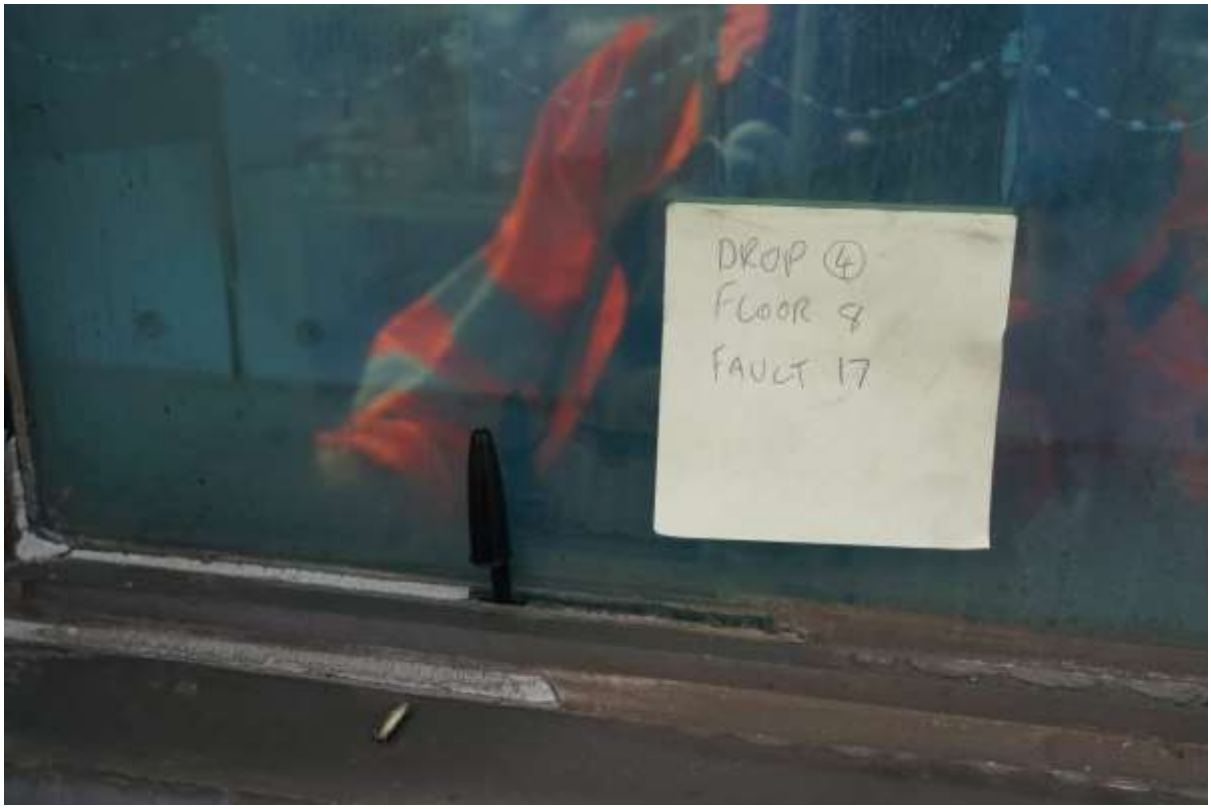
Drop 4 – South Elevation

Fault Number	Floor Number	Defect	Photo Number
13	34	100% Degradation and delamination to all sealant at parapet seal	Drop 4 - 1
14	33	!00% of the mastic on the louvred panels is Perished or delaminating	Drop 4 - 4

15	25	Isolated areas of overbead failure to spandrel panel	Drop 4 - 13
16	20	100% Failure of Mastic to Viewing panels	Drop 4 – 16/17
17	8	Mastic failure and gap behind original 'butyl' tape	Drop 4 – 21/22
18	2	Delamination to base of spandrel panel (5% of all spandrel panels on the building)	Drop 4 – 24/25/26/27/28/29

Overall summary – 100% of the glazing seals are heavily Perished or delaminating.

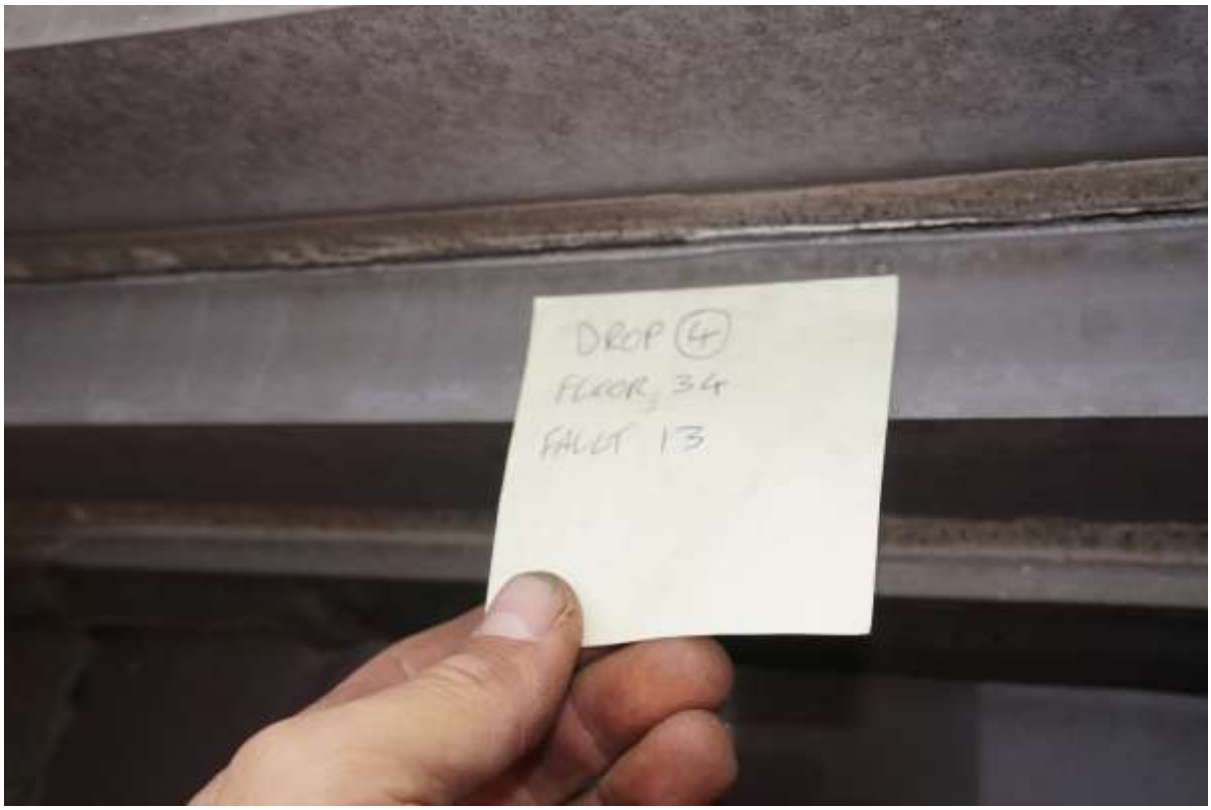
80% of the sealant on the spandrel panels overbead is heavily Perished or delaminated.



Example of failed mastic and gap behind perished butyl tape

Vertex Access

Example of delaminated mastic to viewing panel



Example of de-bonded mastic to frame of viewing panel

Drop 5 – North Facing West Return

Fault Number	Floor Number	Defect	Photo Number
19	16	Loose vent on window frame	Drop 5 - 11
20	8	100% mastic missing from spandrel panel	Drop 5 - 13

Overall summary – 70% of the glazing seals are heavily Perished or delaminating.

15% of the sealant on the spandrel panels overbead is heavily Perished or delaminated.

Example of perished mastic to frame of viewing panel

Vertex Access

Loose vent on north facing west return – 16th floor

Example of delaminated mastic at the base of viewing panel

Vertex Access

Perished butyl tape to spandrel

Perished butyl tape to vision unit

SANDBERG

REPORT 72418/F-K

EUSTON TOWER

TESTING OF CONCRETE CORES

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5 Carpenters Place
Clapham High Street
London SW4 7TD

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SANDBERG
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MATERIALS TESTING

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REPORT 72418/F-K

EUSTON TOWER

TESTING OF CONCRETE CORES

McGee Group (Holdings) Limited
Unit 8 Wharfside
Rosemont Road
Wembley
H40 4PE

This report comprises
2 pages of text
Table 1 of 21 sheets
Table 2 of 2 sheets
Appendix A of 2 sheets
Appendix B of 24 sheets

For the attention of Mr Diego Fenaroli

22 June 2022

Partners: N C D Sandberg S C Clarke D J Ellis R A Rogerson M A Eden J D French C Morgan
G S Mayers G C S Moor J Fagan J H Dell Dr E D W Maclean M I Ingle M Faliva A L Pitman J Glen
Senior Associates: R A Lucas D A Kinnersley Y N P Guellil P Bennett-Hughes G Lee
Associates: K J Green J Gallagher N A Fetter E McPheat F Easthope E Krylowicz S R Kwincinski C S Newberry J S Jones S A J D Hudson A H Khokhar

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SANDBERG
CONSULTING ENGINEERS
INVESTIGATION INSPECTION
TESTING MATERIALS

REPORT 72418/F-K

EUSTON TOWER

TESTING OF CONCRETE CORES

Instruction: Email from Diego Fenaroli, dated 5/5/2022 and PO042901.

1. INTRODUCTION

A set of twenty eight concrete cores were received in our laboratory in two batches on 9 and 12 May 2022. A separate batch of fourteen cores were received in our laboratory on 30 May 2022. All samples were subjected to testing in accordance with your instructions.

2. SAMPLES RECEIVED

A copy of the two sample schedules provided, with corresponding Sandberg sample references added, is given in Appendix A.

3. TEST METHODS AND TEST RESULTS

3.1 Density and Compressive Strength of Concrete Cores

Forty two nominated concrete core samples were diamond sawn to give specimens with a length/diameter ratio in the range 1.95 to 2.05. Where this was not possible a correction factor was applied to specimens tested with a length/diameter ratio in the range 0.90 to 1.10. The ends of each specimen were ground flat and the prepared specimen was used to determine as-received density and compressive strength in accordance with BS EN 12390-7:2019, BS EN 12504-1:2019 and BS EN 12390-3:2019.

The results are given in Table 1.

3.2 Carbonation testing

Twelve nominated concrete core samples were tested to determine depth of carbonation accordance with Sandberg TP/F/10 (based on BRE IP 6/81) using phenolphthalein indicator solution.

The results are given in Table 2.

3.3 Chemical Analysis

Representative portions from forty two nominated core samples were tested for a suite of chemical analysis. The tests scheduled were:

- Determination of cement content, using a documented in-house method based on BS 1881-124:2015+A1:2021

- Determination of chloride content, using a documented in-house method based on BS 1881-124:2015+A1:2021

- Determination of presence of HAC, using a documented in-house method based on BS 1881-124:2015+A1:2021

As instructed on the sample schedule (Appendix A), 30 no tests were undertaken to determine cement content, 30 no tests were undertaken to determine chloride content and 6 no tests were undertaken to determine the presence of High Alumina Cement.

At the time of writing this report the testing is ongoing and will be provided separately.

3.4 Petrographic Examination

Sections from four nominated core samples were subjected to a petrographic microscopical examination including the preparation of a thin section following the procedures given in BS 1881-211: 2016.

The work was carried out by Geomaterials Research Services who are part of Sandberg LLP. Their report is reproduced in full as Appendix B.

4. REMARKS

The compressive test results provided in Table 1 are given as a 'core compressive strength' which provides a measure of the actual strength of the concrete as it presently exists in the structure and is the value that should be used for any assessment of insitu strength or quality in cases of doubt, in accordance with BS EN 13791:2019.

McGee Group (Holdings) Limited
Unit 8 Wharfside
Rosemont Road
Wembley
H40 4PE

for Sandberg LLP

For the attention of Diego Fenaroli

Conrad Newberry
Department Manager

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TABLE 1
COMPRESSIVE STRENGTH AND DENSITY OF CORES
(21 SHEETS)

SANDBERG

UKAS TESTING 0262

72418/F-K
Table/Sheet 1/1
Date of Test 17/5/22

CONCRETE TEST RESULTS
COMPRESSIVE STRENGTH AND DENSITY OF CORES
BS EN 12504-1:2019, BS EN 12390-3:2019 and BS EN 12390-7:2019

Sandberg Reference		F23766	F23767
Site Mark/Client Reference		H1 - P1/02	H1 P1/07
Details: - Location Euston Tower		Position 1	Position 1
- Date of coring		N/A	N/A
- Date received		9/5/22 & 12/5/22	9/5/22 & 12/5/22
Presence of abnormalities		None	None
Reinforcement, as received (diameter/distance)[1]	mm	None	None
Reinforcement, prepared (diameter/distance)[1]	mm	None	None
Aggregate, maximum nominal size	mm	21	18
Condition on receipt		Exposed: Air	Exposed: Air
Storage conditions		As Received	As Received
Method of End preparation (Cap/Ground)		Ground	Ground
Actual Core Lengths			
- Core length, as received	mm	580-700	470-485
- Relation to length, as-received	mm	200-285	200-285
Mean Prepared Length	mm	85	84
Mean Core Diameter d_m	mm	84	84
Length/Diameter ratio of prepared specimen	λ	1.01	1.00
Density[2] - As received	kg/m³	2360	2350
Exposure time before Test	16-24h	N/A	N/A
Estimation of prepared core excess voidage	%	0.5	1.0
Maximum Load at Failure	kN	450	424
Compressive Strength[3] (Measured Core Strength)	MPa (N/mm²)	81.2	76.5
Mode of Failure[4]		Normal	Normal
Deviations from standard		See footnote 2	See footnote 2
Remarks:		2:1 Correction: 66.6 MPa	2:1 Correction: 62.7 MPa

1 Centre of bar to core end, before and after end preparation (eg. 20/100/40 = 20mm diameter bar, 100mm from the core end as-received and 40mm
2 Volume by measurement/water displacement, densities given to nearest 10kg/m³. Balance used complies to BSEN 12504-1:2009. (This will not reduce confidence in the test result.)
3 Compressive strength values given to nearest 0.1 MPa (N/mm²).
4 'Normal' (symmetrical failure) or otherwise as described.

ND = Not determined. NA = Not applicable.

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UKAS TESTING 0262

72418/F-K
Table/Sheet 1/2
Date of Test 17/5/22

CONCRETE TEST RESULTS
COMPRESSIVE STRENGTH AND DENSITY OF CORES
BS EN 12504-1:2019, BS EN 12390-3:2019 and BS EN 12390-7:2019

Sandberg Reference		F23768	F23769
Site Mark/Client Reference		H1 - P2/02	H1 - P2/06
Details: - Location Euston Tower		Position 2	Position 2
- Date of coring		N/A	N/A
- Date received		9/5/22 & 12/5/22	9/5/22 & 12/5/22
Presence of abnormalities		None	None
Reinforcement, as received (diameter/distance)[1]	mm	None	None
Reinforcement, prepared (diameter/distance)[1]	mm	None	None
Aggregate, maximum nominal size	mm	21	25
Condition on receipt		Exposed: Air	Exposed: Air
Storage conditions		As Received	As Received
Method of End preparation (Cap/Ground)		Ground	Ground
Actual Core Lengths			
- Core length, as received	mm	435-460	460-475
- Relation to length, as-received	mm	200-285	200-285
Mean Prepared Length	mm	88	85
Mean Core Diameter d_m	mm	83	84
Length/Diameter ratio of prepared specimen	λ	1.06	1.01
Density[2] - As received	kg/m³	2370	2340
Exposure time before Test	16-24h	N/A	N/A
Estimation of prepared core excess voidage	%	1.5	0.5
Maximum Load at Failure	kN	443	440
Compressive Strength[3] (Measured Core Strength)	MPa (N/mm²)	81.9	79.4
Mode of Failure[4]		Normal	Normal
Deviations from standard		See footnote 2	See footnote 2
Remarks:		2:1 Correction: 67.2	2:1 Correction: 65.1

1 Centre of bar to core end, before and after end preparation (eg. 20/100/40 = 20mm diameter bar, 100mm from the core end as-received and 40mm
2 Volume by measurement/water displacement, densities given to nearest 10kg/m³. Balance used complies to BSEN 12504-1:2009. (This will not reduce confidence in the test result.)
3 Compressive strength values given to nearest 0.1 MPa (N/mm²).
4 'Normal' (symmetrical failure) or otherwise as described.

ND = Not determined. NA = Not applicable.

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UKAS TESTING 0262

72418/F-K

Table/Sheet 1/3

Date of Test 24/5/22

CONCRETE TEST RESULTS
COMPRESSIVE STRENGTH AND DENSITY OF CORES
BS EN 12504-1:2019, BS EN 12390-3:2019 and BS EN 12390-7:2019

Sandberg Reference		F23770	F23771
Site Mark/Client Reference		H1 - P3/01	H1 - P3/07
Details: - Location Euston Tower		Position 3	Position 3
- Date of coring		N/A	N/A
- Date received		9/5/22 & 12/5/22	9/5/22 & 12/5/22
Presence of abnormalities		None	None
Reinforcement, as received (diameter/distance)[1]	mm	None	None
Reinforcement, prepared (diameter/distance)[1]	mm	None	None
Aggregate, maximum nominal size	mm	17	20
Condition on receipt		Exposed to air: Dry	Exposed to air: Dry
Storage conditions		As Received	As Received
Method of End preparation (Cap/Ground)		Ground	Ground
Actual Core Lengths			
- Core length, as received	mm	1000-1010	310-330
- Relation to length, as-received	mm	170-340	70-240
Mean Prepared Length	mm	171	170
Mean Core Diameter d_m	mm	84	83
Length/Diameter ratio of prepared specimen	λ	2.04	2.05
Density[2] - As received	kg/m³	2360	2310
Exposure time before Test	16-24h	-	-
Estimation of prepared core excess voidage	%	0.5	1.0
Maximum Load at Failure	kN	307	266
Compressive Strength[3] (Measured Core Strength)	MPa (N/mm²)	55.4	49.2
Mode of Failure[4]		Normal	Normal
Deviations from standard		See footnote 2	See footnote 2
Remarks:			

1 Centre of bar to core end, before and after end preparation (eg. 20/100/40 = 20mm diameter bar, 100mm from the core end as-received and 40mm

2 Volume by measurement/water displacement, densities given to nearest 10kg/m³. Balance used complies to BSEN 12504-1:2009. (This will not reduce confidence in the test result.)

3 Compressive strength values given to nearest 0.1 MPa (N/mm²).

4 'Normal' (symmetrical failure) or otherwise as described.

ND = Not determined. NA = Not applicable.

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UKAS TESTING 0262

72418/F-K
Table/Sheet 1/4
Date of Test 24/5/22

CONCRETE TEST RESULTS
COMPRESSIVE STRENGTH AND DENSITY OF CORES
BS EN 12504-1:2019, BS EN 12390-3:2019 and BS EN 12390-7:2019

Sandberg Reference		F23773	F23774
Site Mark/Client Reference		H1 - P4/05	H1 - P5/02
Details: - Location Euston Tower		Position 4	Position 5
- Date of coring		N/A	N/A
- Date received		9/5/22 & 12/5/22	9/5/22 & 12/5/22
Presence of abnormalities		None	None
Reinforcement, as received (diameter/distance)[1]	mm	None	None
Reinforcement, prepared (diameter/distance)[1]	mm	None	None
Aggregate, maximum nominal size	mm	20	16
Condition on receipt		Exposed to air: Dry	Exposed to air: Dry
Storage conditions		As Received	As Received
Method of End preparation (Cap/Ground)		Ground	Ground
Actual Core Lengths			
- Core length, as received	mm	310-340	390-405
- Relation to length, as-received	mm	60-230	70-240
Mean Prepared Length	mm	171	173
Mean Core Diameter d_m	mm	84	85
Length/Diameter ratio of prepared specimen	λ	2.04	2.04
Density[2] - As received	kg/m³	2330	2340
Exposure time before Test	16-24h	-	-
Estimation of prepared core excess voidage	%	1.0	1.0
Maximum Load at Failure	kN	300	398
Compressive Strength[3] (Measured Core Strength)	MPa (N/mm²)	52.9	71.8
Mode of Failure[4]		Normal	Normal
Deviations from standard		See footnote 2	See footnote 2
Remarks:			

1 Centre of bar to core end, before and after end preparation (eg. 20/100/40 = 20mm diameter bar, 100mm from the core end as-received and 40mm

2 Volume by measurement/water displacement, densities given to nearest 10kg/m³. Balance used complies to BSEN 12504-1:2009. (This will not reduce confidence in the test result.)

3 Compressive strength values given to nearest 0.1 MPa (N/mm²).

4 'Normal' (symmetrical failure) or otherwise as described.

ND = Not determined. NA = Not applicable.

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UKAS TESTING 0262

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Table/Sheet 1/5
Date of Test 24/5/22

CONCRETE TEST RESULTS
COMPRESSIVE STRENGTH AND DENSITY OF CORES
BS EN 12504-1:2019, BS EN 12390-3:2019 and BS EN 12390-7:2019

Sandberg Reference		F23775	F23776
Site Mark/Client Reference		H1 - P5/07	H1 - R2/01
Details: - Location Euston Tower		Position 5	Pile R2
- Date of coring		N/A	N/A
- Date received		9/5/22 & 12/5/22	9/5/22 & 12/5/22
Presence of abnormalities		None	None
Reinforcement, as received (diameter/distance)[1]	mm	None	None
Reinforcement, prepared (diameter/distance)[1]	mm	None	None
Aggregate, maximum nominal size	mm	17	22
Condition on receipt		Exposed to air: Dry	Exposed to air: Dry
Storage conditions		As Received	As Received
Method of End preparation (Cap/Ground)		Ground	Ground
Actual Core Lengths			
- Core length, as received	mm	455-470	400-450
- Relation to length, as-received	mm	80-250	60-230
Mean Prepared Length	mm	171	170
Mean Core Diameter d_m	mm	84	84
Length/Diameter ratio of prepared specimen	λ	2.04	2.02
Density[2] - As received	kg/m³	2310	2340
Exposure time before Test	16-24h	-	-
Estimation of prepared core excess voidage	%	0.5	2.5
Maximum Load at Failure	kN	266	250
Compressive Strength[3] (Measured Core Strength)	MPa (N/mm²)	48.0	45.1
Mode of Failure[4]		Normal	Normal
Deviations from standard		See footnote 2	See footnote 2
Remarks:			

1 Centre of bar to core end, before and after end preparation (eg. 20/100/40 = 20mm diameter bar, 100mm from the core end as-received and 40mm

2 Volume by measurement/water displacement, densities given to nearest 10kg/m³. Balance used complies to BSEN 12504-1:2009. (This will not reduce confidence in the test result.)

3 Compressive strength values given to nearest 0.1 MPa (N/mm²).

4 'Normal' (symmetrical failure) or otherwise as described.

ND = Not determined. NA = Not applicable.

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Table/Sheet 1/6

Date of Test 24/5/22

CONCRETE TEST RESULTS
COMPRESSIVE STRENGTH AND DENSITY OF CORES
BS EN 12504-1:2019, BS EN 12390-3:2019 and BS EN 12390-7:2019

Sandberg Reference		F23778	F23779
Site Mark/Client Reference		H1 - L3/01	H1 - L3/02
Details: - Location Euston Tower		Pile L3	Pile L3
- Date of coring		N/A	N/A
- Date received		9/5/22 & 12/5/22	9/5/22 & 12/5/22
Presence of abnormalities		None	None
Reinforcement, as received (diameter/distance)[1]	mm	None	None
Reinforcement, prepared (diameter/distance)[1]	mm	None	None
Aggregate, maximum nominal size	mm	24	23
Condition on receipt		Exposed to air: Dry	Exposed to air: Dry
Storage conditions		As Received	As Received
Method of End preparation (Cap/Ground)		Ground	Ground
Actual Core Lengths			
- Core length, as received	mm	355-375	380-410
- Relation to length, as-received	mm	60-230	70-240
Mean Prepared Length	mm	172	170
Mean Core Diameter d_m	mm	84	84
Length/Diameter ratio of prepared specimen	λ	2.05	2.02
Density[2] - As received	kg/m³	2370	2370
Exposure time before Test	16-24h	-	-
Estimation of prepared core excess voidage	%	2.5	1.5
Maximum Load at Failure	kN	305	346
Compressive Strength[3] (Measured Core Strength)	MPa (N/mm²)	55.0	62.4
Mode of Failure[4]		Normal	Explosive
Deviations from standard		See footnote 2	See footnote 2
Remarks:			

1 Centre of bar to core end, before and after end preparation (eg. 20/100/40 = 20mm diameter bar, 100mm from the core end as-received and 40mm

2 Volume by measurement/water displacement, densities given to nearest 10kg/m³. Balance used complies to BSEN 12504-1:2009. (This will not reduce confidence in the test result.)

3 Compressive strength values given to nearest 0.1 MPa (N/mm²).

4 'Normal' (symmetrical failure) or otherwise as described.

ND = Not determined. NA = Not applicable.

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UKAS TESTING 0262

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Table/Sheet 1/7

Date of Test 24/5/22

CONCRETE TEST RESULTS
COMPRESSIVE STRENGTH AND DENSITY OF CORES
BS EN 12504-1:2019, BS EN 12390-3:2019 and BS EN 12390-7:2019

Sandberg Reference		F23784	F23785
Site Mark/Client Reference		H2 - P1/01	H2 - P1/04
Details: - Location Euston Tower		Position 1	Position 1
- Date of coring		N/A	N/A
- Date received		9/5/22 & 12/5/22	9/5/22 & 12/5/22
Presence of abnormalities		None	None
Reinforcement, as received (diameter/distance)[1]	mm	None	None
Reinforcement, prepared (diameter/distance)[1]	mm	None	None
Aggregate, maximum nominal size	mm	19	17
Condition on receipt		Exposed to air: Dry	Exposed to air: Dry
Storage conditions		As Received	As Received
Method of End preparation (Cap/Ground)		Ground	Ground
Actual Core Lengths			
- Core length, as received	mm	670-680	540-570
- Relation to length, as-received	mm	60-230	60-230
Mean Prepared Length	mm	170	170
Mean Core Diameter d_m	mm	83	84
Length/Diameter ratio of prepared specimen	λ	2.05	2.02
Density[2] - As received	kg/m³	2360	2360
Exposure time before Test	16-24h	-	-
Estimation of prepared core excess voidage	%	1.0	1.0
Maximum Load at Failure	kN	409	352
Compressive Strength[3] (Measured Core Strength)	MPa (N/mm²)	75.6	63.5
Mode of Failure[4]		Explosive	Normal
Deviations from standard		See footnote 2	See footnote 2
Remarks:			

1 Centre of bar to core end, before and after end preparation (eg. 20/100/40 = 20mm diameter bar, 100mm from the core end as-received and 40mm

2 Volume by measurement/water displacement, densities given to nearest 10kg/m³. Balance used complies to BSEN 12504-1:2009. (This will not reduce confidence in the test result.)

3 Compressive strength values given to nearest 0.1 MPa (N/mm²).

4 'Normal' (symmetrical failure) or otherwise as described.

ND = Not determined. NA = Not applicable.

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UKAS TESTING 0262

72418/F-K
Table/Sheet 1/8
Date of Test 24/5/22

CONCRETE TEST RESULTS
COMPRESSIVE STRENGTH AND DENSITY OF CORES
BS EN 12504-1:2019, BS EN 12390-3:2019 and BS EN 12390-7:2019

Sandberg Reference		F23786	F23787
Site Mark/Client Reference		H2 - P2/01	H2 - P2/02
Details: - Location Euston Tower		Position 2	Position 2
- Date of coring		N/A	N/A
- Date received		9/5/22 & 12/5/22	9/5/22 & 12/5/22
Presence of abnormalities		None	None
Reinforcement, as received (diameter/distance)[1]	mm	None	None
Reinforcement, prepared (diameter/distance)[1]	mm	None	None
Aggregate, maximum nominal size	mm	15	21
Condition on receipt		Exposed to air: Dry	Exposed to air: Dry
Storage conditions		As Received	As Received
Method of End preparation (Cap/Ground)		Ground	Ground
Actual Core Lengths			
- Core length, as received	mm	465-520	205-215
- Relation to length, as-received	mm	80-250	20-200
Mean Prepared Length	mm	170	171
Mean Core Diameter d_m	mm	84	84
Length/Diameter ratio of prepared specimen	λ	2.02	2.04
Density[2] - As received	kg/m³	2330	2340
Exposure time before Test	16-24h	-	-
Estimation of prepared core excess voidage	%	1.5	1.0
Maximum Load at Failure	kN	299	347
Compressive Strength[3] (Measured Core Strength)	MPa (N/mm²)	54.0	62.6
Mode of Failure[4]		Normal	Normal
Deviations from standard		See footnote 2	See footnote 2
Remarks:			

1 Centre of bar to core end, before and after end preparation (eg. 20/100/40 = 20mm diameter bar, 100mm from the core end as-received and 40mm

2 Volume by measurement/water displacement, densities given to nearest 10kg/m³. Balance used complies to BSEN 12504-1:2009. (This will not reduce confidence in the test result.)

3 Compressive strength values given to nearest 0.1 MPa (N/mm²).

4 'Normal' (symmetrical failure) or otherwise as described.

ND = Not determined. NA = Not applicable.

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UKAS TESTING 0262

72418/F-K
Table/Sheet 1/9
Date of Test 24/5/22

CONCRETE TEST RESULTS
COMPRESSIVE STRENGTH AND DENSITY OF CORES
BS EN 12504-1:2019, BS EN 12390-3:2019 and BS EN 12390-7:2019

Sandberg Reference		F23788	F23789
Site Mark/Client Reference		H2 - P3/02	H2 - P3/06
Details: - Location Euston Tower		Position 3	Position 3
- Date of coring		N/A	N/A
- Date received		9/5/22 & 12/5/22	9/5/22 & 12/5/22
Presence of abnormalities		None	None
Reinforcement, as received (diameter/distance)[1]	mm	None	None
Reinforcement, prepared (diameter/distance)[1]	mm	None	None
Aggregate, maximum nominal size	mm	18	17
Condition on receipt		Exposed to air: Dry	Exposed to air: Dry
Storage conditions		As Received	As Received
Method of End preparation (Cap/Ground)		Ground	Ground
Actual Core Lengths			
- Core length, as received	mm	535-570	285-340
- Relation to length, as-received	mm	80-250	60-230
Mean Prepared Length	mm	172	170
Mean Core Diameter d_m	mm	84	84
Length/Diameter ratio of prepared specimen	λ	2.04	2.02
Density[2] - As received	kg/m³	2360	2370
Exposure time before Test	16-24h	-	-
Estimation of prepared core excess voidage	%	1.0	0.5
Maximum Load at Failure	kN	390	380
Compressive Strength[3] (Measured Core Strength)	MPa (N/mm²)	70.4	68.6
Mode of Failure[4]		Normal	Explosive
Deviations from standard		See footnote 2	See footnote 2
Remarks:			

1 Centre of bar to core end, before and after end preparation (eg. 20/100/40 = 20mm diameter bar, 100mm from the core end as-received and 40mm

2 Volume by measurement/water displacement, densities given to nearest 10kg/m³. Balance used complies to BSEN 12504-1:2009. (This will not reduce confidence in the test result.)

3 Compressive strength values given to nearest 0.1 MPa (N/mm²).

4 'Normal' (symmetrical failure) or otherwise as described.

ND = Not determined. NA = Not applicable.

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UKAS TESTING 0262

72418/F-K
Table/Sheet 1/10
Date of Test 24/5/22

CONCRETE TEST RESULTS
COMPRESSIVE STRENGTH AND DENSITY OF CORES
Position 4

BS EN 12504-1:2019, BS EN 12390-3:2019 and BS EN 12390-7:2019

Sandberg Reference		F23791	F23792
Site Mark/Client Reference		H2 - P4/07	H2 - P5/04
Details: - Location Euston Tower		Position 4	Position 5
- Date of coring		N/A	N/A
- Date received		9/5/22 & 12/5/22	9/5/22 & 12/5/22
Presence of abnormalities		None	None
Reinforcement, as received (diameter/distance)[1]	mm	None	None
Reinforcement, prepared (diameter/distance)[1]	mm	None	None
Aggregate, maximum nominal size	mm	14	17
Condition on receipt		Exposed to air: Dry	Exposed to air: Dry
Storage conditions		As Received	As Received
Method of End preparation (Cap/Ground)		Ground	Ground
Actual Core Lengths			
- Core length, as received	mm	290-300	650-700
- Relation to length, as-received	mm	60-230	110-280
Mean Prepared Length	mm	171	172
Mean Core Diameter d_m	mm	84	88
Length/Diameter ratio of prepared specimen	λ	2.04	1.95
Density[2] - As received	kg/m³	2380	2360
Exposure time before Test	16-24h	-	-
Estimation of prepared core excess voidage	%	0.5	0.5
Maximum Load at Failure	kN	445	465
Compressive Strength[3] (Measured Core Strength)	MPa (N/mm²)	80.3	76.5
Mode of Failure[4]		Explosive	Explosive
Deviations from standard		See footnote 2	See footnote 2
Remarks:			

1 Centre of bar to core end, before and after end preparation (eg. 20/100/40 = 20mm diameter bar, 100mm from the core end as-received and 40mm

2 Volume by measurement/water displacement, densities given to nearest 10kg/m³. Balance used complies to BSEN 12504-1:2009. (This will not reduce confidence in the test result.)

3 Compressive strength values given to nearest 0.1 MPa (N/mm²).

4 'Normal' (symmetrical failure) or otherwise as described.

ND = Not determined. NA = Not applicable.

SANDBERG

UKAS TESTING 0262

72418/F-K
Table/Sheet 1/11
Date of Test 24/5/22

CONCRETE TEST RESULTS
COMPRESSIVE STRENGTH AND DENSITY OF CORES
BS EN 12504-1:2019, BS EN 12390-3:2019 and BS EN 12390-7:2019

Sandberg Reference		F23793	F23794
Site Mark/Client Reference		H2 - P5/07	H2 - L2/01
Details: - Location Euston Tower		Position 5	Pile R2
- Date of coring		N/A	N/A
- Date received		9/5/22 & 12/5/22	9/5/22 & 12/5/22
Presence of abnormalities		None	None
Reinforcement, as received (diameter/distance)[1]	mm	None	None
Reinforcement, prepared (diameter/distance)[1]	mm	None	None
Aggregate, maximum nominal size	mm	14	12
Condition on receipt		Exposed to air: Dry	Exposed to air: Dry
Storage conditions		As Received	As Received
Method of End preparation (Cap/Ground)		Ground	Ground
Actual Core Lengths			
- Core length, as received	mm	220-250	120-165
- Relation to length, as-received	mm	40-210	55-140
Mean Prepared Length	mm	172	87
Mean Core Diameter d_m	mm	88	84
Length/Diameter ratio of prepared specimen	λ	1.95	1.04
Density[2] - As received	kg/m³	2360	2370
Exposure time before Test	16-24h	-	-
Estimation of prepared core excess voidage	%	0.5	2.5
Maximum Load at Failure	kN	474	487
Compressive Strength[3] (Measured Core Strength)	MPa (N/mm²)	77.9	87.9
Mode of Failure[4]		Explosive	Explosive
Deviations from standard		See footnote 2	See footnote 2
Remarks:			2:1 Correction: 72.1 MPa

1 Centre of bar to core end, before and after end preparation (eg. 20/100/40 = 20mm diameter bar, 100mm from the core end as-received and 40mm
2 Volume by measurement/water displacement, densities given to nearest 10kg/m³. Balance used complies to BSEN 12504-1:2009. (This will not reduce confidence in the test result.)
3 Compressive strength values given to nearest 0.1 MPa (N/mm²).
4 'Normal' (symmetrical failure) or otherwise as described.

ND = Not determined. NA = Not applicable.

SANDBERG

UKAS TESTING 0262

72418/F-K
Table/Sheet 1/12
Date of Test 24/5/22

CONCRETE TEST RESULTS
COMPRESSIVE STRENGTH AND DENSITY OF CORES
BS EN 12504-1:2019, BS EN 12390-3:2019 and BS EN 12390-7:2019

Sandberg Reference		F23796	F23797
Site Mark/Client Reference		H2-R1/01	H2 - R1/02
Details: - Location Euston Tower		Pile L3	Pile L3
- Date of coring		N/A	N/A
- Date received		9/5/22 & 12/5/22	9/5/22 & 12/5/22
Presence of abnormalities		None	None
Reinforcement, as received (diameter/distance)[1]	mm	None	None
Reinforcement, prepared (diameter/distance)[1]	mm	None	None
Aggregate, maximum nominal size	mm	22	16
Condition on receipt		Exposed to air: Dry	Exposed to air: Dry
Storage conditions		As Received	As Received
Method of End preparation (Cap/Ground)		Ground	Ground
Actual Core Lengths			
- Core length, as received	mm	270-320	265-230
- Relation to length, as-received	mm	70-240	50-220
Mean Prepared Length	mm	170	172
Mean Core Diameter d_m	mm	84	84
Length/Diameter ratio of prepared specimen	λ	2.02	2.05
Density[2] - As received	kg/m³	2360	2370
Exposure time before Test	16-24h	-	-
Estimation of prepared core excess voidage	%	0.5	1.0
Maximum Load at Failure	kN	362	481
Compressive Strength[3] (Measured Core Strength)	MPa (N/mm²)	65.3	86.8
Mode of Failure[4]		Explosive	Explosive
Deviations from standard		See footnote 2	See footnote 2
Remarks:			

1 Centre of bar to core end, before and after end preparation (eg. 20/100/40 = 20mm diameter bar, 100mm from the core end as-received and 40mm

2 Volume by measurement/water displacement, densities given to nearest 10kg/m³. Balance used complies to BSEN 12504-1:2009. (This will not reduce confidence in the test result.)

3 Compressive strength values given to nearest 0.1 MPa (N/mm²).

4 'Normal' (symmetrical failure) or otherwise as described.

ND = Not determined. NA = Not applicable.

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UKAS TESTING 0262

72418/F-K
Table/Sheet 1/13
Date of Test 27/5/22

CONCRETE TEST RESULTS
COMPRESSIVE STRENGTH AND DENSITY OF CORES
BS EN 12504-1:2019, BS EN 12390-3:2019 and BS EN 12390-7:2019

Sandberg Reference		F23772	F237777
Site Mark/Client Reference		H1-P4/02	H1-R2/02
Details: - Location Euston Tower		Position 4	Pile R2
- Date of coring		N/A	N/A
- Date received		9/5/22-12/5/22	9/5/22-12/5/22
Presence of abnormalities		None	None
Reinforcement, as received (diameter/distance)[1]	mm	None	None
Reinforcement, prepared (diameter/distance)[1]	mm	None	None
Aggregate, maximum nominal size	mm	18	19
Condition on receipt		Exposed to air: Dry	Exposed to air: Dry
Storage conditions		As Received	As Received
Method of End preparation (Cap/Ground)		Ground	Ground
Actual Core Lengths			
- Core length, as received	mm	420-430	240-260
- Relation to length, as-received	mm	0-170	0-85
Mean Prepared Length	mm	171	87
Mean Core Diameter d_m	mm	84	83
Length/Diameter ratio of prepared specimen	λ	2.04	1.05
Density[2] - As received	kg/m³	2380	2360
Exposure time before Test	16-24h	-	-
Estimation of prepared core excess voidage	%	1.0	1.0
Maximum Load at Failure	kN	270	348
Compressive Strength[3] (Measured Core Strength)	MPa (N/mm²)	48.7	64.3
Mode of Failure[4]		Normal	Normal
Deviations from standard		See footnote 2	See footnote 2
Remarks:			2:1 Correction: 52.7 MPa

1 Centre of bar to core end, before and after end preparation (eg. 20/100/40 = 20mm diameter bar, 100mm from the core end as-received and 40mm
2 Volume by measurement/water displacement, densities given to nearest 10kg/m³. Balance used complies to BSEN 12504-1:2009. (This will not reduce confidence in the test result.)
3 Compressive strength values given to nearest 0.1 MPa (N/mm²).
4 'Normal' (symmetrical failure) or otherwise as described.

ND = Not determined. NA = Not applicable.

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UKAS TESTING 0262

72418/F-K
Table/Sheet 1/14
Date of Test 27/5/22

CONCRETE TEST RESULTS
COMPRESSIVE STRENGTH AND DENSITY OF CORES
BS EN 12504-1:2019, BS EN 12390-3:2019 and BS EN 12390-7:2019

Sandberg Reference		F23790	F23795
Site Mark/Client Reference		H2-P4/02	H2-L2/02
Details: - Location Euston Tower		Position 4	Pile R2
- Date of coring		N/A	N/A
- Date received		9/5/22-12/5/22	9/5/22-12/5/22
Presence of abnormalities		None	None
Reinforcement, as received (diameter/distance)[1]	mm	None	None
Reinforcement, prepared (diameter/distance)[1]	mm	None	None
Aggregate, maximum nominal size	mm	20	20
Condition on receipt		Exposed to air: Dry	Exposed to air: Dry
Storage conditions		As Received	As Received
Method of End preparation (Cap/Ground)		Ground	Ground
Actual Core Lengths			
- Core length, as received	mm	510-525	340-365
- Relation to length, as-received	mm	0-170	0-170
Mean Prepared Length	mm	172	170
Mean Core Diameter d_m	mm	84	83
Length/Diameter ratio of prepared specimen	λ	2.05	2.05
Density[2] - As received	kg/m³	2370	2370
Exposure time before Test	16-24h	-	-
Estimation of prepared core excess voidage	%	1.0	1.5
Maximum Load at Failure	kN	378	414
Compressive Strength[3] (Measured Core Strength)	MPa (N/mm²)	68.2	76.5
Mode of Failure[4]		Normal	Explosive
Deviations from standard		See footnote 2	See footnote 2
Remarks:			

1 Centre of bar to core end, before and after end preparation (eg. 20/100/40 = 20mm diameter bar, 100mm from the core end as-received and 40mm

2 Volume by measurement/water displacement, densities given to nearest 10kg/m³. Balance used complies to BSEN 12504-1:2009. (This will not reduce confidence in the test result.)

3 Compressive strength values given to nearest 0.1 MPa (N/mm²).

4 'Normal' (symmetrical failure) or otherwise as described.

ND = Not determined. NA = Not applicable.

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UKAS TESTING 0262

72418/F-K

Table/Sheet 1/15

Date of Test 14/6/22

CONCRETE TEST RESULTS
COMPRESSIVE STRENGTH AND DENSITY OF CORES
BS EN 12504-1:2019, BS EN 12390-3:2019 and BS EN 12390-7:2019

Sandberg Reference		F23908	F23909
Site Mark/Client Reference		H3 - P1/01	H3 - P2/01
Details: - Location Euston Tower		Position 1	Position 2
- Date of coring		N/D	N/D
- Date received		30/5/22	30/5/22
Presence of abnormalities		None	None
Reinforcement, as received (diameter/distance)[1]	mm	Sliver/65 (⌀30)	None
Reinforcement, prepared (diameter/distance)[1]	mm	None	None
Aggregate, maximum nominal size	mm	16	20
Condition on receipt		Dry	Dry
Storage conditions		Ambient Air	Ambient Air
Method of End preparation (Cap/Ground)		Ground	Ground
Actual Core Lengths			
- Core length, as received	mm	345-360	505-510
- Relation to length, as-received	mm	85-260	25-200
Mean Prepared Length	mm	170	170
Mean Core Diameter d_m	mm	84	83
Length/Diameter ratio of prepared specimen	λ	2.02	2.05
Density[2] - As received	kg/m³	2380	2360
Exposure time before Test	16-24h	X	X
Estimation of prepared core excess voidage	%	1.5	2.0
Maximum Load at Failure	kN	444	422
Compressive Strength[3] (Measured Core Strength)	MPa (N/mm²)	80.1	78.0
Mode of Failure[4]		Explosive	Explosive
Deviations from standard		See footnote 2	See footnote 2
Remarks:			

1 Centre of bar to core end, before and after end preparation (eg. 20/100/40 = 20mm diameter bar, 100mm from the core end as-received and 40mm

2 Volume by measurement/water displacement, densities given to nearest 10kg/m³. Balance used complies to BSEN 12504-1:2009. (This will not reduce confidence in the test result.)

3 Compressive strength values given to nearest 0.1 MPa (N/mm²).

4 'Normal' (symmetrical failure) or otherwise as described.

ND = Not determined. NA = Not applicable.

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UKAS TESTING 0262

72418/F-K
Table/Sheet 1/16
Date of Test 14/6/22

CONCRETE TEST RESULTS
COMPRESSIVE STRENGTH AND DENSITY OF CORES
BS EN 12504-1:2019, BS EN 12390-3:2019 and BS EN 12390-7:2019

Sandberg Reference		F23910	F23911
Site Mark/Client Reference		H3 - P3/01	H3 - C2/01
Details: - Location Euston Tower		Position 3	Pile C2
- Date of coring		N/D	N/D
- Date received		30/5/22	30/5/22
Presence of abnormalities		None	None
Reinforcement, as received (diameter/distance)[1]	mm	None	None
Reinforcement, prepared (diameter/distance)[1]	mm	None	None
Aggregate, maximum nominal size	mm	20	20
Condition on receipt		Dry	Dry
Storage conditions		Ambient Air	Ambient Air
Method of End preparation (Cap/Ground)		Ground	Ground
Actual Core Lengths			
- Core length, as received	mm	415-445	275-295
- Relation to length, as-received	mm	70-245	70-245
Mean Prepared Length	mm	163	165
Mean Core Diameter d_m	mm	81	82
Length/Diameter ratio of prepared specimen	λ	2.01	2.01
Density[2] - As received	kg/m³	2320	2300
Exposure time before Test	16-24h	X	X
Estimation of prepared core excess voidage	%	1.5	1.5
Maximum Load at Failure	kN	308	264
Compressive Strength[3] (Measured Core Strength)	MPa (N/mm²)	59.8	50.0
Mode of Failure[4]		Normal	Normal
Deviations from standard		See footnote 2	See footnote 2
Remarks:			

1 Centre of bar to core end, before and after end preparation (eg. 20/100/40 = 20mm diameter bar, 100mm from the core end as-received and 40mm

2 Volume by measurement/water displacement, densities given to nearest 10kg/m³. Balance used complies to BSEN 12504-1:2009. (This will not reduce confidence in the test result.)

3 Compressive strength values given to nearest 0.1 MPa (N/mm²).

4 'Normal' (symmetrical failure) or otherwise as described.

ND = Not determined. NA = Not applicable.

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Table/Sheet 1/17
Date of Test 14/6/22

CONCRETE TEST RESULTS
COMPRESSIVE STRENGTH AND DENSITY OF CORES
BS EN 12504-1:2019, BS EN 12390-3:2019 and BS EN 12390-7:2019

Sandberg Reference		F23912	F23913
Site Mark/Client Reference		H3 - C2/02	H3 - R2/01
Details: - Location Euston Tower		Pile C2	Pile R2
- Date of coring		N/D	N/D
- Date received		30/5/22	30/5/22
Presence of abnormalities		None	None
Reinforcement, as received (diameter/distance)[1]	mm	None	7/130
Reinforcement, prepared (diameter/distance)[1]	mm	None	None
Aggregate, maximum nominal size	mm	22	20
Condition on receipt		Dry	Dry
Storage conditions		Ambient Air	Ambient Air
Method of End preparation (Cap/Ground)		Ground	Ground
Actual Core Lengths			
- Core length, as received	mm	425-430	500-530
- Relation to length, as-received	mm	100-275	200-375
Mean Prepared Length	mm	168	168
Mean Core Diameter d_m	mm	83	83
Length/Diameter ratio of prepared specimen	λ	2.02	2.02
Density[2] - As received	kg/m³	2290	2380
Exposure time before Test	16-24h	X	X
Estimation of prepared core excess voidage	%	2.0	3.0
Maximum Load at Failure	kN	261	381
Compressive Strength[3] (Measured Core Strength)	MPa (N/mm²)	48.2	70.4
Mode of Failure[4]		Normal	Normal
Deviations from standard		See footnote 2	See footnote 2
Remarks:			

1 Centre of bar to core end, before and after end preparation (eg. 20/100/40 = 20mm diameter bar, 100mm from the core end as-received and 40mm
2 Volume by measurement/water displacement, densities given to nearest 10kg/m³. Balance used complies to BSEN 12504-1:2009. (This will not reduce confidence in the test result.)
3 Compressive strength values given to nearest 0.1 MPa (N/mm²).
4 'Normal' (symmetrical failure) or otherwise as described.

ND = Not determined. NA = Not applicable.

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UKAS TESTING 0262

72418/F-K
Table/Sheet 1/18
Date of Test 14/6/22

CONCRETE TEST RESULTS
COMPRESSIVE STRENGTH AND DENSITY OF CORES
BS EN 12504-1:2019, BS EN 12390-3:2019 and BS EN 12390-7:2019

Sandberg Reference		F23914	F23915
Site Mark/Client Reference		H3 - R2/02	H3 - LC1/03
Details: - Location Euston Tower		Pile R2	Location 1
- Date of coring		N/D	N/D
- Date received		30/5/22	30/5/22
Presence of abnormalities		None	None
Reinforcement, as received (diameter/distance)[1]	mm	None	None
Reinforcement, prepared (diameter/distance)[1]	mm	None	None
Aggregate, maximum nominal size	mm	18	20
Condition on receipt		Dry	Dry
Storage conditions		Ambient Air	Ambient Air
Method of End preparation (Cap/Ground)		Ground	Ground
Actual Core Lengths			
- Core length, as received	mm	215-225	940-950
- Relation to length, as-received	mm	70-160	100-275
Mean Prepared Length	mm	86	170
Mean Core Diameter d_m	mm	83	83
Length/Diameter ratio of prepared specimen	λ	1.04	2.05
Density[2] - As received	kg/m³	2370	2340
Exposure time before Test	16-24h	X	X
Estimation of prepared core excess voidage	%	1.0	2.0
Maximum Load at Failure	kN	554	290
Compressive Strength[3] (Measured Core Strength)	MPa (N/mm²)	102.4 (84.0)*	53.6
Mode of Failure[4]		Explosive	Normal
Deviations from standard		See footnote 2	See footnote 2
Remarks:		*Corrected 2:1 Ratio	

1 Centre of bar to core end, before and after end preparation (eg. 20/100/40 = 20mm diameter bar, 100mm from the core end as-received and 40mm
2 Volume by measurement/water displacement, densities given to nearest 10kg/m³. Balance used complies to BSEN 12504-1:2009. (This will not reduce confidence in the test result.)
3 Compressive strength values given to nearest 0.1 MPa (N/mm²).
4 'Normal' (symmetrical failure) or otherwise as described.

ND = Not determined. NA = Not applicable.

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UKAS TESTING 0262

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Table/Sheet 1/19

Date of Test 14/6/22

CONCRETE TEST RESULTS
COMPRESSIVE STRENGTH AND DENSITY OF CORES
BS EN 12504-1:2019, BS EN 12390-3:2019 and BS EN 12390-7:2019

Sandberg Reference		F23916	F23917
Site Mark/Client Reference		H3 - LC1/06	H3 - LC2/02
Details: - Location Euston Tower		Location 1	Location 2
- Date of coring		N/D	N/D
- Date received		30/5/22	30/5/22
Presence of abnormalities		None	None
Reinforcement, as received (diameter/distance)[1]	mm	None	None
Reinforcement, prepared (diameter/distance)[1]	mm	None	None
Aggregate, maximum nominal size	mm	16	18
Condition on receipt		Dry	Dry
Storage conditions		Ambient Air	Ambient Air
Method of End preparation (Cap/Ground)		Ground	Ground
Actual Core Lengths			
- Core length, as received	mm	525-530	350-365
- Relation to length, as-received	mm	100-275	100-275
Mean Prepared Length	mm	169	169
Mean Core Diameter d_m	mm	83	84
Length/Diameter ratio of prepared specimen	λ	2.04	2.01
Density[2] - As received	kg/m³	2340	2360
Exposure time before Test	16-24h	X	X
Estimation of prepared core excess voidage	%	0.5	0.5
Maximum Load at Failure	kN	368	299
Compressive Strength[3] (Measured Core Strength)	MPa (N/mm²)	68.0	54.0
Mode of Failure[4]		Normal	Normal
Deviations from standard		See footnote 2	See footnote 2
Remarks:			

1 Centre of bar to core end, before and after end preparation (eg. 20/100/40 = 20mm diameter bar, 100mm from the core end as-received and 40mm

2 Volume by measurement/water displacement, densities given to nearest 10kg/m³. Balance used complies to BSEN 12504-1:2009. (This will not reduce confidence in the test result.)

3 Compressive strength values given to nearest 0.1 MPa (N/mm²).

4 'Normal' (symmetrical failure) or otherwise as described.

ND = Not determined. NA = Not applicable.

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UKAS TESTING 0262

72418/F-K
Table/Sheet 1/20
Date of Test 14/6/22

CONCRETE TEST RESULTS
COMPRESSIVE STRENGTH AND DENSITY OF CORES
BS EN 12504-1:2019, BS EN 12390-3:2019 and BS EN 12390-7:2019

Sandberg Reference		F23918	F23919
Site Mark/Client Reference		H3 - LC2/07	H3 - LC3
Details: - Location Euston Tower		Location 2	Location 3
- Date of coring		N/D	N/D
- Date received		30/5/22	30/5/22
Presence of abnormalities		None	Crack 0 - 70 mm
Reinforcement, as received (diameter/distance)[1]	mm	None	Sliver (⌀30)/155
Reinforcement, prepared (diameter/distance)[1]	mm	None	Sliver (⌀30)/38
Aggregate, maximum nominal size	mm	18	18
Condition on receipt		Dry	Dry
Storage conditions		Ambient Air	Ambient Air
Method of End preparation (Cap/Ground)		Ground	Ground
Actual Core Lengths			
- Core length, as received	mm	690-700	200-210
- Relation to length, as-received	mm	100-275	100-190
Mean Prepared Length	mm	171	86
Mean Core Diameter d_m	mm	84	82
Length/Diameter ratio of prepared specimen	λ	2.04	1.05
Density[2] - As received	kg/m³	2350	2370
Exposure time before Test	16-24h	X	X
Estimation of prepared core excess voidage	%	2.0	0.5
Maximum Load at Failure	kN	367	362
Compressive Strength[3] (Measured Core Strength)	MPa (N/mm²)	66.2	68.5 (56.2)*
Mode of Failure[4]		Explosive	Normal
Deviations from standard		See footnote 2	See footnote 2
Remarks:			*Corrected 2:1 Ratio

1 Centre of bar to core end, before and after end preparation (eg. 20/100/40 = 20mm diameter bar, 100mm from the core end as-received and 40mm
2 Volume by measurement/water displacement, densities given to nearest 10kg/m³. Balance used complies to BSEN 12504-1:2009. (This will not reduce confidence in the test result.)
3 Compressive strength values given to nearest 0.1 MPa (N/mm²).
4 'Normal' (symmetrical failure) or otherwise as described.

ND = Not determined. NA = Not applicable.

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UKAS TESTING 0262

72418/F-K

Table/Sheet 1/21

Date of Test 14/6/22

CONCRETE TEST RESULTS
COMPRESSIVE STRENGTH AND DENSITY OF CORES
BS EN 12504-1:2019, BS EN 12390-3:2019 and BS EN 12390-7:2019

Sandberg Reference		F23920	F23921
Site Mark/Client Reference		H3 - LC4	H3 - LC5
Details: - Location Euston Tower		Location 4	Location 5
- Date of coring		N/D	N/D
- Date received		30/5/22	30/5/22
Presence of abnormalities		Shear Crack 225 - 320 mm	None
Reinforcement, as received (diameter/distance)[1]	mm	None	None
Reinforcement, prepared (diameter/distance)[1]	mm	None	None
Aggregate, maximum nominal size	mm	20	20
Condition on receipt		Dry	Dry
Storage conditions		Ambient Air	Ambient Air
Method of End preparation (Cap/Ground)		Ground	Ground
Actual Core Lengths			
- Core length, as received	mm	380-415	485-500
- Relation to length, as-received	mm	170-345	100-275
Mean Prepared Length	mm	167	170
Mean Core Diameter d_m	mm	82	83
Length/Diameter ratio of prepared specimen	λ	2.04	2.05
Density[2] - As received	kg/m³	2300	2360
Exposure time before Test	16-24h	X	X
Estimation of prepared core excess voidage	%	2.0	1.5
Maximum Load at Failure	kN	202	278
Compressive Strength[3] (Measured Core Strength)	MPa (N/mm²)	38.3	51.4
Mode of Failure[4]		Shear	Normal
Deviations from standard		See footnote 2	See footnote 2
Remarks:			

1 Centre of bar to core end, before and after end preparation (eg. 20/100/40 = 20mm diameter bar, 100mm from the core end as-received and 40mm

2 Volume by measurement/water displacement, densities given to nearest 10kg/m³. Balance used complies to BSEN 12504-1:2009. (This will not reduce confidence in the test result.)

3 Compressive strength values given to nearest 0.1 MPa (N/mm²).

4 'Normal' (symmetrical failure) or otherwise as described.

ND = Not determined. NA = Not applicable.

TABLE 2
DEPTH OF CARBONATION
(2 SHEETS)

SANDBERG

72418/F-K

Table/Sheet

2/1

Date of Test

23/5/22

CONCRETE TEST RESULTS
DEPTH OF CARBONATION
TP/F/10

Sandberg Sample Reference	Client Reference	Depth of Carbonation, mm	Sandberg Sample Reference	Client Reference	Depth of Carbonation, mm
F23780		< 1			
F23781		< 1			
F23782		< 1			
F23783		< 1			
F23798		< 1			
F23799		< 1			
F23800		< 1			
F23801		< 1			

Note: Top surfaces of all samples seem to be broken.

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72418/F-K

Table/Sheet

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CONCRETE TEST RESULTS
DEPTH OF CARBONATION
TP/F/10

Date of Test

10/6/22

Sandberg Sample Reference	Client Reference	Depth of Carbonation, mm	Sandberg Sample Reference	Client Reference	Depth of Carbonation, mm
F23922	CL3.1	1			
F23923	CL3.2	1			
F23924	CL3.3	1			
F23925	CL3.4	1			

APPENDIX A
CONCRETE SAMPLES - SCHEDULE OF TESTS
(2 SHEETS)

72418 /k

ETF149 - EUSTON TOWER FOUNDATION INVESTIGATION WORKS
CONCRETE SAMPLES - SCHEDULE OF TESTS

Revision -
Issued 27/04/2022
Prepared by Diego Fenaroli
Checked by -

McGEE

rec 9/5/22
and 12/5/22

Actually H1-P2/06

Sample Reference	Heading	Location	Sandberg ref	Tests Required: Compressive Strength	Cement Content	Chloride Content	Alumina Content	Petrographic Test	Carbonation Test
H1-P1/02	1	Position 1	F23766	x	x	x			
H1-P1/07	1	Position 1	67	x		x			
H1-P2/02	1	Position 2	68	x	x		x		
H1-P2/07	1	Position 2	69	x			x		
H1-P3/01	1	Position 3	F23770	x	x	x			
H1-P3/07	1	Position 3	71	x	x	x			
H1-P4/02	1	Position 4	72	x	x	x		x	
H1-P4/05	1	Position 4	73	x	x				
H1-P5/02	1	Position 5	74	x	x	x			
H1-P5/07	1	Position 5	75	x	x				
H1-R2/01	1	Pile R2	76	x	x	x			
H1-R2/02	1	Pile R2	77	x		x		x	
H1-L3/01	1	Pile L3	78	x		x			
H1-L3/02	1	Pile L3	79	x	x	x			
CL1.1	1	Not Specitified	F23780						x <1 (Bottom Surface)
Cl1.2	1	Not Specitified	81						x
CL1.3	1	Not Specitified	82						x
CL1.4	1	Not Specitified	83						x
			84						
H2-P1/01	2	Position 1	F23784	x	x	x			
H2-P1/04	2	Position 1	85	x		x			
H2-P2/01	2	Position 2	86	x	x		x		
H2-P2/02	2	Position 2	87	x			x		
H2-P3/02	2	Position 3	88	x	x	x			
H2-P3/06	2	Position 3	89	x	x	x			
H2-P4/02	2	Position 4	F23790	x	x	x		x	
H2-P4/07	2	Position 4	91	x	x				
H2-P5/04	2	Position 5	92	x	x	x			
H2-P5/07	2	Position 5	93	x	x				
H2-L2/01	2	Pile R2	94	x	x	x			
H2-L2/02	2	Pile R2	95	x		x		x	
H2-R1/01	2	Pile L3	96	x		x			
H2-R1/02	2	Pile L3	97	x	x	x			
CL2.1	2	Not Specitified	98						x
CL2.2	2	Not Specitified	99						x
CL2.3	2	Not Specitified	F23800						x
CL2.4	2	Not Specitified	01						x

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ETF149 - EUSTON TOWER FOUNDATION INVESTIGATION WORKS

CONCRETE SAMPLES - SCHEDULE OF TESTS - Page 2 of 2

Revision A
Issued 20/05/2022
Prepared by Diego Penaroli
Checked by -

McGEE

Sample Reference	Heading	Location	Comments	Tests Required					
				Compressive Strength	Cement Content	Chloride Content	Alumina Content	Petrographic Test	Carbonation Test
H3-P1/01	3	Position 1	F23908	x	x	x			
H3-P2/01	3	Position 2	9	x		x			
H3-P3/01	3	Position 3	F23910	x	x		x		
H3-C2/01	3	Pile C2	1	x			x		
H3-C2/02	3	Pile C2	2	x	x	x			
H3-R2/01	3	Pile R2	3	x	x	x			
H3-R2/02	3	Pile R2	4	x	x	x		x	
H3-LC1/03	3	Location 1	5	x	x				
H3-LC1/06	3	Location 1	6	x	x	x			
H3-LC2/02	3	Location 2	7	x	x				
H3-LC2/07	3	Location 2	8	x	x	x			
H3-LC3	3	Location 3	9	x		x		x	
H3-LC4	3	Location 4	F23920	x		x			
H3-LC5	3	Location 5	1	x	x	x			
CL3.1	3	Not Specified	2						x
CL3.2	3	Not Specified	3						x
CL3.3	3	Not Specified	4						x
CL3.4	3	Not Specified	F23925						x

APPENDIX B
PETROGRAPHIC REPORT
(24 SHEETS)

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Report - 72418/K

REPORT ON THE PETROGRAPHIC EXAMINATION OF FOUR CONCRETE CORES (Client Ref: ETF149 – Euston Tower Foundation Investigation Works)

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This report comprises
6 pages of text
Appendix A – Petrographic description - 2 pages
Appendix B – Photographs - 4 page
Appendix C – Photomicrographs - 4 page
Appendix D – Glossary - 6 pages

For the attention of Diego Fenaroli

16 June 2022

Partners: N C D Sandberg S C Clarke D J Ellis R A Rogerson M A Eden J D French C Morgan
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1 INTRODUCTION

Four core samples for petrographic examination were received on 09 May 2022. As per the Client's instructions (PO reference M-ETF149/0056 dated 13 May 2022), it was requested that the cores were subject to petrographic examination. No information was provided on the age of the structure from which the core was obtained.

2 SAMPLES

The following samples were provided for petrographic examination:

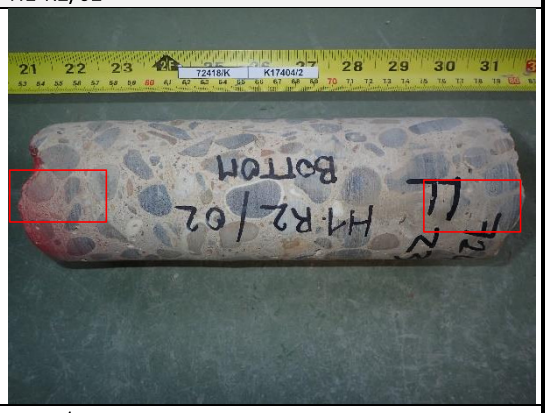
Laboratory reference	Client reference	Location	Core diameter, mm	Core length, mm
K17404/1	H1-P4/02	Position 4	82	414-426
K17404/2	H1-R2/02	Pile R2	82	236-255
K17404/3	H2-P4/02	Position 4	82	507-528
K17404/4	H2-L2/02	Pile R2	82	335-365

3 TEST METHODS

The petrographic testing was carried out in accordance with BS 1881-211: 2016[1].. A summary of the procedures followed and a glossary of terms used in the description of the samples are given in Appendix D. In brief, the following work was carried out.

(i) The samples were examined as received and photographed.

(ii) Fluorescent resin impregnated thin section were prepared from the locations highlighted in red illustrated below. The thin-section represented approximately 67 x 45 mm of concrete.

H1-P4/02	H1-R2/02
	
H2-P4/02	H2-L2/02

(iii) The thin section was examined with a Zeiss petrological photomicroscope and the distribution of porosity and microcracking was assessed from an examination of the thin sections in fluorescent light using the petrological microscope.

[1] BS 1881-211: 2016, Testing concrete. Procedure and terminology for the petrographic examination of hardened concrete

4 PETROGRAPHIC EXAMINATION RESULTS

4.1 Visual description of the samples

The visual descriptions of the samples as received is given in Table A1 in Appendix A and photographs illustrating the samples as received are given in Appendix B.

4.2 Petrographic description of the aggregate

A petrographic description of the aggregate in the samples is given in Table A2 in Appendix A.

4.3 Petrographic description of the paste

A petrographic description of the paste in the samples is given in Table A3 in Appendix A. Photomicrographs illustrating the typical appearance of the paste in the thin section are given in Appendix C.

5 DISCUSSION

5.1 Aggregate characteristics

(i) Coarse aggregate type

The coarse aggregate in all cores comprised natural flint gravel.

(ii) Fine aggregate type

The fine aggregate in all cores was dominated by quartz, with minor proportions of quartzite and flint, with variable trace proportions of ironstone, glauconite, sandstone and shell.

(iii) Potential aggregate properties

The dominant coarse aggregate constituent (flint) is a dense and robust rock type that would be expected to have a high compressive strength. The fine aggregate is dominated by quartz, which would be expected to have a combined normal water absorption value.

(iv) Alkali-aggregate reaction (AAR) and aggregate deterioration

The combination of coarse and fine aggregate is typically classified as being of potentially normal reactivity[2] with alkalis in cement paste. No evidence of alkali-silica reaction (ASR) was observed within any of the samples.

5.2 General paste characteristics in the samples at depth

(i) Binder type

The binder type for the samples examined was similar comprising ordinary Portland cement (OPC / CEM I[3]). No evidence of replacement materials, such as fly ash or ground granulated blastfurnace slab (GGBS) was observed.

(ii) Moisture ingress and paste alteration

No evidence of moisture ingress or paste alteration was observed in any of the cores.

(iii) Microporosity and apparent water/binder ratio

The current level of microporosity of the paste has been used in conjunction with laboratory control concretes to make a petrographic assessment of the water/binder ratio for these samples and the results are as follows:

Laboratory reference	Client reference	Apparent water / binder ratio	Apparent degree of leaching
K17404/1	H1-P4/02	0.40-0.50, typically 0.45	None
K17404/2	H1-R2/02	0.40-0.50, typically 0.45	None
K17404/3	H2-P4/02	0.45-0.55, typically 0.50	None
K17404/4	H2-L2/02	0.45-0.55, typically 0.50	None

[2] Concrete Society Technical Report No. 30, Alkali-silica reaction: minimizing the risk of damage to concrete, Guidance notes and model clauses for specifications, Report of a Concrete Society Working Party, 1999 (3rd edition)

[3] BS EN 197-1: 2011, Cement, Part 1: Composition, specifications and conformity criteria for common cements

5.3 Characteristics of the surface concrete

Other than carbonation, there was no change in the cement matrix at the surfaces of any of the samples.

5.4 Magnitude of deterioration

With respect to the Grades of Deterioration table given in Appendix D the grades of deterioration of these samples are considered to be as follows:

Laboratory reference	Client reference	Evidence of moisture ingress	Grade of Deterioration (1 = Low, 10 = high)
K17404/1	H1-P4/02	None	1
K17404/2	H1-R2/02	None	1
K17404/3	H2-P4/02	None	1
K17404/4	H2-L2/02	None	1

6 CONCLUSIONS

6.1 The samples comprised flint gravel coarse aggregate and natural quartzitic sand fine aggregate.

6.2 The sample exhibited a Portland-type binder (OPC/CEM I), which did not exhibit any cement replacement materials, such as fly ash or GGBS.

6.3 The samples exhibited a range of apparent water/cement ratios between 0.45 and 0.50.

6.4 The samples did not exhibit any evidence of distress or deterioration.

6.6 The combination of coarse aggregate and fine aggregate would be considered normal reactivity in respect of alkali-silica reaction. No evidence of ASR was observed in any of the samples.

7 REMARKS

The above concludes the requested programme of testing. Please do not hesitate to contact us if we can be of any further assistance in this matter.

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for GEOMATERIALS RESEARCH SERVICES
(part of Sandberg LLP)

Paul Bennett-Hughes, MGeol, FGS., C.Geol. EurGeol
Senior Associate

For the attention of Diego Fenaroli

16 June 2022

Samples can only be retained for a period of two months from the date of issue of the report unless we are instructed otherwise. Samples can be returned or retained for a further charge. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

APPENDIX A – PETROGRAPHIC DESCRIPTION OF THE SAMPLES – PETROGRAPHIC EXAMINATION OF HARDENED CONCRETE – ASTM C856-20

TABLE A1 OF 3: VISUAL DESCRIPTION OF THE SAMPLE

Lab Ref.	**K17404/1**	**K17404/2**	**K17404/3**	**K17404/4**
Client Ref	**H1-P4/02**	**H1-R2/02**	**H2-P4/02**	**H2-L2/02**
Core Dia. / length, mm	82 / 414-426	82 / 236-255	82 / 507-528	82 / 333-365
Description of outer end	Broken end	Broken end	Broken end	Broken end
Description of inner end	Broken end	Broken end	Broken end	Broken end
Paste colour	Light brown	Light brown	Light brown	Light brown
Macroscopic cracking	None	None	None	None
Carbonation at outer end:				
General depth (mm)	1.1	0.8	0 / 0.2	0
Maximum depth (mm)	1.4	2.0	1.6	0
Reinforcement:				
Diameter / Min depth of cover	-	-	-	An imprint of a bar was observed on the inner end surface.
Corrosion	-	-	-	None seen on the impression surface
Comment	-	-	-	-
Voids:				
Maximum size (mm)	7	13	14	21
Typical size (mm)	1	1	1	1
Estimated excess void content (%)	2	1	1	2
Deposits:	None	None	None	None

TABLE A2 OF 3: PETROGRAPHIC DESCRIPTION OF THE AGGREGATE

Lab Ref.	**K17404/1**	**K17404/2**	**K17404/3**	**K17404/4**
Client Ref	**H1-P4/02**	**H1-R2/02**	**H2-P4/02**	**H2-L2/02**
Coarse aggregate:				
Maximum size (mm)	19	20	21	19
Typical shape	Sub-rounded	Sub-rounded	Sub-rounded	Sub-rounded
Major rock types	Flint gravel	Flint gravel	Flint gravel	Flint gravel
Minor rock types	-	-	-	-
Trace rock types	-	-	-	-
Aggregate type	Natural gravel	Natural gravel	Natural gravel	Natural gravel
Additional comments	-	-	-	-
Fine aggregate:				
Grading	Fine (0/2)	Fine (0/2)	Fine (0/2)	Fine (0/2)
Typical shape	Sub-rounded to sub-angular	Sub-rounded to sub-angular	Sub-rounded to sub-angular	Sub-rounded to sub-angular
Major rock types	Quartz	Quartz	Quartz	Quartz
Minor rock types	Quartzite, Flint	Quartzite, Flint	Quartzite, Flint	Quartzite, Flint
Trace rock types	Ironstone, Shell	Ironstone, Shell	Ironstone, Glauconite, Sandstone	Ironstone, Glauconite, Sandstone, Shell
Aggregate type	Natural sand	Natural sand	Natural sand	Natural sand
Additional comments	None	None	None	None
Alkali-aggregate reaction:				
Gel on surfaces of sample as received	None	None	None	None
Gel in voids	None	None	None	None
Gel in cracks	None	None	None	None

APPENDIX A – PETROGRAPHIC DESCRIPTION OF THE SAMPLES – PETROGRAPHIC EXAMINATION OF HARDENED CONCRETE – ASTM C856-20

TABLE A3 OF 3: PETROGRAPHIC DESCRIPTION OF THE PASTE

GMRS Ref.	**K17404/1**	**K17404/2**	**K17404/3**	**K17404/4**
Client Ref.	**H1-P4/02**	**H1-R2/02**	**H2-P4/02**	**H2-L2/02**
Binder type	OPC / CEM I	OPC / CEM I	OPC / CEM I	OPC / CEM I
Cement replacement/additions	None	None	None	None
Portlandite (estimated. vol.% of paste)	6	5	6	5
Portlandite - typical crystal size, mm	0.03	0.03	0.025	0.03
Unhydrated cement (estimated. vol.% of paste)	3	2	3	6
Apparent water/cement ratio	0.40-0.50, typically 0.45	0.40-0.50, typically 0.45	0.45-0.55, typically 0.50	0.45-0.55, typically 0.5
Porosity:				
General level	Very low to moderate	Very low to moderate	Moderate	Moderate
Porosity distribution	Typically even	Typically even	Typically even	Typically even
Microcracking level	Low Microcracks observed rarely running between fine aggregate particles	Low Microcracks observed rarely running between fine aggregate particles	Low Microcracks observed rarely running between fine aggregate particles	Low Microcracks observed rarely running between fine aggregate particles
Crack fillings	None	None	None	None
Void fillings	None	None	None	None
Leaching	None	None	None	None

APPENDIX B – PHOTOGRAPHS ILLUSTRATING THE SAMPLE AS RECEIVED

Figure B1

Laboratory Ref: K17404/1
Client Ref: **H1-P4/02**

Profile view of the sample

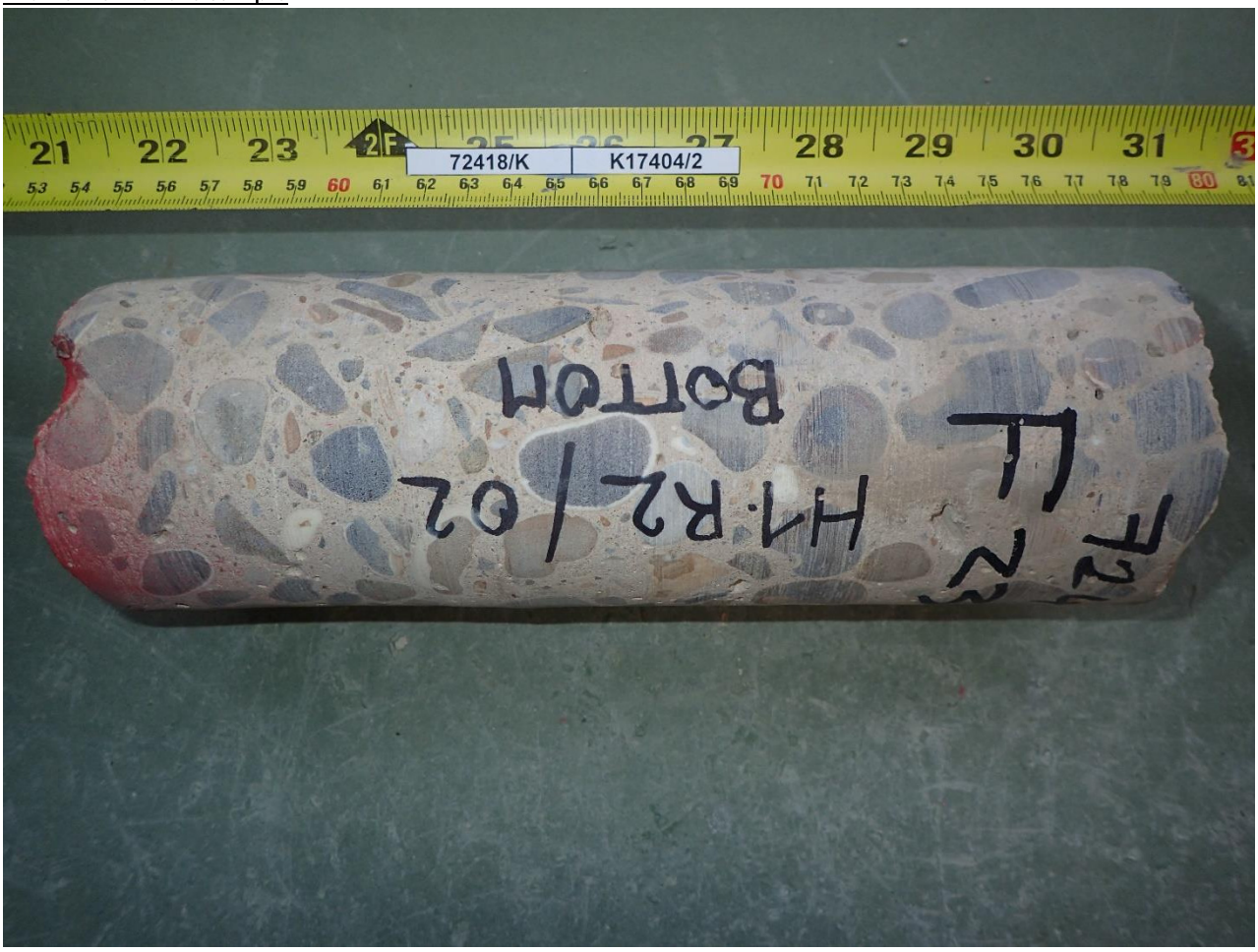
View of the outer surface

View of the inner surface

Figure B2

Laboratory Ref: K17404/2
Client Ref: **H1-R2/02**

Profile view of the sample



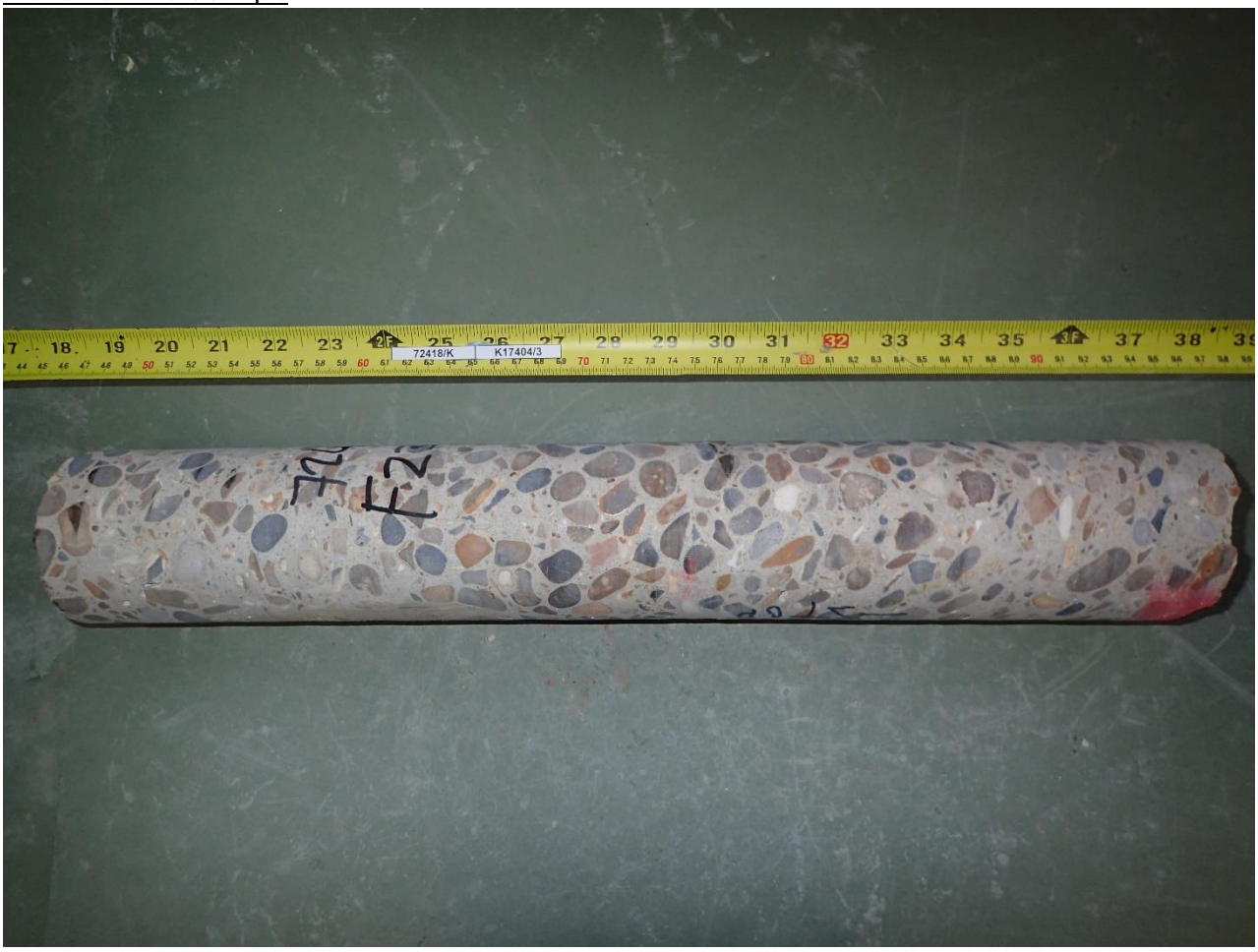
View of the outer surface

View of the inner surface

Figure B3

Laboratory Ref: K17404/3
Client Ref: **H2-P4/02**

Profile view of the sample



View of the outer surface

View of the inner surface

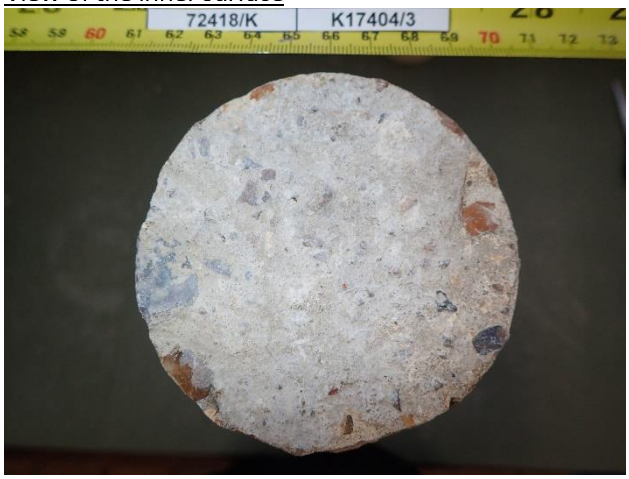
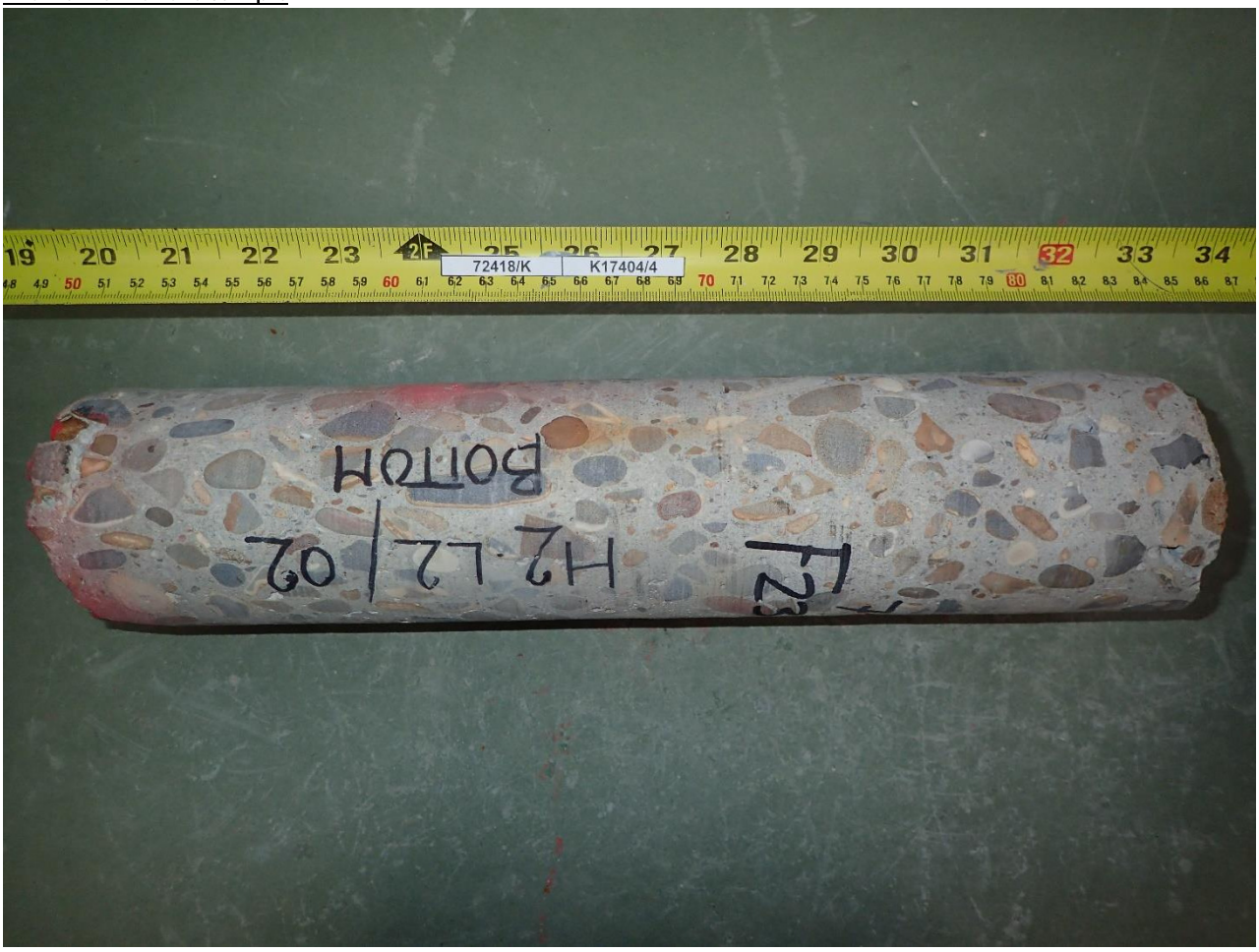


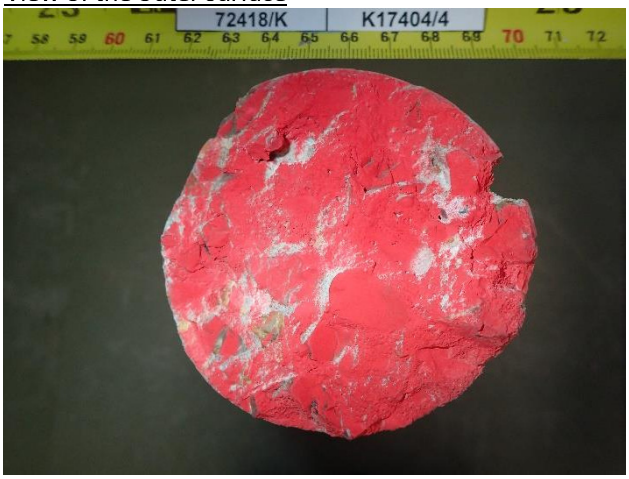
Figure B4

Laboratory Ref: K17404/4
Client Ref: **H2-L2/02**

Profile view of the sample



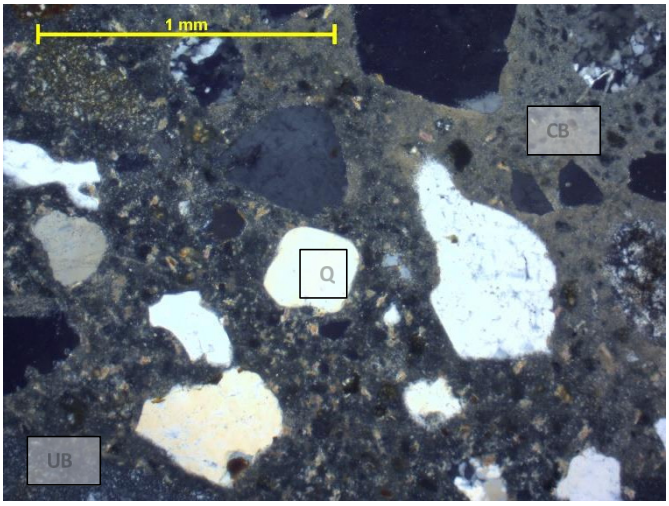
View of the outer surface



View of the inner surface

APPENDIX C – PHOTOMICROGRAPHS ILLUSTRATING THE THIN SECTIONS

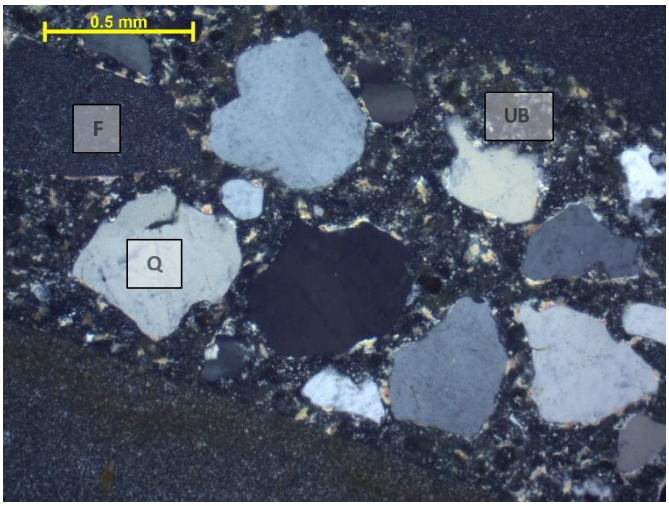
Figure C1 - **H1-P4/02**



Photomicrograph A:

View of the outer surface of the concrete, showing quartz (Q) aggregate particles, bound by carbonated (CB) and uncarbonated (UB) Portland-type cement matrix.

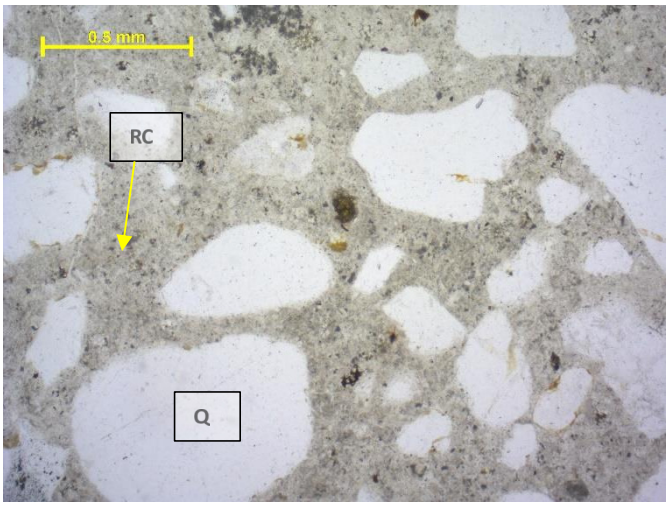
x50, Cross-polarised light



Photomicrograph B:

View of the concrete, showing flint (F) and quartz (Q) fine aggregate particles, bound by uncarbonated Portland-type cement matrix (UB), which includes portlandite crystallites.

x50, Cross-polarised light

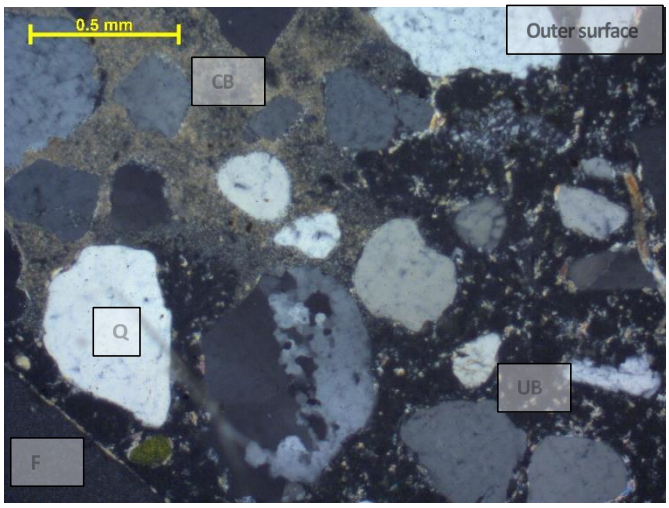


Photomicrograph C:

View of the concrete, showing quartz (Q) fine aggregate particles, bound by uncarbonated Portland-type cement matrix, which includes relict unhydrated cement grains (RC).

x50, Plane-polarised light

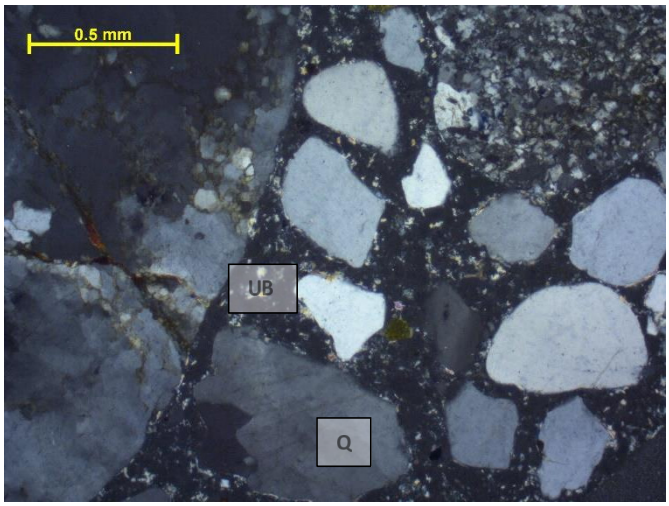
Figure C2 - **H1-R2/02**



Photomicrograph A:

View of the outer surface of the concrete, showing flint (F) and quartz (Q) aggregate particles, bound by carbonated (CB) and uncarbonated (UB) Portland-type cement matrix (CB).

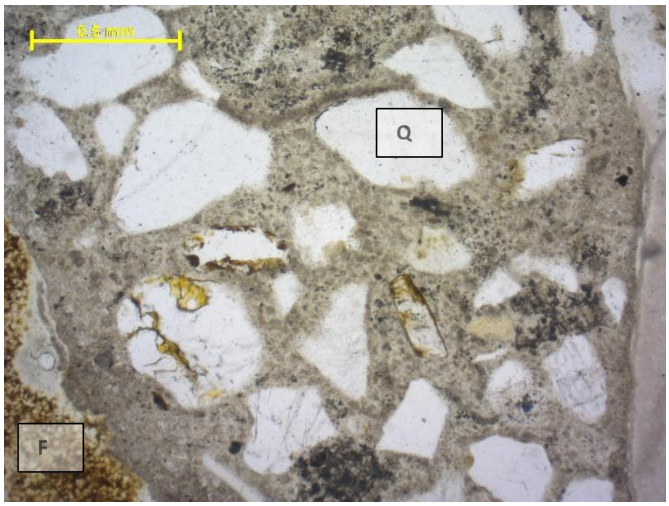
x50, Cross-polarised light



Photomicrograph B:

View of the concrete, showing quartz (Q) fine aggregate particles, bound by uncarbonated Portland-type cement matrix (UB), which includes portlandite crystallites.

x50, Cross-polarised light

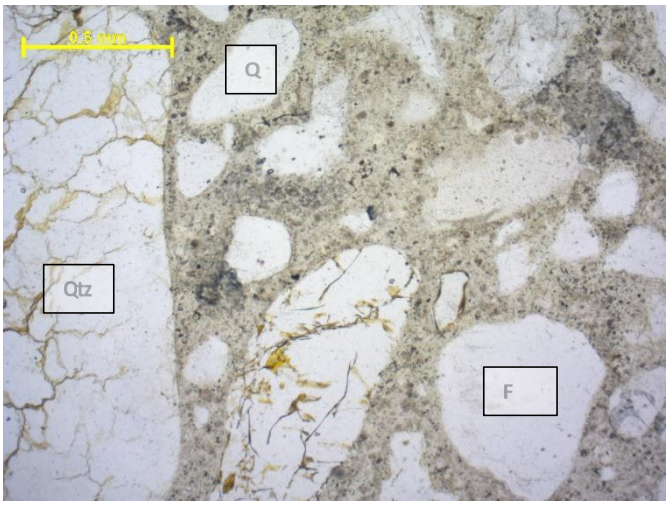


Photomicrograph C:

View of the concrete, showing quartz (Q) and flint (F) fine aggregate particles, bound by uncarbonated Portland-type cement matrix.

x50, Plane-polarised light

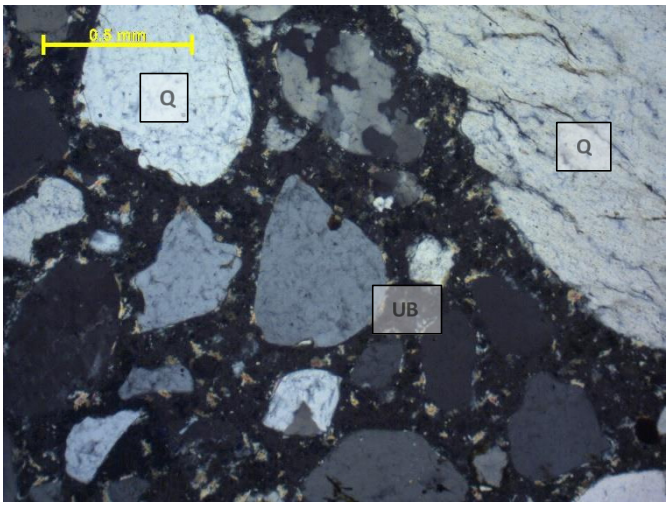
Figure C3 - **H2-P4/02**



Photomicrograph A:

View of the outer surface zone of the concrete, showing flint (F), quartz (Q) and quartzite (Qtz) aggregate particles, bound by uncarbonated Portland-type cement matrix (CB).

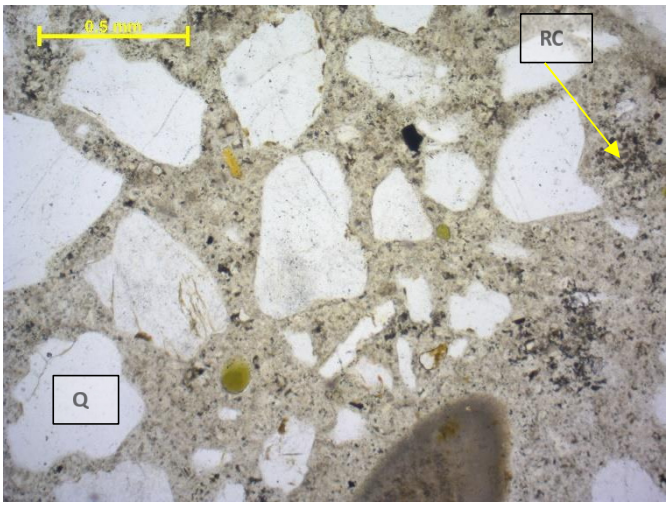
x50, Plane-polarised light



Photomicrograph B:

View of the concrete, showing quartz (Q) fine aggregate particles, bound by uncarbonated Portland-type cement matrix (UB), which includes portlandite crystallites.

x50, Cross-polarised light

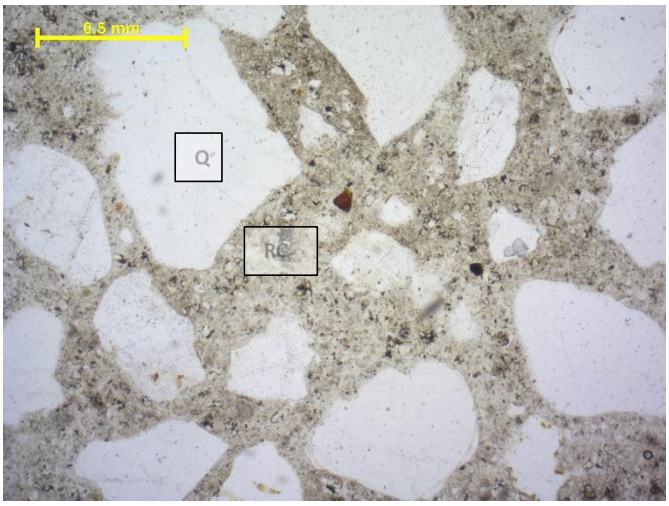


Photomicrograph C:

View of the concrete, showing quartz (Q) fine aggregate particles, bound by uncarbonated Portland-type cement matrix, which includes relict unhydrated cement grains (RC).

x50, Plane-polarised light

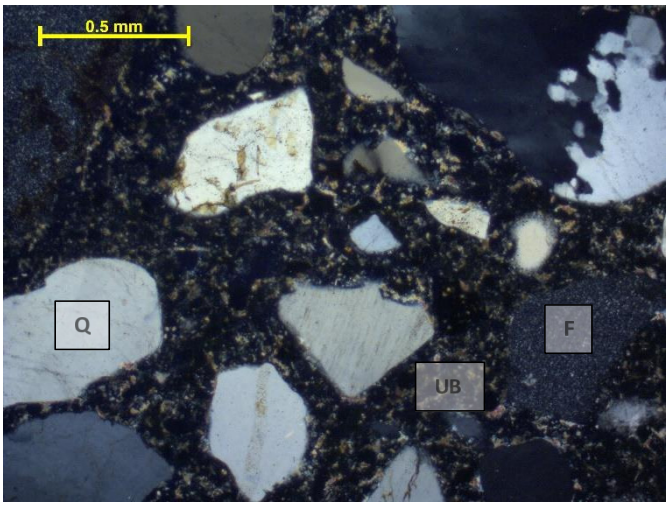
Figure C4 - **H2-L2/02**



Photomicrograph A:

View of the concrete, showing quartz (Q) aggregate particles, bound by uncarbonated Portland-type cement matrix, which includes relict cement grains (RC).

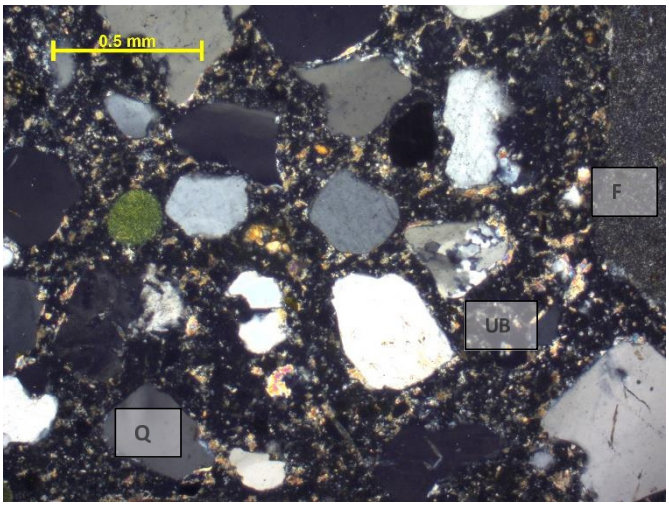
x50, Plane-polarised light



Photomicrograph B:

View of the concrete, showing flint (F) and quartz (Q) fine aggregate particles, bound by uncarbonated Portland-type cement matrix, which includes portlandite crystallites.

x50, Cross-polarised light



Photomicrograph C:

View of the concrete, showing quartz (Q) and flint (F) fine aggregate particles, bound by uncarbonated Portland-type cement matrix, which includes portlandite crystallites.

x50, Cross-polarised light

APPENDIX D – PETROGRAPHIC PROCEDURES AND GLOSSARY

GRADES OF DETERIORATION

COHERENT CONCRETE WITH NO MACROSCOPIC EVIDENCE OF DETERIORATION

1. Normal homogeneous concrete with few microcracks. Void content in keeping with the amount of paste. Paste structure in keeping with water/cement ratio. Portlandite abundance in keeping with water/cement ratio.

2. Slight deterioration, possibly through slightly excess voidage, excess microcracking, uneven paste composition, low levels of alkali-aggregate reaction, drying shrinkage, low temperature curing, possibly slightly lean mixture.

3. Moderately low deterioration, possibly with enhanced voidage, microcracking frequency fairly high, excessive paste porosity, evidence of leaching or other forms of secondary alteration, possible lean mixture.

COHERENT CONCRETE WITH MACROSCOPIC EVIDENCE OF DETERIORATION

4. Moderate deterioration, possibly with evident macrocracking or fine cracking, enhanced voidage, high frequencies of microcracking or fine cracks, evidence of significant leaching or other forms of secondary alteration, evidence of ettringite in cracks and voids, evidence of significant alkali-aggregate reaction with gel in cracks.

5. Moderate deterioration, possibly with much fine cracking and some macrocracking, high frequency of microcracks, very high excess voidage, evidence of paste recrystallization, excessive porosity, carbonation highly penetrative, evidence of significant alkali-aggregate in some abundance.

6. As for 5, but with enhanced level of deterioration but with concrete remaining intact.

CONCRETE LACKS COHERENCE AND IS FRIABLE OR READILY DECOMPOSED

7. Concrete shows deterioration and may be partly decomposed or friable. May be difficult to cut and to polish.

8. As 7, but enhanced friability and tending to break into fragments. Loose aggregate particles, honeycombed.

9. As 8, but enhanced deterioration. Much cracking and fragmentation.

10. All cementitious value, coherence and strength lost.

---

1. **Preliminary examination:**

   The samples are examined with the binocular microscope as received and their dimensions and main features are recorded. The features observed include the following.

   (a) The presence and position of reinforcement.

   (b) The extent to which reinforcement is corroded.

   (c) The nature of the external surfaces of the concrete.

   (d) The features and distribution of macro and fine cracks.

   (e) The distribution and size range and type of the aggregate.

   (f) The type and condition of the cement paste.

   (g) Any superficial evidence of deleterious processes affecting the concrete.

2. **Polished surfaces:**

   A plate is cut, where possible, from each sample. This is typically about 20 mm thick and usually provides as large a section of the sample as is possible and typically has a polished surface area of >100cm^2. The plate is polished to give a high-quality surface that can be examined with a high-quality binocular microscope or even with the petrological microscope if necessary. The polished plate is used to assess the following.

   (a) The size, shape and distribution of coarse and fine aggregate.

   (b) The coherence, colour, and porosity of the cement paste.

   (c) The distribution, size, shape, and content of voids.

   (d) The composition of the concrete in terms of the volume proportions of coarse aggregate, fine aggregate, paste and void.

   (e) The distribution of fine cracks and microcracks. Often the surface is stained with a penetrative dye, so that these cracks can be seen. Microcrack frequency is measured along lines of traverse across the surface.

   (f) The relative abundance of rock types in the coarse aggregate is assessed.

3. **Thin sections:**

   A thin section is prepared for each sample as appropriate. The section is usually made from a plate cut at right angles to the external surface of the concrete, so that the outer 70 mm or so of the concrete are included in the section. Sometimes it is more appropriate to make the section from inner parts of the concrete. This might be appropriate where specific problems are being investigated for example. The section normally measures about 50 x 70 mm.

   In manufacturing the thin section a plate some 10 mm thick is cut from the sample. This is impregnated with a penetrative resin containing a yellow fluorescent dye. The resin penetrates into cracks, microcracks, and capillary pores in the sample. One side of the impregnated plate is then polished and the plate is mounted on to a glass slide. The surplus sample is then removed and the plate is ground and polished to give a final thickness of between 20 and 30 micrometres. At all stages the cutting and grinding is carried out using an oil based coolant in order to prevent further hydration of the cement and excessive heating of the section. The thin section is covered and then examined with a high quality Zeiss petrological photomicroscope.

The thin section supplies the following types of information:

(a) Details of the rock types present in the coarse and fine aggregate and in particular structures seen within those rocks.

(b) Details of the aggregate properties are measured such as the degree of strain in quartz.

(c) The size, distribution and abundance of phases in the cement paste are assessed including, for example, the occurrence of calcium hydroxide and the amount of residual unhydrated clinker.

(d) The presence of cement replacement phases such as slag or PFA can usually be recognised (though the amount of these phases cannot be judged accurately). The presence of high alumina cement can be detected and the type of cement clinker can often be assessed.

(e) Any products of processes of deterioration of either the cement paste or the aggregate can be recognised.

4. Broken surfaces:

After the specially prepared surfaces and sections are completed, the remainder of the core is examined with the binocular microscope. In particular, the pieces are broken to produce fresh surfaces. These surfaces allow the contents of voids to be studied and the nature of aggregate surfaces or crack surfaces to be investigated.

5. Composition:

Where the size of the sample is appropriate the composition of the sample can be measured using either the polished slice or the thin section, depending on the size of the sample and on details of the aggregate type and paste. The thin section is preferable, for example where large quantities of dust are present. The volume proportions are found by the method of point counting using a mechanical stage. The amount of coarse aggregate can also be assessed by this method if a distinction can be made between coarse and fine aggregate. The results obtained usually represent the sample reasonably, but may not represent the concrete.

6. Water/cement ratio:

The hydration processes of cement paste vary significantly with the original water/cement ratio. Concretes with a low water/cement ratio tend to leave substantial quantities of unhydrated cement clinker and to develop only limited amounts of coarsely crystalline calcium hydroxide. In particular, the extent to which calcium hydroxide is separated into layers on aggregate surfaces and occurs in voids and on void surfaces varies with the original water/cement ratio. The number and proportion of unhydrated cement clinker particles varies inversely with the original water/cement ratio. Comparison with standard concretes made with known water/cement ratios visually, and by measurement allows the water/cement ratio of the cement paste to be assessed directly. The standard error attached to the estimation of water/cement ratio by this means is considered to be approximately +/- 0.1 for unaltered concrete of similar type that in the Sandberg Reference Concrete Collection. It should be noted that aggregate dust, the presence of admixtures and additives all contribute to uncertainty in the petrographic measurement of the water/cement ratio of the concrete.

7. Glossary:

The following is a short list of technical terms in common use in the petrographic examination of concrete.[4]

Alkali-aggregate reaction (AAR): This is a broad term encompassing both alkali carbonate reaction (ACR) and alkali silicate reaction and alkali-silica reaction (ASR). It refers to reactions between alkalies in usually derived from the cement in the cement paste and aggregate particles. Some forms of alkali-aggregate reaction such as ASR result in the formation of an alkali-silicate gel that is readily detectable in thin sections. Other forms of alkali-carbonate reaction such as ACR may not result gel formation.

Alkali carbonate reaction (ACR): This form of reaction is very rare in the UK and there is some debate over the precise mechanism of this reaction. Most documented cases of ACR involve argillaceous, dolomitic limestone. The reaction which is expansive is rarely associated with the formation of obvious gel deposits.

Alkali-silicate/silica reaction (ASR): This is by far the most common form of AAR and generally results from reactions between either microcrystalline, cryptocrystalline, or substantially strained quartz and associated microcrystalline quartz at grain margins and alkalies in cement paste. On rare occasions, ASR may result from the presence of highly reactive opaline silica in aggregate. Petrographic examination is the definitive method for the detection of this form of concrete deterioration. The reaction commonly results in the development of cracking that originates within reactive aggregate particles and continues into the surrounding paste and gel deposits are commonly associated with the occurrence of ASR.

Calcium aluminate cement (CAC): This is a general term that encompasses high alumina cement (HAC) as well as some of the more modern aluminate cements used in rapid setting concrete repair materials or some types of sprayed concretes and grouts.

Carbonation: Carbonation most commonly results from the exposure of concrete to atmospheric carbon dioxide and results in the conversion of portlandite to calcium carbonate and also affects some of the cement hydrate phases forming complex calcium silicate hydrate carbonate compounds. In damp conditions or in concrete exposed to moisture containing dissolved carbon dioxide, coarse-textured carbonation may develop and coarse crystals of calcium carbonate may develop within the cement paste. "Popcorn" calcite deposition (PCD) is one form of this type of carbonation.

Cracking: Cracks are classified using the following terms:

- **Macroscopic cracks:** These cracks are visible in the hand specimen or with the aid of a stereo binocular microscope and are typically >0.01mm wide.
- **Macrocrack:** These are cracks that are readily visible to the naked eye without the aid of a stereo binocular microscope and are typically >0.1mm wide.
- **Fine crack:** These are cracks that are only readily visible with a stereo binocular microscope or in thin section. Cracks of this type are typically between 0.01 and 0.10mm wide.
- **Microcracking:** These cracks cannot be detected with a stereo binocular microscope. They are typically <0.01mm wide and are most easily seen in petrographic thin sections containing fluorescent dye and by using fluorescent illumination.

Delayed ettringite formation (DEF): This term describes deleterious ettringite formation in concrete that has been cured at elevated temperatures, typically >65°C. Ettringite formation resulting from this process can be readily detected using thin sections and the ettringite tends to form in peripheral cracks around aggregate surfaces and sometimes within microcracks in the paste.

[4] From APG SR-2

Drying shrinkage cracking: Drying shrinkage microcracks tend to develop radially around the surfaces of fine aggregate particles in concrete. Fine cracks and macrocracks caused by drying shrinkage tend to be parallel-sided cracks and orientated perpendicular to concrete surfaces.

Ettringite: This is a very common calcium-alumino-sulfate mineral. It occurs in most concretes where moisture ingress has occurred. Ettringite formation may be deleterious in the case of DEF or sulfate attack where it can give rise to a deleterious expansion and distinctive forms of cracking but in most cases secondary ettringite formation is non-deleterious.

Fine crack: See section on cracking.

GGBS: Ground, granulated blast furnace slag. This material is commonly employed as a cement replacement material in concrete and can be easily recognised in thin section. The GGBS particles are typically angular and are composed almost entirely of glass.

High alumina cement (HAC): This is a form of cement manufactured from the fusion of limestone and bauxite. It is readily distinguishable in thin section from most other types of cement. Petrographic examination is the definitive method for the detection of carbonation in concrete containing HAC.

Macrocrack: See section on cracking.

Macroscopic: This is a general term referring to features that are visible to the naked eye or with the aid of a stereo microscope.

Microcrack: See section on cracking.

Microsilica: Well dispersed microsilica cannot be directly observed in thin sections. However, distinctive clots of undispersed microsilica area commonly present in concrete containing microsilica – even where most of the microsilica is well dispersed. Microsilica clots are isotropic, and tend to be spherical and are sometimes concentrically layered. They are typically <100µm in diameter.

PFA: Pulverised fly ash. This material is a by-product of coal burning power stations and can be readily recognised in thin sections, where it is visible as spherical glass particles, some of which may be hollow. Hollow PFA particles may be referred to as cenospheres. PFA is also commonly associated with small quantities of graphite particles that appear black in thin section.

Plastic shrinkage cracking: This form of cracking occurs in concrete prior to its hardening. It can be distinguished from many other forms of cracking in that it results in cracks that are generally restricted to the cement paste and are non-parallel sided. Cracks of this type typically appear on the concrete surface and commonly diminish in width rapidly with depth and the paste surrounding cracks of this type is commonly of locally high porosity reflecting the migration of moisture towards the cracks during the drying out of the concrete surfaces.

Porosity: This term is distinct from void content. It refers to microscopic pores within cement hydrates. Porosity is directly related to water/cement ratio, but is also strongly influenced by curing and many forms of concrete deterioration. Porosity is sometimes used as an indicator of water/cement ratio in hardened concrete.

Portland cement: Portland cement is the most common form of binder used in concrete and is manufactured from the burning of limestone and an alumino-silicate rock (clay or shale) at temperatures of up to 1500°C. There are many forms of Portland cement and it is commonly possible to distinguish sulfate-resisting and white Portland cement and ordinary Portland cement using petrographic thin sections.

Portlandite: Portlandite is calcium hydroxide and is one of the products formed during cement hydration. Portlandite is readily recognisable in thin sections and has a distinctively high birefringence that contrasts with the much lower birefringence of the hydrated cement phases.

Sulfate attack: This is a general term encompassing both conventional sulfate attack resulting in gypsum and ettringite formation, but also includes sulfate attack associated with thaumasite formation. Sulfate attack can be readily recognised in thin sections and commonly results in the development of surface-parallel cracks infilled with ettringite or thaumasite.

Thaumasite: This is a carbonate-sulfate calcium hydrate mineral with a complex composition. It is a common reaction product in concrete exposed to moisture containing both carbonate and sulfate ions. Thaumasite is most commonly encountered in concrete exposed to temperatures of <4°C. Some forms of thaumasite can be readily distinguished from ettringite and have a high birefringence. However, some forms of thaumasite have a much lower birefringence and can be difficult to distinguish from ettringite without recourse to SEM micro-analysis.

Void: This describes empty spaces present in concrete that are typically greater than about 5 micrometres in diameter. It encompasses both entrained air voids (spherical voids typically <1mm in diameter) as well as much larger entrapped air voids. It should be noted that it is possible for concrete to have a low porosity, but a high void content.

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9 June 2022

Your Ref: M-ETF149/0056
Our Ref: 72435/M

McGee Group (Holdings) Limited
5 Hatfields
Level 9 Alto Tower
London
SE1 9PG

For the attention of Diego Fenaroli

Dear Diego

Re: Euston Tower - Steel Testing

Please find attached certificates 1 to 35 of 35 for your records.

Yours sincerely

Mariyana Pencheva
Secretary to Metallurgy Department

Enc.

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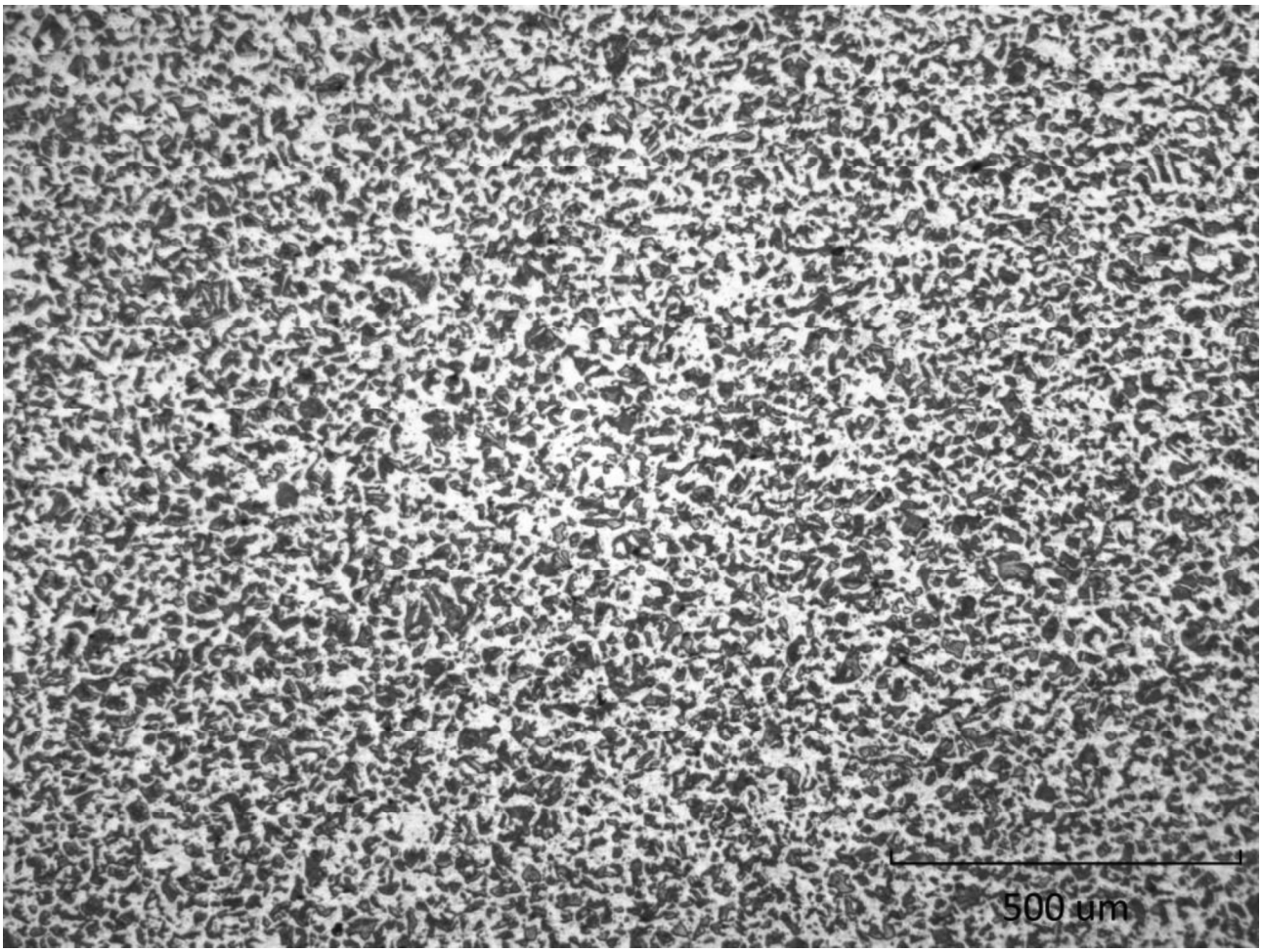
TEST CERTIFICATE
METALLOGRAPHIC EXAMINATION
TO BS EN ISO 643:2020

Certificate:	72435/M/1	**Order Ref:**	M-ETF149/0056
Samples Received:	12 May 2022	**Tested By:**	VM
Test Date:	24 May 2022	**Test Procedure:**	M5/3/3 & M13/3/2
Client Details:	McGee Group, 5 Hatfields, Level 9 Alto Tower, London, SE1 9PG.		



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Examined By:	AK	Mag: x 84	Etchant:	2% Nital	Grain Size Index: 7.5
Comments:	Material is a ferrite matrix with pearlite present. The image shows the material to be a carbon steel with an even and homogenous uniform structure.				

For Sandberg LLP

Date: 9 June 2022

Neale Fetter - Assistant Manager Metallurgy Department

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Test Date:	24 May 2022	**Test Procedure:**	M5/3/3 & M13/3/2
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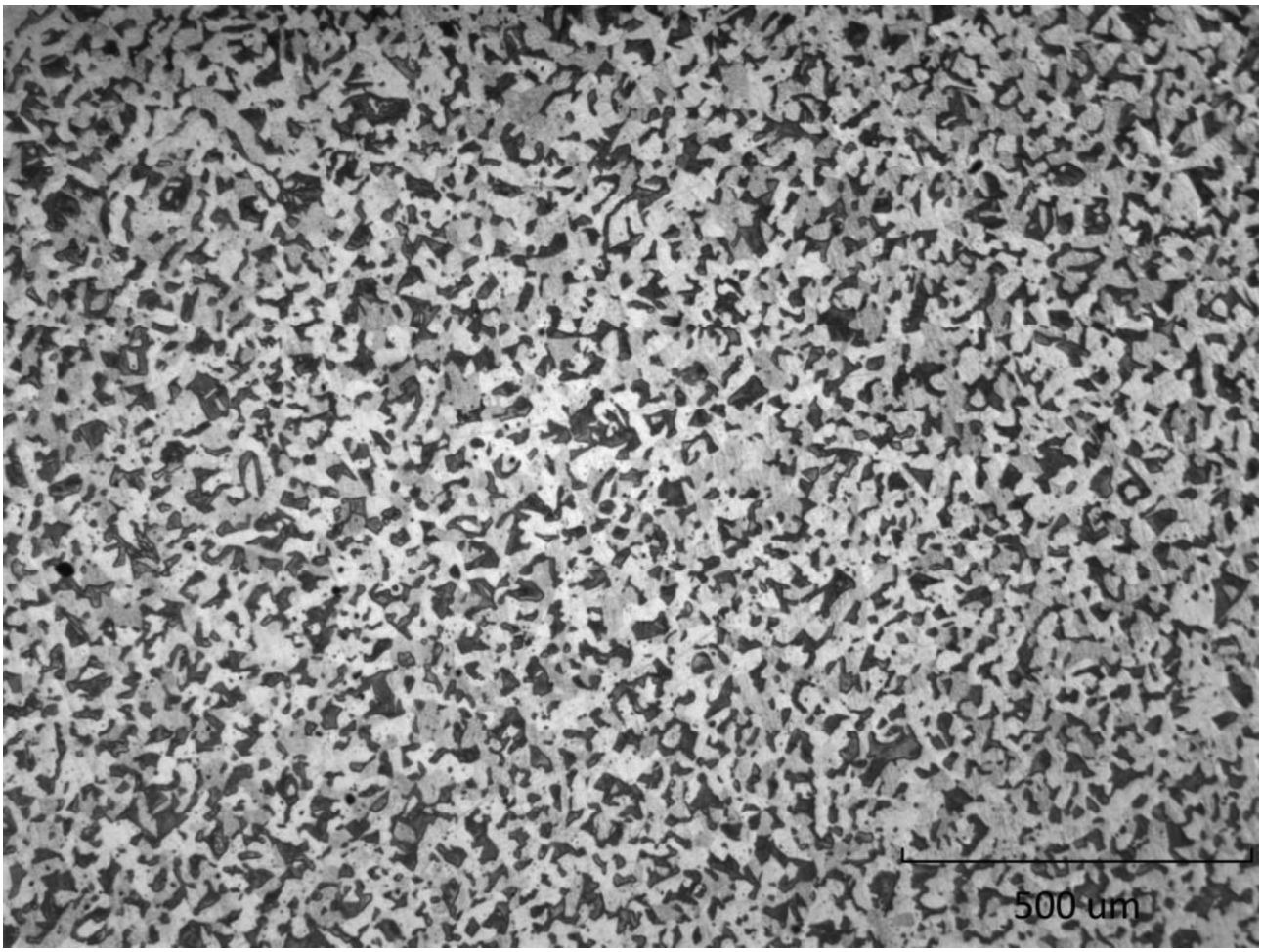

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Comments:	Material is a ferrite matrix with pearlite present. The image shows the material to be a carbon steel with an even and homogenous uniform structure.				

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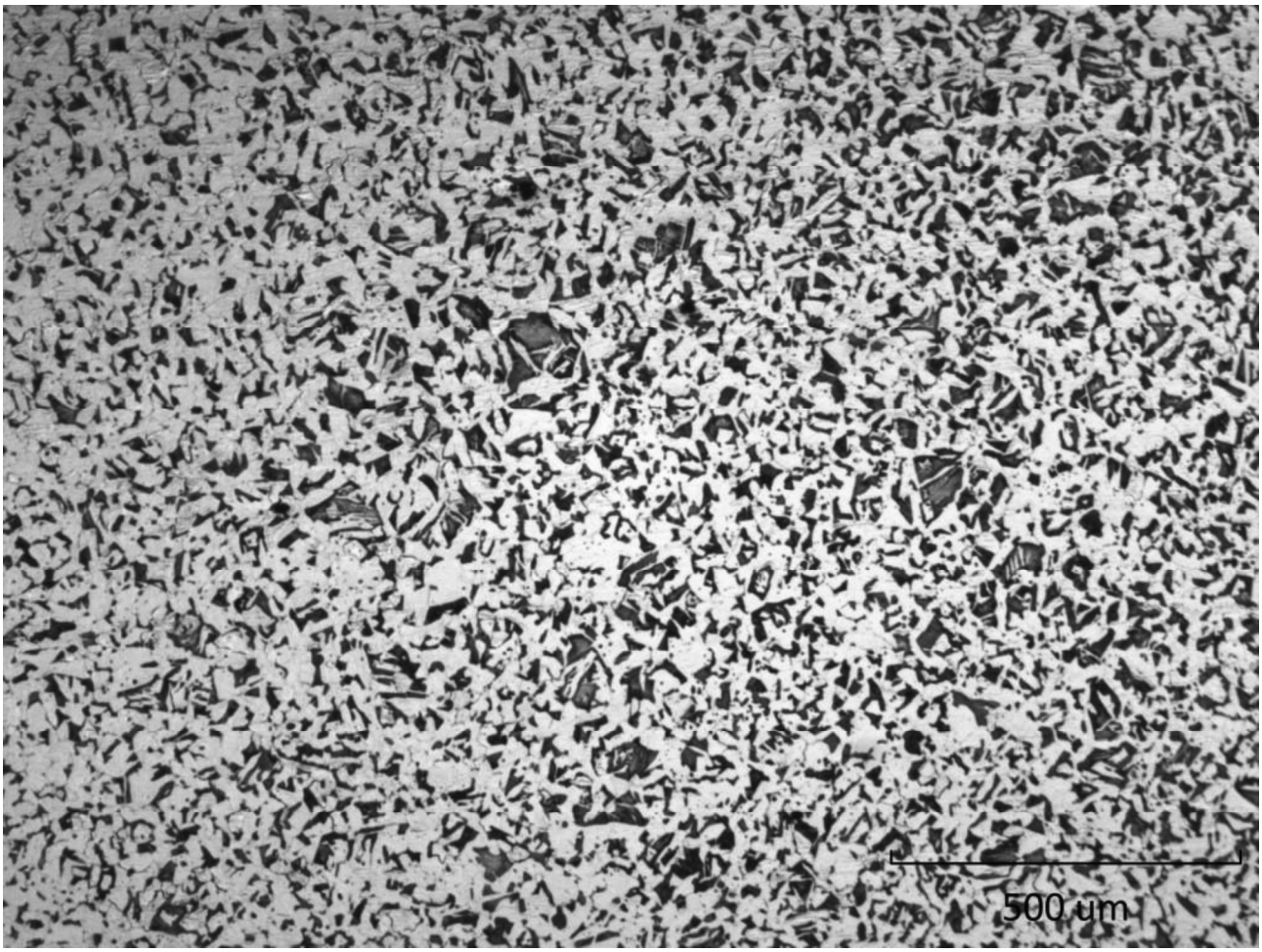

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Comments:	Material is a ferrite matrix with pearlite present. The image shows the material to be a carbon steel with an even and homogenous uniform structure.				

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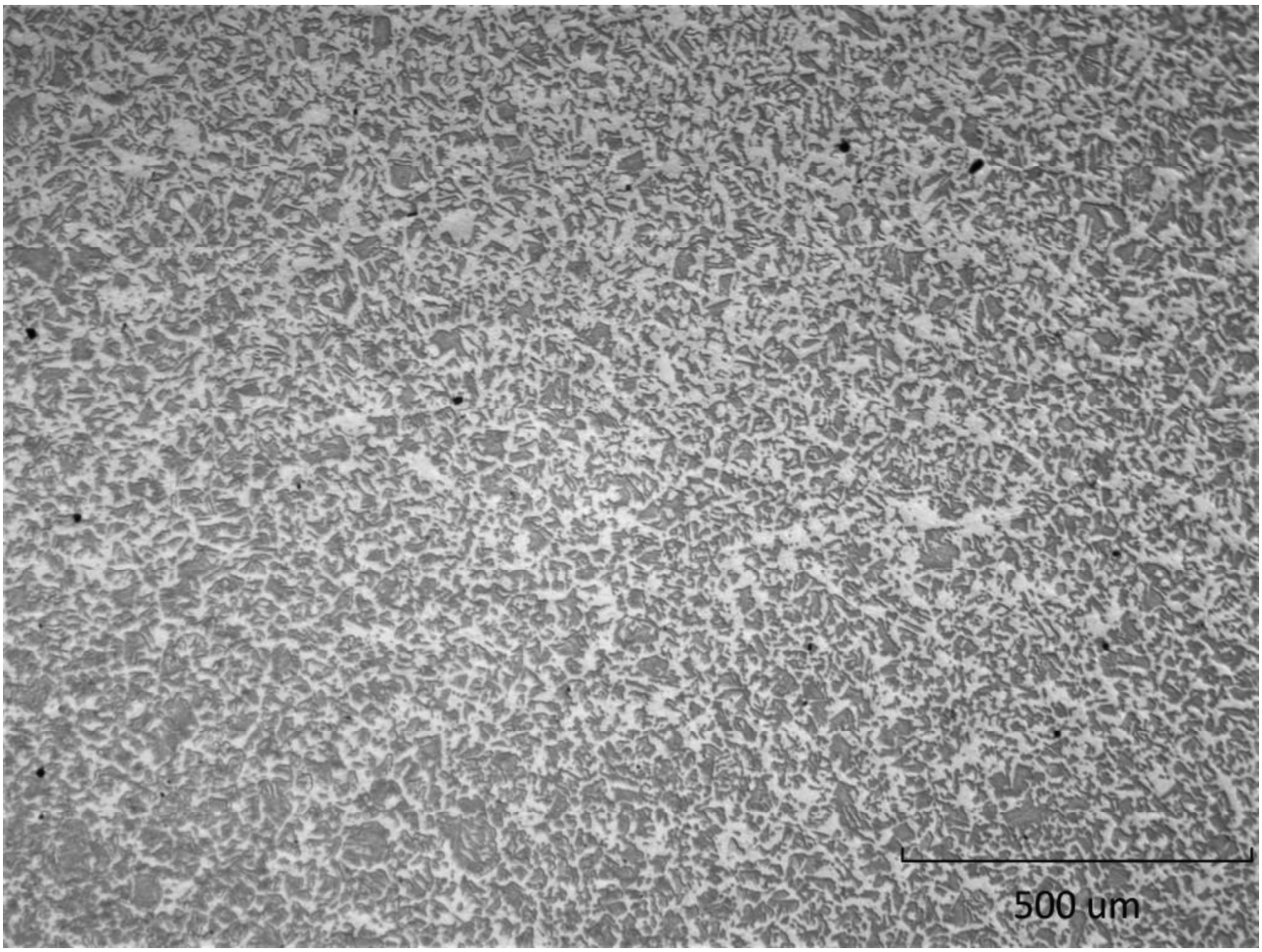

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Comments:	Material is a ferrite matrix with pearlite present. The image shows the material to be a carbon steel with an even and homogenous uniform structure.				

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Test Date:	24 May 2022	**Test Procedure:**	M5/3/3 & M13/3/2
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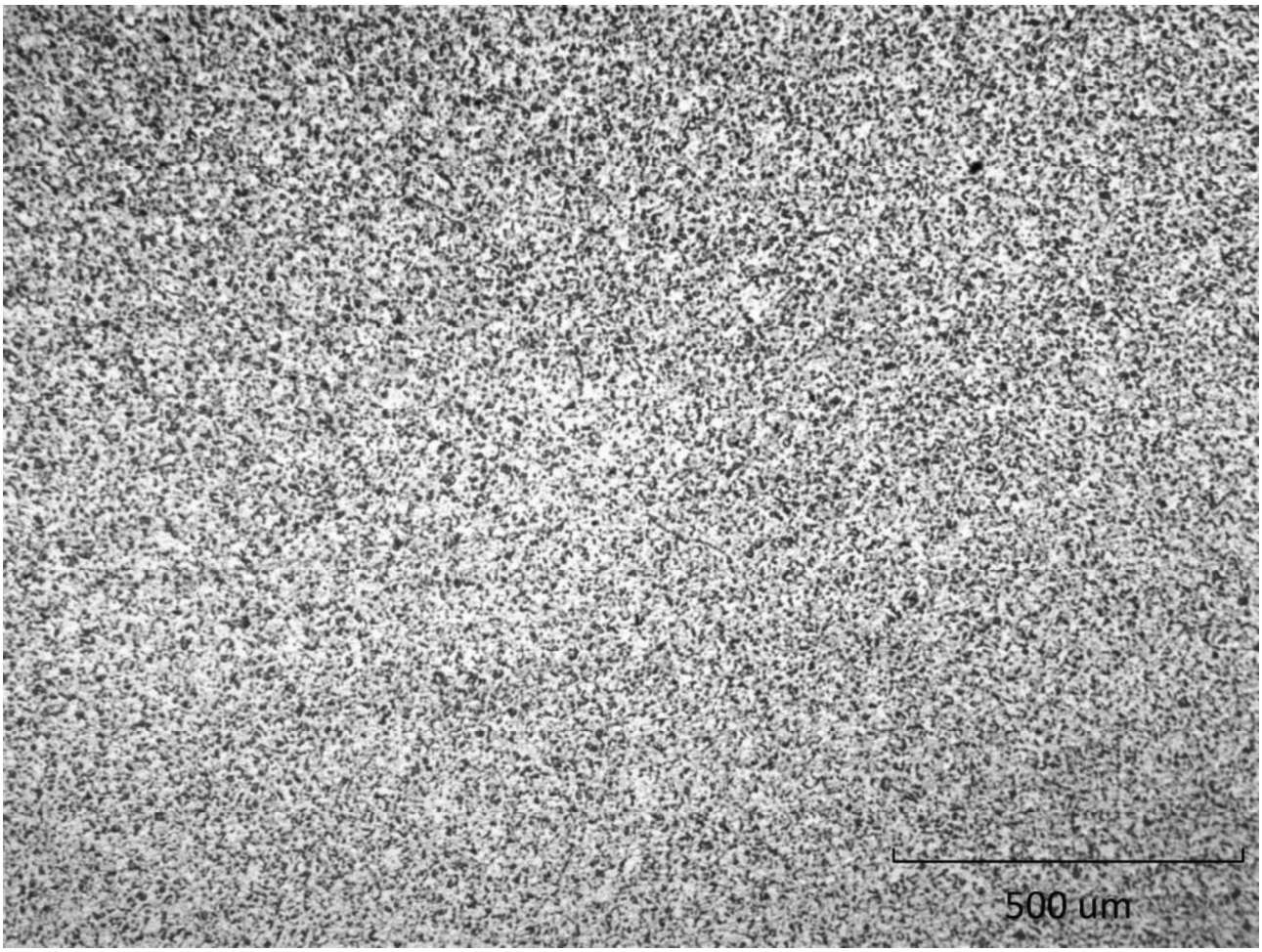

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Comments:	Material is a ferrite matrix with pearlite present. The image shows the material to be a carbon steel with an even and homogenous uniform structure.				

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Samples Received:	12 May 2022	**Tested By:**	VM
Test Date:	24 May 2022	**Test Procedure:**	M5/3/3 & M13/3/2
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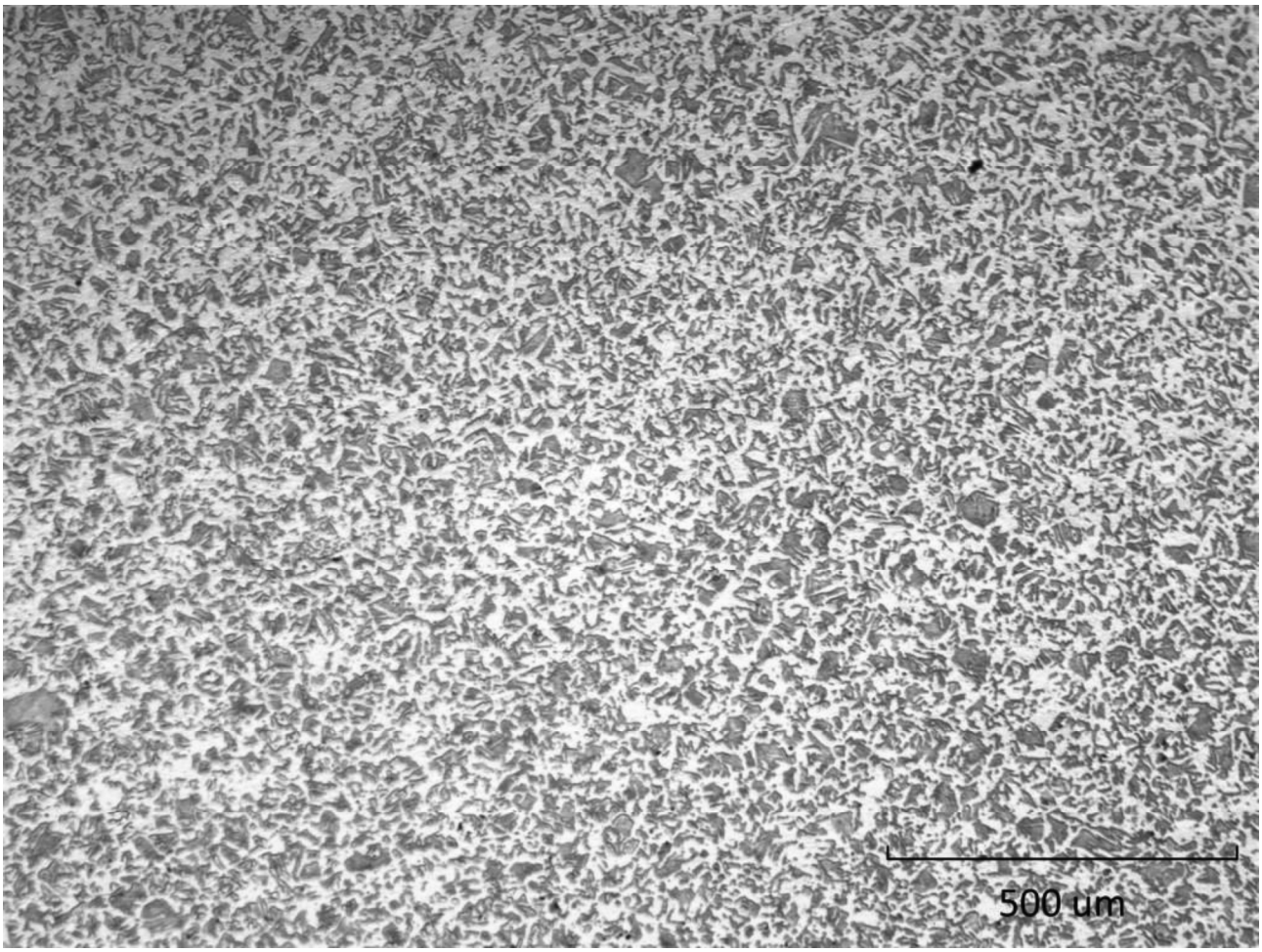

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Examined By:	AK	Mag: x 84	Etchant:	2% Nital	Grain Size Index: 7.0
Comments:	Material is a ferrite matrix with pearlite present. The image shows the material to be a carbon steel with an even and homogenous uniform structure.				

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Samples Received:	12 May 2022	**Tested By:**	VM
Test Date:	24 May 2022	**Test Procedure:**	M5/3/3 & M13/3/2
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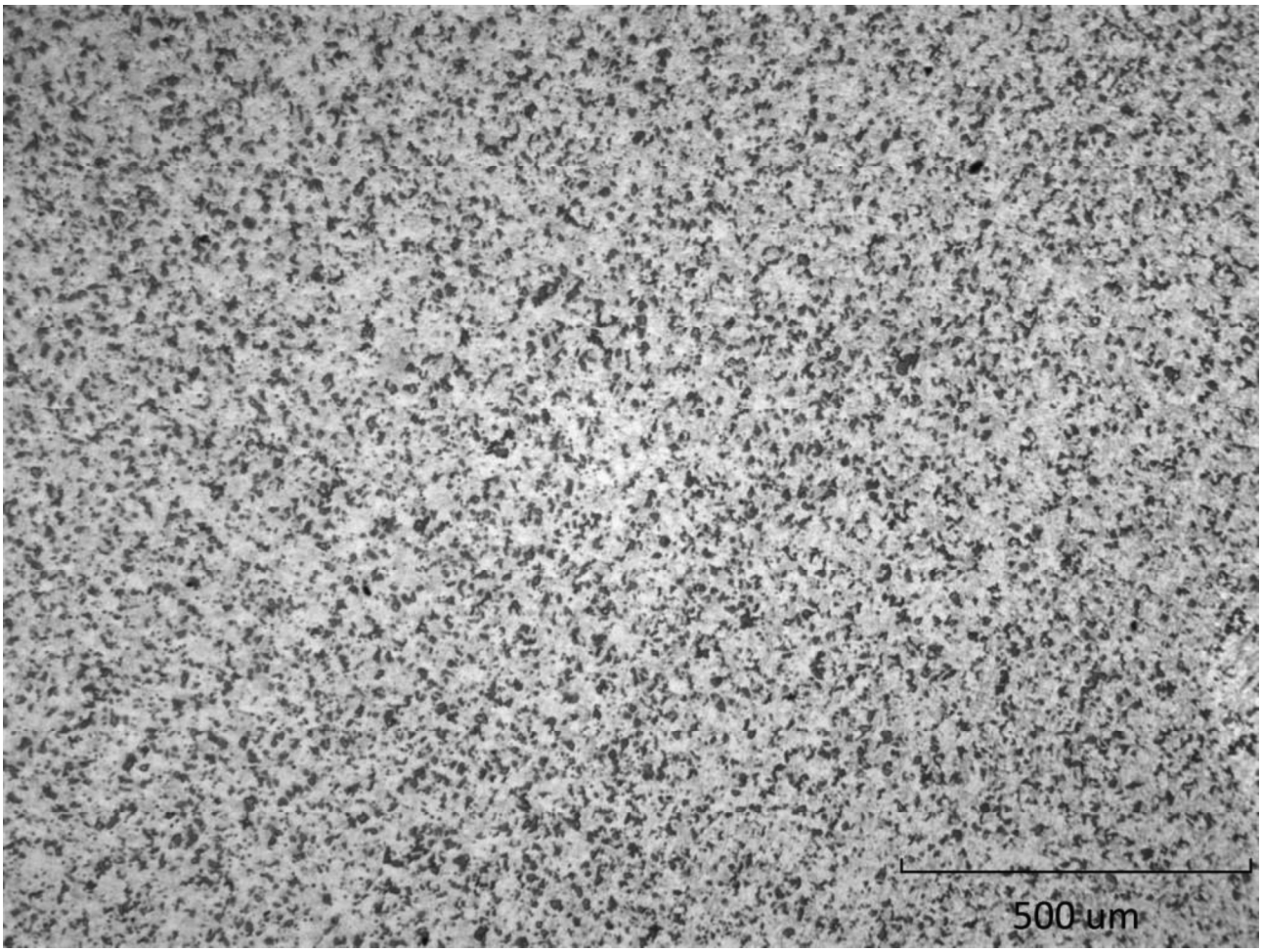

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Comments:	Material is a ferrite matrix with pearlite present. The image shows the material to be a carbon steel with an even and homogenous uniform structure.				

For Sandberg LLP

Date: 9 June 2022

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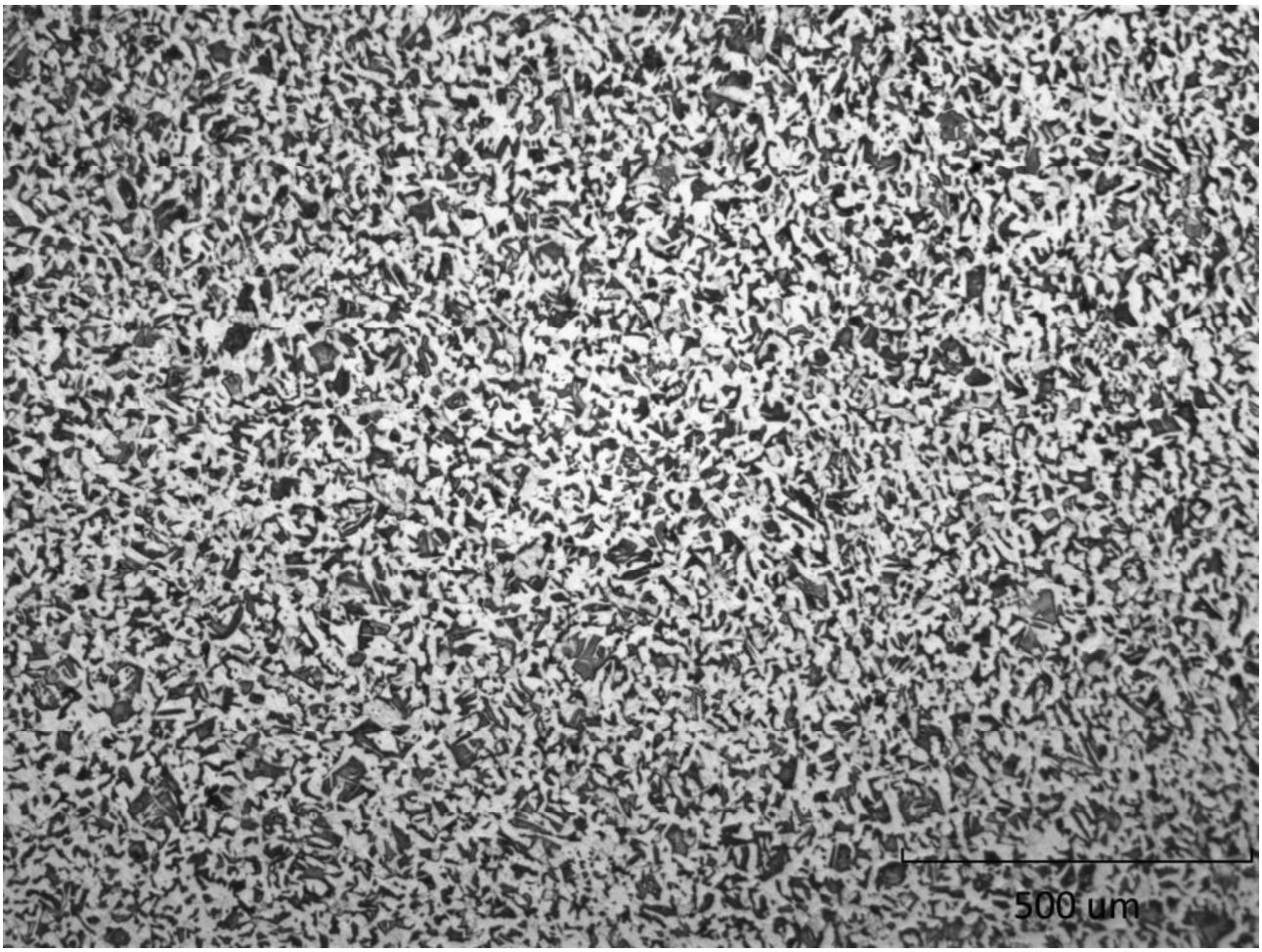
Certificate:	72435/M/8	**Order Ref:**	M-ETF149/0056
Samples Received:	12 May 2022	**Tested By:**	VM
Test Date:	24 May 2022	**Test Procedure:**	M5/3/3 & M13/3/2
Client Details:	McGee Group, 5 Hatfields, Level 9 Alto Tower, London, SE1 9PG.		



Met Lab Ref:	MC 416		Client Ref:	H2-P2/B1 25 mm Ø Square Twisted Bar	
Examined By:	AK	Mag: x 84	Etchant:	2% Nital	Grain Size Index: 7.0
Comments:	Material is a ferrite matrix with pearlite present. The image shows the material to be a carbon steel with an even and homogenous uniform structure.				

For Sandberg LLP

Date: 9 June 2022

N. Fetter

Neale Fetter - Assistant Manager Metallurgy Department

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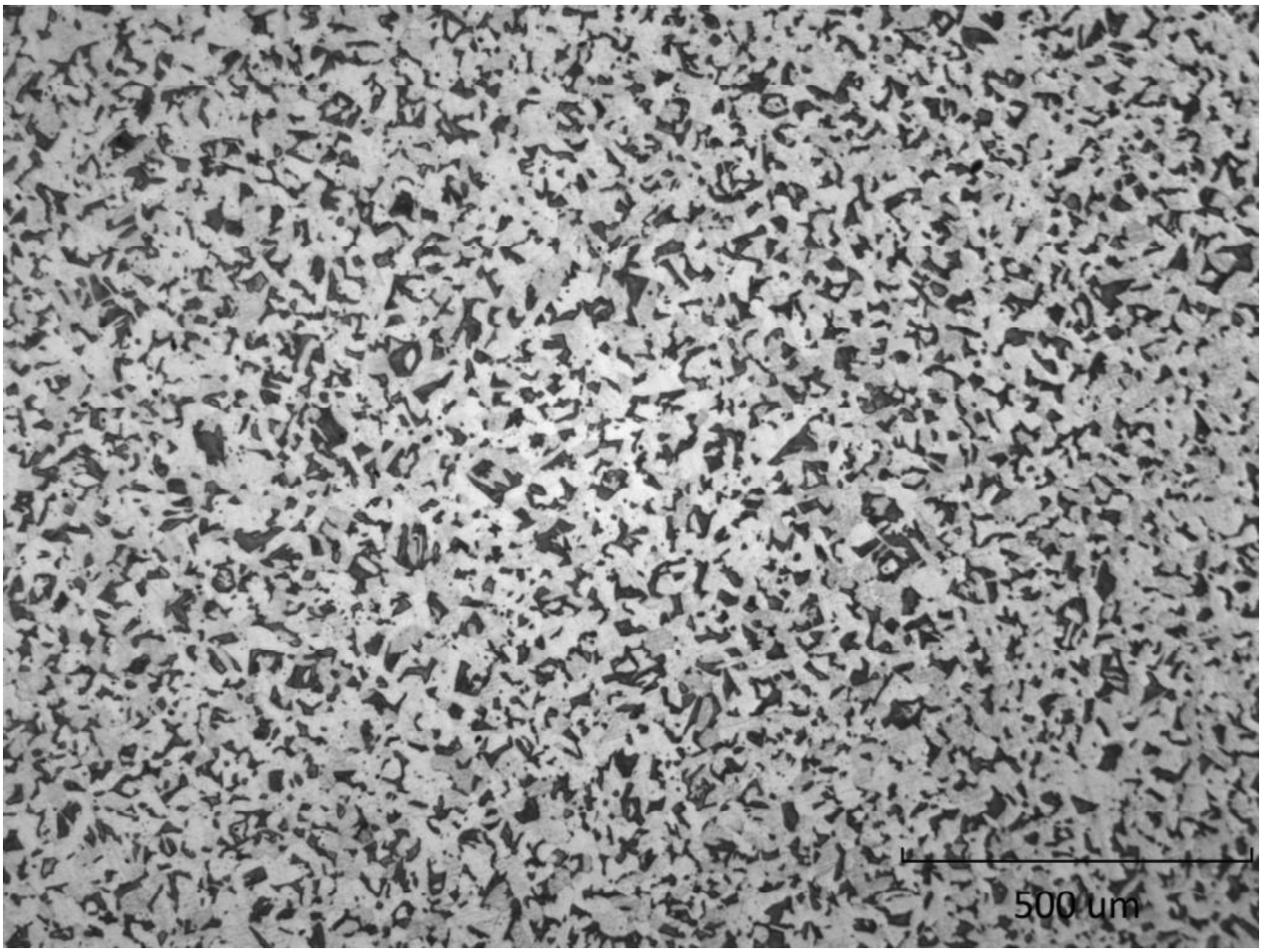
web: www.sandberg.co.uk

TEST CERTIFICATE
METALLOGRAPHIC EXAMINATION
TO BS EN ISO 643:2020

Certificate:	72435/M/9	**Order Ref:**	M-ETF149/0056
Samples Received:	12 May 2022	**Tested By:**	VM
Test Date:	24 May 2022	**Test Procedure:**	M5/3/3 & M13/3/2
Client Details:	McGee Group, 5 Hatfields, Level 9 Alto Tower, London, SE1 9PG.		



Met Lab Ref:	MC 417		Client Ref:	H2-P2/B2 25 mm Ø Square Twisted Bar	
Examined By:	AK	Mag: x 84	Etchant:	2% Nital	Grain Size Index: 6.5
Comments:	Material is a ferrite matrix with pearlite present. The image shows the material to be a carbon steel with an even and homogenous uniform structure.				

For Sandberg LLP

Date: 9 June 2022

N. Fetter

Neale Fetter - Assistant Manager Metallurgy Department

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TEST CERTIFICATE
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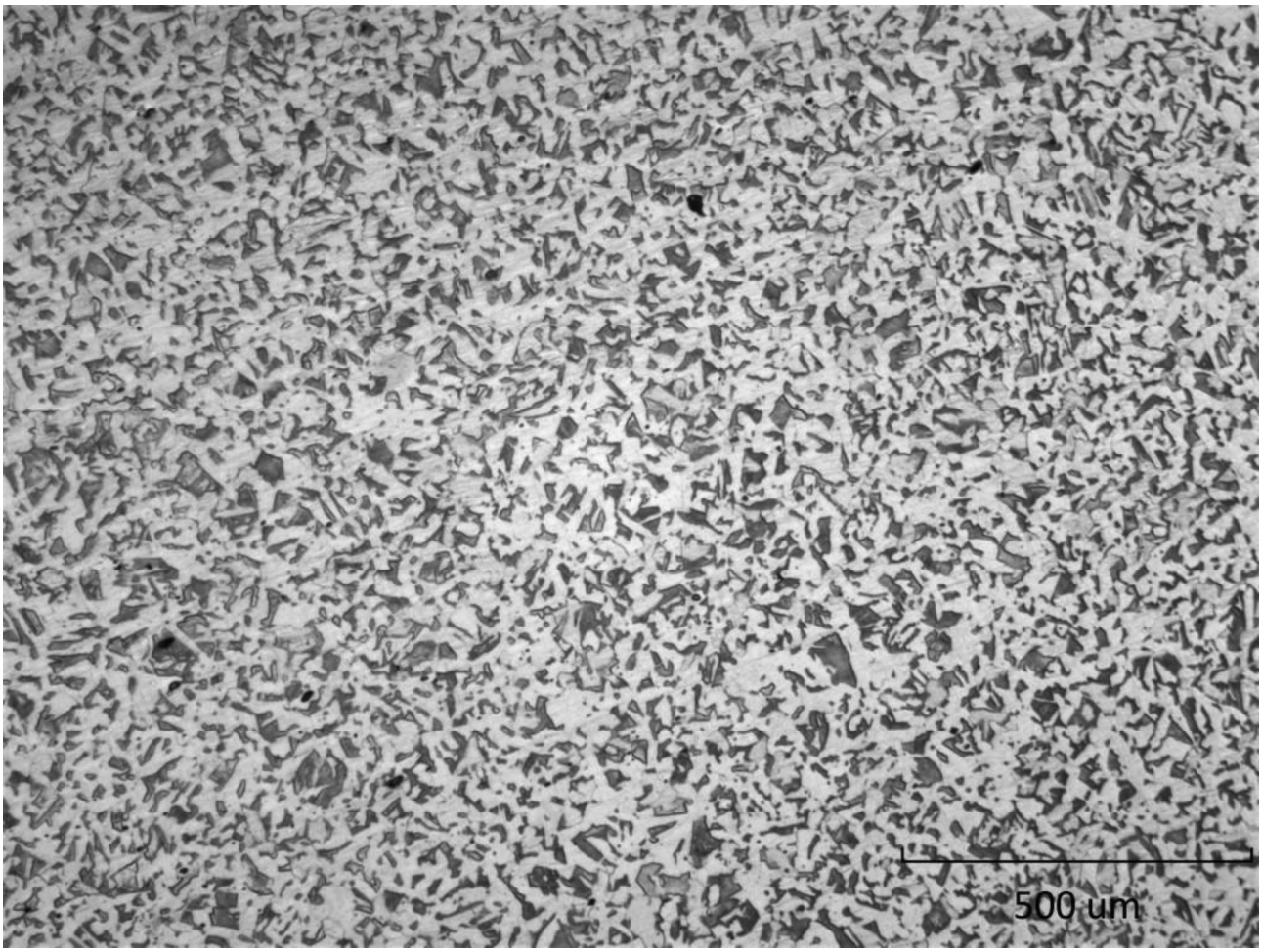
Certificate:	72435/M/10	**Order Ref:**	M-ETF149/0056
Samples Received:	12 May 2022	**Tested By:**	VM
Test Date:	24 May 2022	**Test Procedure:**	M5/3/3 & M13/3/2
Client Details:	McGee Group, 5 Hatfields, Level 9 Alto Tower, London, SE1 9PG.		



Met Lab Ref:	MC 418		Client Ref:	H2/B1 25 mm Ø Square Twisted Bar	
Examined By:	AK	Mag: x 84	Etchant:	2% Nital	Grain Size Index: 6.5
Comments:	Material is a ferrite matrix with pearlite present. The image shows the material to be a carbon steel with an even and homogenous uniform structure.				

For Sandberg LLP

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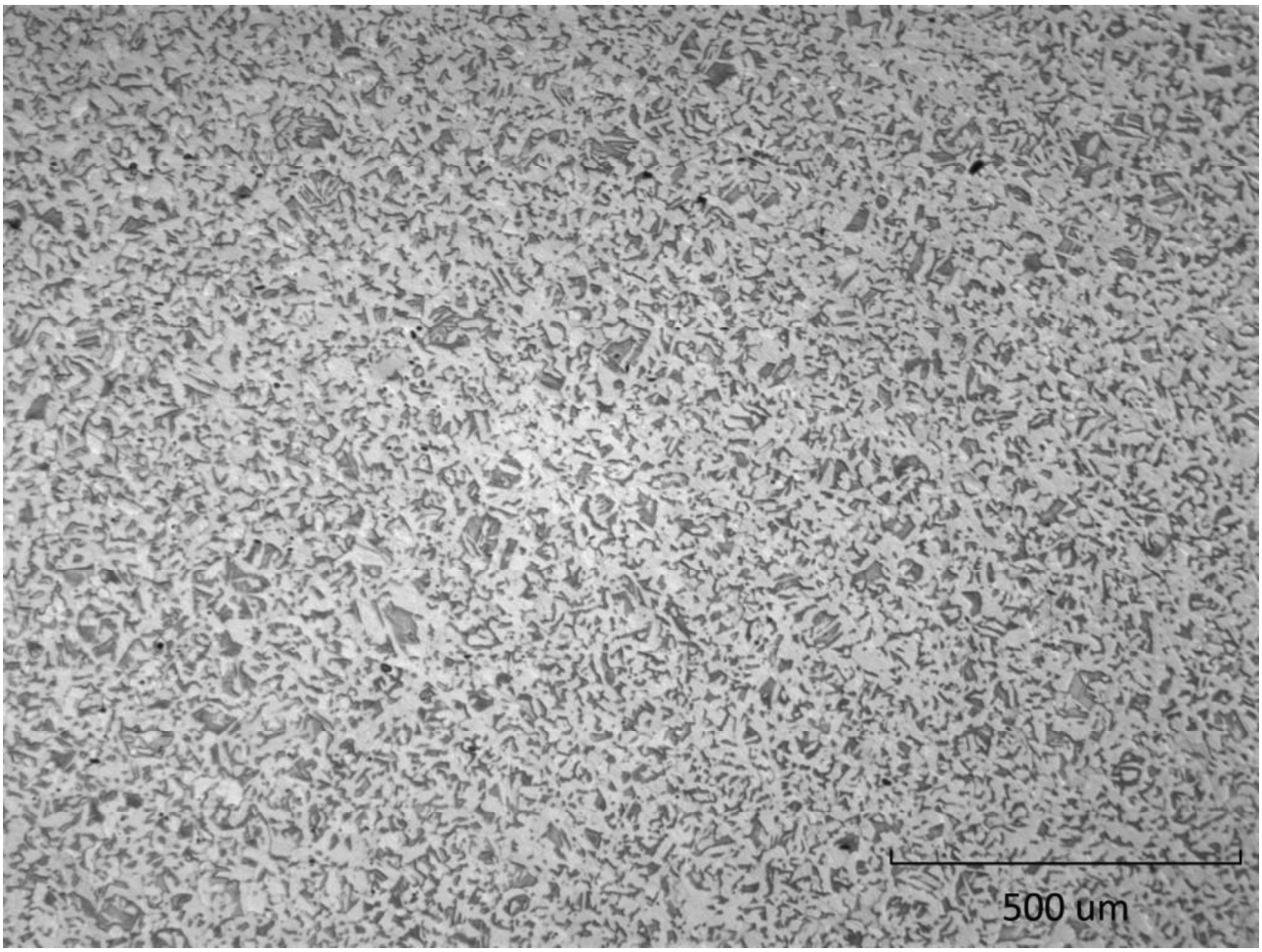
Certificate:	72435/M/11	**Order Ref:**	M-ETF149/0056
Samples Received:	12 May 2022	**Tested By:**	VM
Test Date:	24 May 2022	**Test Procedure:**	M5/3/3 & M13/3/2
Client Details:	McGee Group, 5 Hatfields, Level 9 Alto Tower, London, SE1 9PG.		



Met Lab Ref:	MC 419		Client Ref:	H2-L2/B1 16 mm Ø Plain Round Bar	
Examined By:	AK	Mag: x 84	Etchant:	2% Nital	Grain Size Index: 7.5
Comments:	Material is a ferrite matrix with pearlite present. The image shows the material to be a carbon steel with an even and homogenous uniform structure.				

For Sandberg LLP

Date: 9 June 2022

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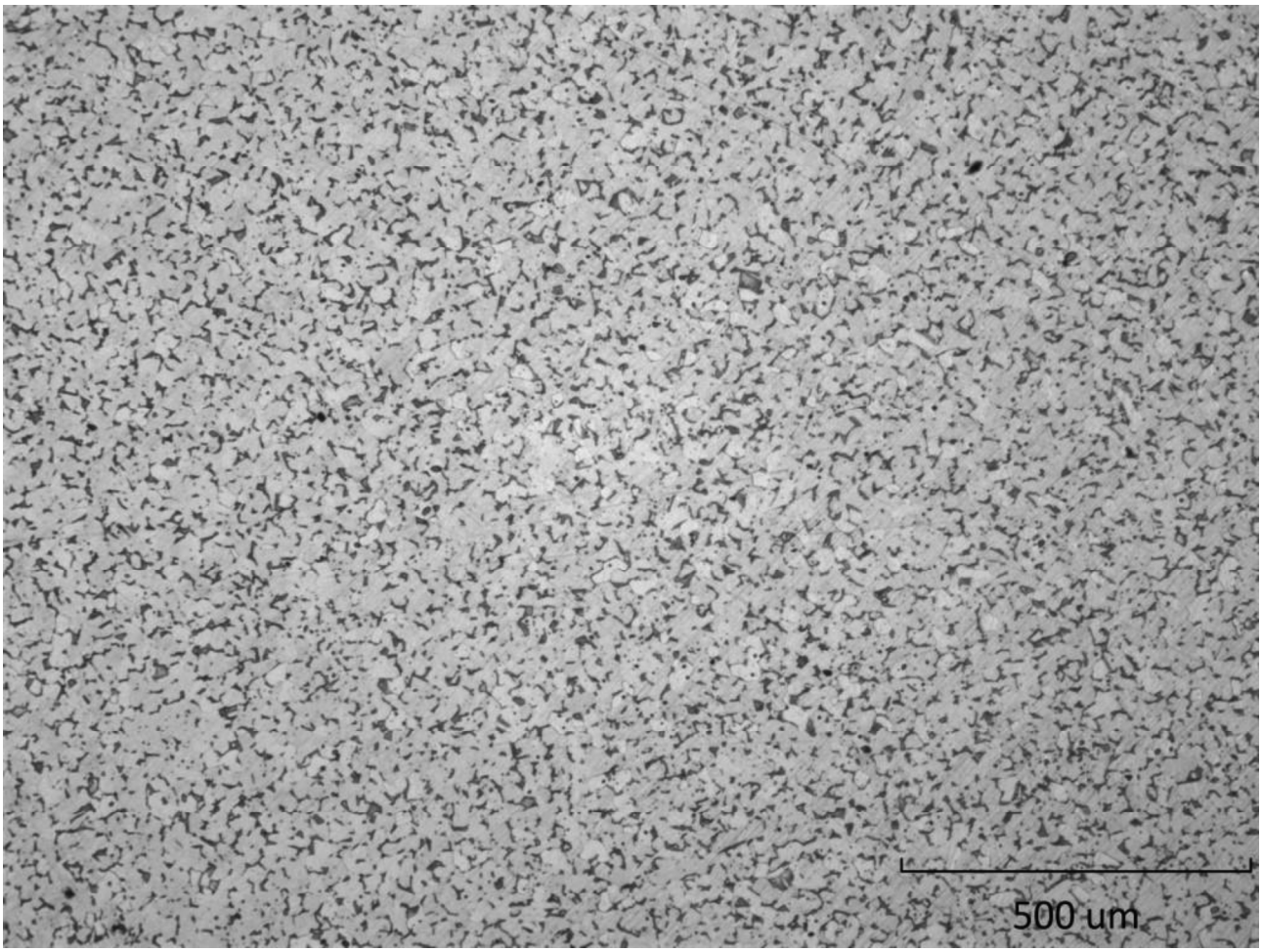
Certificate:	72435/M/12	**Order Ref:**	M-ETF149/0056
Samples Received:	12 May 2022	**Tested By:**	VM
Test Date:	24 May 2022	**Test Procedure:**	M5/3/3 & M13/3/2
Client Details:	McGee Group, 5 Hatfields, Level 9 Alto Tower, London, SE1 9PG.		



Met Lab Ref:	MC 420		Client Ref:	H2-L2/L1 6 mm Ø Plain Round Bar	
Examined By:	AK	Mag: x 84	Etchant:	2% Nital	Grain Size Index: 8.0
Comments:	Material is a ferrite matrix with pearlite present. The image shows the material to be a carbon steel with an even and homogenous uniform structure.				

For Sandberg LLP

Date: 9 June 2022

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Neale Fetter - Assistant Manager Metallurgy Department

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TEST CERTIFICATE
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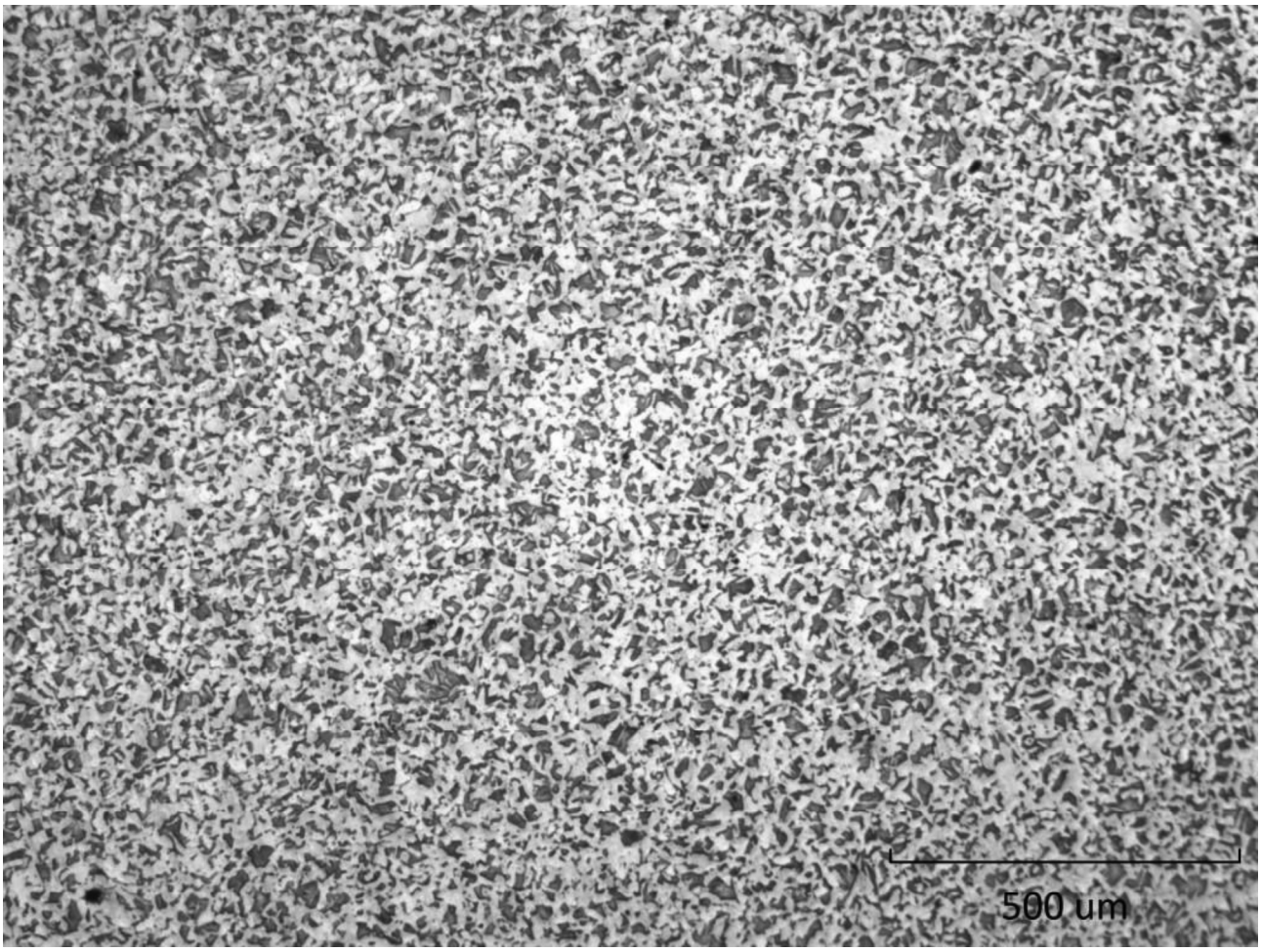
Certificate:	72435/M/13	**Order Ref:**	M-ETF149/0056
Samples Received:	12 May 2022	**Tested By:**	VM
Test Date:	24 May 2022	**Test Procedure:**	M5/3/3 & M13/3/2
Client Details:	McGee Group, 5 Hatfields, Level 9 Alto Tower, London, SE1 9PG.		



Met Lab Ref:	MC 421		Client Ref:	H2-R1/B1 16 mm Ø Plain Round Bar	
Examined By:	AK	Mag: x 84	Etchant:	2% Nital	Grain Size Index: 7.5
Comments:	Material is a ferrite matrix with pearlite present. The image shows the material to be a carbon steel with an even and homogenous uniform structure.				

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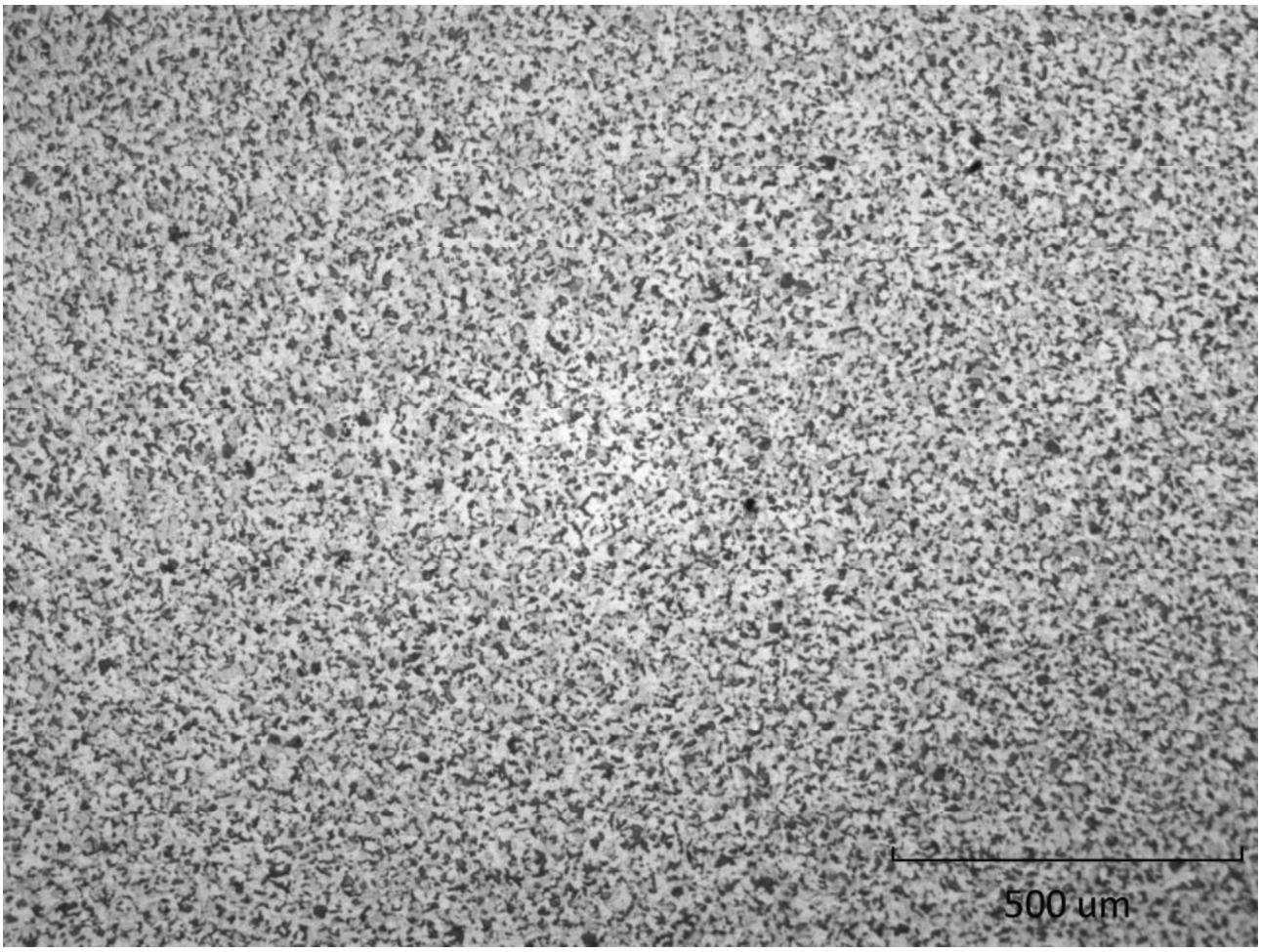
Certificate:	72435/M/14	**Order Ref:**	M-ETF149/0056
Samples Received:	12 May 2022	**Tested By:**	VM
Test Date:	24 May 2022	**Test Procedure:**	M5/3/3 & M13/3/2
Client Details:	McGee Group, 5 Hatfields, Level 9 Alto Tower, London, SE1 9PG.		



Met Lab Ref:	MC 422		Client Ref:	H2-R1/L1 6 mm Ø Plain Round Bar	
Examined By:	AK	Mag: x 84	Etchant:	2% Nital	Grain Size Index: 8.0
Comments:	Material is a ferrite matrix with pearlite present. The image shows the material to be a carbon steel with an even and homogenous uniform structure.				

For Sandberg LLP

Date: 9 June 2022

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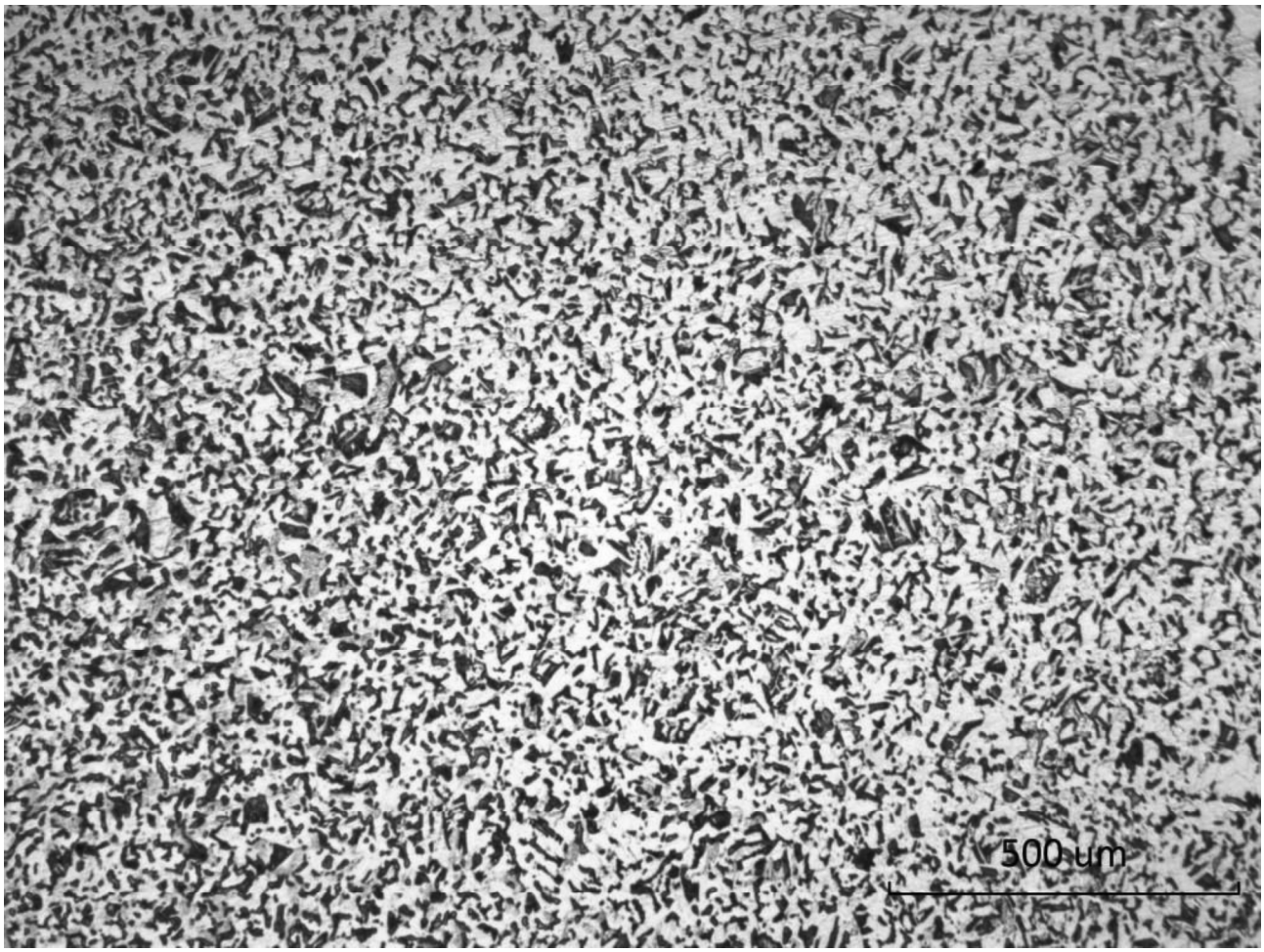
Certificate:	72435/M/15	**Order Ref:**	M-ETF149/0056
Samples Received:	24 May 2022	**Tested By:**	VM
Test Date:	27 May 2022	**Test Procedure:**	M5/3/3 & M13/3/2
Client Details:	McGee Group, 5 Hatfields, Level 9 Alto Tower, London, SE1 9PG.		



Met Lab Ref:	MC 462		Client Ref:	H3-LC6/B1 25 mm Ø Square Twisted Bar	
Examined By:	AK	Mag: x 84	Etchant:	2% Nital	Grain Size Index: 7.0
Comments:	Material is a ferrite matrix with pearlite present. The image shows the material to be a carbon steel with an even and homogenous uniform structure.				

For Sandberg LLP

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TEST CERTIFICATE
METALLOGRAPHIC EXAMINATION
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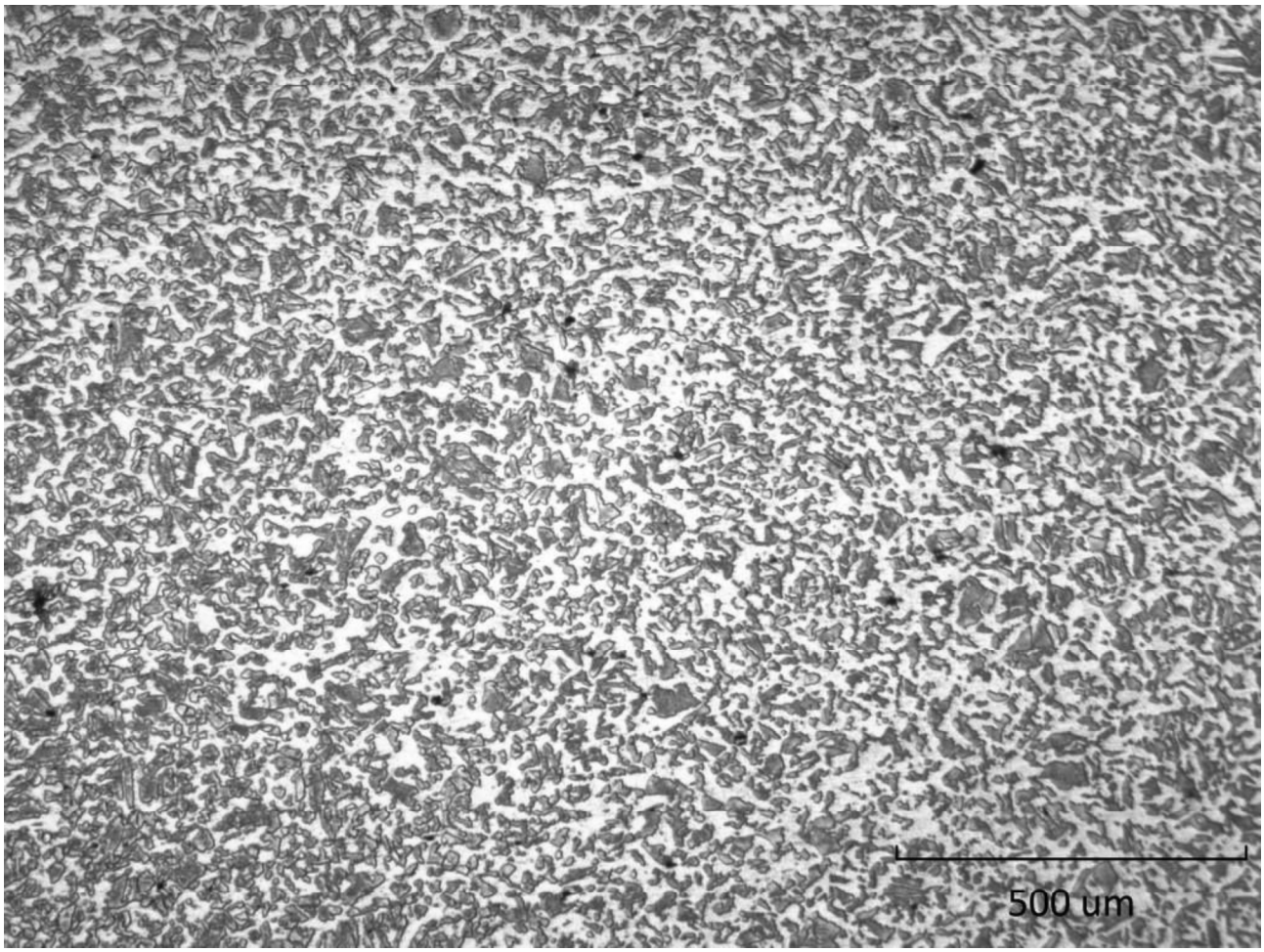
Certificate:	72435/M/16	**Order Ref:**	M-ETF149/0056
Samples Received:	24 May 2022	**Tested By:**	VM
Test Date:	27 May 2022	**Test Procedure:**	M5/3/3 & M13/3/2
Client Details:	McGee Group, 5 Hatfields, Level 9 Alto Tower, London, SE1 9PG.		



Met Lab Ref:	MC 463		Client Ref:	H3-LC6/B2 25 mm Ø Square Twisted Bar	
Examined By:	AK	Mag: x 84	Etchant:	2% Nital	Grain Size Index: 6.5
Comments:	Material is a ferrite matrix with pearlite present. The image shows the material to be a carbon steel with an even and homogenous uniform structure.				

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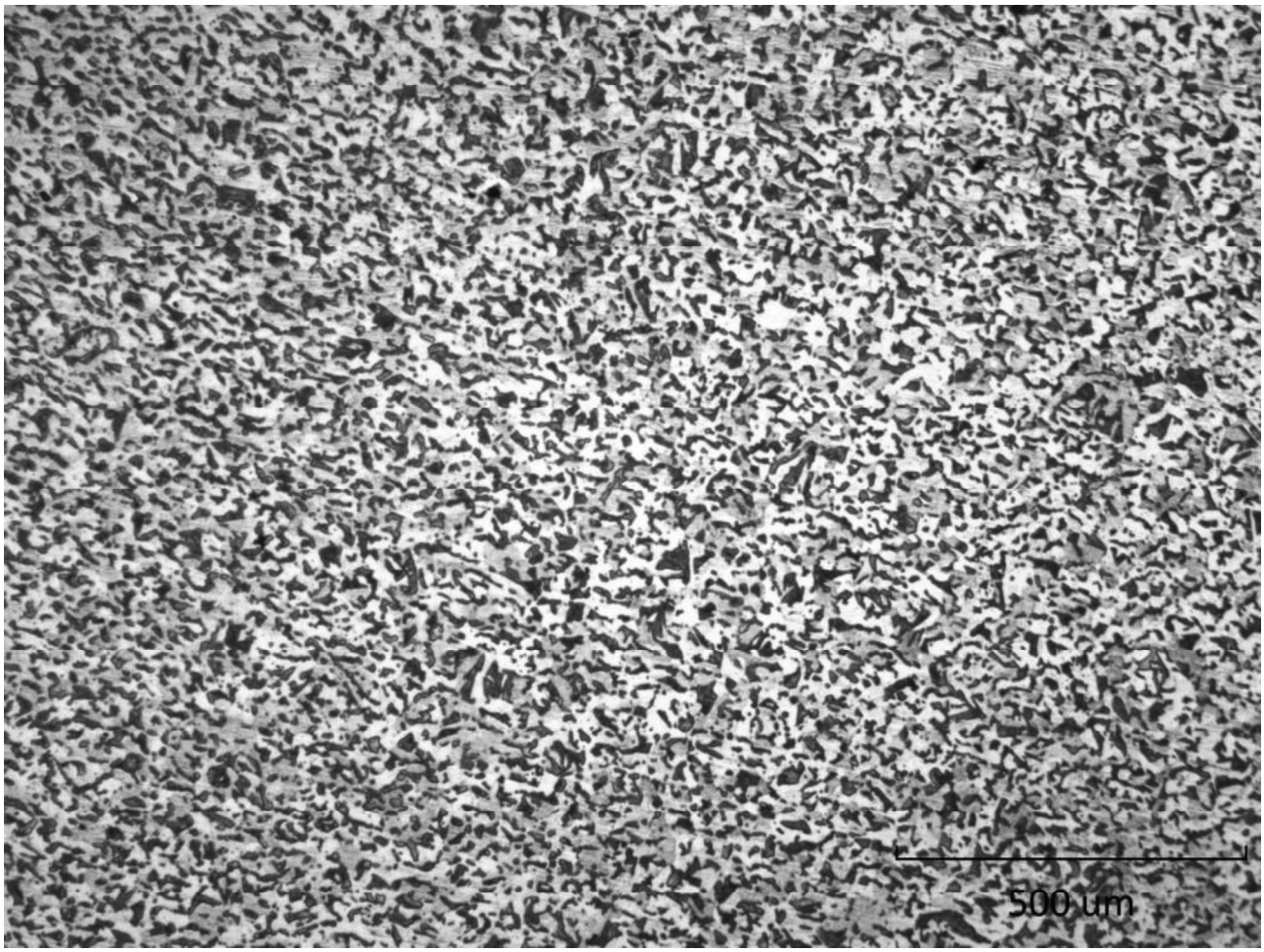
Certificate:	72435/M/17	**Order Ref:**	M-ETF149/0056
Samples Received:	24 May 2022	**Tested By:**	VM
Test Date:	27 May 2022	**Test Procedure:**	M5/3/3 & M13/3/2
Client Details:	McGee Group, 5 Hatfields, Level 9 Alto Tower, London, SE1 9PG.		



Met Lab Ref:	MC 464		Client Ref:	H3-P1/B1 25 mm Ø Square Twisted Bar	
Examined By:	AK	Mag: x 84	Etchant:	2% Nital	Grain Size Index: 6.5
Comments:	Material is a ferrite matrix with pearlite present. The image shows the material to be a carbon steel with an even and homogenous uniform structure.				

For Sandberg LLP

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TEST CERTIFICATE
METALLOGRAPHIC EXAMINATION
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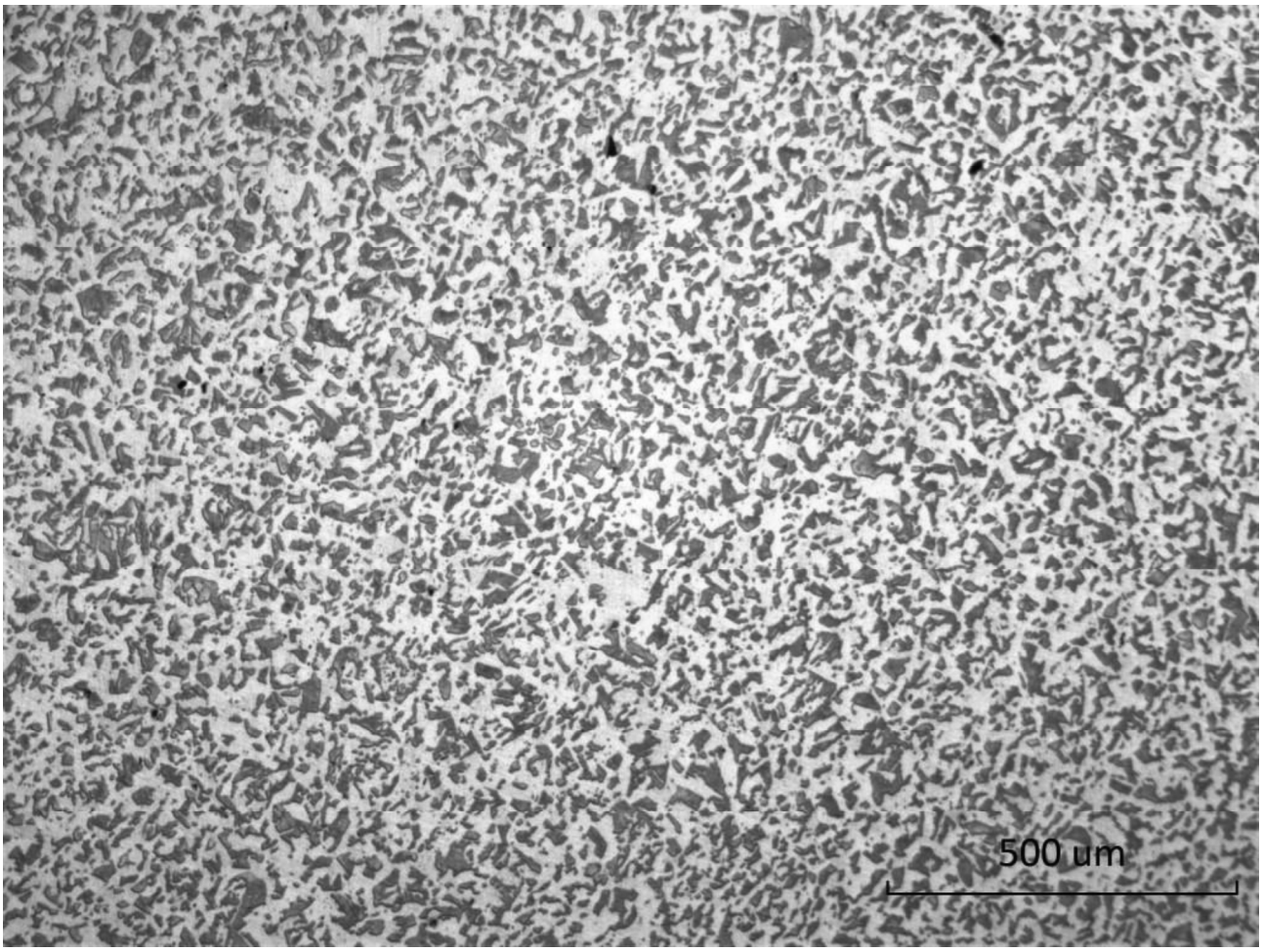
Certificate:	72435/M/18	**Order Ref:**	M-ETF149/0056
Samples Received:	24 May 2022	**Tested By:**	VM
Test Date:	27 May 2022	**Test Procedure:**	M5/3/3 & M13/3/2
Client Details:	McGee Group, 5 Hatfields, Level 9 Alto Tower, London, SE1 9PG.		



Met Lab Ref:	MC 465		Client Ref:	H3-P2/B1 25 mm Ø Square Twisted Bar	
Examined By:	AK	Mag: x 84	Etchant:	2% Nital	Grain Size Index: 6.5
Comments:	Material is a ferrite matrix with pearlite present. The image shows the material to be a carbon steel with an even and homogenous uniform structure.				

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Date: 9 June 2022

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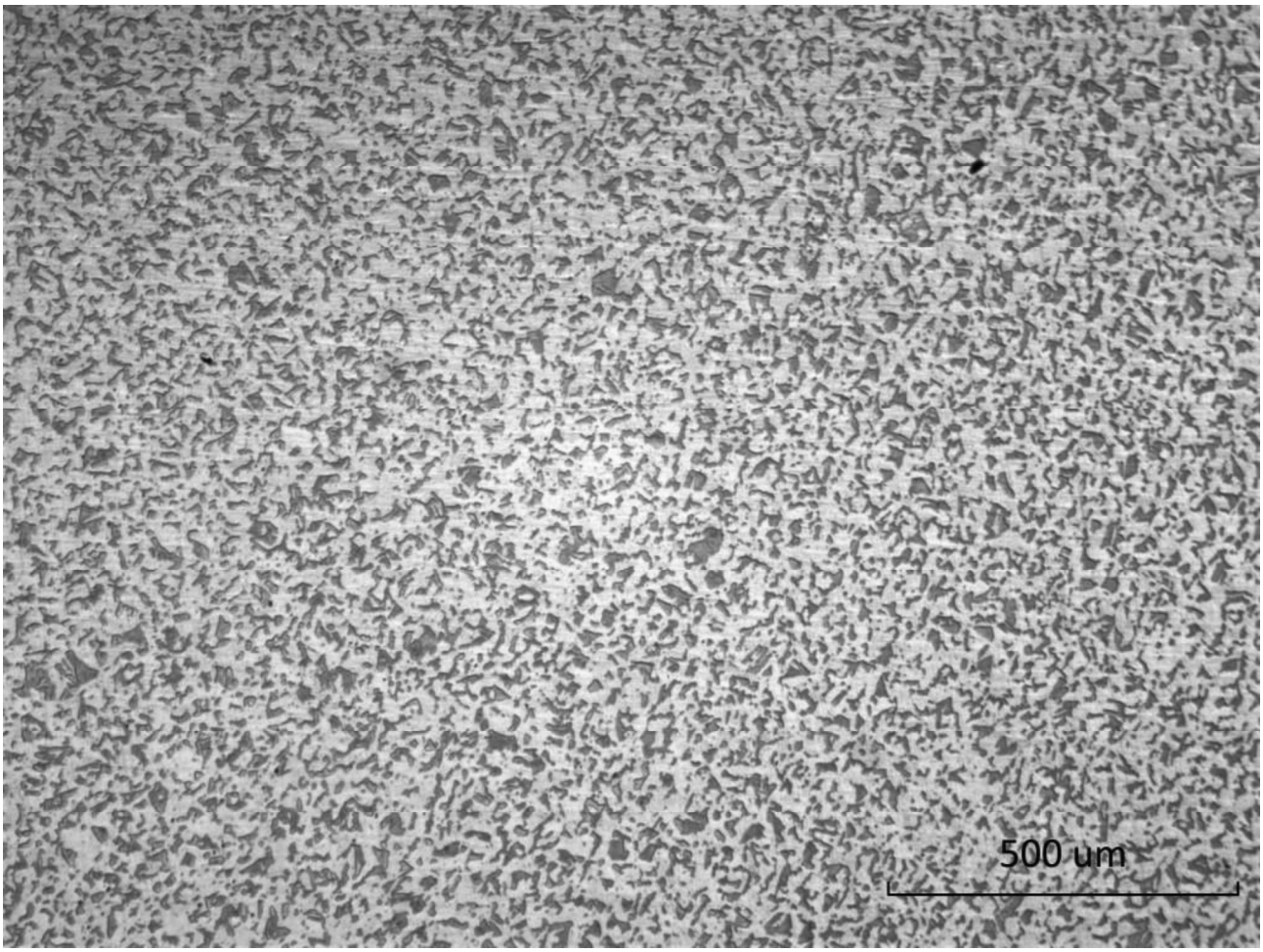
Certificate:	72435/M/19	**Order Ref:**	M-ETF149/0056
Samples Received:	24 May 2022	**Tested By:**	VM
Test Date:	27 May 2022	**Test Procedure:**	M5/3/3 & M13/3/2
Client Details:	McGee Group, 5 Hatfields, Level 9 Alto Tower, London, SE1 9PG.		



Met Lab Ref:	MC 466		Client Ref:	H3-R2/B1 20 mm Ø Square Twisted Bar	
Examined By:	AK	Mag: x 84	Etchant:	2% Nital	Grain Size Index: 7.5
Comments:	Material is a ferrite matrix with pearlite present. The image shows the material to be a carbon steel with an even and homogenous uniform structure.				

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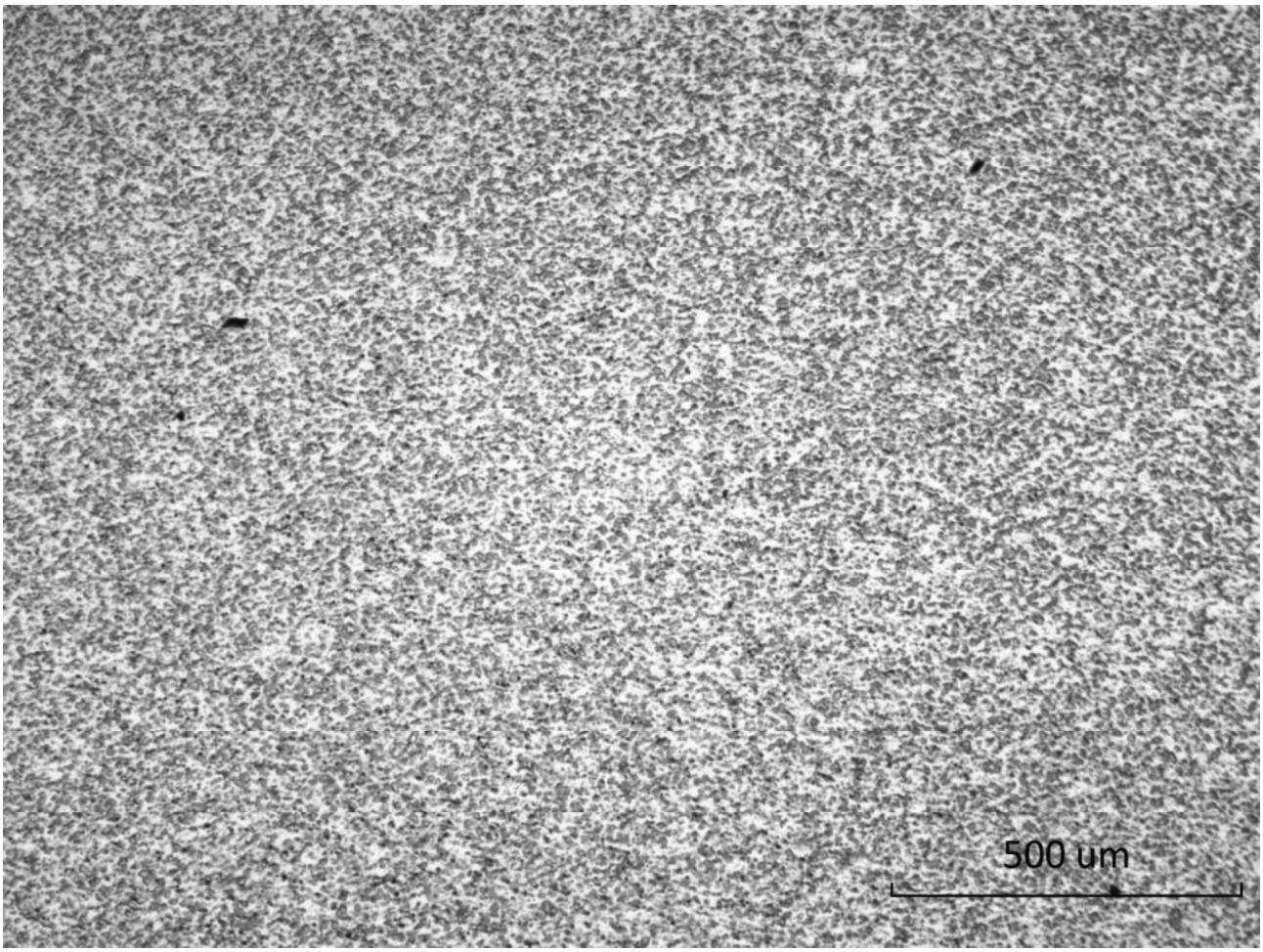
Certificate:	72435/M/20	**Order Ref:**	M-ETF149/0056
Samples Received:	24 May 2022	**Tested By:**	VM
Test Date:	27 May 2022	**Test Procedure:**	M5/3/3 & M13/3/2
Client Details:	McGee Group, 5 Hatfields, Level 9 Alto Tower, London, SE1 9PG.		



Met Lab Ref:	MC 467		Client Ref:	H3-R2/L1 6 mm Ø Plain Round Bar	
Examined By:	AK	Mag: x 84	Etchant:	2% Nital	Grain Size Index: 9.0
Comments:	Material is a ferrite matrix with pearlite present. The image shows the material to be a carbon steel with an even and homogenous uniform structure.				

For Sandberg LLP

Date: 9 June 2022

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TENSILE TEST CERTIFICATE
BS EN ISO 6892-1:2019 B

Certificate:	72435/M/21	**Order Ref:**	M-ETF149/0056
Samples Received:	12/24 May 2022	**Tested By:**	AT/NAF
Test Date:	18/30 May 2022	**Test Procedure:**	M16/3/3
Client Details:	McGee Group, 5 Hatfields, Level 9 Alto Tower, London, SE1 9PG.		

Specimen Reference	Area mm²	0.2% Proof		Ultimate Tensile		Stress Ratio Rm/Re	Elongation %
		Load kN	Stress N/mm²	Load kN	Stress N/mm²		
MC 410 H1-P1/B2 32 mm Ø square twisted bar	968.39	446.87	461	539.38	557	1.21	N/D*
MC 411 H1/B1 25 mm Ø square twisted bar	630.18	306.88	487	369.14	586	1.20	N/D*
MC 462 H3-LC6/B1 25 mm Ø square twisted bar	660.02	316.26	479	367.31	556	1.16	N/D*
MC 463 H3-LC6/B2 25 mm Ø square twisted bar	659.12	322.62	489	379.27	575	1.18	N/D*
MC 465 H3-P2/B1 25 mm Ø square twisted bar	644.67	311.57	483	381.15	591	1.22	N/D*
Specification: BS 4449:1997 (For reference only)							
Grade 250			250 min			1.15 min	22 min
Grade 460A			460 min			1.05 min	12 min
Grade 460B			460 min			1.08 min	14 min

Comments:	* Samples fractured in grips so no elongation was recorded. The tensile properties of samples MC 410, MC 411, MC 462, MC 463 and MC 465 would be considered typical of a cold-worked reinforcing bar.

For Sandberg LLP

Date: 9 June 2022

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SANDBERG
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UKAS TESTING
0262

TENSILE TEST CERTIFICATE
BS EN ISO 6892-1:2019 A224

Certificate:	72435/M/22	**Order Ref:**	M-ETF149/0056
Samples Received:	12 May 2022	**Tested By:**	AT
Test Date:	20 May 2022	**Test Procedure:**	M10/3/3
Client Details:	McGee Group, 5 Hatfields, Level 9 Alto Tower, London, SE1 9PG.		

Specimen Reference	Area mm²	Upper Yield		Ultimate Tensile		Stress Ratio Rm/Re	Elongation %
		Load kN	Stress N/mm²	Load kN	Stress N/mm²		
MC 412 H1-L3/B1 - 16 mm Ø Plain Round Bar	196.83	64.38	327	98.37	500	1.53	34.0
MC 413 H1-L3/L1 - 6 mm Ø Plain Round Bar	32.18	9.88	307*	13.98	434	1.42	37.5
MC 414 H1-R2/B1 - 16 mm Ø Plain Round Bar	197.97	65.85	333	98.79	499	1.50	32.0
MC 415 H1-R2/L1 - 6 mm Ø Plain Round Bar	33.16	9.29	280*	14.24	429	1.53	36.5
MC 419 H2-L2/B1 - 16 mm Ø Plain Round Bar	199.93	60.80	304	96.05	480	1.58	35.0
Specification: BS 4449:1997							
Grade 250			250 min			1.15 min	22 min
Grade 460A			460 min			1.05 min	12 min
Grade 460B			460 min			1.08 min	14 min

Comments:	* Upper yield phenomenon was not exhibited so 0.2% proof stress has been reported instead. The tensile properties of samples MC 412, MC 413, MC 414, MC 415 and MC 419 would comply with the requirements for a grade 250 reinforcing bar.

For Sandberg LLP

Date: 9 June 2022

N. Fetter

Neale Fetter - Assistant Manager Metallurgy Department

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TENSILE TEST CERTIFICATE
BS EN ISO 6892-1:2019 A224

Certificate:	72435/M/23	**Order Ref:**	M-ETF149/0056
Samples Received:	12/24 May 2022	**Tested By:**	AT
Test Date:	20/27 May 2022	**Test Procedure:**	M10/3/3
Client Details:	McGee Group, 5 Hatfields, Level 9 Alto Tower, London, SE1 9PG.		

Specimen Reference	Area mm²	Upper Yield		Ultimate Tensile		Stress Ratio Rm/Re	Elongation %
		Load kN	Stress N/mm²	Load kN	Stress N/mm²		
MC 420 H2-L2/L1 - 6 mm Ø Plain Round Bar	34.52	9.55	277*	13.55	393	1.42	36.5
MC 421 H2-R1/B1 - 16 mm Ø Plain Round Bar	195.69	65.38	334	93.80	479	1.43	34.0
MC 422 H2-R1/L1 - 6 mm Ø Plain Round Bar	34.76	10.75	309*	16.33	470	1.52	26.5
MC 467 H3-R2/L1 - 6 mm Ø Plain Round Bar	33.67	11.59	344*	15.32	455	1.32	40.0
Specification: BS 4449:1997							
Grade 250			250 min			1.15 min	22 min
Grade 460A			460 min			1.05 min	12 min
Grade 460B			460 min			1.08 min	14 min

Comments:	* Upper yield phenomenon was not exhibited so 0.2% proof stress has been reported instead. The tensile properties of samples MC 420, MC 421, MC 422 and MC 467 would comply with the requirements for a grade 250 reinforcing bar.

For Sandberg LLP

Date: 9 June 2022

N. Fetter

Neale Fetter - Assistant Manager Metallurgy Department

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UKAS TESTING
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TENSILE TEST CERTIFICATE
BS EN ISO 6892-1:2019 A224

Certificate:	72435/M/24	**Order Ref:**	M-ETF149/0056
Samples Received:	12 May 2022	**Tested By:**	AT
Test Date:	20 May 2022	**Test Procedure:**	M10/3/3
Client Details:	McGee Group, 5 Hatfields, Level 9 Alto Tower, London, SE1 9PG.		

Specimen Reference	Area mm²	0.2% Proof		Ultimate Tensile		Stress Ratio Rm/Re	Elongation %
		Load kN	Stress N/mm²	Load kN	Stress N/mm²		
MC 409 H1-P1/B1 25 mm Ø square twisted bar	249.13	105.08	422	135.91	546	1.29	20.0
MC 416 H2-P2/B1 25 mm Ø square twisted bar	322.38	153.50	476	191.90	595	1.25	19.5
MC 417 H2-P2/B2 25 mm Ø square twisted bar	320.47	127.21	397	165.50	516	1.30	18.5
MC 418 H2/B1 25 mm Ø square twisted bar	309.15	129.39	419	164.00	530	1.27	22.0
MC 464 H3-P1/B1 25 mm Ø square twisted bar	381.17	169.95	446	210.75	553	1.24	19.5
MC 466 H3-R2/B1 20 mm Ø square twisted bar	256.45	114.45	446	143.67	560	1.26	17.0
Specification: BS 4449:1997 (For reference only)							
Grade 250			250 min			1.15 min	22 min
Grade 460A			460 min			1.05 min	12 min
Grade 460B			460 min			1.08 min	14 min

Comments:	Due to mechanical damage, the above samples were tested as reduced section machined test pieces. The tensile properties of samples MC 409, MC 416, MC 417, MC 418, MC 464 and MC 466 would be considered typical of a square twisted reinforcing bar.

For Sandberg LLP

Date: 9 June 2022

N. Fetter

Neale Fetter - Assistant Manager Metallurgy Department

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TEST CERTIFICATE

Certificate:	72435/M/25	**Samples Received:**	12 May 2022	**Test Date:**	18 May 2022
Reference:	M-ETF149/0056	**Tested By:**	Metaltech Services Limited	**Test Procedure:**	OES
Client Details:	McGee Group, 5 Hatfields, Level 9 Alto Tower, London, SE1 9PG.				

Chemical Composition %

Met Lab Ref	Client Description	C	Si	Mn	P	S	Cr	Mo	Ni	Al	Cu	Nb	V	CEV
MC 409	H1-P1/B1 25 mm Ø Square Twisted Bar	0.26	0.023	0.63	0.037	0.051	<0.06	<0.02	<0.035	<0.01	0.049	<0.01	<0.025	0.368
MC 410	H1-P1/B2 32 mm Ø Square Twisted Bar	0.24	0.049	0.63	0.012	0.042	<0.06	<0.02	0.042	<0.01	0.084	<0.01	<0.025	0.353
MC 411	H1/B1 25 mm Ø Square Twisted Bar	0.19	0.039	0.64	0.011	0.051	<0.06	<0.02	0.153	<0.01	0.274	<0.01	<0.025	0.325
Specification: BS 4449:1997 (For reference only) Grade 250		0.27			0.065	0.065								0.45

Comments:	Results contained in this certificate are outside the UKAS accreditation for this laboratory but have been performed on our behalf by another laboratory that is so accredited at their laboratory. Metaltech Services Limited Report No. MSL 7208-1.

For Sandberg LLP

Date: 09 June 2022

N. Fetter

Neale Fetter - Assistant Manager Metallurgy Department

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TEST CERTIFICATE

Certificate:	72435/M/26	**Samples Received:**	12 May 2022	**Test Date:**	18 May 2022
Reference:	M-ETF149/0056	**Tested By:**	Metaltech Services Limited	**Test Procedure:**	OES
Client Details:	McGee Group, 5 Hatfields, Level 9 Alto Tower, London, SE1 9PG.				

Chemical Composition %

Met Lab Ref	Client Description	C	Si	Mn	P	S	Cr	Mo	Ni	Al	Cu	Nb	V	CEV
MC 412	H1-L3/B1 16 mm Ø Plain Round Bar	0.29	0.073	0.56	0.035	0.023	<0.06	<0.02	0.071	<0.01	0.077	<0.01	<0.025	0.393
MC 414	H1-R2/B1 16 mm Ø Plain Round Bar	0.30	0.071	0.58	0.015	0.021	<0.06	<0.02	0.043	<0.01	0.077	<0.01	<0.025	0.405
MC 416	H2-P2/B1 25 mm Ø Square Twisted Bar	0.21	0.071	1.24	0.016	0.022	<0.06	<0.02	<0.035	<0.01	<0.015	<0.01	<0.025	0.417
Specification: BS 4449:1997 (For reference only) Grade 250		0.27			0.065	0.065								0.45

Comments:	Results contained in this certificate are outside the UKAS accreditation for this laboratory but have been performed on our behalf by another laboratory that is so accredited at their laboratory. Metaltech Services Limited Report No. MSL 7208-1.

For Sandberg LLP

Date: 09 June 2022

N. Fetter

Neale Fetter - Assistant Manager Metallurgy Department

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TEST CERTIFICATE

Certificate:	72435/M/27	**Samples Received:**	12 May 2022	**Test Date:**	18 May 2022
Reference:	M-ETF149/0056	**Tested By:**	Metaltech Services Limited	**Test Procedure:**	OES
Client Details:	McGee Group, 5 Hatfields, Level 9 Alto Tower, London, SE1 9PG.				

Chemical Composition %

Met Lab Ref	Client Description	C	Si	Mn	P	S	Cr	Mo	Ni	Al	Cu	Nb	V	CEV
MC 417	H2-P2/B2 25 mm Ø Square Twisted Bar	0.18	0.029	0.50	0.033	0.036	<0.06	<0.02	0.089	<0.01	0.165	<0.01	<0.025	0.280
MC 418	H2/B1 25 mm Ø Square Twisted Bar	0.23	0.042	0.79	0.040	0.042	<0.06	<0.02	<0.035	<0.01	<0.015	<0.01	<0.025	0.362
MC 419	H2-L2/B1 16 mm Ø Plain Round Bar	0.23	0.079	0.63	0.035	0.018	<0.06	<0.02	<0.035	<0.01	0.053	<0.01	<0.025	0.339
Specification: BS 4449:1997 (For reference only) Grade 250		0.27			0.065	0.065								0.45

Comments:	Results contained in this certificate are outside the UKAS accreditation for this laboratory but have been performed on our behalf by another laboratory that is so accredited at their laboratory. Metaltech Services Limited Report No. MSL 7208-1.

For Sandberg LLP

Date: 09 June 2022

N. Fetter

Neale Fetter - Assistant Manager Metallurgy Department

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TEST CERTIFICATE

Certificate:	72435/M/28	**Samples Received:**	12/24 May 2022	**Test Date:**	18/27 May 2022
Reference:	M-ETF149/0056	**Tested By:**	Metaltech Services Limited	**Test Procedure:**	OES
Client Details:	McGee Group, 5 Hatfields, Level 9 Alto Tower, London, SE1 9PG.				

Chemical Composition %

Met Lab Ref	Client Description	C	Si	Mn	P	S	Cr	Mo	Ni	Al	Cu	Nb	V	CEV
MC 421	H2-R1/B1 16 mm Ø Plain Round Bar	0.25	0.013	0.59	0.010	0.038	<0.06	0.037	0.148	0.026	0.173	<0.01	<0.025	0.377
MC 462	H3-LC6/B1 25 mm Ø Square Twisted Bar	0.17	0.086	1.24	0.014	0.022	<0.06	<0.02	<0.035	<0.01	<0.015	<0.01	<0.025	0.377
MC 463	H3-LC6/B2 25 mm Ø Square Twisted Bar	0.18	0.078	1.22	0.021	0.027	<0.06	<0.02	<0.035	<0.01	<0.015	<0.01	<0.025	0.383
Specification:	BS 4449:1997 (For reference only) Grade 250	0.27			0.065	0.065								0.45

Comments:	Results contained in this certificate are outside the UKAS accreditation for this laboratory but have been performed on our behalf by another laboratory that is so accredited at their laboratory. Metaltech Services Limited Report No. MSL 7208-1 & 7233-2.

For Sandberg LLP

Date: 09 June 2022

N. Fetter

Neale Fetter - Assistant Manager Metallurgy Department

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TEST CERTIFICATE

Certificate:	72435/M/29	**Samples Received:**	24 May 2022	**Test Date:**	27 May 2022
Reference:	M-ETF149/0056	**Tested By:**	Metaltech Services Limited	**Test Procedure:**	OES
Client Details:	McGee Group, 5 Hatfields, Level 9 Alto Tower, London, SE1 9PG.				

Chemical Composition %

Met Lab Ref	Client Description	C	Si	Mn	P	S	Cr	Mo	Ni	Al	Cu	Nb	V	CEV
MC 464	H3-P1/B1 25 mm Ø Square Twisted Bar	0.20	0.062	1.06	0.027	0.031	<0.06	<0.02	<0.035	<0.01	<0.015	<0.01	<0.025	0.377
MC 465	H3-P2/B1 25 mm Ø Square Twisted Bar	0.22	0.059	1.06	0.047	0.037	<0.06	<0.02	<0.035	<0.01	<0.015	<0.01	<0.025	0.397
MC 466	H3-R2/B1 20 mm Ø Square Twisted Bar	0.19	0.071	0.64	0.010	0.050	<0.06	<0.02	0.083	<0.01	0.176	<0.01	<0.025	0.314
Specification: BS 4449:1997 (For reference only) Grade 250		0.27			0.065	0.065								0.45

Comments:	Results contained in this certificate are outside the UKAS accreditation for this laboratory but have been performed on our behalf by another laboratory that is so accredited at their laboratory. Metaltech Services Limited Report No. MSL 7233-2.

For Sandberg LLP

Date: 09 June 2022

N. Fetter

Neale Fetter - Assistant Manager Metallurgy Department

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TEST CERTIFICATE

Certificate:	72435/M/30	**Samples Received:**	12 May 2022	**Test Date:**	25 May 2022
Reference:	M-ETF149/0056	**Tested By:**	Rotech Laboratories	**Test Procedure:**	ICP-OES
Client Details:	McGee Group, 5 Hatfields, Level 9 Alto Tower, London, SE1 9PG.				

Chemical Composition %

Met Lab Ref	Client Description	C	Si	Mn	P	S	Cr	Mo	Ni	Al	Cu	Nb	V	CEV
MC 413	H1-L3/L1 - 6 mm Ø Plain Round Bar	0.15	0.02	0.61	0.024	0.037	0.03	0.01	0.06	<0.01	0.06	<0.01	<0.01	0.270
MC 415	H1-R2/L1 - 6 mm Ø Plain Round Bar	0.17	0.03	0.62	0.026	0.043	0.03	0.01	0.06	<0.01	0.06	<0.01	<0.01	0.291
MC 420	H2-L2/L1 - 6 mm Ø Plain Round Bar	0.11	<0.01	0.39	0.011	0.039	0.03	0.01	0.06	<0.01	0.10	<0.01	<0.01	0.196
Specification: BS 4449:1997 (For reference only) Grade 250		0.27			0.065	0.065								0.45

Comments:	Results contained in this certificate are outside the UKAS accreditation for this laboratory but have been performed on our behalf by another laboratory that is so accredited at their laboratory. Rotech Laboratories Report No. 22-05802.

For Sandberg LLP

Date: 09 June 2022

N. Fetter

Neale Fetter - Assistant Manager Metallurgy Department

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TEST CERTIFICATE

Certificate:	72435/M/31	**Samples Received:**	12/24 May 2022	**Test Date:**	25 May/ 07 June 2022
Reference:	M-ETF149/0056	**Tested By:**	Rotech Laboratories	**Test Procedure:**	ICP-OES
Client Details:	McGee Group, 5 Hatfields, Level 9 Alto Tower, London, SE1 9PG.				

Chemical Composition %

Met Lab Ref	Client Description	C	Si	Mn	P	S	Cr	Mo	Ni	Al	Cu	Nb	V	CEV
MC 422	H2-R1/L1 - 6 mm Ø Plain Round Bar	0.20	0.05	0.64	0.011	0.030	0.04	0.01	0.04	<0.01	0.05	<0.01	<0.01	0.325
MC 467	H3-R2/L1 6 mm Ø Plain Round Bar	0.048	<0.01	0.38	0.028	0.035	0.03	<0.01	0.05	<0.01	0.06	<0.01	<0.01	0.129
Specification: BS 4449:1997 (For reference only) Grade 250		0.27			0.065	0.065								0.45

Comments:	Results contained in this certificate are outside the UKAS accreditation for this laboratory but have been performed on our behalf by another laboratory that is so accredited at their laboratory. Rotech Laboratories Report No. 22-05802 and 22-06248.

For Sandberg LLP

Date: 09 June 2022

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UKAS TESTING
0262

TEST CERTIFICATE
VICKERS HARDNESS
BS EN ISO 6507-1:2018

Certificate:	72435/M/32	**Order Ref:**	M-ETF149/0056
Samples Received:	12 May 2022	**Tested By:**	VM
Test Date:	19-20 May 2022	**Test Procedure:**	M20/1/1
Client Details:	McGee Group, 5 Hatfields, Level 9 Alto Tower, London, SE1 9PG.		

METALLURGY REFERENCE	MC 409	MC 410	MC 411	MC 412	MC 413
CLIENT REFERENCE	H1-P1/B1 25 mm Ø Square Twisted Bar	H1-P1/B2 32 mm Ø Square Twisted Bar	H1/B1 25 mm Ø Square Twisted Bar	H1-L3/B1 16 mm Ø Plain Round Bar	H1-L3/L1 6 mm Ø Plain Round Bar
LOAD/kg	10	10	10	10	10
HARDNESS VALUE (SURFACE)	211	199	216	143	179
	209	206	224	143	189
	208	200	215	144	195
AVERAGE HARDNESS VALUE (SURFACE)	209	202	218	143	188
HARDNESS VALUE (CORE)	164	179	191	151	143
	175	181	205	153	143
	190	181	193	153	161
AVERAGE HARDNESS VALUE (CORE)	176	180	196	152	149

Comments: The above hardness values show that samples MC 409, MC 410, MC 411, MC 412 and MC 413 have not been quenched and self-tempered.

For Sandberg LLP

Date: 9 June 2022

N. Fetter

Neale Fetter - Assistant Manager Metallurgy Department

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UKAS TESTING
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TEST CERTIFICATE
VICKERS HARDNESS
BS EN ISO 6507-1:2018

Certificate:	72435/M/33	**Order Ref:**	M-ETF149/0056
Samples Received:	12 May 2022	**Tested By:**	VM
Test Date:	18-20 May 2022	**Test Procedure:**	M20/1/1
Client Details:	McGee Group, 5 Hatfields, Level 9 Alto Tower, London, SE1 9PG.		

METALLURGY REFERENCE	MC 414	MC 415	MC 416	MC 417	MC 418
CLIENT REFERENCE	H1-R2/B1 16 mm Ø Plain Round Bar	H1-R2/L1 6 mm Ø Plain Round Bar	H2-P2/B1 25 mm Ø Square Twisted Bar	H2-P2/B2 25 mm Ø Square Twisted Bar	H2/B1 25 mm Ø Square Twisted Bar
LOAD/kg	10	10	10	10	10
HARDNESS VALUE (SURFACE)	148	133	198	184	193
	148	138	203	192	163
	149	139	200	201	180
AVERAGE HARDNESS VALUE (SURFACE)	148	137	200	192	179
HARDNESS VALUE (CORE)	148	154	186	151	202
	152	156	179	155	196
	149	130	178	173	192
AVERAGE HARDNESS VALUE (CORE)	150	147	181	159	197

Comments: The above hardness values show that samples MC 414, MC 415, MC 416, MC 417 and MC 418 have not been quenched and self-tempered.

For Sandberg LLP

Date: 9 June 2022

N. Fetter

Neale Fetter - Assistant Manager Metallurgy Department

Materials, samples and test specimens are retained for a period of 2 months from the issue of the final report.
Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.
Where test results are given, the results and our conclusions relate only to the samples tested and apply to the sample(s) as received, except where sampling has been conducted by Sandberg LLP.

SANDBERG
CONSULTING ENGINEERS
INVESTIGATION INSPECTION
MATERIALS TESTING

UKAS TESTING
0262

Sandberg LLP
5 Carpenters Place
Clapham High Street
London, SW4 7TD

Tel: 020 7565 7000
Fax: 020 7565 7100
email: mail@sandberg.co.uk
web: www.sandberg.co.uk

TEST CERTIFICATE
VICKERS HARDNESS
BS EN ISO 6507-1:2018

Certificate:	72435/M/34	**Order Ref:**	M-ETF149/0056
Samples Received:	12/24 May 2022	**Tested By:**	VM
Test Date:	19-20/ May 2022	**Test Procedure:**	M20/1/1
Client Details:	McGee Group, 5 Hatfields, Level 9 Alto Tower, London, SE1 9PG.		

METALLURGY REFERENCE	MC 419	MC 420	MC 421	MC 422	MC 462
CLIENT REFERENCE	H2-L2/B1 16 mm Ø Plain Round Bar	H2-L2/L1 6 mm Ø Plain Round Bar	H2-R1/B1 16 mm Ø Plain Round Bar	H2-R1/L1 6 mm Ø Plain Round Bar	H3-LC6/B1 25 mm Ø Square Twisted Bar
LOAD/kg	10	10	10	10	10
HARDNESS VALUE (SURFACE)	142	142	152	192	209
	145	144	159	207	207
	146	138	169	209	202
AVERAGE HARDNESS VALUE (SURFACE)	145	142	160	203	206
HARDNESS VALUE (CORE)	137	126	140	184	146
	136	133	141	178	155
	138	148	154	159	164
AVERAGE HARDNESS VALUE (CORE)	137	135	145	174	155

Comments: The above hardness values show that samples MC 419, MC 420, MC 421, MC 422 and MC 462 have not been quenched and self-tempered.

For Sandberg LLP

Date: 9 June 2022

N. Fetter

Neale Fetter - Assistant Manager Metallurgy Department

Materials, samples and test specimens are retained for a period of 2 months from the issue of the final report.
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CONSULTING ENGINEERS
INVESTIGATION INSPECTION
MATERIALS TESTING

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London, SW4 7TD

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email: mail@sandberg.co.uk
web: www.sandberg.co.uk

UKAS TESTING
0262

TEST CERTIFICATE
VICKERS HARDNESS
BS EN ISO 6507-1:2018

Certificate:	72435/M/35	**Order Ref:**	M-ETF149/0056
Samples Received:	24 May 2022	**Tested By:**	VM
Test Date:	May 2022	**Test Procedure:**	M20/1/1
Client Details:	McGee Group, 5 Hatfields, Level 9 Alto Tower, London, SE1 9PG.		

METALLURGY REFERENCE	MC 463	MC 464	MC 465	MC 466	MC 467
CLIENT REFERENCE	H3-LC6/B2 25 mm Ø Square Twisted Bar	H3-P1/B1 25 mm Ø Square Twisted Bar	H3-P2/B1 25 mm Ø Square Twisted Bar	H3-R2/B1 20 mm Ø Square Twisted Bar	H3-R2/L1 6 mm Ø Plain Round Bar
LOAD/kg	10	10	10	10	10
HARDNESS VALUE (SURFACE)	213	212	209	210	170
	217	205	213	207	186
	222	205	206	206	190
AVERAGE HARDNESS VALUE (SURFACE)	217	207	209	208	182
HARDNESS VALUE (CORE)	151	146	177	150	142
	156	153	174	158	153
	165	162	190	171	168
AVERAGE HARDNESS VALUE (CORE)	158	154	180	160	155

Comments: The above hardness values show that samples MC 463, MC 464, MC 465, MC 466 and MC 467 have not been quenched and self-tempered.

For Sandberg LLP

Date: 9 June 2022

N. Fetter

Neale Fetter - Assistant Manager Metallurgy Department

Materials, samples and test specimens are retained for a period of 2 months from the issue of the final report.
Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.
Where test results are given, the results and our conclusions relate only to the samples tested and apply to the sample(s) as received, except where sampling has been conducted by Sandberg LLP.

SANDBERG
CONSULTING ENGINEERS
INVESTIGATION INSPECTION
MATERIALS TESTING

Sandberg LLP
5 Carpenters Place
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Tel: 020 7565 7000
email: mail@sandberg.co.uk
web: www.sandberg.co.uk

AUTHORISATION FOR THE RETENTION OF MATERIALS, SAMPLES AND TEST SPECIMENS

CLIENT:	McGee Group (Holdings) Limited		
DATE REPORT ISSUED:	9 June 2022	JOB NO:	72435/M

Materials, samples and test specimens are retained for a period of 2 months from the issue of the final report. Thereafter we will either dispose of them or retain them for a further period, whichever you require. However, we cannot accept requests for indefinite retention and the maximum period of retention without review by yourselves is 6 months.

A charge is made for storage at £50 per 0.025 m^3 (approximately one cubic foot) or part thereof per quarter commencing at the end of our standard 2 month retention period. You will be invoiced for the storage charges at the start of each quarterly period.

If you wish to retain them for a specified period, or if you intend to collect any of these items, please complete the form below and return it to the above address with 1 month.

PLEASE KEEP UPPER HALF FOR REFERENCE

PLEASE COMPLETE 'A' OR 'B' AND RETURN IF APPROPRIATE

A. Please RETAIN/PREPARE FOR COLLECTION* all materials.
* Delete as appropriate

If materials are to be retained please give retention period

If materials are to be collected please give intended date of collection

---

B. If you require only certain materials, samples or test specimens to be retained or collected please describe them below and give retention period or intended collection date.

(Any material not listed will be disposed)

TO BE RETAINED/COLLECTED (delete as appropriate)			JOB NO:
Contact Name		Signature	
Company		Date	

CONCEPT SITE INVESTIGATIONS

Site Name:	Euston Tower	**Job No.:**	22/3686
Client:	McGee	**Date Reported:**	09/06/2022

Summary Test Report

Determination of Moisture Content and Liquid and Plastic Limits by 4 Point Cone Method

Borehole No.	Sample Type	Sample No.	Depth m	Description	Natural Moisture Content %	Washed Natural	Passing 425 µm sieve %	Liquid Limit %	Plastic Limit %	Plasticity Index %	Remarks
Heading 1	D	Face S001A	0.15	Dark grey slightly micaceous silty CLAY	26	Natural	100	71	26	45	
Heading 1	D	Face S002A	0.80	Greyish brown slightly micaceous silty CLAY with rare pockets of light brown silty fine sand	26	Natural	100	71	26	45	
Heading 1	D	Face S003A	1.65	Greyish brown slightly micaceous silty CLAY	27	Natural	100	75	27	48	
Heading 2	D	Face S004A	0.10	Brown silty CLAY	29	Natural	100	75	27	48	
Heading 2	D	Face S005A	1.00	Greyish brown slightly micaceous slightly sandy silty CLAY with rare shell fragments and pockets of light grey silty fine sand	24	Natural	100	66	25	41	
Heading 2	D	Face S006A	2.00	Greyish brown slightly micaceous silty CLAY	27	Natural	100	73	26	47	

BS 1377: Part 2: Clause 4.3 & 4.4: 1990 Determination of the liquid limit by the cone penetrometer method

BS 1377: Part 2: Clause 5: 1990 Determination of the plastic limit and plasticity index

BS 1377: Part 2: Clause 3.2: 1990 Determination of the moisture content by the oven drying method

AGS ASSOCIATION OF GEOTECHNICAL & GEOENVIRONMENTAL SPECIALISTS

UKAS TESTING 4503

Remarks: The results reported relate only to the items tested or sampled.

Date - samples received:	20/04/2022		
Date - sample testing commenced :	24/05/2022	Checked / Approved by:	01/06/2022
Date - sample testing completed :	26/05/2022	Date Approved:	KM
Approved Signatories:	L Griffin LG (QA Technical & Lab Mngr) – K Mazerant KM (Lab Mngr)		

CONCEPT
47-49 Brunel Road, London W3 7XR
Tel: 02087401553 Email: lab@conceptconsultants.co.uk

CONCEPT SITE INVESTIGATIONS

Site Name:	Euston Tower	**Job No.:**	22/3686
Client:	McGee	**Date Reported:**	16/06/2022

Summary Test Report

Determination of Moisture Content and Liquid and Plastic Limits by 4 Point Cone Method

Borehole No.	Sample Type	Sample No.	Depth m	Description	Natural Moisture Content %	Washed Natural	Passing 425 µm sieve %	Liquid Limit %	Plastic Limit %	Plasticity Index %	Remarks
Heading 1	U38	Pile L3 S010 Disc 1	1.20	Greyish brown silty CLAY	26						
Heading 1	U38	Pile L3 S010 Disc 2	1.20	Greyish brown silty CLAY	26						
Heading 1	U38	Pile L3 S010 Disc 3	1.20	Greyish brown silty CLAY	27						
Heading 1	U38	Pile L3 S010 Disc 4	1.20	Greyish brown silty CLAY	32						
Heading 1	U38	Pile L3 S010 Disc 5	1.20	Greyish brown silty CLAY	29						
Heading 1	U38	Pile L3 S010 Disc 6	1.20	Greyish brown silty CLAY	28						
Heading 1	U38	Pile L3 S010 Disc 7	1.20	Greyish brown silty CLAY	29						

BS 1377: Part 2: Clause 4.3 & 4.4: 1990 Determination of the liquid limit by the cone penetrometer method

BS 1377: Part 2: Clause 5: 1990 Determination of the plastic limit and plasticity index

BS 1377: Part 2: Clause 3.2: 1990 Determination of the moisture content by the oven drying method

AGS ASSOCIATION OF GEOTECHNICAL & GEOENVIRONMENTAL SPECIALISTS

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Summary Test Report

Determination of Moisture Content and Liquid and Plastic Limits by 4 Point Cone Method

Borehole No.	Sample Type	Sample No.	Depth m	Description	Natural Moisture Content %	Washed Natural	Passing 425 µm sieve %	Liquid Limit %	Plastic Limit %	Plasticity Index %	Remarks
Heading 1	U38	Pile R3 S011 Disc 1	1.20	Greyish brown silty CLAY with rare pockets of grey silty sand	25						
Heading 1	U38	Pile R3 S011 Disc 2	1.20	Greyish brown silty CLAY with rare pockets of grey silty sand	26						
Heading 1	U38	Pile R3 S011 Disc 3	1.20	Greyish brown silty CLAY with rare pockets of grey silty sand	26						
Heading 1	U38	Pile R3 S011 Disc 4	1.20	Greyish brown silty CLAY with rare pockets of grey silty sand	26						
Heading 1	U38	Pile R3 S011 Disc 5	1.20	Greyish brown silty CLAY with rare pockets of grey silty sand	23						
Heading 1	U38	Pile R3 S011 Disc 6	1.20	Greyish brown silty CLAY with rare pockets of grey silty sand	25						
Heading 1	U38	Pile R3 S011 Disc 7	1.20	Greyish brown silty CLAY with rare pockets of grey silty sand	25						

BS 1377: Part 2: Clause 4.3 & 4.4: 1990 Determination of the liquid limit by the cone penetrometer method

BS 1377: Part 2: Clause 5: 1990 Determination of the plastic limit and plasticity index

BS 1377: Part 2: Clause 3.2: 1990 Determination of the moisture content by the oven drying method

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Summary Test Report

Determination of Moisture Content and Liquid and Plastic Limits by 4 Point Cone Method

Borehole No.	Sample Type	Sample No.	Depth m	Description	Natural Moisture Content %	Washed Natural	Passing 425 µm sieve %	Liquid Limit %	Plastic Limit %	Plasticity Index %	Remarks
Heading 1	U38	Pile L4 S012 Disc 1	1.20	Greyish brown silty CLAY with rare pockets of grey silty sand	26						
Heading 1	U38	Pile L4 S012 Disc 2	1.20	Greyish brown silty CLAY with rare pockets of grey silty sand	25						
Heading 1	U38	Pile L4 S012 Disc 3	1.20	Greyish brown silty CLAY with rare pockets of grey silty sand	26						
Heading 1	U38	Pile L4 S012 Disc 4	1.20	Greyish brown silty CLAY with rare pockets of grey silty sand	26						
Heading 1	U38	Pile L4 S012 Disc 5	1.20	Greyish brown silty CLAY with rare pockets of grey silty sand	25						
Heading 1	U38	Pile L4 S012 Disc 6	1.20	Greyish brown silty CLAY with rare pockets of grey silty sand	25						
Heading 1	U38	Pile L4 S012 Disc 7	1.20	Greyish brown silty CLAY with rare pockets of grey silty sand	25						
Heading 1	U38	Pile L4 S012 Disc 8	1.20	Greyish brown silty CLAY with rare pockets of grey silty sand	25						

BS 1377: Part 2: Clause 4.3 & 4.4: 1990 Determination of the liquid limit by the cone penetrometer method

BS 1377: Part 2: Clause 5: 1990 Determination of the plastic limit and plasticity index

BS 1377: Part 2: Clause 3.2: 1990 Determination of the moisture content by the oven drying method

4503

Remarks: The results reported relate only to the items tested or sampled.

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Summary Test Report

Determination of Moisture Content and Liquid and Plastic Limits by 4 Point Cone Method

Borehole No.	Sample Type	Sample No.	Depth m	Description	Natural Moisture Content %	Washed Natural	Passing 425 µm sieve %	Liquid Limit %	Plastic Limit %	Plasticity Index %	Remarks
Heading 3	D	Face S030A	0.20	Dark grey slightly micaceous silty CLAY	34	Natural	100	86	29	57	
Heading 3	D	Face S031A	1.05	Greyish brown slightly micaceous silty CLAY with rare pockets of light brown silty fine sand	28	Natural	100	80	27	53	
Heading 3	D	Face S032A	1.95	Greyish brown slightly micaceous silty CLAY	30	Natural	100	80	28	52	

BS 1377: Part 2: Clause 4.3 & 4.4: 1990 Determination of the liquid limit by the cone penetrometer method

BS 1377: Part 2: Clause 5: 1990 Determination of the plastic limit and plasticity index

BS 1377: Part 2: Clause 3.2: 1990 Determination of the moisture content by the oven drying method

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UKAS TESTING 4503

Remarks: The results reported relate only to the items tested or sampled.

Date - samples received:	25/05/2022		
Date - sample testing commenced :	06/06/2022	Checked / Approved by:	15/06/2022
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CONCEPT SITE INVESTIGATIONS

Site Name:	Euston Tower	**Job No.:**	22/3686
Client:	McGee	**Date Reported:**	16/06/2022

Summary Test Report

Determination of Moisture Content and Liquid and Plastic Limits by 4 Point Cone Method

Borehole No.	Sample Type	Sample No.	Depth m	Description	Natural Moisture Content %	Washed Natural	Passing 425 µm sieve %	Liquid Limit %	Plastic Limit %	Plasticity Index %	Remarks
Heading 3	U38	Pile C2 S035 Disc 1	3.50	Greyish brown silty CLAY	27						
Heading 3	U38	Pile C2 S035 Disc 2	3.50	Greyish brown silty CLAY	28						
Heading 3	U38	Pile C2 S035 Disc 3	3.50	Greyish brown silty CLAY	27						
Heading 3	U38	Pile C2 S035 Disc 4	3.50	Greyish brown silty CLAY	27						
Heading 3	U38	Pile C2 S035 Disc 5	3.50	Greyish brown silty CLAY	28						
Heading 3	U38	Pile C2 S035 Disc 6	3.50	Greyish brown silty CLAY	27						
Heading 3	U38	Pile C2 S035 Disc 7	3.50	Greyish brown silty CLAY	27						
Heading 3	U38	Pile C2 S035 Disc 8	3.50	Greyish brown silty CLAY	27						
Heading 3	U38	Pile C2 S035 Disc 9	3.50	Greyish brown silty CLAY	27						

BS 1377: Part 2: Clause 4.3 & 4.4: 1990 Determination of the liquid limit by the cone penetrometer method

BS 1377: Part 2: Clause 5: 1990 Determination of the plastic limit and plasticity index

BS 1377: Part 2: Clause 3.2: 1990 Determination of the moisture content by the oven drying method

AGS ASSOCIATION OF GEOTECHNICAL & GEOENVIRONMENTAL SPECIALISTS

UKAS TESTING 4503

Remarks: The results reported relate only to the items tested or sampled.

Date - samples received:	25/05/2022		
Date - sample testing commenced :	06/06/2022	Checked / Approved by:	15/06/2022
Date - sample testing completed :	13/06/2022	Date Approved:	KM
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CONCEPT SITE INVESTIGATIONS

Site Name:	Euston Tower	**Job No.:**	22/3686
Client:	McGee	**Date Reported:**	16/06/2022

Summary Test Report

Determination of Moisture Content and Liquid and Plastic Limits by 4 Point Cone Method

Borehole No.	Sample Type	Sample No.	Depth m	Description	Natural Moisture Content %	Washed Natural	Passing 425 µm sieve %	Liquid Limit %	Plastic Limit %	Plasticity Index %	Remarks
Heading 3	U38	Pile C2 S035 Disc 10	3.50	Greyish brown silty CLAY with rare pockets of grey silty sand	27						

BS 1377: Part 2: Clause 4.3 & 4.4: 1990 Determination of the liquid limit by the cone penetrometer method

BS 1377: Part 2: Clause 5: 1990 Determination of the plastic limit and plasticity index

BS 1377: Part 2: Clause 3.2: 1990 Determination of the moisture content by the oven drying method

Remarks: The results reported relate only to the items tested or sampled.

4503

Date - samples received:	25/05/2022		
Date - sample testing commenced :	06/06/2022	Checked / Approved by:	15/06/2022
Date - sample testing completed :	13/06/2022	Date Approved:	KM
Approved Signatories:	L Griffin LG (QA Technical & Lab Mngr) – K Mazerant KM (Lab Mngr)		

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CONCEPT SITE INVESTIGATIONS

Site Name:	Euston Tower	**Job No.:**	22/3686
Client:	McGee	**Date Reported:**	16/06/2022

Summary Test Report

Determination of Moisture Content and Liquid and Plastic Limits by 4 Point Cone Method

Borehole No.	Sample Type	Sample No.	Depth m	Description	Natural Moisture Content %	Washed Natural	Passing 425 µm sieve %	Liquid Limit %	Plastic Limit %	Plasticity Index %	Remarks
Heading 3	U38	Pile C2 S033 Disc 1	7.00	Brownish grey silty CLAY	28						
Heading 3	U38	Pile C2 S033 Disc 2	7.00	Brownish grey silty CLAY	28						
Heading 3	U38	Pile C2 S033 Disc 3	7.00	Brownish grey silty CLAY	29						
Heading 3	U38	Pile C2 S033 Disc 4	7.00	Brownish grey silty CLAY	28						
Heading 3	U38	Pile C2 S033 Disc 5	7.00	Brownish grey silty CLAY	27						
Heading 3	U38	Pile C2 S033 Disc 6	7.00	Brownish grey silty CLAY	28						
Heading 3	U38	Pile C2 S033 Disc 7	7.00	Brownish grey silty CLAY	28						
Heading 3	U38	Pile C2 S033 Disc 8	7.00	Brownish grey silty CLAY	27						
Heading 3	U38	Pile C2 S033 Disc 9	7.00	Brownish grey silty CLAY	27						

BS 1377: Part 2: Clause 4.3 & 4.4: 1990 Determination of the liquid limit by the cone penetrometer method

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BS 1377: Part 2: Clause 3.2: 1990 Determination of the moisture content by the oven drying method

AGS ASSOCIATION OF GEOTECHNICAL & GEOENVIRONMENTAL SPECIALISTS

UKAS TESTING 4503

Remarks: The results reported relate only to the items tested or sampled.

Date - samples received:	20/04/2022		
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Date - sample testing completed :	13/06/2022	Date Approved:	KM
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CONCEPT SITE INVESTIGATIONS

Site Name:	Euston Tower	**Job No.:**	22/3686
Client:	McGee	**Date Reported:**	16/06/2022

Summary Test Report

Determination of Moisture Content and Liquid and Plastic Limits by 4 Point Cone Method

Borehole No.	Sample Type	Sample No.	Depth m	Description	Natural Moisture Content %	Washed Natural	Passing 425 µm sieve %	Liquid Limit %	Plastic Limit %	Plasticity Index %	Remarks
Heading 3	U38	Pile C2 S033 Disc 10	7.00	Brownish grey silty CLAY	27						

BS 1377: Part 2: Clause 4.3 & 4.4: 1990 Determination of the liquid limit by the cone penetrometer method

BS 1377: Part 2: Clause 5: 1990 Determination of the plastic limit and plasticity index

BS 1377: Part 2: Clause 3.2: 1990 Determination of the moisture content by the oven drying method

Remarks: The results reported relate only to the items tested or sampled.

4503

Date - samples received:	20/04/2022		
Date - sample testing commenced :	06/06/2022	Checked / Approved by:	15/06/2022
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CONCEPT SITE INVESTIGATIONS

Site Name:	Euston Tower	**Job No.:**	22/3686
Client:	McGee	**Date Reported:**	16/06/2022

Summary Test Report

Determination of Moisture Content and Liquid and Plastic Limits by 4 Point Cone Method

Borehole No.	Sample Type	Sample No.	Depth m	Description	Natural Moisture Content %	Washed Natural	Passing 425 µm sieve %	Liquid Limit %	Plastic Limit %	Plasticity Index %	Remarks
Heading 3	U38	Pile C2 S034 Disc 1	1.40	Brownish grey silty CLAY	29						
Heading 3	U38	Pile C2 S034 Disc 2	1.40	Brownish grey silty CLAY	29						
Heading 3	U38	Pile C2 S034 Disc 3	1.40	Brownish grey silty CLAY	28						
Heading 3	U38	Pile C2 S034 Disc 4	1.40	Brownish grey silty CLAY	28						
Heading 3	U38	Pile C2 S034 Disc 5	1.40	Brownish grey silty CLAY	29						
Heading 3	U38	Pile C2 S034 Disc 6	1.40	Brownish grey silty CLAY	29						
Heading 3	U38	Pile C2 S034 Disc 7	1.40	Brownish grey silty CLAY	29						
Heading 3	U38	Pile C2 S034 Disc 8	1.40	Brownish grey silty CLAY	29						
Heading 3	U38	Pile C2 S034 Disc 9	1.40	Brownish grey silty CLAY	29						

BS 1377: Part 2: Clause 4.3 & 4.4: 1990 Determination of the liquid limit by the cone penetrometer method

BS 1377: Part 2: Clause 5: 1990 Determination of the plastic limit and plasticity index

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AGS ASSOCIATION OF GEOTECHNICAL & GEOENVIRONMENTAL SPECIALISTS

UKAS TESTING 4503

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Date - samples received:	20/04/2022		
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CONCEPT SITE INVESTIGATIONS

Site Name:	Euston Tower	**Job No.:**	22/3686
Client:	McGee	**Date Reported:**	16/06/2022

Summary Test Report

Determination of Moisture Content and Liquid and Plastic Limits by 4 Point Cone Method

Borehole No.	Sample Type	Sample No.	Depth m	Description	Natural Moisture Content %	Washed Natural	Passing 425 µm sieve %	Liquid Limit %	Plastic Limit %	Plasticity Index %	Remarks
Heading 3	U38	Pile C2 S034 Disc 10	1.40	Brownish grey silty CLAY	30						

BS 1377: Part 2: Clause 4.3 & 4.4: 1990 Determination of the liquid limit by the cone penetrometer method

BS 1377: Part 2: Clause 5: 1990 Determination of the plastic limit and plasticity index

BS 1377: Part 2: Clause 3.2: 1990 Determination of the moisture content by the oven drying method

AGS ASSOCIATION OF GEOTECHNICAL & GEOENVIRONMENTAL SPECIALISTS

UKAS TESTING 4503

Remarks: The results reported relate only to the items tested or sampled.

Date - samples received:	20/04/2022		
Date - sample testing commenced :	06/06/2022	Checked / Approved by:	15/06/2022
Date - sample testing completed :	13/06/2022	Date Approved:	KM
Approved Signatories:	L Griffin LG (QA Technical & Lab Mngr) – K Mazerant KM (Lab Mngr)		

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CONCEPT SITE INVESTIGATIONS

PARTICLE SIZE DISTRIBUTION

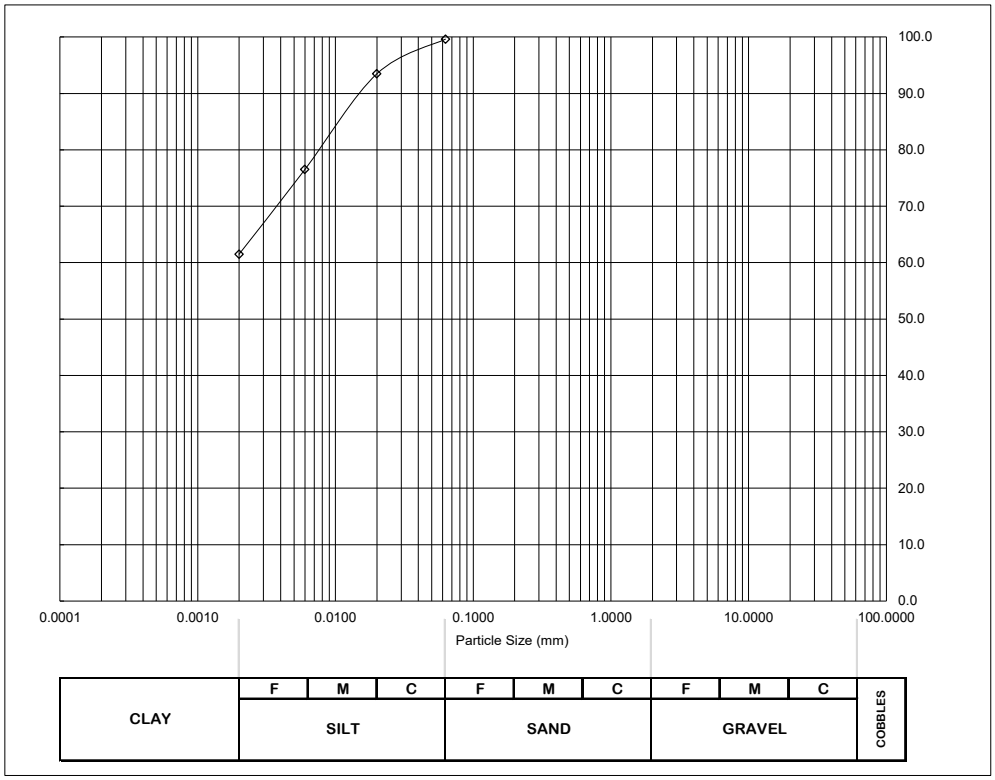
TEST REPORT

Site Name:	**Euston Tower**					**Job Number:**	**22/3686**
Client:	**McGee**					**Date Reported:**	**01/06/2022**
Borehole No:	**Heading 1**	**Sample Type/No.**	**D**	**Face S001A**	**Top Depth: 0.15 m**	**Bottom Depth:**	**m**

Soil Description:

Dark grey slightly micaceous silty CLAY

BS Test Sieves	
Size (mm)	% Passing
75.000	100
63.000	100
50.000	100
37.500	100
28.000	100
20.000	100
14.000	100
10.000	100
6.300	100
5.000	100
3.350	100
2.000	100
1.180	100
0.600	100
0.425	100
0.300	100
0.212	100
0.150	100
0.063	100



Sedimentation (*if applicable)	
Size (mm)	% Passing
0.020	93
0.006	77
0.002	61

Method/type:	
	Pipette

BS 1377: Part 2: Clause 9.4: 1990 Determination of sedimentation by the pipette method.

Particle Proportions %	
Cobbles	
Gravel	
Sand	0.4
Silt	38.2
Clay	61.5

4503

Remarks:

Particle size distribution by dry sieve was not carried out on sand fraction

The results reported relate only to the items tested or sampled.

Date - samples received:	20/04/2022		
Date - sample testing commenced :	24/05/2022	Checked / Approved by:	01/06/2022
Date - sample testing completed :	29/05/2022	Date Approved:	KM

Approved Signatories: L Griffin LG (QA Technical & Lab Mngr) – K Mazerant KM (Lab Mngr)

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CONCEPT SITE INVESTIGATIONS

PARTICLE SIZE DISTRIBUTION

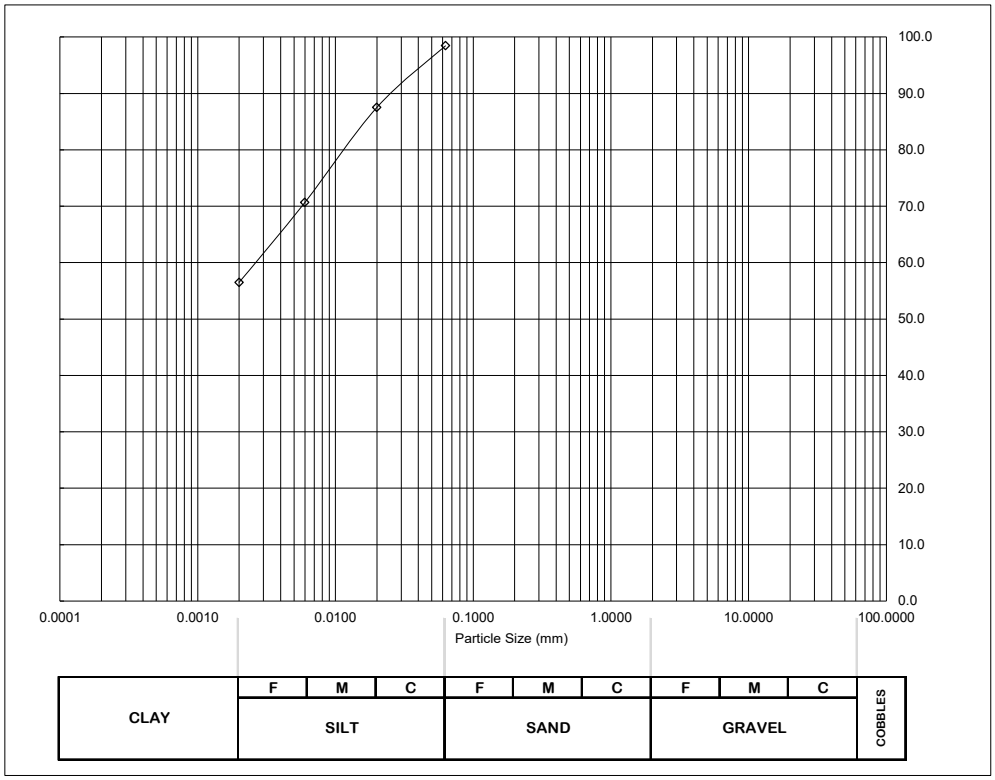
TEST REPORT

Site Name:	**Euston Tower**					**Job Number:**	**22/3686**
Client:	**McGee**					**Date Reported:**	**01/06/2022**
Borehole No:	**Heading 1**	**Sample Type/No.**	**D**	**Face S002A**	**Top Depth: 0.80 m**	**Bottom Depth:**	**m**

Soil Description:

Greyish brown slightly micaceous silty CLAY with rare pockets of light brown silty fine sand

BS Test Sieves	
Size (mm)	% Passing
75.000	100
63.000	100
50.000	100
37.500	100
28.000	100
20.000	100
14.000	100
10.000	100
6.300	100
5.000	100
3.350	100
2.000	100
1.180	100
0.600	100
0.425	100
0.300	100
0.212	100
0.150	100
0.063	98



Sedimentation (*if applicable)	
Size (mm)	% Passing
0.020	88
0.006	71
0.002	56

Method/type:	
	Pipette

BS 1377: Part 2: Clause 9.4: 1990 Determination of sedimentation by the pipette method.

Particle Proportions %	
Cobbles	
Gravel	
Sand	1.5
Silt	42.0
Clay	56.5

4503

Remarks:

Particle size distribution by dry sieve was not carried out on sand fraction

The results reported relate only to the items tested or sampled.

Date - samples received:	20/04/2022		
Date - sample testing commenced :	24/05/2022	Checked / Approved by:	01/06/2022
Date - sample testing completed :	29/05/2022	Date Approved:	KM

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CONCEPT SITE INVESTIGATIONS

PARTICLE SIZE DISTRIBUTION

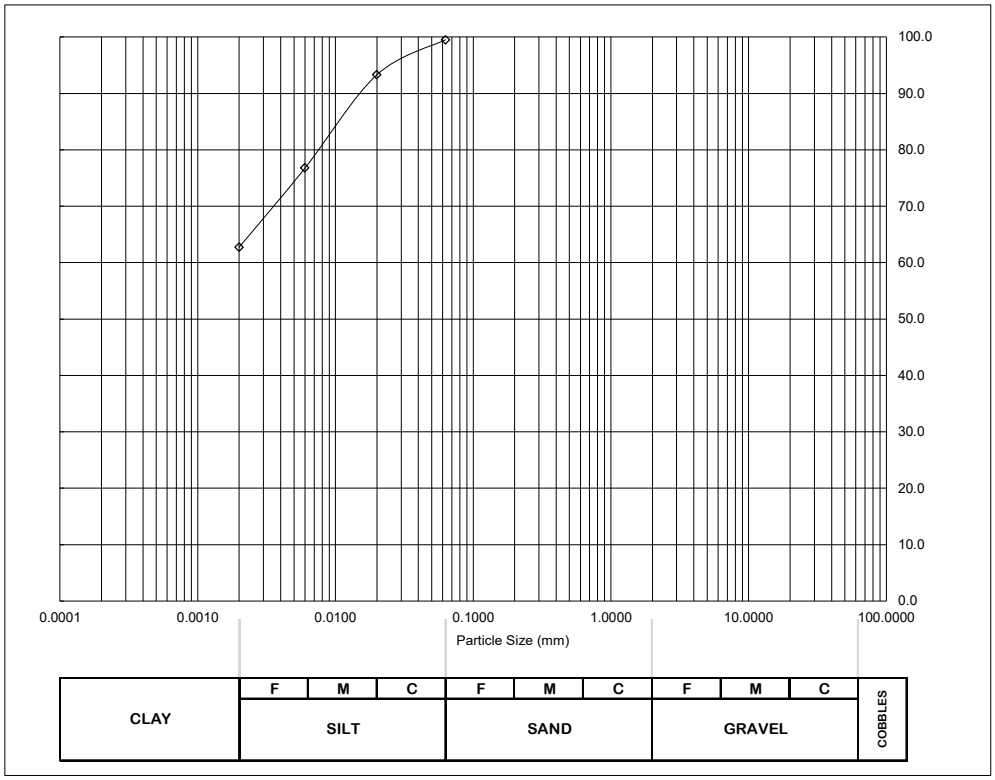
TEST REPORT

Site Name:	**Euston Tower**					**Job Number:**	**22/3686**
Client:	**McGee**					**Date Reported:**	**01/06/2022**
Borehole No:	**Heading 1**	**Sample Type/No.**	**D**	**Face S003A**	**Top Depth: 1.65 m**	**Bottom Depth:**	**m**

Soil Description:

Greyish brown slightly micaceous silty CLAY

BS Test Sieves	
Size (mm)	% Passing
75.000	100
63.000	100
50.000	100
37.500	100
28.000	100
20.000	100
14.000	100
10.000	100
6.300	100
5.000	100
3.350	100
2.000	100
1.180	100
0.600	100
0.425	100
0.300	100
0.212	100
0.150	100
0.063	99



Sedimentation (*if applicable)	
Size (mm)	% Passing
0.020	93
0.006	77
0.002	63

Method/type:	
	Pipette

BS 1377: Part 2: Clause 9.4: 1990 Determination of sedimentation by the pipette method.

Particle Proportions %	
Cobbles	
Gravel	
Sand	0.5
Silt	36.8
Clay	62.7

4503

Remarks:

Particle size distribution by dry sieve was not carried out on sand fraction

The results reported relate only to the items tested or sampled.

Date - samples received:	20/04/2022		
Date - sample testing commenced :	24/05/2022	Checked / Approved by:	01/06/2022
Date - sample testing completed :	29/05/2022	Date Approved:	KM

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CONCEPT SITE INVESTIGATIONS

PARTICLE SIZE DISTRIBUTION

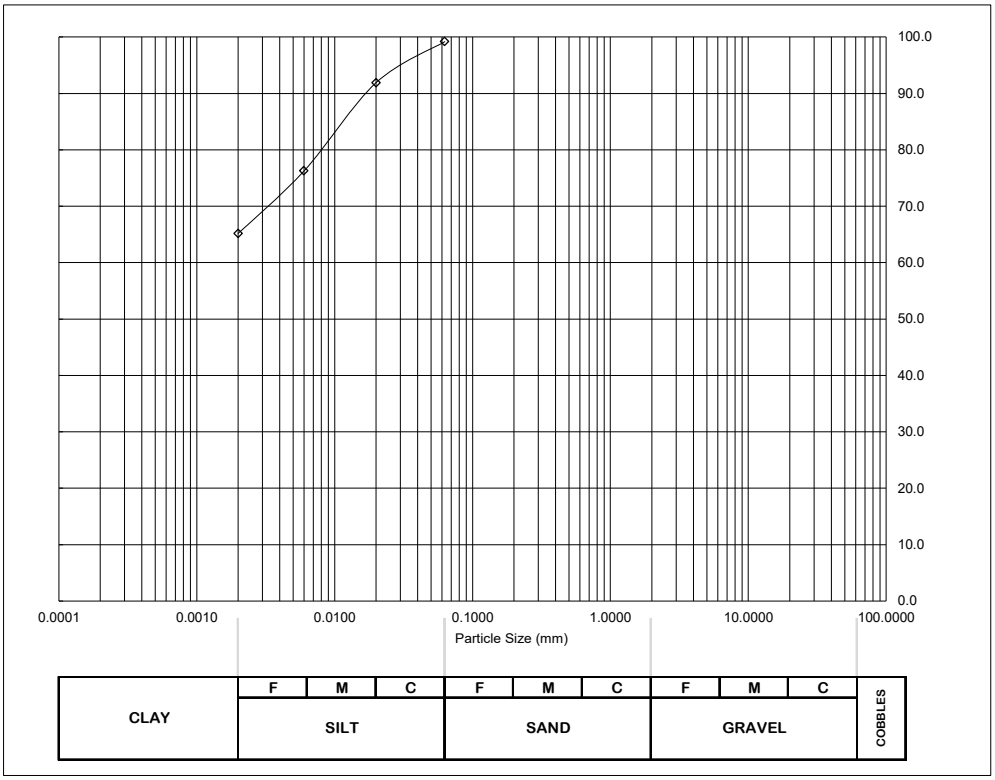
TEST REPORT

Site Name:	**Euston Tower**					**Job Number:**	**22/3686**
Client:	**McGee**					**Date Reported:**	**01/06/2022**
Borehole No:	**Heading 2**	**Sample Type/No.**	**D**	**Face S004A**	**Top Depth: 0.10 m**	**Bottom Depth:**	**m**

Soil Description:

Brown silty CLAY

BS Test Sieves	
Size (mm)	% Passing
75.000	100
63.000	100
50.000	100
37.500	100
28.000	100
20.000	100
14.000	100
10.000	100
6.300	100
5.000	100
3.350	100
2.000	100
1.180	100
0.600	100
0.425	100
0.300	100
0.212	100
0.150	100
0.063	99



Sedimentation (*if applicable)	
Size (mm)	% Passing
0.020	92
0.006	76
0.002	65

Method/type:	
	Pipette

BS 1377: Part 2: Clause 9.4: 1990 Determination of sedimentation by the pipette method.

Particle Proportions %	
Cobbles	
Gravel	
Sand	0.8
Silt	34.0
Clay	65.2

4503

Remarks:

Particle size distribution by dry sieve was not carried out on sand fraction

The results reported relate only to the items tested or sampled.

Date - samples received:	20/04/2022		
Date - sample testing commenced :	24/05/2022	Checked / Approved by:	01/06/2022
Date - sample testing completed :	29/05/2022	Date Approved:	KM

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CONCEPT SITE INVESTIGATIONS

PARTICLE SIZE DISTRIBUTION

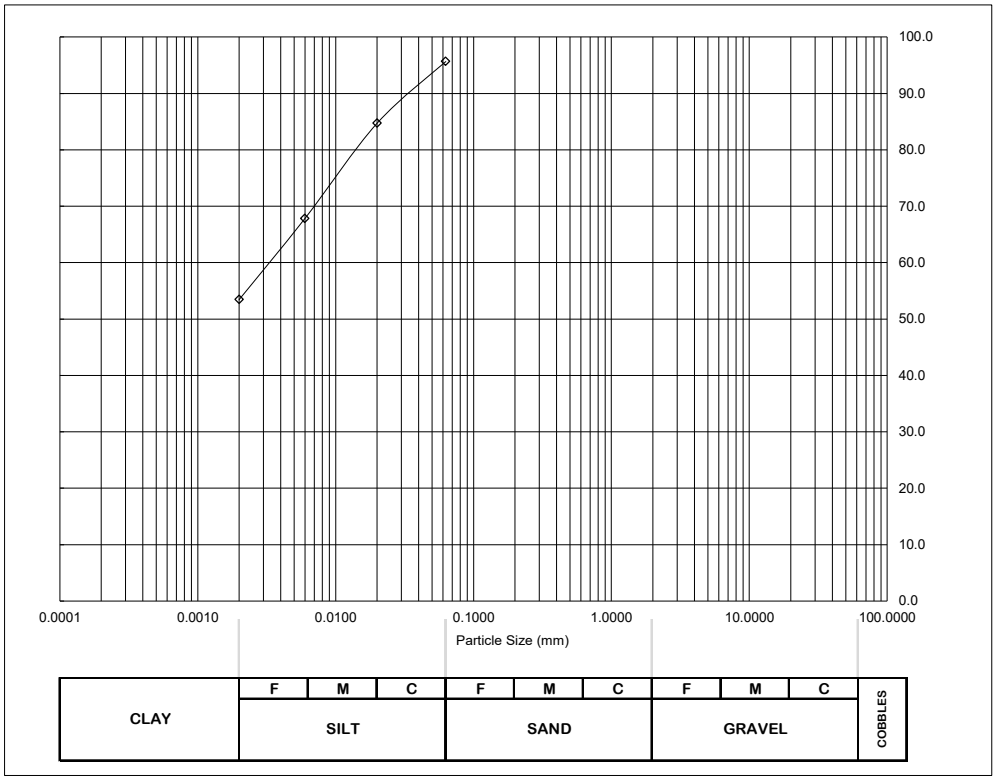
TEST REPORT

Site Name:	**Euston Tower**					**Job Number:**	**22/3686**
Client:	**McGee**					**Date Reported:**	**01/06/2022**
Borehole No:	**Heading 2**	**Sample Type/No.**	**D**	**Face S005A**	**Top Depth: 1.00 m**	**Bottom Depth:**	**m**

Soil Description:

Greyish brown slightly micaceous slightly sandy silty CLAY with rare shell fragments and pockets of light grey silty fine sand

BS Test Sieves	
Size (mm)	% Passing
75.000	100
63.000	100
50.000	100
37.500	100
28.000	100
20.000	100
14.000	100
10.000	100
6.300	100
5.000	100
3.350	100
2.000	100
1.180	100
0.600	100
0.425	100
0.300	100
0.212	100
0.150	100
0.063	96



Sedimentation (*if applicable)	
Size (mm)	% Passing
0.020	85
0.006	68
0.002	53

Method/type:	
	Pipette

BS 1377: Part 2: Clause 9.4: 1990 Determination of sedimentation by the pipette method.

Particle Proportions %	
Cobbles	
Gravel	
Sand	4.3
Silt	42.2
Clay	53.5

4503

Remarks: Particle size distribution by dry sieve was not carried out on sand fraction

The results reported relate only to the items tested or sampled.

Date - samples received:	20/04/2022		
Date - sample testing commenced :	24/05/2022	Checked / Approved by:	01/06/2022
Date - sample testing completed :	29/05/2022	Date Approved:	KM

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CONCEPT SITE INVESTIGATIONS

PARTICLE SIZE DISTRIBUTION

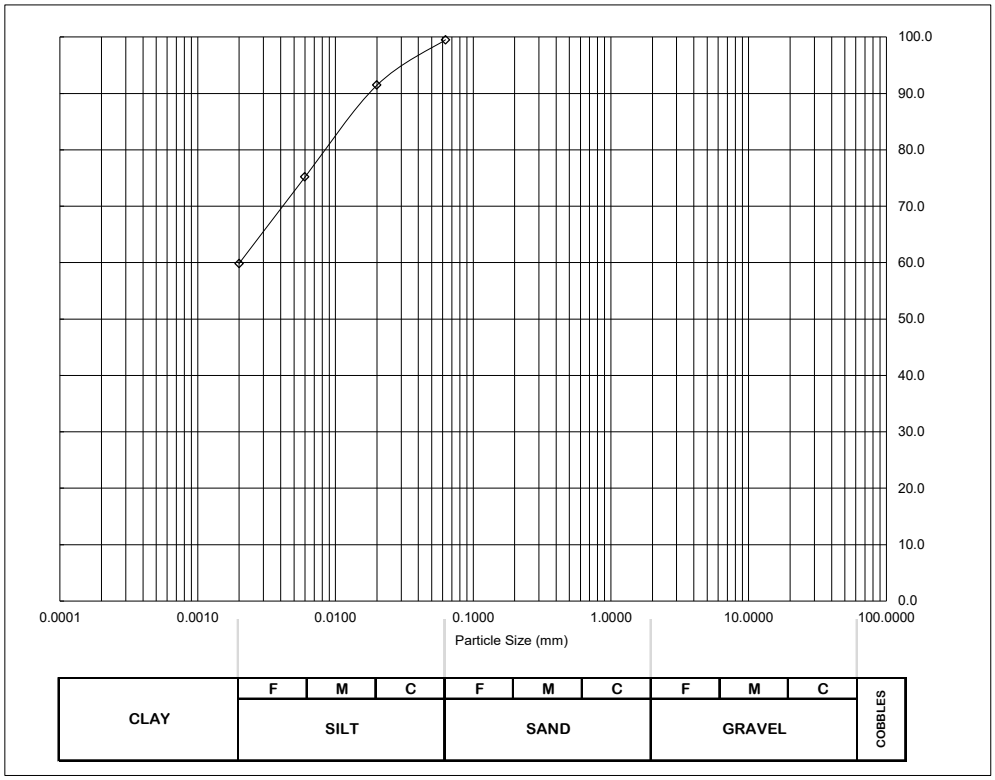
TEST REPORT

Site Name:	**Euston Tower**					**Job Number:**	**22/3686**
Client:	**McGee**					**Date Reported:**	**01/06/2022**
Borehole No:	**Heading 2**	**Sample Type/No.**	**D**	**Face S006A**	**Top Depth: 2.00 m**	**Bottom Depth:**	**m**

Soil Description:

Greyish brown slightly micaceous silty CLAY

BS Test Sieves	
Size (mm)	% Passing
75.000	100
63.000	100
50.000	100
37.500	100
28.000	100
20.000	100
14.000	100
10.000	100
6.300	100
5.000	100
3.350	100
2.000	100
1.180	100
0.600	100
0.425	100
0.300	100
0.212	100
0.150	100
0.063	100



Sedimentation (*if applicable)	
Size (mm)	% Passing
0.020	91
0.006	75
0.002	60

Method/type:	
	Pipette

BS 1377: Part 2: Clause 9.4: 1990 Determination of sedimentation by the pipette method.

Particle Proportions %	
Cobbles	
Gravel	
Sand	0.5
Silt	39.7
Clay	59.8

4503

Remarks:

Particle size distribution by dry sieve was not carried out on sand fraction

The results reported relate only to the items tested or sampled.

Date - samples received:	20/04/2022		
Date - sample testing commenced :	24/05/2022	Checked / Approved by:	01/06/2022
Date - sample testing completed :	29/05/2022	Date Approved:	KM

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CONCEPT SITE INVESTIGATIONS

PARTICLE SIZE DISTRIBUTION

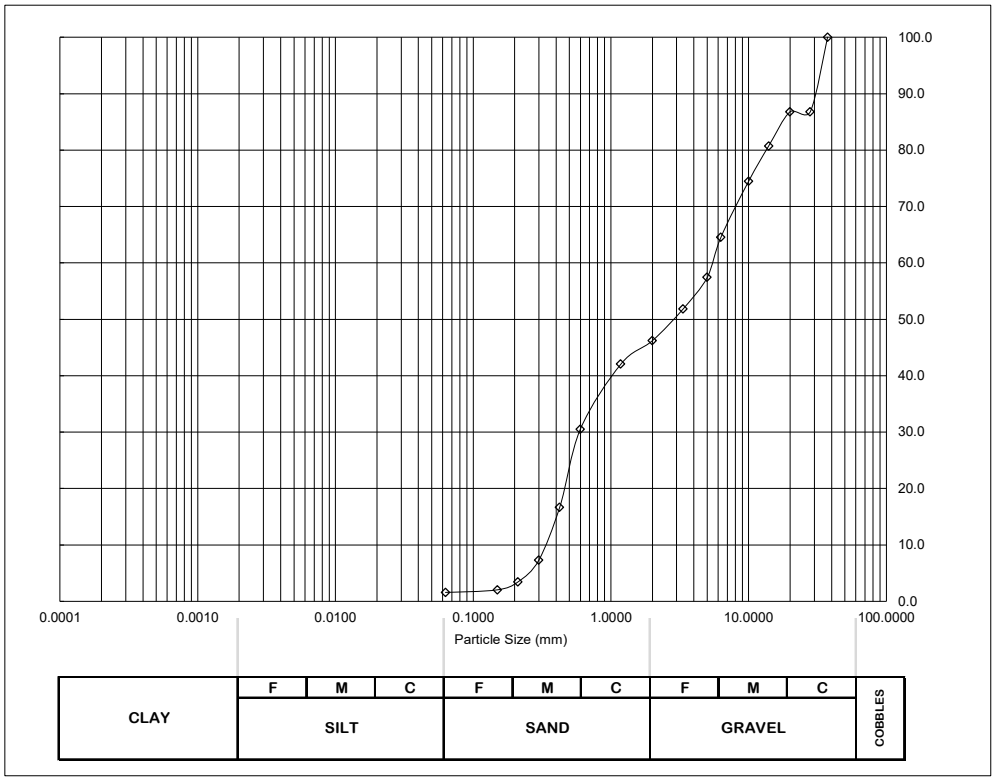
TEST REPORT

Site Name:	**Euston Tower**					**Job Number:**	**22/3686**
Client:	**McGee**					**Date Reported:**	**01/06/2022**
Borehole No:	**Heading 2**	**Sample Type/No.**	**D**	**Gravel spoil**	**Top Depth: 2.00 m**	**Bottom Depth:**	**m**

Soil Description:

Brown slightly silty very sandy fine to coarse flint GRAVEL

BS Test Sieves	
Size (mm)	% Passing
75.000	100
63.000	100
50.000	100
37.500	100
28.000	87
20.000	87
14.000	81
10.000	74
6.300	65
5.000	57
3.350	52
2.000	46
1.180	42
0.600	30
0.425	17
0.300	7
0.212	3
0.150	2
0.063	2



Sedimentation (*if applicable)	
Size (mm)	% Passing
0.020	
0.006	
0.002	

Method/type:	Wet Sieving

BS 1377: Part 2: Clause 9.2: 1990 Determination of particle size distribution - wet sieving method.

Particle Proportions %	
Cobbles	
Gravel	53.8
Sand	44.6
Silt and Clay	1.6

4503

Remarks:

Sample mass does not meet the requirements of BS1377: Part 2: 1990

The results reported relate only to the items tested or sampled.

Date - samples received:	20/04/2022		
Date - sample testing commenced :	24/05/2022	Checked / Approved by:	01/06/2022
Date - sample testing completed :	25/05/2022	Date Approved:	KM

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CONCEPT SITE INVESTIGATIONS

PARTICLE SIZE DISTRIBUTION

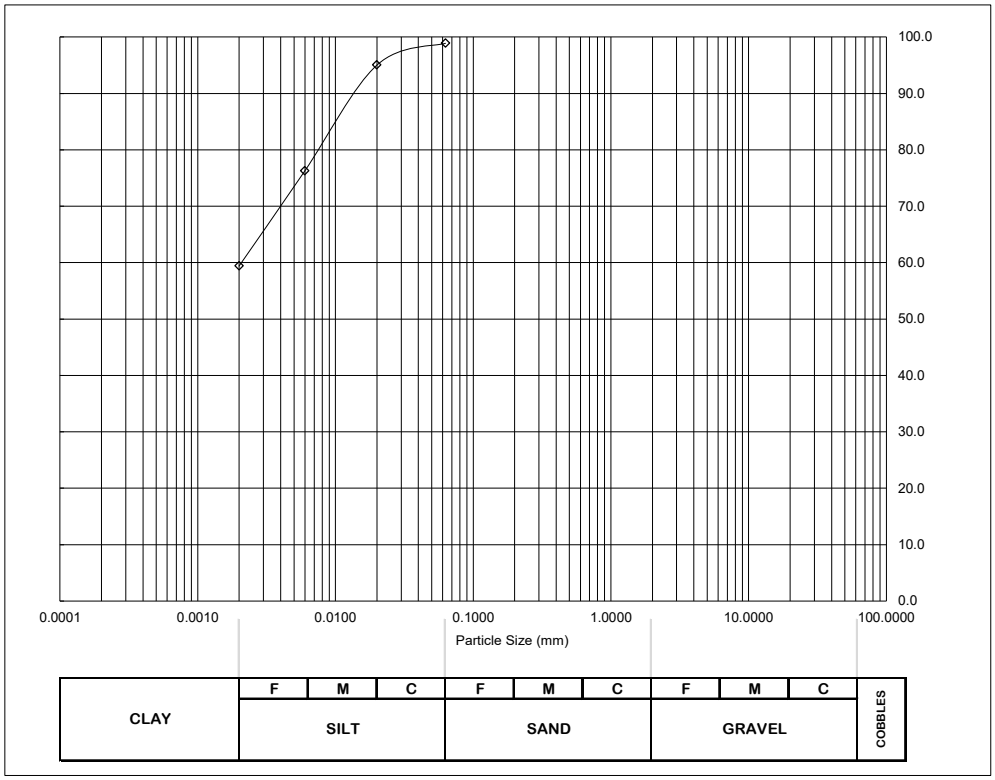
TEST REPORT

Site Name:	**Euston Tower**					**Job Number:**	**22/3686**
Client:	**McGee**					**Date Reported:**	**15/06/2022**
Borehole No:	**Heading 3**	**Sample Type/No.**	**D**	**Face S030A**	**Top Depth: 0.20 m**	**Bottom Depth:**	**m**

Soil Description:

Brownish grey silty CLAY with rare pockets of silty fine sand and fine flint gravel

BS Test Sieves	
Size (mm)	% Passing
75.000	100
63.000	100
50.000	100
37.500	100
28.000	100
20.000	100
14.000	100
10.000	100
6.300	100
5.000	100
3.350	100
2.000	100
1.180	100
0.600	100
0.425	100
0.300	100
0.212	100
0.150	100
0.063	99



Sedimentation (*if applicable)	
Size (mm)	% Passing
0.020	95
0.006	76
0.002	59

Method/type:	
	Pipette

BS 1377: Part 2: Clause 9.4: 1990 Determination of sedimentation by the pipette method.

Particle Proportions %	
Cobbles	
Gravel	
Sand	1.1
Silt	39.5
Clay	59.4

4503

Remarks:

Particle size distribution by dry sieve was not carried out on sand fraction

The results reported relate only to the items tested or sampled.

Date - samples received:	25/05/2022		
Date - sample testing commenced :	06/06/2022	Checked / Approved by:	KM
Date - sample testing completed :	13/06/2022	Date Approved:	15/06/2022

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CONCEPT SITE INVESTIGATIONS

PARTICLE SIZE DISTRIBUTION

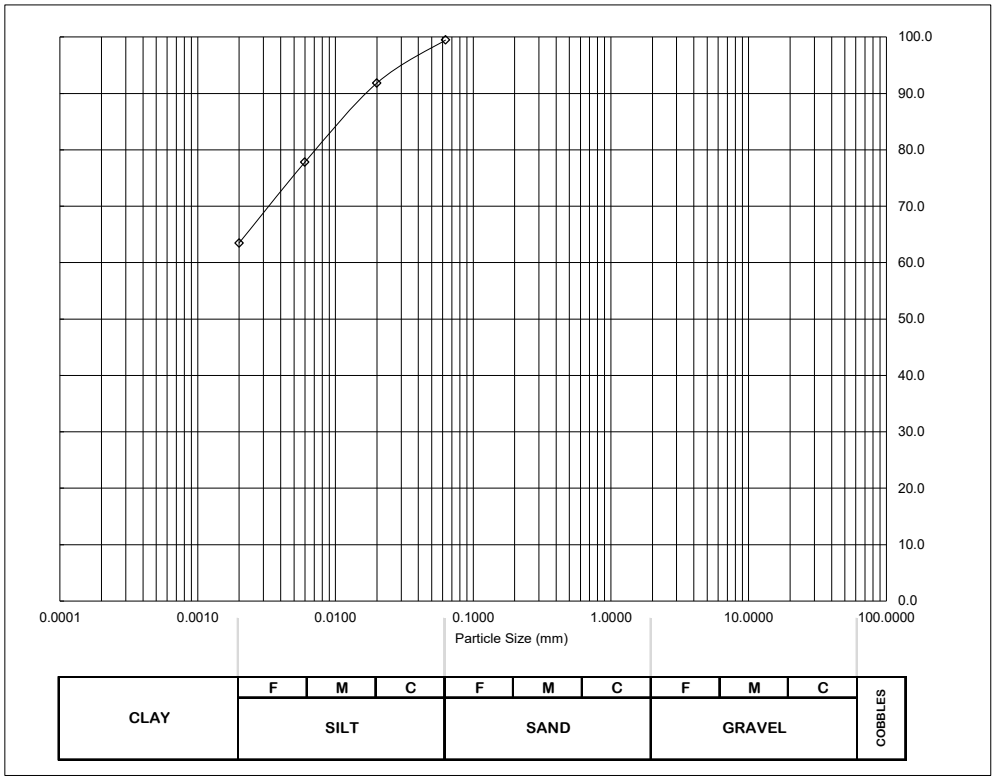
TEST REPORT

Site Name:	**Euston Tower**					**Job Number:**	**22/3686**
Client:	**McGee**					**Date Reported:**	**15/06/2022**
Borehole No:	**Heading 3**	**Sample Type/No.**	**D**	**Face S031A**	**Top Depth: 1.05 m**	**Bottom Depth:**	**m**

Soil Description:

Brownish grey slightly micaceous silty CLAY

BS Test Sieves	
Size (mm)	% Passing
75.000	100
63.000	100
50.000	100
37.500	100
28.000	100
20.000	100
14.000	100
10.000	100
6.300	100
5.000	100
3.350	100
2.000	100
1.180	100
0.600	100
0.425	100
0.300	100
0.212	100
0.150	100
0.063	99



Sedimentation (*if applicable)	
Size (mm)	% Passing
0.020	92
0.006	78
0.002	63

Method/type:	
	Pipette

BS 1377: Part 2: Clause 9.4: 1990 Determination of sedimentation by the pipette method.

Particle Proportions %	
Cobbles	
Gravel	
Sand	0.5
Silt	36.0
Clay	63.5

4503

Remarks:

Particle size distribution by dry sieve was not carried out on sand fraction

The results reported relate only to the items tested or sampled.

Date - samples received:	25/05/2022		
Date - sample testing commenced :	06/06/2022	Checked / Approved by:	KM
Date - sample testing completed :	13/06/2022	Date Approved:	15/06/2022

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CONCEPT SITE INVESTIGATIONS

PARTICLE SIZE DISTRIBUTION

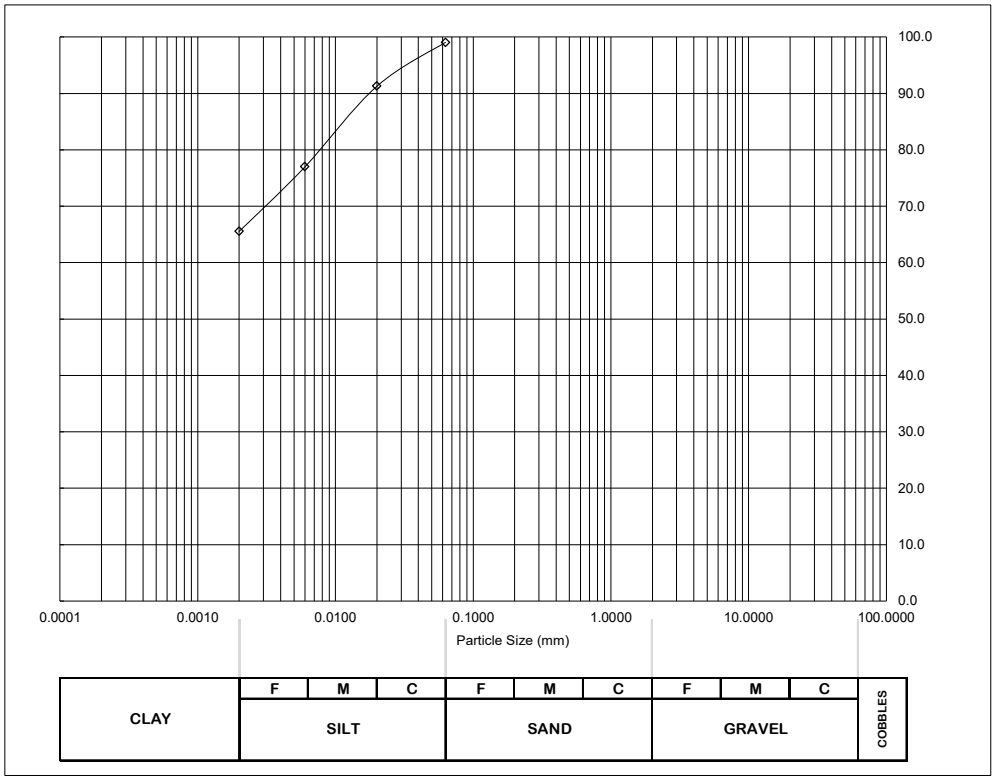
TEST REPORT

Site Name:	**Euston Tower**					**Job Number:**	**22/3686**
Client:	**McGee**					**Date Reported:**	**15/06/2022**
Borehole No:	**Heading 3**	**Sample Type/No.**	**D**	**Face S032A**	**Top Depth: 1.95 m**	**Bottom Depth:**	**m**

Soil Description:

Brownish grey slightly micaceous silty CLAY with rare pockets of light grey silt

BS Test Sieves	
Size (mm)	% Passing
75.000	100
63.000	100
50.000	100
37.500	100
28.000	100
20.000	100
14.000	100
10.000	100
6.300	100
5.000	100
3.350	100
2.000	100
1.180	100
0.600	100
0.425	100
0.300	100
0.212	100
0.150	100
0.063	99



Sedimentation (*if applicable)	
Size (mm)	% Passing
0.020	91
0.006	77
0.002	66

Method/type:	
	Pipette

BS 1377: Part 2: Clause 9.4: 1990 Determination of sedimentation by the pipette method.

Particle Proportions %	
Cobbles	
Gravel	
Sand	1.0
Silt	33.5
Clay	65.5

4503

Remarks:

Particle size distribution by dry sieve was not carried out on sand fraction

The results reported relate only to the items tested or sampled.

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Date - sample testing commenced :	06/06/2022	Checked / Approved by:	KM
Date - sample testing completed :	13/06/2022	Date Approved:	15/06/2022

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Analytical Report Number : 22-57065

Replaces Analytical Report Number: 22-57065, issue no. 2
Client references/information amended.

Project / Site name:	Euston Tower	**Samples received on:**	09/05/2022
Your job number:	22 3686	**Samples instructed on/ Analysis started on:**	09/05/2022
Your order number:	L2800	**Analysis completed by:**	17/05/2022
Report Issue Number:	3	**Report issued on:**	17/05/2022
Samples Analysed:	5 soil samples		

Signed:

Joanna Wawrzeczko
Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

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The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 22-57065
Project / Site name: Euston Tower
Your Order No: L2800

Lab Sample Number				2268489	2268490	2268491	2268492	2268493
Sample Reference				Heading 1	Heading 1	Heading 2	Heading 2	Heading 2
Sample Number				Face S001A	Face S003A	Face S004A	Face S006A	Gravel spoil S007
Depth (m)				0.15	1.65	0.10	2.00	2.00
Date Sampled				09/05/2022	09/05/2022	09/05/2022	09/05/2022	09/05/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	17	17	18	17	4.5
Total mass of sample received	kg	0.001	NONE	0.2	0.2	0.2	0.2	0.4

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.2	8.3	8.6	8.2	9
Total Sulphate as SO4	%	0.005	MCERTS	0.154	0.101	0.014	0.113	-
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.94	0.47	0.06	0.67	0.1
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	938	470	60.4	671	99.5
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	73	47	4.5	40	4.5
Total Sulphur	%	0.005	MCERTS	0.407	0.289	0.011	0.35	-
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0

Heavy Metals / Metalloids

Magnesium (water soluble)	mg/kg	5	NONE	69	56	8.2	77	< 5.0
Magnesium (leachate equivalent)	mg/l	2.5	NONE	34	28	4.1	39	< 2.5

U/S = Unsuitable Sample I/S = Insufficient Sample

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Analytical Report Number : 22-57065
Project / Site name: Euston Tower

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Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2268489	Heading 1	Face S001A	0.15	Grey clay.
2268490	Heading 1	Face S003A	1.65	Grey clay.
2268491	Heading 2	Face S004A	0.1	Brown clay.
2268492	Heading 2	Face S006A	2	Grey clay.
2268493	Heading 2	Gravel spoil S007	2	Brown sand with gravel.

Analytical Report Number : 22-57065
Project / Site name: Euston Tower

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Magnesium, water soluble, in soil	Determination of water soluble magnesium by extraction with water followed by ICP-OES.	In-house method based on TRL 447	L038-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total Sulphate in soil as %	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Total Sulphur in soil as %	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Water Soluble Nitrate (2:1) as N in soil	Determination of nitrate by reaction with sodium salicylate and colorimetry.	In-house method based on Examination of Water and Wastewatern & Polish Standard Method PN-82/C-04579.08, 2:1 extraction.	L078-PL	W	NONE
Chloride, water soluble, in soil	Determination of Chloride colorimetrically by discrete analyser.	In house method.	L082-PL	D	MCERTS
Sulphate, water soluble, in soil	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Lynn Griffin
Concept Site Investigations
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Analytical Report Number : 22-63057

Replaces Analytical Report Number: 22-63057, issue no. 1
Client sampling date amended.

Project / Site name:	Euston Tower	**Samples received on:**	07/06/2022
Your job number:	22 3686	**Samples instructed on/ Analysis started on:**	07/06/2022
Your order number:	L2825	**Analysis completed by:**	15/06/2022
Report Issue Number:	2	**Report issued on:**	15/06/2022
Samples Analysed:	2 soil samples		

Signed: Martyna Langer

Martyna Langer
Junior Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

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soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

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The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 22-63057
Project / Site name: Euston Tower
Your Order No: L2825

Lab Sample Number				2303222	2303223
Sample Reference				Heading 3	Heading 3
Sample Number				Face S030A	Face S032A
Depth (m)				0.20	1.95
Date Sampled				06/06/2022	06/06/2022
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**		
Stone Content	%	0.1	NONE	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	22	19
Total mass of sample received	kg	0.001	NONE	0.2	0.3

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.9	8.1
Total Sulphate as SO4	%	0.005	MCERTS	0.141	0.184
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.56	0.75
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	562	746
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	39	39
Total Sulphur	%	0.005	MCERTS	0.252	0.353
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	< 2.0	< 2.0

Heavy Metals / Metalloids

Magnesium (water soluble)	mg/kg	5	NONE	6.6	67
Magnesium (leachate equivalent)	mg/l	2.5	NONE	3.3	33

U/S = Unsuitable Sample I/S = Insufficient Sample

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Analytical Report Number : 22-63057
Project / Site name: Euston Tower

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Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2303222	Heading 3	Face S030A	0.2	Brown clay and loam.
2303223	Heading 3	Face S032A	1.95	Brown clay.

Analytical Report Number : 22-63057
Project / Site name: Euston Tower

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Magnesium, water soluble, in soil	Determination of water soluble magnesium by extraction with water followed by ICP-OES.	In-house method based on TRL 447	L038-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total Sulphate in soil as %	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Total Sulphur in soil as %	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Water Soluble Nitrate (2:1) as N in soil	Determination of nitrate by reaction with sodium salicylate and colorimetry.	In-house method based on Examination of Water and Wastewatern & Polish Standard Method PN-82/C-04579.08, 2:1 extraction.	L078-PL	W	NONE
Chloride, water soluble, in soil	Determination of Chloride colorimetrically by discrete analyser.	In house method.	L082-PL	D	MCERTS
Sulphate, water soluble, in soil	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS

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For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

CONCEPT SITE INVESTIGATIONS

Summary Test Report - Undrained Triaxial Compression (Single-Stage)

BS 1377 : Part 7: 1990 Clause 8

Date Reported: 16/06/2022

Job No.: 22/3686

Site Location: Euston Tower

Client: McGee

BH No.	Sample Type	Sample No	Depth top (m)	Description	Cell pressure kN/m2	Strain at failure %	Bulk Density Mg/m3	Dry Density Mg/m3	NMC %	Max Dev. Stress kPa	Shear Strength kPa	Mode of failure/Comments
Heading 1	UT100	Face U1/5020	0.35	Very stiff, extremely closely fissured dark brown slightly micaceous silty CLAY with occasional pockets of light brown silty sand (<30mm)	75	3.8	2.00	1.58	27	245	123	Brittle
Heading 1	UT100	Face U25021	1.45	Very stiff, extremely closely fissured dark brown slightly micaceous silty CLAY with rare pockets of light brown silty sand (<25mm)	100	4.6	1.99	1.58	26	168	84	Brittle
Heading 2	UT100	Face U3/5022	0.15	Very stiff, dark brown slightly micaceous silty CLAY	75	4.0	1.97	1.54	28	126	63	Brittle
Heading 2	UT100	Face U4/5023	1.50	Very stiff, extremely closely fissured dark brown slightly micaceous silty CLAY with 1 No pocket (<65mm) of claystone fragments (<20mm) at 1.71m	100	4.1	2.00	1.58	27	242	121	Brittle

Remarks: The results reported relate only to the items tested or sampled.

Date - samples received:	20/04/2022		
Date - sample testing commenced:	27/05/2022	Checked/Approved by:	KM
Date - sample testing completed:	27/05/2022	Date Approved:	01/06/2022

Approved Signatories: L Griffin LG (QA Technical & Lab Mngr) – K Mazerant KM (Lab Mngr)

CONCEPT
47-49 Brunel Road, London W3 7XR
Tel: 02087401553
Email: Lab@conceptconsultants.co.uk

AGS ASSOCIATION OF GEOTECHNICAL & GEOENVIRONMENTAL SPECIALISTS

UKAS TESTING 4503

CONCEPT SITE INVESTIGATIONS	Summary Test Report - Undrained Triaxial Compression (Single-Stage) BS 1377 : Part 7: 1990 Clause 8	Date Reported:	16/06/2022
		Job No.:	22/3686

Site Location: Euston Tower **Client:** McGee

BH No.	Sample Type	Sample No	Depth top (m)	Description	Cell pressure kN/m2	Strain at failure %	Bulk Density Mg/m3	Dry Density Mg/m3	NMC %	Max Dev. Stress kPa	Shear Strength kPa	Mode of failure/Comments
Heading 3	UT100	RHS OF PILE C2 S040	0.25	Stiff to very stiff, dark brown slightly micaceous silty CLAY with white flecks	75	7.6	1.98	1.54	28	168	84	Brittle
Heading 3	UT100	LHS OF PILE C2 S041	1.55	Very stiff, extremely closely fissured dark brown slightly micaceous silty CLAY with rare shell fragments (<1mm)	100	6.4	1.96	1.52	29	215	108	Brittle
Heading 3	UT100	LHS OF PILE R1 S042	0.10	Very stiff, dark brown mottled dark grey slightly micaceous silty CLAY with rare shell fragments (<1mm)	75	6.6	1.92	1.49	29	124	62	Brittle
Heading 3	UT100	LHS OF PILE R1 S043	1.40	Very stiff, dark brown slightly micaceous silty CLAY with rare shell fragments (<1mm) and rare pyrite nodules (<12mm)	100	2.8	1.98	1.55	28	186	93	Brittle

Remarks: The results reported relate only to the items tested or sampled.

Date - samples received:	25/05/2022		
Date - sample testing commenced:	09/06/2022	Checked/Approved by:	KM
Date - sample testing completed:	09/06/2022	Date Approved:	15/06/2022

Approved Signatories: L Griffin LG (QA Technical & Lab Mngr) – K Mazerant KM (Lab Mngr)

CONCEPT
47-49 Brunel Road, London W3 7XR
Tel: 02087401553
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AGS ASSOCIATION OF GEOTECHNICAL & GEOENVIRONMENTAL SPECIALISTS

UKAS TESTING 4503

TEST CERTIFICATE

DETERMINATION OF THE UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE

UKAS TESTING 4041

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Environmental Science

Tested in Accordance with: BS 1377-7: 1990: Clause 8

Client:	Concept Site Investigations	Client Reference:	22 3686
Client Address:	Unit 8, Warple Mews, Warple Way, London W3 0RF	Job Number:	22-60188
		Date Sampled:	Not Given
		Date Received:	18/05/2022
Contact:	Lynn Griffin	Date Tested:	03/06/2022
Site Address:	Euston Tower	Sampled By:	Not Given

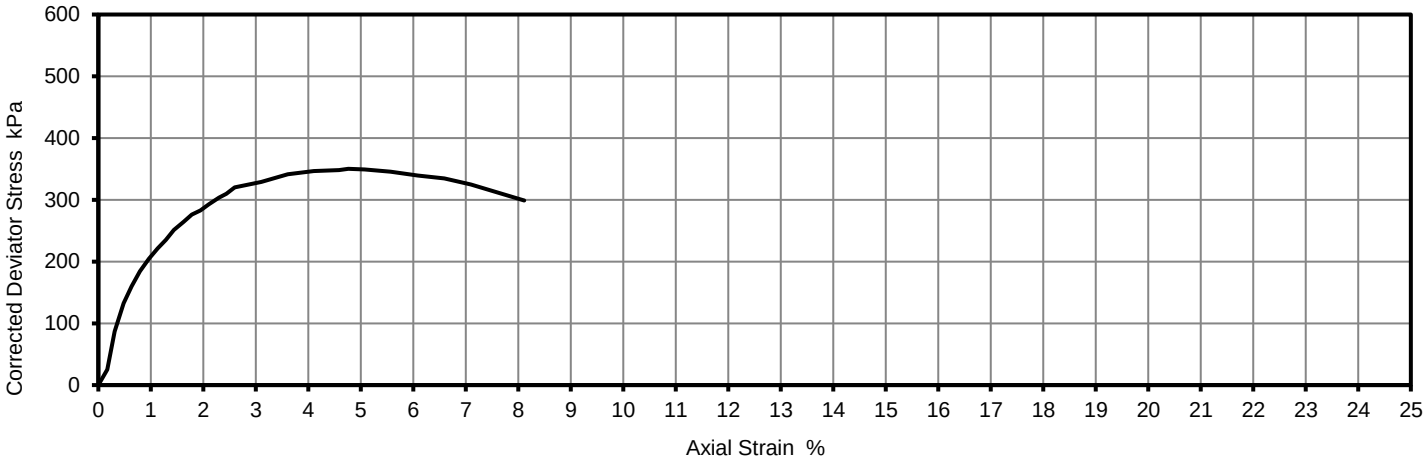
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

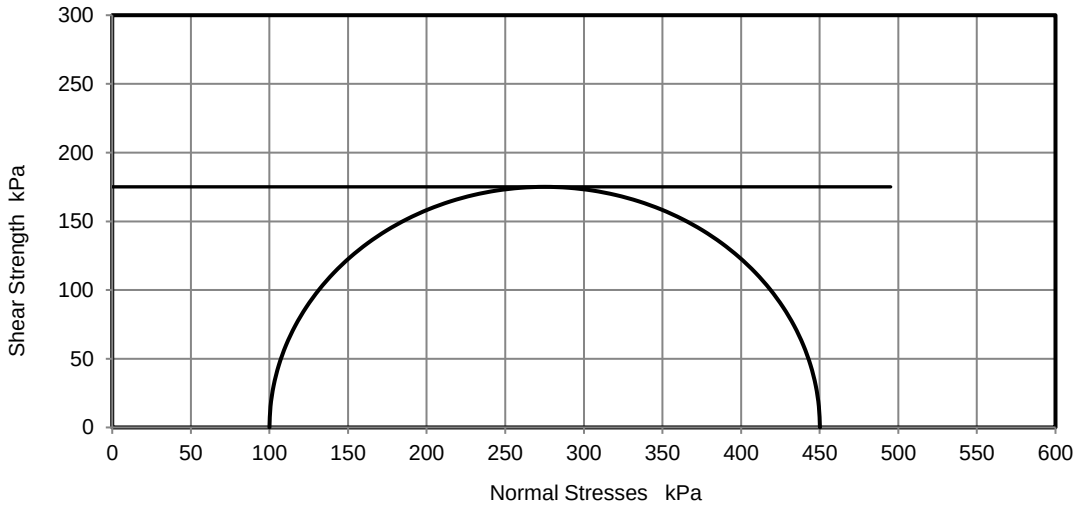
Laboratory Reference:	2286735	Depth Top [m]:	0.15
Hole No.:	Heading 1	Depth Base [m]:	Not Given
Sample Reference:	Face S001	Sample Type:	U
Sample Description:	Greyish brown CLAY		
Sample Preparation:	Sample prepared in accordance with BS 1377-1:2016 Clause 9.1.1.		

Test Number	1		Rate of Strain	2.00	%/min
Length	77.05	mm	Cell Pressure	100	kPa
Diameter	37.64	mm	Axial Strain at failure	4.8	%
Bulk Density	2.01	Mg/m3	Deviator Stress, (σ1 - σ3)f	350	kPa
Moisture Content	26	%	Undrained Shear Strength, cu	175	kPa ½(σ1 - σ3)f
Dry Density	1.59	Mg/m3	Mode of Failure	Brittle	
Membrane Correction	0.73	kPa	Membrane thickness	0.21	mm

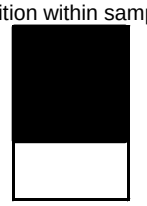
Deviator Stress v Axial Strain



Mohr Circles



Position within sample



Note: Deviator stress corrected for area change and membrane effects. Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

Remarks:

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.

Signed: Dudzińska Anna

Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

 Date Reported: 13/06/2022 **GF 184.12**

TEST CERTIFICATE

DETERMINATION OF THE UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE

UKAS TESTING 4041

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Environmental Science

Tested in Accordance with: BS 1377-7: 1990: Clause 8

Client:	Concept Site Investigations	Client Reference:	22 3686
Client Address:	Unit 8, Warple Mews, Warple Way, London W3 0RF	Job Number:	22-60188
		Date Sampled:	Not Given
		Date Received:	18/05/2022
Contact:	Lynn Griffin	Date Tested:	03/06/2022
Site Address:	Euston Tower	Sampled By:	Not Given

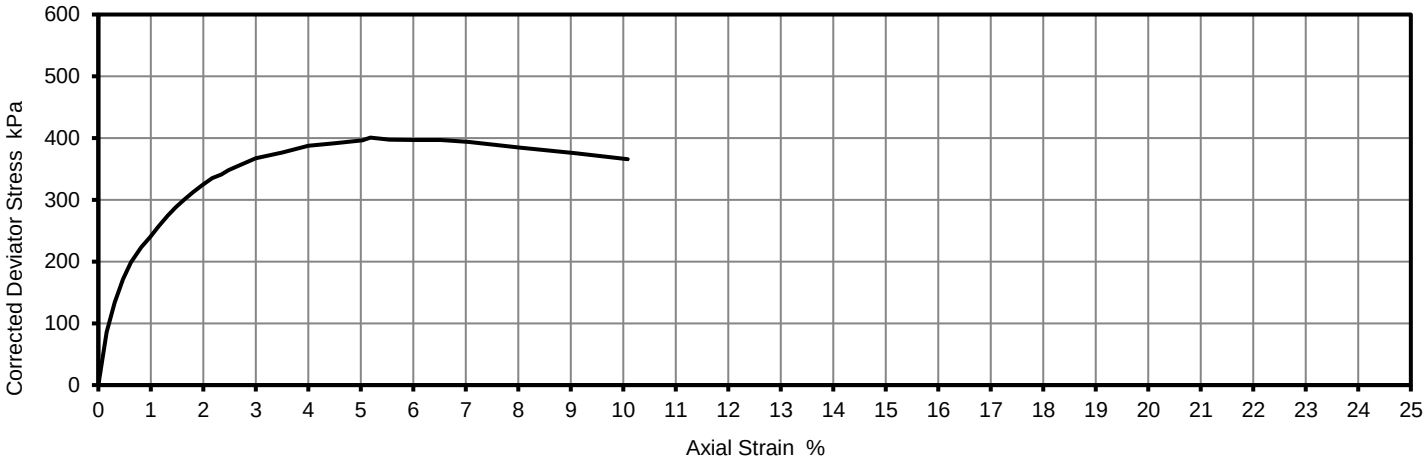
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

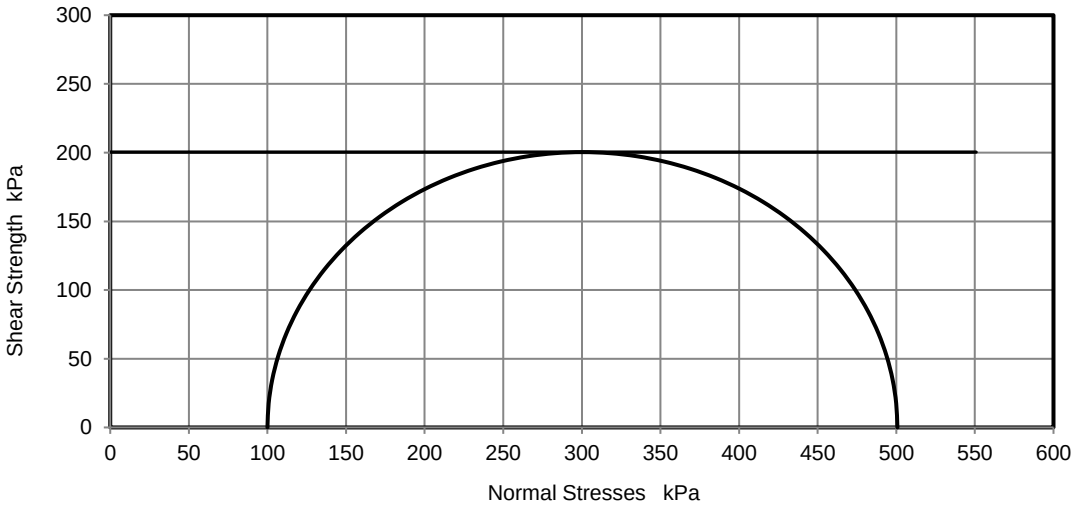
Laboratory Reference:	2286735_1	Depth Top [m]:	0.15
Hole No.:	Heading 1	Depth Base [m]:	Not Given
Sample Reference:	Face S001	Sample Type:	U
Sample Description:	Greyish brown CLAY		
Sample Preparation:	Sample prepared in accordance with BS 1377-1:2016 Clause 9.1.1.		

Test Number	1		Rate of Strain	2.00	%/min
Length	76.96	mm	Cell Pressure	100	kPa
Diameter	37.47	mm	Axial Strain at failure	5.2	%
Bulk Density	2.04	Mg/m3	Deviator Stress, (σ1 - σ3)f	401	kPa
Moisture Content	26	%	Undrained Shear Strength, cu	200	kPa ½(σ1 - σ3)f
Dry Density	1.62	Mg/m3	Mode of Failure	Brittle	
Membrane Correction	0.81	kPa	Membrane thickness	0.21	mm

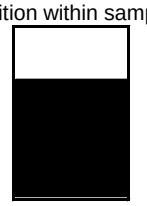
Deviator Stress v Axial Strain



Mohr Circles



Position within sample



Note: Deviator stress corrected for area change and membrane effects. Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

Remarks:

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Signed: Dudzińska Anna

Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

 Date Reported: 13/06/2022 **GF 184.12**

TEST CERTIFICATE

DETERMINATION OF THE UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE

UKAS TESTING 4041

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Environmental Science

Tested in Accordance with: BS 1377-7: 1990: Clause 8

Client:	Concept Site Investigations	Client Reference:	22 3686
Client Address:	Unit 8, Warple Mews, Warple Way, London W3 0RF	Job Number:	22-60188
		Date Sampled:	Not Given
		Date Received:	18/05/2022
Contact:	Lynn Griffin	Date Tested:	03/06/2022
Site Address:	Euston Tower	Sampled By:	Not Given

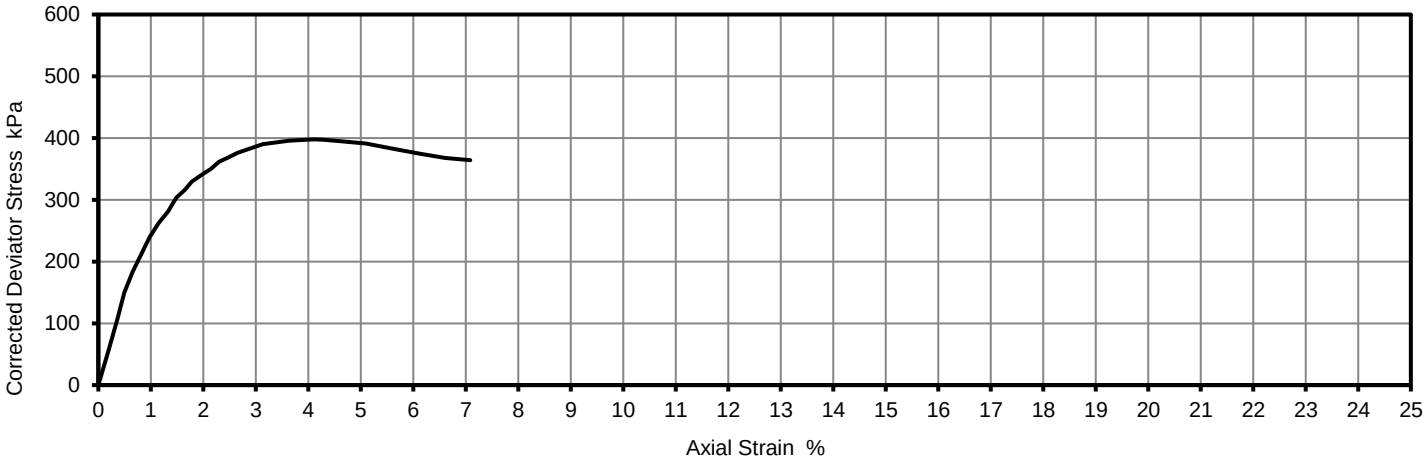
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

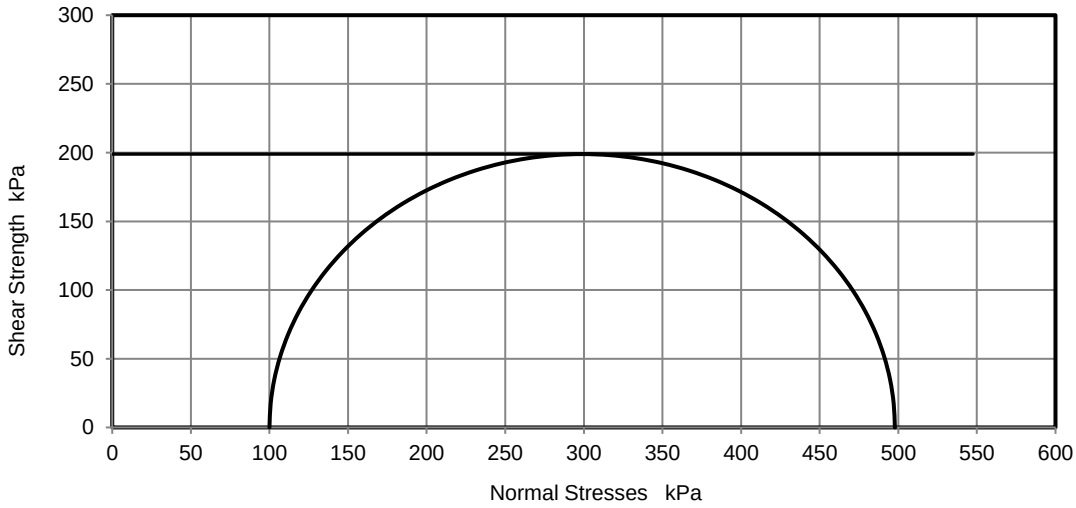
Laboratory Reference:	2286736	Depth Top [m]:	0.80
Hole No.:	Heading 1	Depth Base [m]:	Not Given
Sample Reference:	Face S002	Sample Type:	U
Sample Description:	Greyish brown CLAY		
Sample Preparation:	Sample prepared in accordance with BS 1377-1:2016 Clause 9.1.1.		

Test Number	1		Rate of Strain	2.00	%/min
Length	76.93	mm	Cell Pressure	100	kPa
Diameter	37.62	mm	Axial Strain at failure	4.1	%
Bulk Density	2.01	Mg/m3	Deviator Stress, (σ1 - σ3)f	398	kPa
Moisture Content	23	%	Undrained Shear Strength, cu	199	kPa ½(σ1 - σ3)f
Dry Density	1.63	Mg/m3	Mode of Failure	Brittle	
Membrane Correction	0.66	kPa	Membrane thickness	0.22	mm

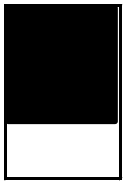
Deviator Stress v Axial Strain



Mohr Circles



Position within sample



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Signed: Dudzińska Anna

Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

 Date Reported: 13/06/2022 **GF 184.12**

TEST CERTIFICATE

DETERMINATION OF THE UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE

UKAS TESTING 4041

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Environmental Science

Tested in Accordance with: BS 1377-7: 1990: Clause 8

Client:	Concept Site Investigations	Client Reference:	22 3686
Client Address:	Unit 8, Warple Mews, Warple Way, London W3 0RF	Job Number:	22-60188
		Date Sampled:	Not Given
		Date Received:	18/05/2022
Contact:	Lynn Griffin	Date Tested:	03/06/2022
Site Address:	Euston Tower	Sampled By:	Not Given

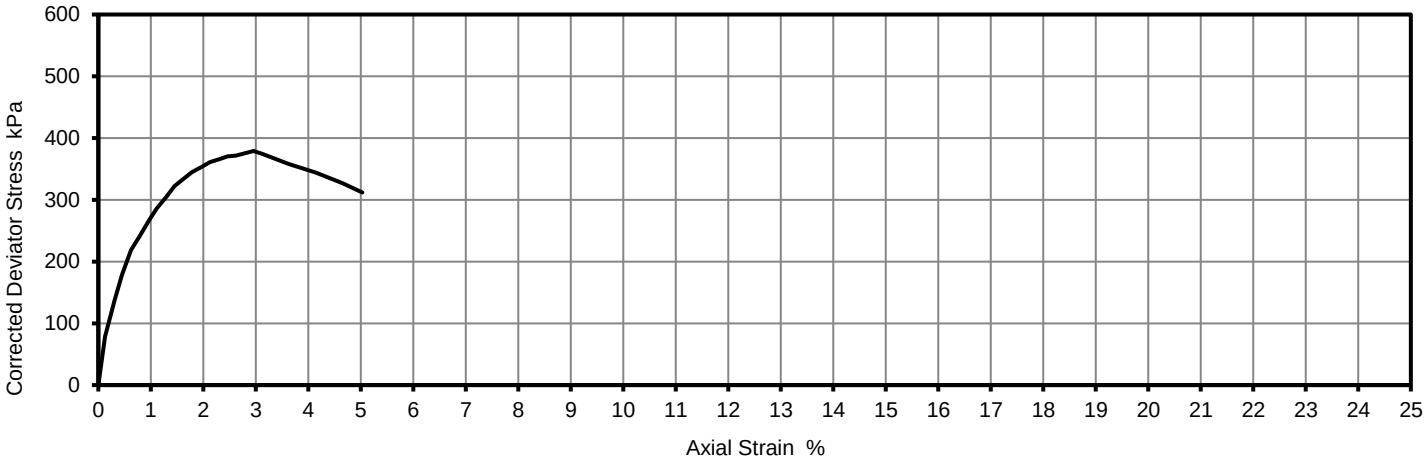
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

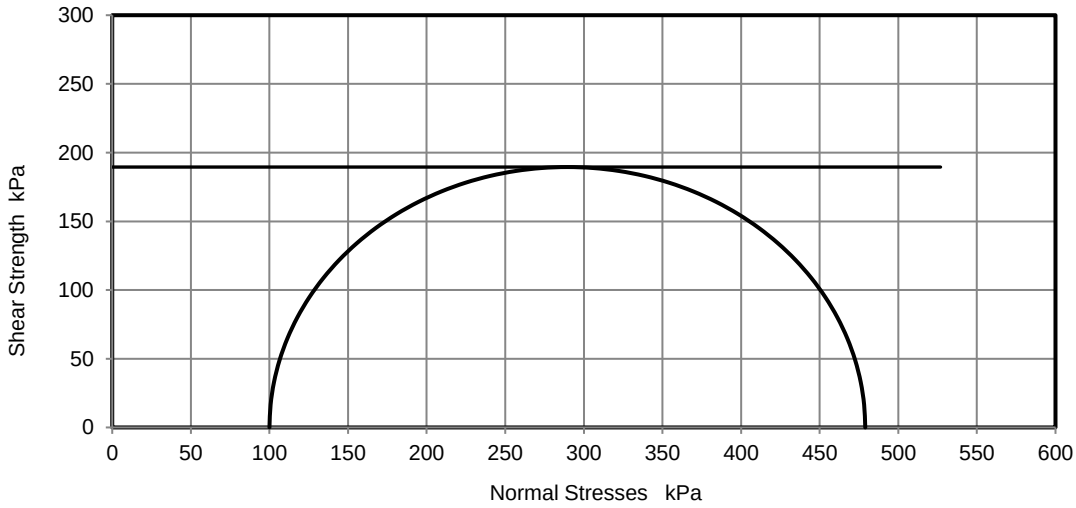
Laboratory Reference:	2286736_1	Depth Top [m]:	0.80
Hole No.:	Heading 1	Depth Base [m]:	Not Given
Sample Reference:	Face S002	Sample Type:	U
Sample Description:	Greyish brown CLAY		
Sample Preparation:	Sample prepared in accordance with BS 1377-1:2016 Clause 9.1.1.		

Test Number	1		Rate of Strain	2.00	%/min
Length	77.16	mm	Cell Pressure	100	kPa
Diameter	37.68	mm	Axial Strain at failure	3.0	%
Bulk Density	2.02	Mg/m3	Deviator Stress, (σ1 - σ3)f	379	kPa
Moisture Content	27	%	Undrained Shear Strength, cu	189	kPa ½(σ1 - σ3)f
Dry Density	1.59	Mg/m3	Mode of Failure	Brittle	
Membrane Correction	0.45	kPa	Membrane thickness	0.21	mm

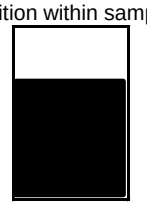
Deviator Stress v Axial Strain



Mohr Circles



Position within sample



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Northampton NN4 7EB

Environmental Science

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Client:	Concept Site Investigations	Client Reference:	22 3686
Client Address:	Unit 8, Warple Mews, Warple Way, London W3 0RF	Job Number:	22-60188
		Date Sampled:	Not Given
		Date Received:	18/05/2022
Contact:	Lynn Griffin	Date Tested:	03/06/2022
Site Address:	Euston Tower	Sampled By:	Not Given

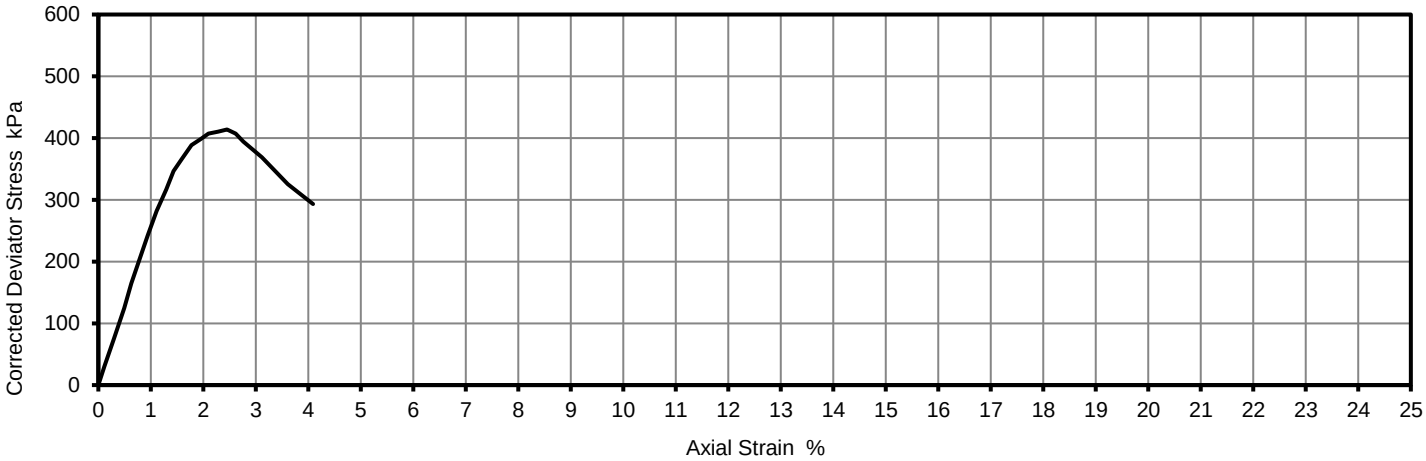
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

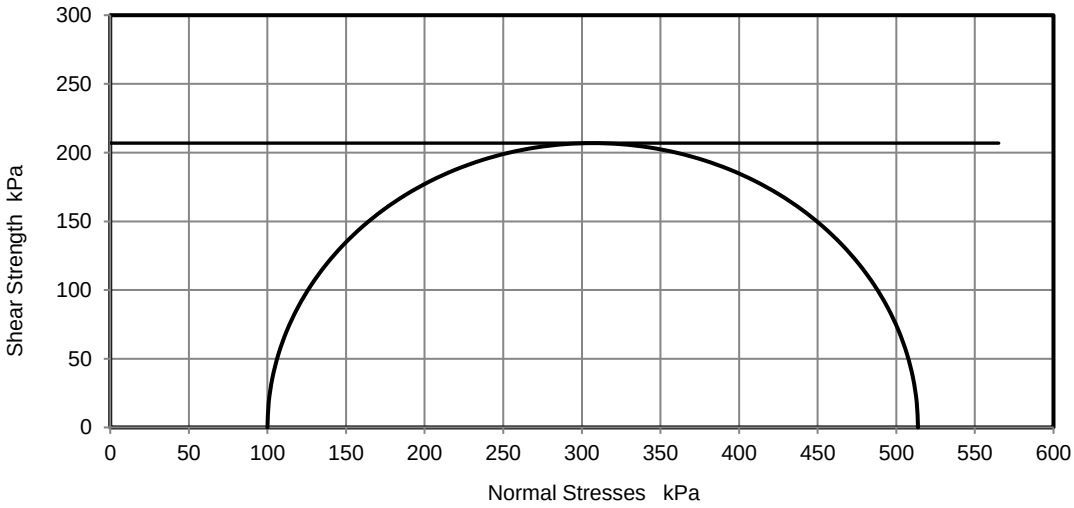
Laboratory Reference:	2286737	Depth Top [m]:	1.65
Hole No.:	Heading 1	Depth Base [m]:	Not Given
Sample Reference:	Face S003	Sample Type:	U
Sample Description:	Greyish brown CLAY		
Sample Preparation:	Sample prepared in accordance with BS 1377-1:2016 Clause 9.1.1.		

Test Number	1		Rate of Strain	2.00	%/min
Length	76.78	mm	Cell Pressure	100	kPa
Diameter	37.58	mm	Axial Strain at failure	2.4	%
Bulk Density	2.03	Mg/m3	Deviator Stress, (σ1 - σ3)f	414	kPa
Moisture Content	25	%	Undrained Shear Strength, cu	207	kPa ½(σ1 - σ3)f
Dry Density	1.62	Mg/m3	Mode of Failure	Brittle	
Membrane Correction	0.39	kPa	Membrane thickness	0.22	mm

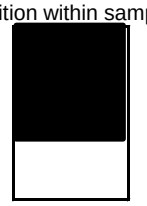
Deviator Stress v Axial Strain



Mohr Circles



Position within sample



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 Date Reported: 13/06/2022 **GF 184.12**

TEST CERTIFICATE

DETERMINATION OF THE UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE

UKAS TESTING 4041

i2 Analytical Ltd
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Brackmills Industrial Estate
Northampton NN4 7EB

Environmental Science

Tested in Accordance with: BS 1377-7: 1990: Clause 8

Client:	Concept Site Investigations	Client Reference:	22 3686
Client Address:	Unit 8, Warple Mews, Warple Way, London W3 0RF	Job Number:	22-60188
		Date Sampled:	Not Given
		Date Received:	18/05/2022
Contact:	Lynn Griffin	Date Tested:	03/06/2022
Site Address:	Euston Tower	Sampled By:	Not Given

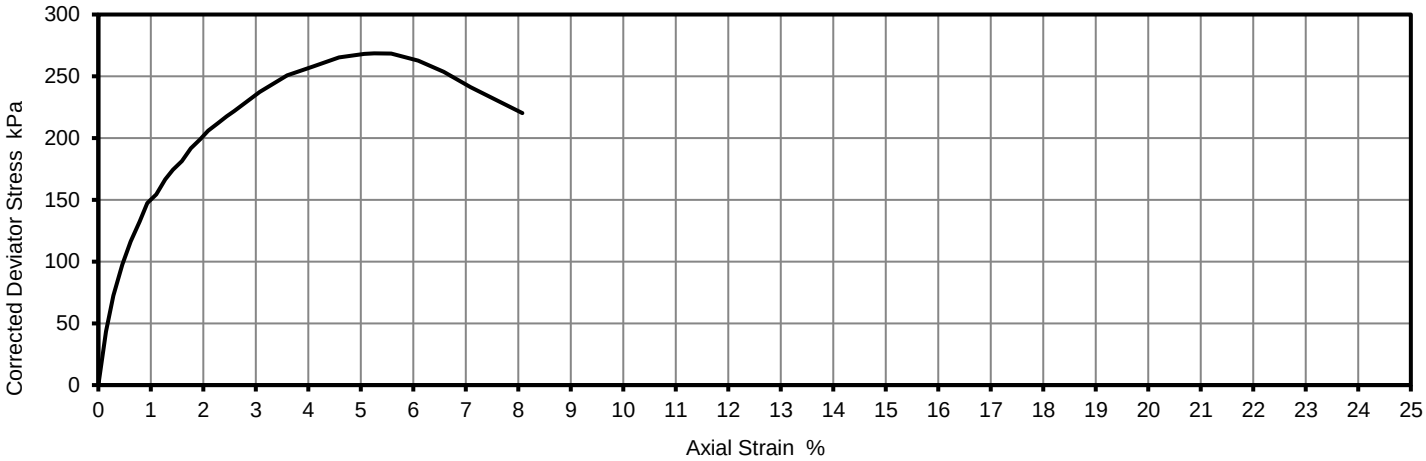
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

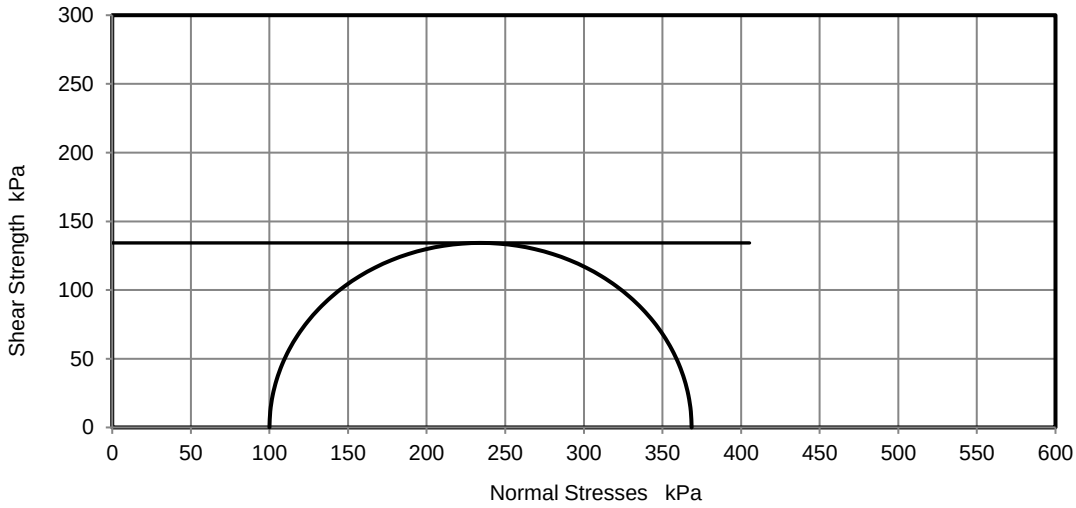
Laboratory Reference:	2286738	Depth Top [m]:	0.10
Hole No.:	Heading 2	Depth Base [m]:	Not Given
Sample Reference:	Face S004	Sample Type:	U
Sample Description:	Yellowish brown CLAY		
Sample Preparation:	Sample prepared in accordance with BS 1377-1:2016 Clause 9.1.1.		

Test Number	1		Rate of Strain	2.00	%/min
Length	76.15	mm	Cell Pressure	100	kPa
Diameter	37.44	mm	Axial Strain at failure	5.3	%
Bulk Density	1.97	Mg/m3	Deviator Stress, (σ1 - σ3)f	269	kPa
Moisture Content	29	%	Undrained Shear Strength, cu	134	kPa ½(σ1 - σ3)f
Dry Density	1.53	Mg/m3	Mode of Failure	Brittle	
Membrane Correction	0.78	kPa	Membrane thickness	0.20	mm

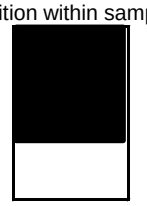
Deviator Stress v Axial Strain



Mohr Circles



Position within sample



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TEST CERTIFICATE

DETERMINATION OF THE UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE

UKAS TESTING 4041

i2 Analytical Ltd
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Brackmills Industrial Estate
Northampton NN4 7EB

Environmental Science

Tested in Accordance with: BS 1377-7: 1990: Clause 8

Client:	Concept Site Investigations	Client Reference:	22 3686
Client Address:	Unit 8, Warple Mews, Warple Way, London W3 0RF	Job Number:	22-60188
		Date Sampled:	Not Given
		Date Received:	18/05/2022
Contact:	Lynn Griffin	Date Tested:	03/06/2022
Site Address:	Euston Tower	Sampled By:	Not Given

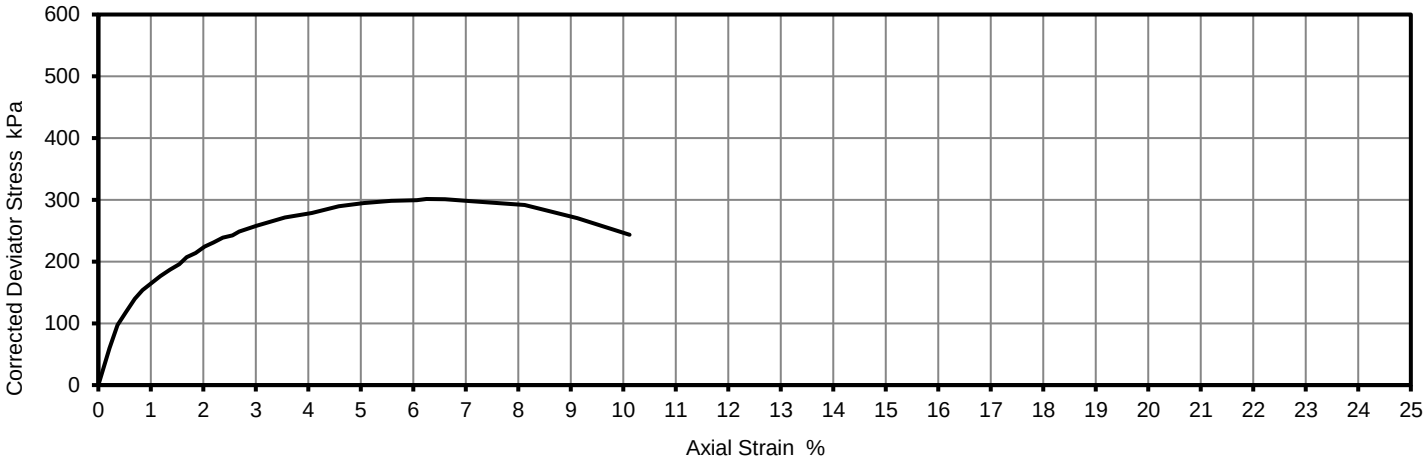
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

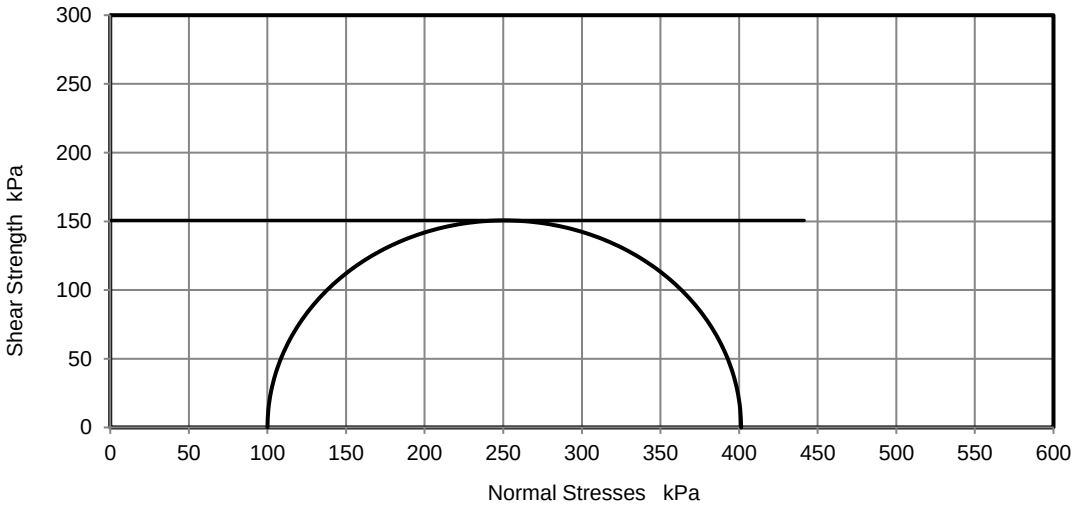
Laboratory Reference:	2286738_1	Depth Top [m]:	0.10
Hole No.:	Heading 2	Depth Base [m]:	Not Given
Sample Reference:	Face S004	Sample Type:	U
Sample Description:	Yellowish brown CLAY		
Sample Preparation:	Sample prepared in accordance with BS 1377-1:2016 Clause 9.1.1.		

Test Number	1		Rate of Strain	2.00	%/min
Length	76.00	mm	Cell Pressure	100	kPa
Diameter	37.34	mm	Axial Strain at failure	6.3	%
Bulk Density	1.95	Mg/m3	Deviator Stress, (σ1 - σ3)f	301	kPa
Moisture Content	30	%	Undrained Shear Strength, cu	151	kPa ½(σ1 - σ3)f
Dry Density	1.50	Mg/m3	Mode of Failure	Brittle	
Membrane Correction	0.91	kPa	Membrane thickness	0.21	mm

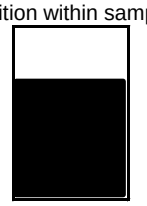
Deviator Stress v Axial Strain



Mohr Circles



Position within sample



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Anna Dudzinska
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for and on behalf of i2 Analytical Ltd

Date Reported: 13/06/2022

GF 184.12

TEST CERTIFICATE

DETERMINATION OF THE UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE

4041

Tested in Accordance with: BS 1377-7: 1990: Clause 8

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Environmental Science

Client:	Concept Site Investigations	Client Reference:	22 3686
Client Address:	Unit 8, Warple Mews, Warple Way, London W3 0RF	Job Number:	22-60188
		Date Sampled:	Not Given
		Date Received:	18/05/2022
Contact:	Lynn Griffin	Date Tested:	03/06/2022
Site Address:	Euston Tower	Sampled By:	Not Given

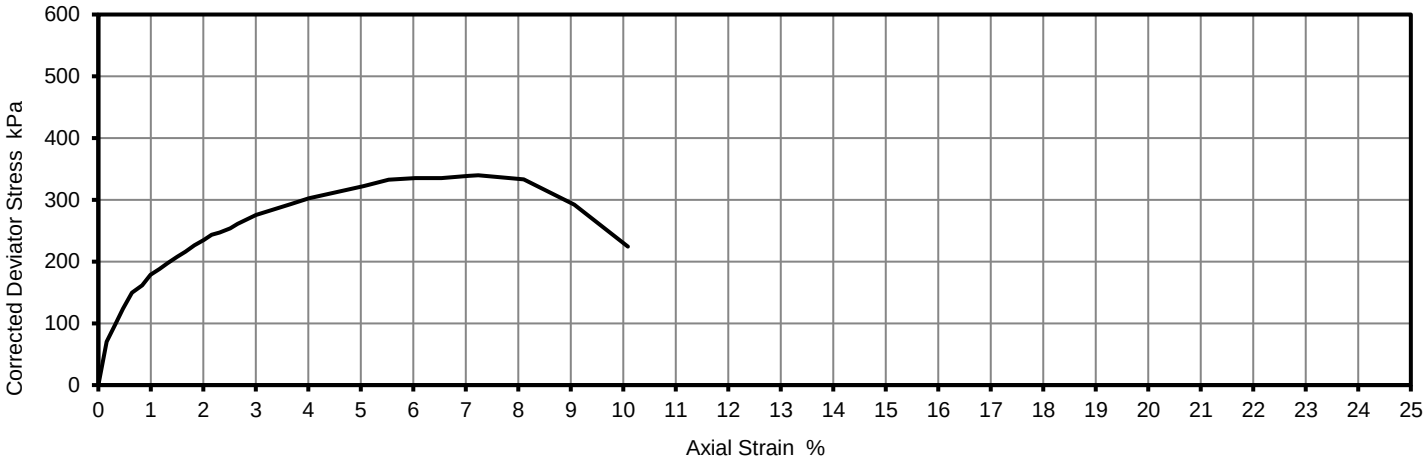
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

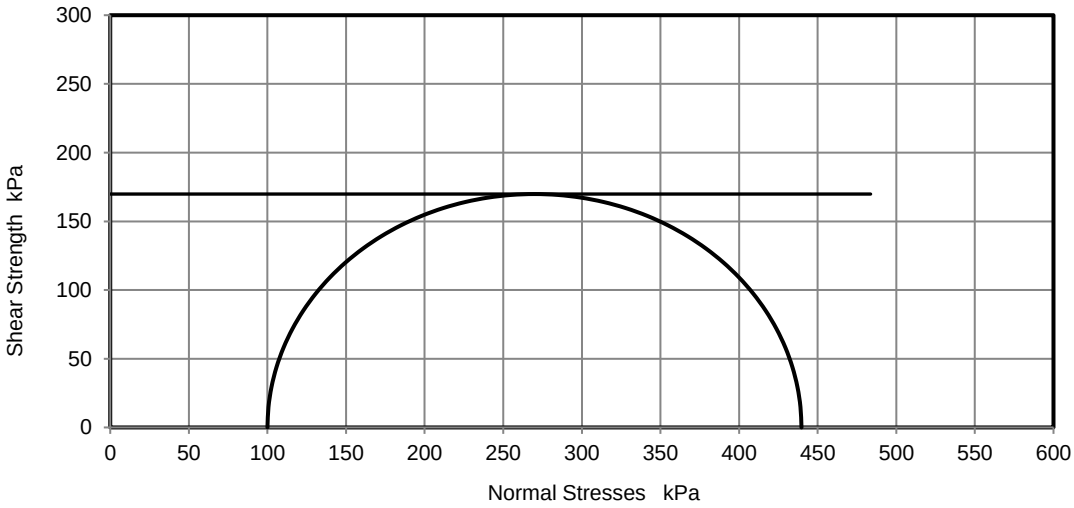
Laboratory Reference:	2286739	Depth Top [m]:	1.00
Hole No.:	Heading 2	Depth Base [m]:	Not Given
Sample Reference:	Face S005	Sample Type:	U
Sample Description:	Greyish brown CLAY		
Sample Preparation:	Sample prepared in accordance with BS 1377-1:2016 Clause 9.1.1.		

Test Number	1		Rate of Strain	2.00	%/min	
Length	76.54	mm	Cell Pressure	100	kPa	
Diameter	36.10	mm	Axial Strain at failure	7.2	%	
Bulk Density	2.08	Mg/m3	Deviator Stress, (σ1 - σ3)f	340	kPa	
Moisture Content	24	%	Undrained Shear Strength, cu	170	kPa	½(σ1 - σ3)f
Dry Density	1.69	Mg/m3	Mode of Failure	Brittle		
Membrane Correction	1.04	kPa	Membrane thickness	0.21	mm	

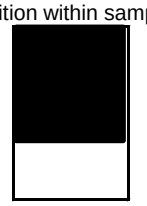
Deviator Stress v Axial Strain



Mohr Circles



Position within sample



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Northampton NN4 7EB

Environmental Science

Tested in Accordance with: BS 1377-7: 1990: Clause 8

Client:	Concept Site Investigations	Client Reference:	22 3686
Client Address:	Unit 8, Warple Mews, Warple Way, London W3 0RF	Job Number:	22-60188
		Date Sampled:	Not Given
		Date Received:	18/05/2022
Contact:	Lynn Griffin	Date Tested:	03/06/2022
Site Address:	Euston Tower	Sampled By:	Not Given

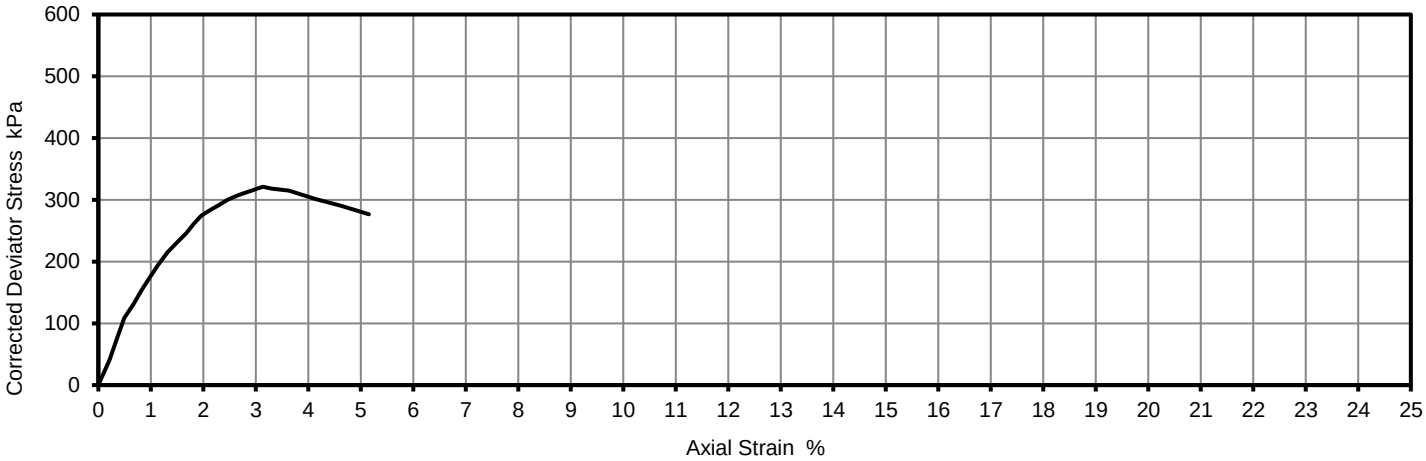
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

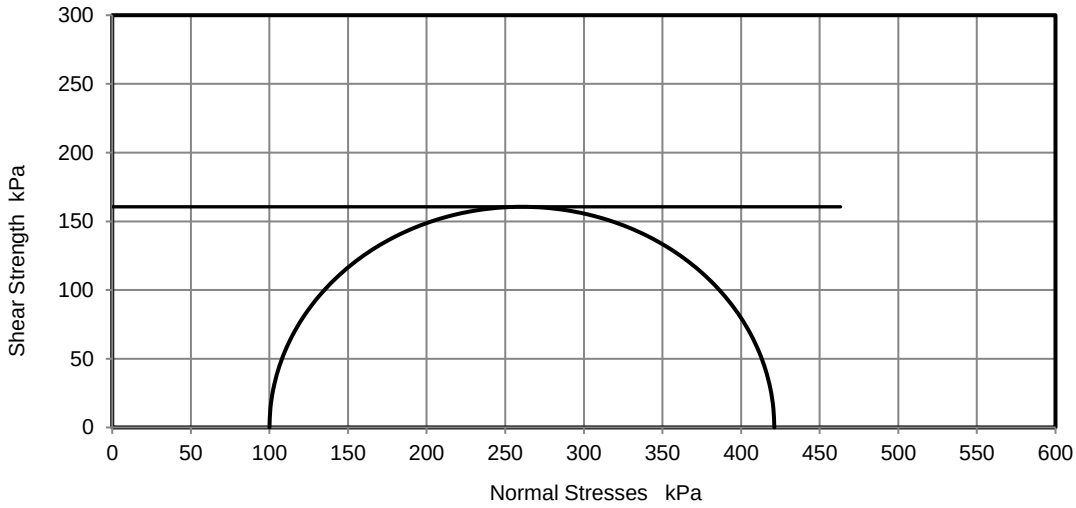
Laboratory Reference:	2286740	Depth Top [m]:	2.00
Hole No.:	Heading 2	Depth Base [m]:	Not Given
Sample Reference:	Face S006	Sample Type:	U
Sample Description:	Greyish brown CLAY		
Sample Preparation:	Sample prepared in accordance with BS 1377-1:2016 Clause 9.1.1.		

Test Number	1		Rate of Strain	2.00	%/min
Length	75.30	mm	Cell Pressure	100	kPa
Diameter	37.51	mm	Axial Strain at failure	3.1	%
Bulk Density	2.00	Mg/m3	Deviator Stress, (σ1 - σ3)f	321	kPa
Moisture Content	27	%	Undrained Shear Strength, cu	161	kPa ½(σ1 - σ3)f
Dry Density	1.57	Mg/m3	Mode of Failure	Brittle	
Membrane Correction	0.50	kPa	Membrane thickness	0.22	mm

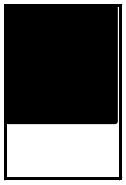
Deviator Stress v Axial Strain



Mohr Circles



Position within sample



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Environmental Science

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Client:	Concept Site Investigations	Client Reference:	22 3686
Client Address:	Unit 8, Warple Mews, Warple Way, London W3 0RF	Job Number:	22-60188
		Date Sampled:	Not Given
		Date Received:	18/05/2022
Contact:	Lynn Griffin	Date Tested:	03/06/2022
Site Address:	Euston Tower	Sampled By:	Not Given

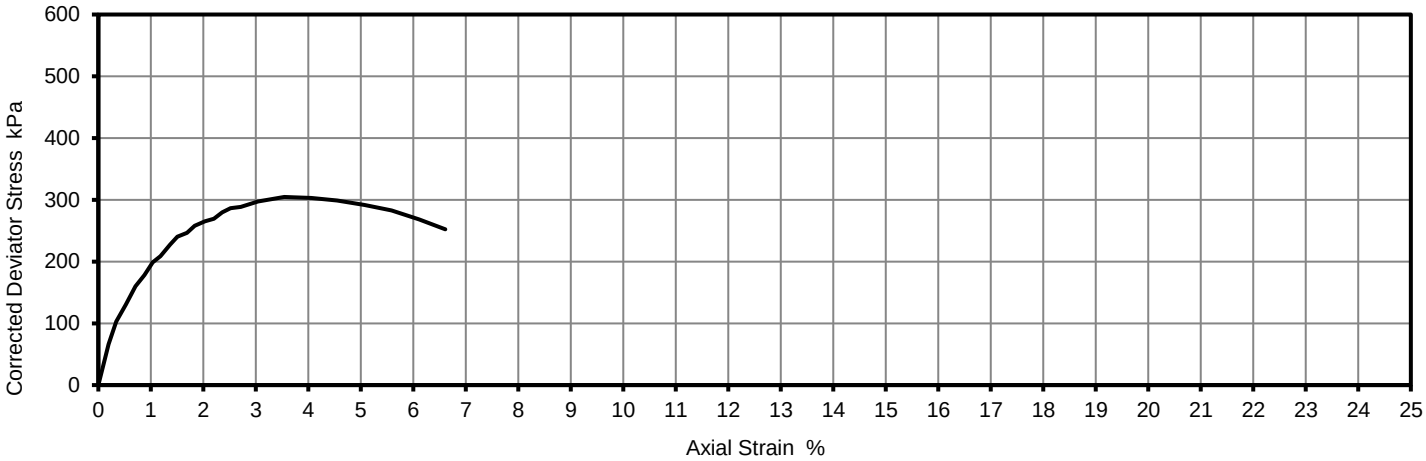
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

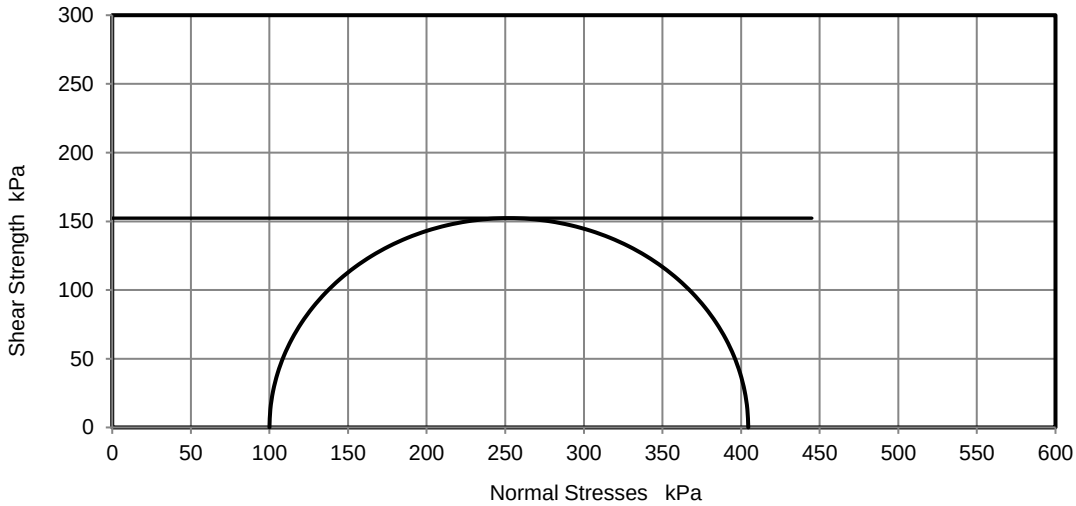
Laboratory Reference:	2286740_1	Depth Top [m]:	2.00
Hole No.:	Heading 2	Depth Base [m]:	Not Given
Sample Reference:	Face S006	Sample Type:	U
Sample Description:	Greyish brown CLAY		
Sample Preparation:	Sample prepared in accordance with BS 1377-1:2016 Clause 9.1.1.		

Test Number	1		Rate of Strain	2.00	%/min
Length	76.26	mm	Cell Pressure	100	kPa
Diameter	37.16	mm	Axial Strain at failure	3.5	%
Bulk Density	2.04	Mg/m3	Deviator Stress, (σ1 - σ3)f	305	kPa
Moisture Content	27	%	Undrained Shear Strength, cu	152	kPa ½(σ1 - σ3)f
Dry Density	1.60	Mg/m3	Mode of Failure	Brittle	
Membrane Correction	0.55	kPa	Membrane thickness	0.21	mm

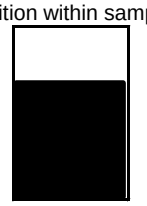
Deviator Stress v Axial Strain



Mohr Circles



Position within sample



Note: Deviator stress corrected for area change and membrane effects. Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

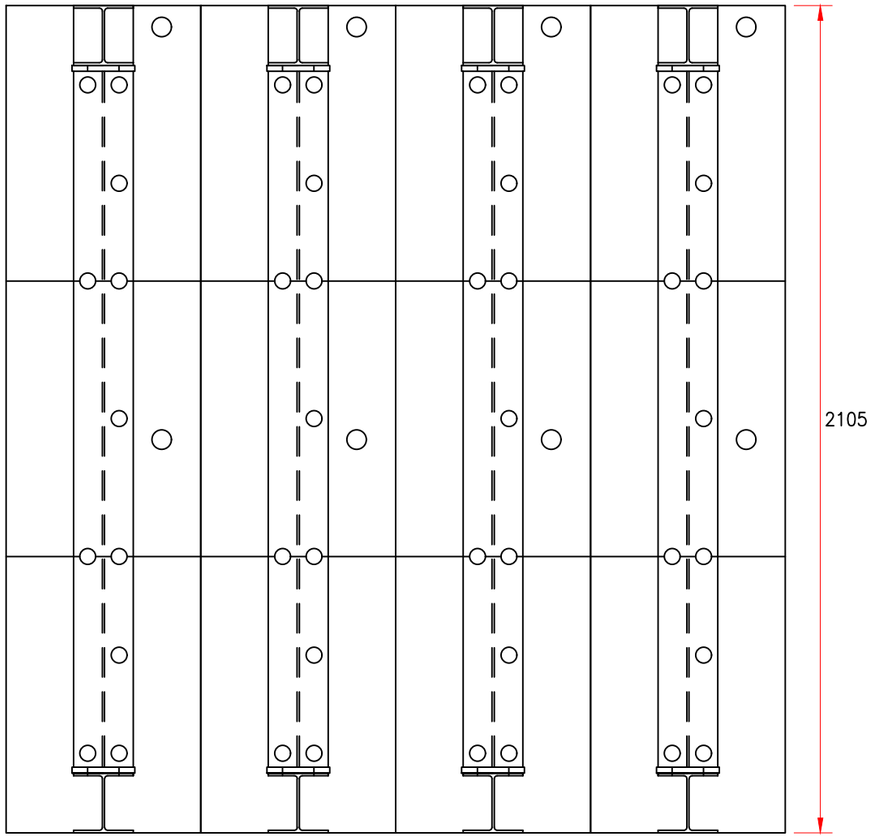
Remarks:

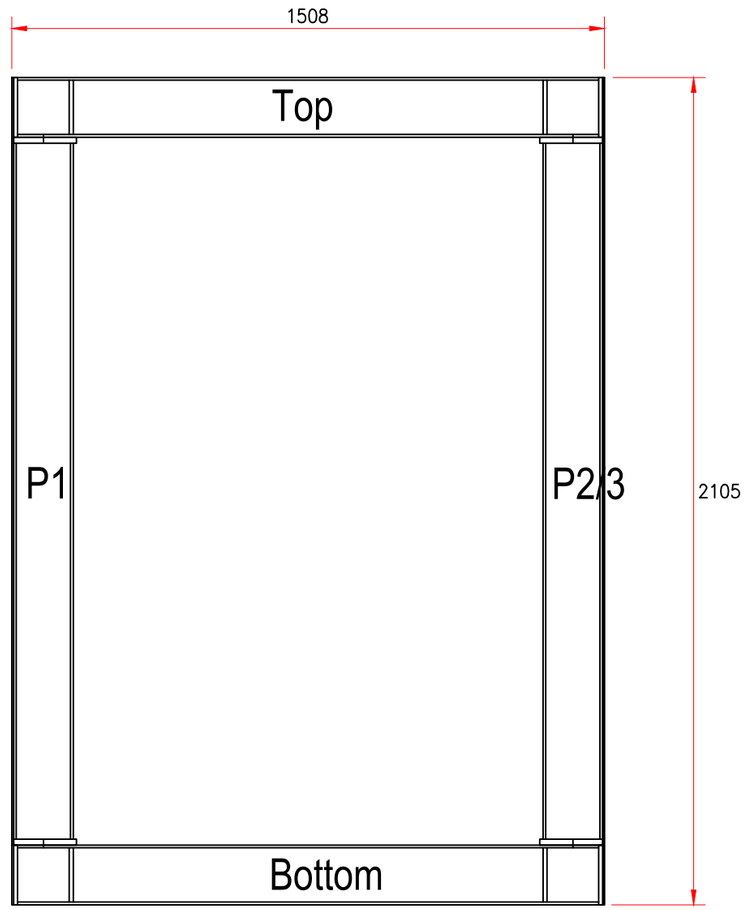
Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.

Signed: Dudzińska Anna

Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

 Date Reported: 13/06/2022 **GF 184.12**





Beams (B) Plates (P)	Sizes:	P/O no. or Cast No.	Initial	Date

Fabrication Status	
Saw by	Date:
Drill by	Date:
Fab by	Date:
Weld by	Date:
Painted by	Date:
Check by	Date:

General Notes
All dimetres in milimetres UNO
All holes 22 dia. UNO
All material min. S275 JR UNO
All weld leg lenght ≥5mm UNO
All butt weld full penetration UNO
All weld symbols to be in accordance with BS EN ISO 2553
Fabrication tolerance to be in accordance with BS EN1090-2 Annex B
Function tolerance class 1 UNO
Weld acceptance criteria to be BS EN 5817 class C
suplementary NDT to be in accordance with table 24 UNO
Hold times to be in accordance with table 23UNO

EXC 2 | Welding Wire batch 12125212

TITLE JN3323 / Mc Gee

ADDRESS Euston Tower

SCALE: N.T.S.

Draw by: G.K.

DRAWING No. 3323-11-02-22-0

Rev

ISSUE/DATE 11/020/2022

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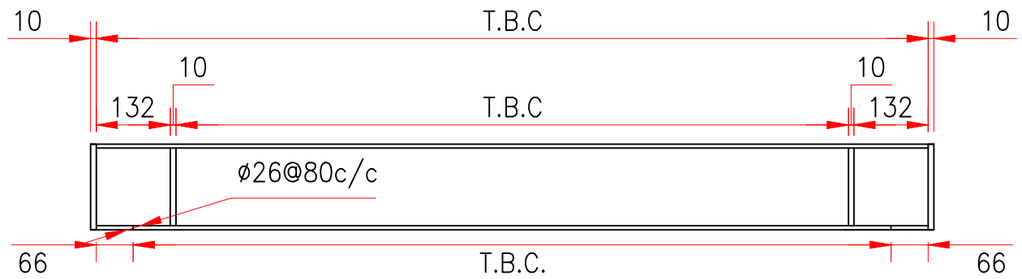
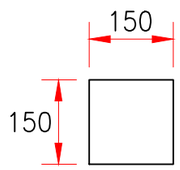
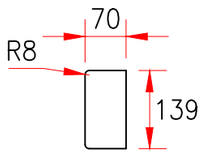


56no. 152x152x23 UC Top/Bottom

Plates Details





112no. 150x150x10 PLT

224no. 139x73x10 PLT

Beams (B) Plates (P)	Sizes:	P/O no. or Cast No.	Initial	Date

Fabrication Status	
Saw by	Date:
Drill by	Date:
Fab by	Date:
Weld by	Date:
Painted by	Date:
Check by	Date:

General Notes
All dimetres in milimetres UNO
All holes 22 dia. UNO
All material min. S275 JR UNO
All weld leg lenght z6mm UNO
All butt weld full penetration UNO
All weld symbols to be in accordance with BS EN ISO 2553
Fabrication tolerance to be in accordance with BS EN1090-2 Annex B
Function tolerance class 1 UNO
Weld acceptance criteria to be BS EN 5817 class C
suplementary NDT to be in accordance with table 24 UNO
Hold times to be in accordance with table 23UNO

EXC 2 | Welding Wire batch 12125212

TITLE JN3323 / Mc Gee

ADDRESS Euston Tower

SCALE: N.T.S.

Draw by: G.K.

DRAWING No. 3323-11-02-22-1

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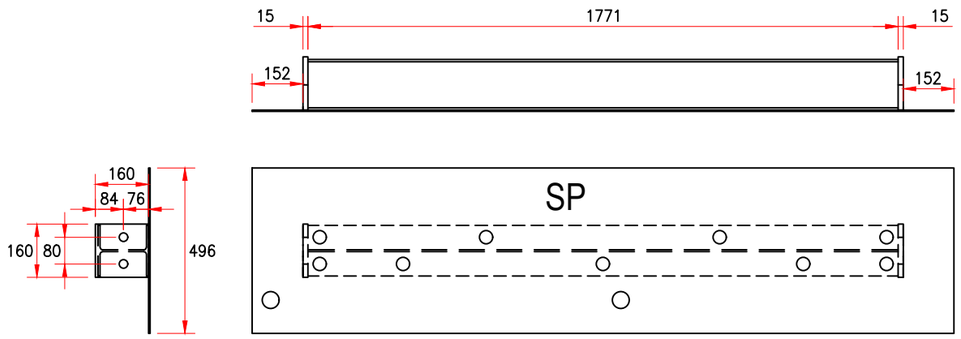
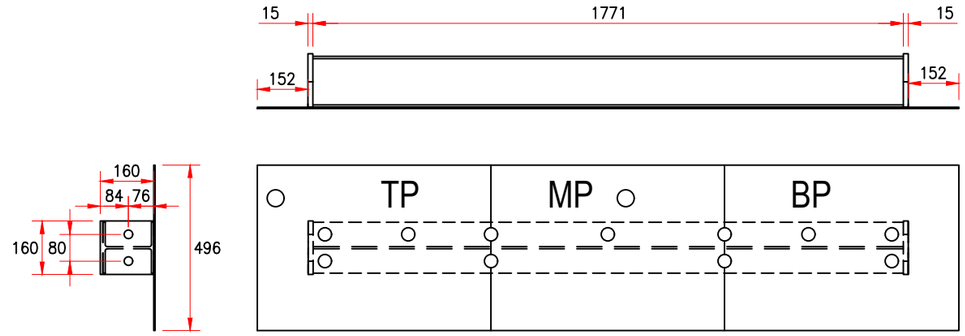


28no. 152x152x23 UC P1



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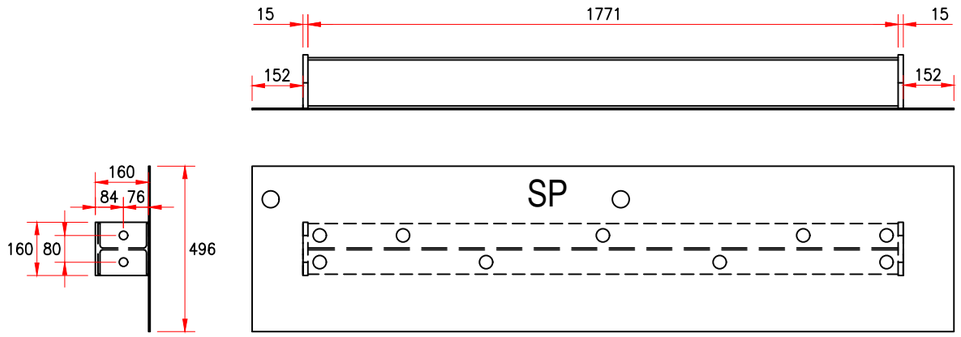
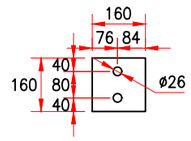
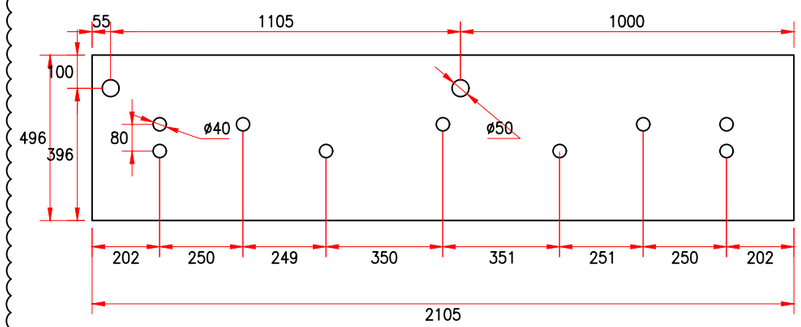


14no. 152x152x23 UC P2

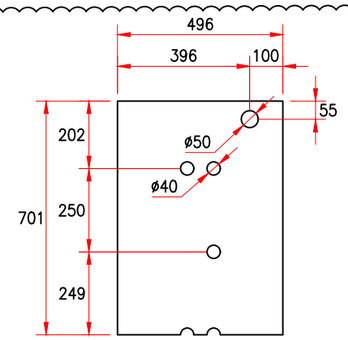
Plate Details



112no. 160x160x15 PLT



42no. 496x2105x4 PLT SP



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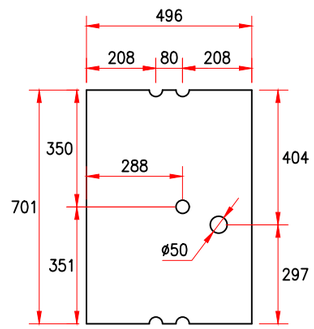

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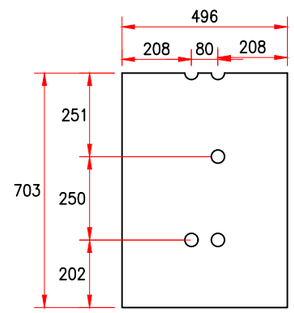

14no. 496x2105x4 PLT BP

Beams (B) Plates (P)	Sizes:	P/O no. or Cast No.	Initial	Date

Fabrication Status	
Saw by	Date:
Drill by	Date:
Fab by	Date:
Weld by	Date:
Painted by	Date:
Check by	Date:

General Notes
All dimetres in milimetres UNO
All holes 22 dia. UNO
All material min. S275 JR UNO
All weld leg lenght ±5mm UNO
All butt weld full penetration UNO
All weld symbols to be in accordance with BS EN ISO 2553
Fabrication tolerance to be in accordance with BS EN1090-2 Annex B
Function tolerance class 1 UNO
Weld acceptance criteria to be BS EN 5817 class C
suplementary NDT to be in accordance with table 24 UNO
Hold times to be in accordance with table 23UNO

EXC 2	Welding Wire batch 12125212			
TITLE	JN3323 / Mc Gee			
ADDRESS	Euston Tower			
SCALE: N.T.S.	Draw by: G.K.	DRAWING No. 3323-11-02-22-2	Rev	ISSUE/DATE 11/020/2022

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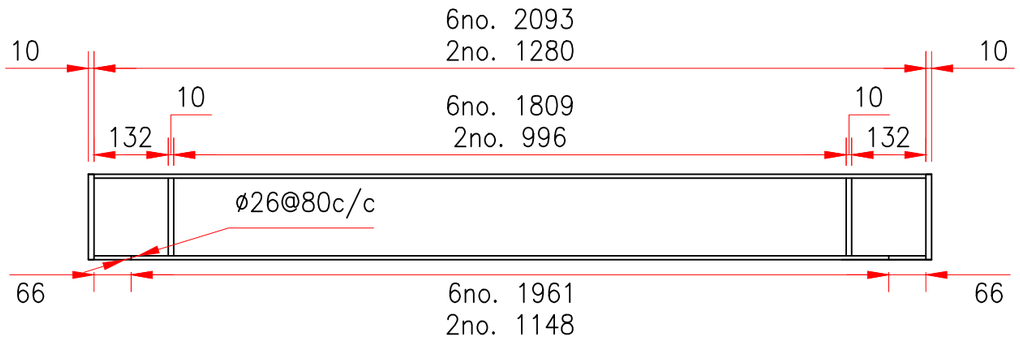

8no. 152x152x23 UC Top/Bottom

Plates from drawing 3323-11-02-22-1

112no. 150x150x10 PLT 224no. 139x73x10 PLT

Beams (B) Plates (P)	Sizes:	P/O no. or Cast No.	Initial	Date

Fabrication Status	
Saw by	Date:
Drill by	Date:
Fab by	Date:
Weld by	Date:
Painted by	Date:
Check by	Date:

General Notes
All dimetres in milimetres UNO
All holes 22 dia. UNO
All material min. S275 JR UNO
All weld leg lenght z6mm UNO
All butt weld full penetration UNO
All weld symbols to be in accordance with BS EN ISO 2553
Fabrication tolerance to be in accordance with BS EN1090-2 Annex B
Function tolerance class 1 UNO
Weld acceptance criteria to be BS EN 5817 class C
suplementary NDT to be in accordance with table 24 UNO
Hold times to be in accordance with table 23UNO

EXC 2 | Welding Wire batch 12125212

TITLE JN3323 / Mc Gee

ADDRESS Euston Tower

SCALE: N.T.S.

Draw by: G.K.

DRAWING No. 3323-11-02-22-3

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ISSUE/DATE 11/020/2022

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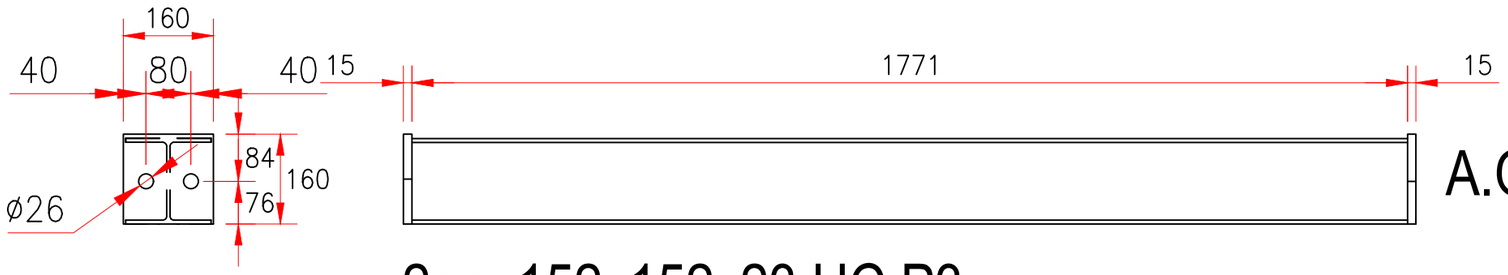

A.O.E.

2no. 152x152x23 UC P3

Beams (B) Plates (P)	Sizes:	P/O no. or Cast No.	Initial	Date

Fabrication Status	
Saw by	Date:
Drill by	Date:
Fab by	Date:
Weld by	Date:
Painted by	Date:
Check by	Date:

General Notes
All dimetres in milimetres UNO
All holes 22 dia. UNO
All material min. S275 JR UNO
All weld leg lenght z6mm UNO
All butt weld full penetration UNO
All weld symbols to be in accordance with BS EN ISO 2553
Fabrication tolerance to be in accordance with BS EN1090-2 Annex B
Function tolerance class 1 UNO
Weld acceptance criteria to be BS EN 5817 class C
suplementary NDT to be in accordance with table 24 UNO
Hold times to be in accordance with table 23UNO

EXC 2 | Welding Wire batch 12125212

TITLE JN3323 / Mc Gee

ADDRESS Euston Tower

SCALE: N.T.S.

Draw by: G.K.

DRAWING No. 3323-11-02-22-4

Rev

ISSUE/DATE 11/020/2022

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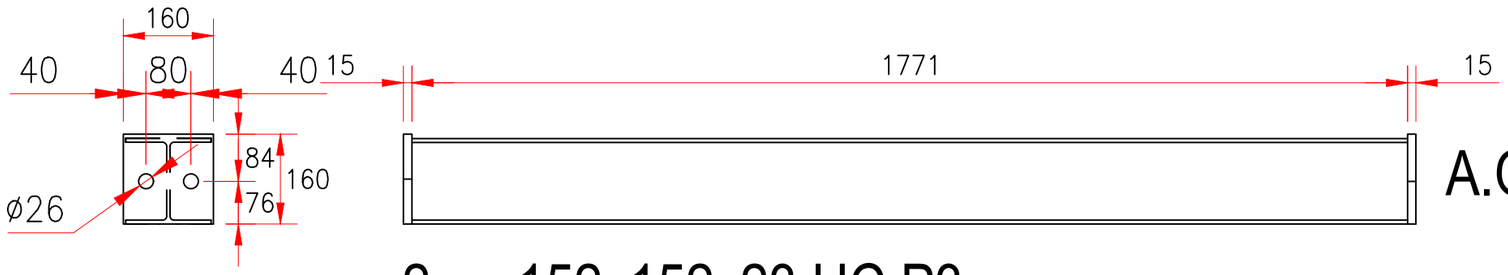

A.O.E.

2no. 152x152x23 UC P3

Beams (B) Plates (P)	Sizes:	P/O no. or Cast No.	Initial	Date

Fabrication Status	
Saw by	Date:
Drill by	Date:
Fab by	Date:
Weld by	Date:
Painted by	Date:
Check by	Date:

General Notes
All dimetres in milimetres UNO
All holes 22 dia. UNO
All material min. S275 JR UNO
All weld leg lenght z6mm UNO
All butt weld full penetration UNO
All weld symbols to be in accordance with BS EN ISO 2553
Fabrication tolerance to be in accordance with BS EN1090-2 Annex B
Function tolerance class 1 UNO
Weld acceptance criteria to be BS EN 5817 class C
suplementary NDT to be in accordance with table 24 UNO
Hold times to be in accordance with table 23UNO

EXC 2

Welding Wire batch 12125212

TITLE JN3323 / Mc Gee

ADDRESS Euston Tower

SCALE: N.T.S.

Draw by: G.K.

DRAWING No. 3323-11-02-22-5

Rev

ISSUE/DATE 26/02/2022

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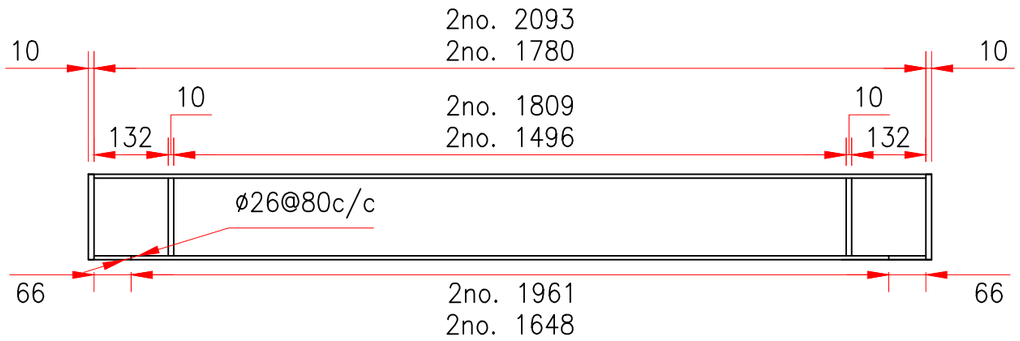
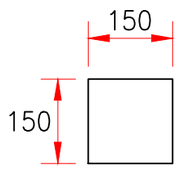
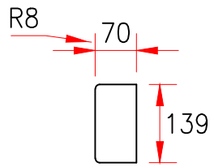


4no. 152x152x23 UC Top/Bottom

Plates from drawing 3323-11-02-22-1





112no. 150x150x10 PLT 224no. 139x73x10 PLT

Beams (B) Plates (P)	Sizes:	P/O no. or Cast No.	Initial	Date

Fabrication Status	
Saw by	Date:
Drill by	Date:
Fab by	Date:
Weld by	Date:
Painted by	Date:
Check by	Date:

General Notes
All dimetres in milimetres UNO
All holes 22 dia. UNO
All material min. S275 JR UNO
All weld leg lenght z6mm UNO
All butt weld full penetration UNO
All weld symbols to be in accordance with BS EN ISO 2553
Fabrication tolerance to be in accordance with BS EN1090-2 Annex B
Function tolerance class 1 UNO
Weld acceptance criteria to be BS EN 5817 class C
suplementary NDT to be in accordance with table 24 UNO
Hold times to be in accordance with table 23UNO

EXC 2 | Welding Wire batch 12125212

TITLE JN3323 / Mc Gee

ADDRESS Euston Tower

SCALE: N.T.S.

Draw by: G.K.

DRAWING No. 3323-11-02-22-6

Rev

ISSUE/DATE 26/02/2022

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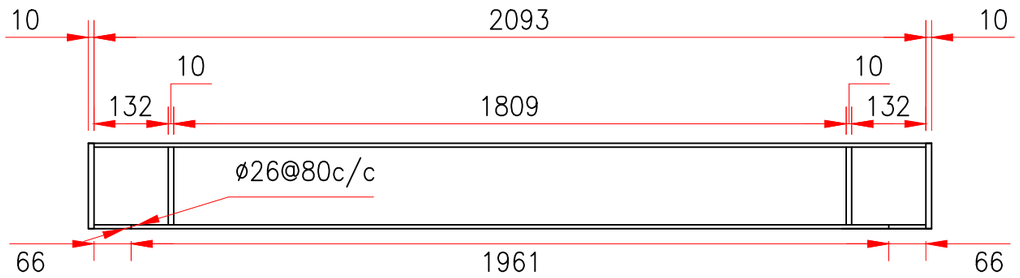
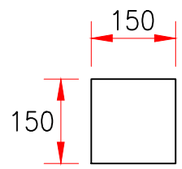
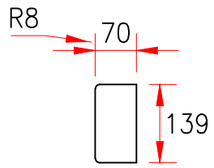


16no. 152x152x23 UC Top/Bottom

Plates from drawing 3323-11-02-22-1





112no. 150x150x10 PLT 224no. 139x73x10 PLT

Beams (B) Plates (P)	Sizes:	P/O no. or Cast No.	Initial	Date

Fabrication Status	
Saw by	Date:
Drill by	Date:
Fab by	Date:
Weld by	Date:
Painted by	Date:
Check by	Date:

General Notes
All dimetres in milimetres UNO
All holes 22 dia. UNO
All material min. S275 JR UNO
All weld leg lenght z6mm UNO
All butt weld full penetration UNO
All weld symbols to be in accordance with BS EN ISO 2553
Fabrication tolerance to be in accordance with BS EN1090-2 Annex B
Function tolerance class 1 UNO
Weld acceptance criteria to be BS EN 5817 class C
suplementary NDT to be in accordance with table 24 UNO
Hold times to be in accordance with table 23UNO

EXC 2 | Welding Wire batch 12125212

TITLE JN3323 / Mc Gee

ADDRESS Euston Tower

SCALE: N.T.S.

Draw by: G.K.

DRAWING No. 3323-11-02-22-7

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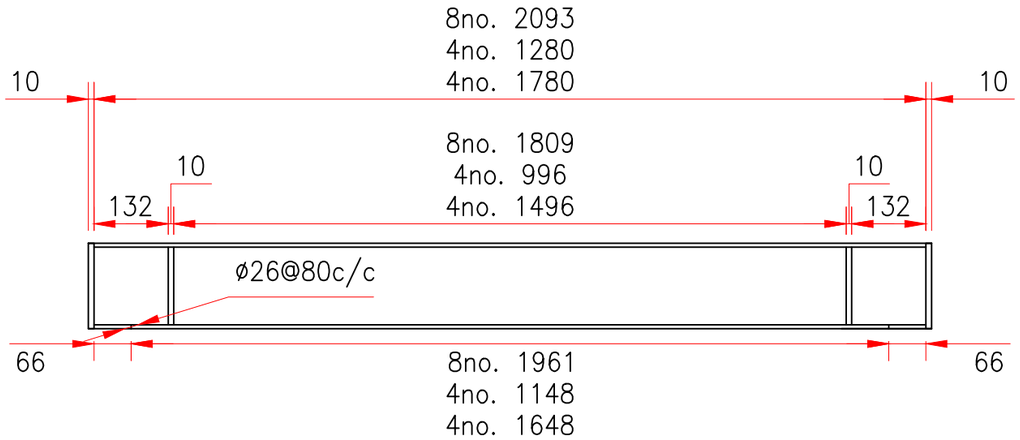

16no. 152x152x23 UC Top/Bottom

Plates from drawing 3323-11-02-22-1

112no. 150x150x10 PLT 224no. 139x73x10 PLT

Beams (B) Plates (P)	Sizes:	P/O no. or Cast No.	Initial	Date

Fabrication Status	
Saw by	Date:
Drill by	Date:
Fab by	Date:
Weld by	Date:
Painted by	Date:
Check by	Date:

General Notes
All dimetres in milimetres UNO
All holes 22 dia. UNO
All material min. S275 JR UNO
All weld leg lenght z6mm UNO
All butt weld full penetration UNO
All weld symbols to be in accordance with BS EN ISO 2553
Fabrication tolerance to be in accordance with BS EN1090-2 Annex B
Function tolerance class 1 UNO
Weld acceptance criteria to be BS EN 5817 class C
suplementary NDT to be in accordance with table 24 UNO
Hold times to be in accordance with table 23UNO

EXC 2 | Welding Wire batch 12125212

TITLE JN3323 / Mc Gee

ADDRESS Euston Tower

SCALE: N.T.S.

Draw by: G.K.

DRAWING No. 3323-11-02-22-8

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ISSUE/DATE 08/03/2022

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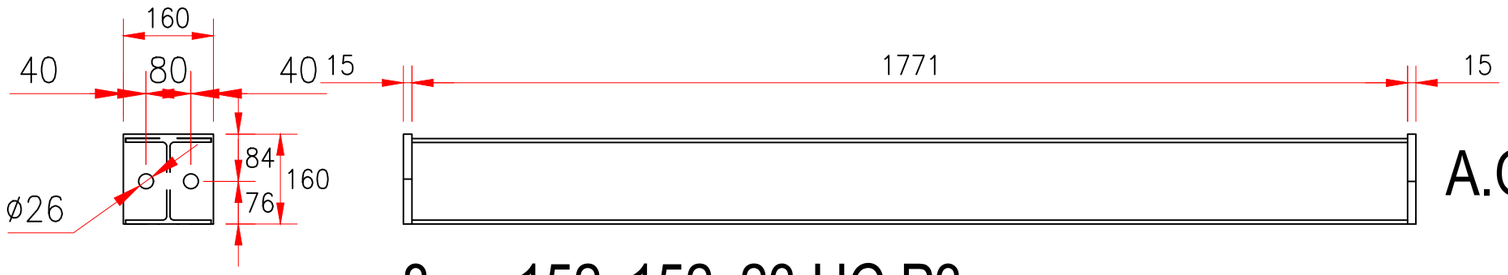

A.O.E.

8no. 152x152x23 UC P3

Beams (B) Plates (P)	Sizes:	P/O no. or Cast No.	Initial	Date

Fabrication Status	
Saw by	Date:
Drill by	Date:
Fab by	Date:
Weld by	Date:
Painted by	Date:
Check by	Date:

General Notes
All dimetres in milimetres UNO
All holes 22 dia. UNO
All material min. S275 JR UNO
All weld leg lenght z6mm UNO
All butt weld full penetration UNO
All weld symbols to be in accordance with BS EN ISO 2553
Fabrication tolerance to be in accordance with BS EN1090-2 Annex B
Function tolerance class 1 UNO
Weld acceptance criteria to be BS EN 5817 class C
suplementary NDT to be in accordance with table 24 UNO
Hold times to be in accordance with table 23UNO

EXC 2 | Welding Wire batch 12125212

TITLE JN3323 / Mc Gee

ADDRESS Euston Tower

SCALE: N.T.S.

Draw by: G.K.

DRAWING No. 3323-11-02-22-9

Rev

ISSUE/DATE 08/03/2022

MARETH FABRICATIONS LTD.
5 ARKWRIGHT ROAD
COLNBROOK
SLOUGH
SL3 0HJ
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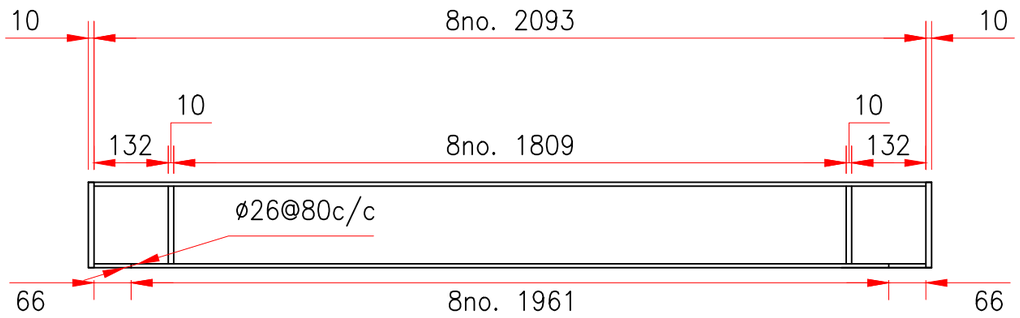
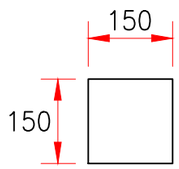
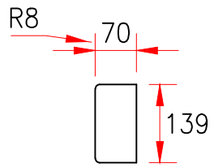
g.kubala@mareth.co.uk



8no. 152x152x23 UC Top/Bottom

Plates from drawing 3323-11-02-22-1





112no. 150x150x10 PLT 224no. 139x73x10 PLT

Beams (B) Plates (P)	Sizes:	P/O no. or Cast No.	Initial	Date

Fabrication Status	
Saw by	Date:
Drill by	Date:
Fab by	Date:
Weld by	Date:
Painted by	Date:
Check by	Date:

General Notes
All dimetres in milimetres UNO
All holes 22 dia. UNO
All material min. S275 JR UNO
All weld leg lenght z6mm UNO
All butt weld full penetration UNO
All weld symbols to be in accordance with BS EN ISO 2553
Fabrication tolerance to be in accordance with BS EN1090-2 Annex B
Function tolerance class 1 UNO
Weld acceptance criteria to be BS EN 5817 class C
suplementary NDT to be in accordance with table 24 UNO
Hold times to be in accordance with table 23UNO

EXC 2 | Welding Wire batch 12125212

TITLE JN3323 / Mc Gee

ADDRESS Euston Tower

SCALE: N.T.S.

Draw by: G.K.

DRAWING No. 3323-11-02-22-10

Rev

ISSUE/DATE 14/03/2022

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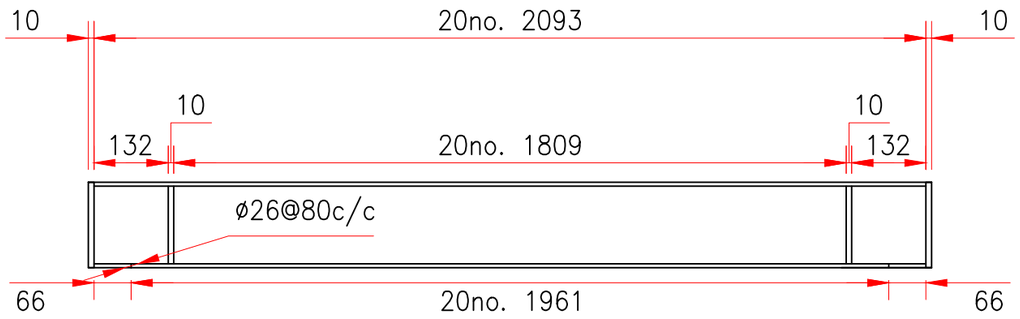

16no. 152x152x23 UC Top/Bottom

Plates from drawing 3323-11-02-22-1

112no. 150x150x10 PLT 224no. 139x73x10 PLT

Beams (B) Plates (P)	Sizes:	P/O no. or Cast No.	Initial	Date

Fabrication Status	
Saw by	Date:
Drill by	Date:
Fab by	Date:
Weld by	Date:
Painted by	Date:
Check by	Date:

General Notes
All dimetres in milimetres UNO
All holes 22 dia. UNO
All material min. S275 JR UNO
All weld leg lenght z6mm UNO
All butt weld full penetration UNO
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Fabrication tolerance to be in accordance with BS EN1090-2 Annex B
Function tolerance class 1 UNO
Weld acceptance criteria to be BS EN 5817 class C
suplementary NDT to be in accordance with table 24 UNO
Hold times to be in accordance with table 23UNO

EXC 2 | Welding Wire batch 12125212

TITLE JN3323 / Mc Gee

ADDRESS Euston Tower

SCALE: N.T.S.

Draw by: G.K.

DRAWING No. 3323-11-02-22-11

Rev

ISSUE/DATE 17/03/2022

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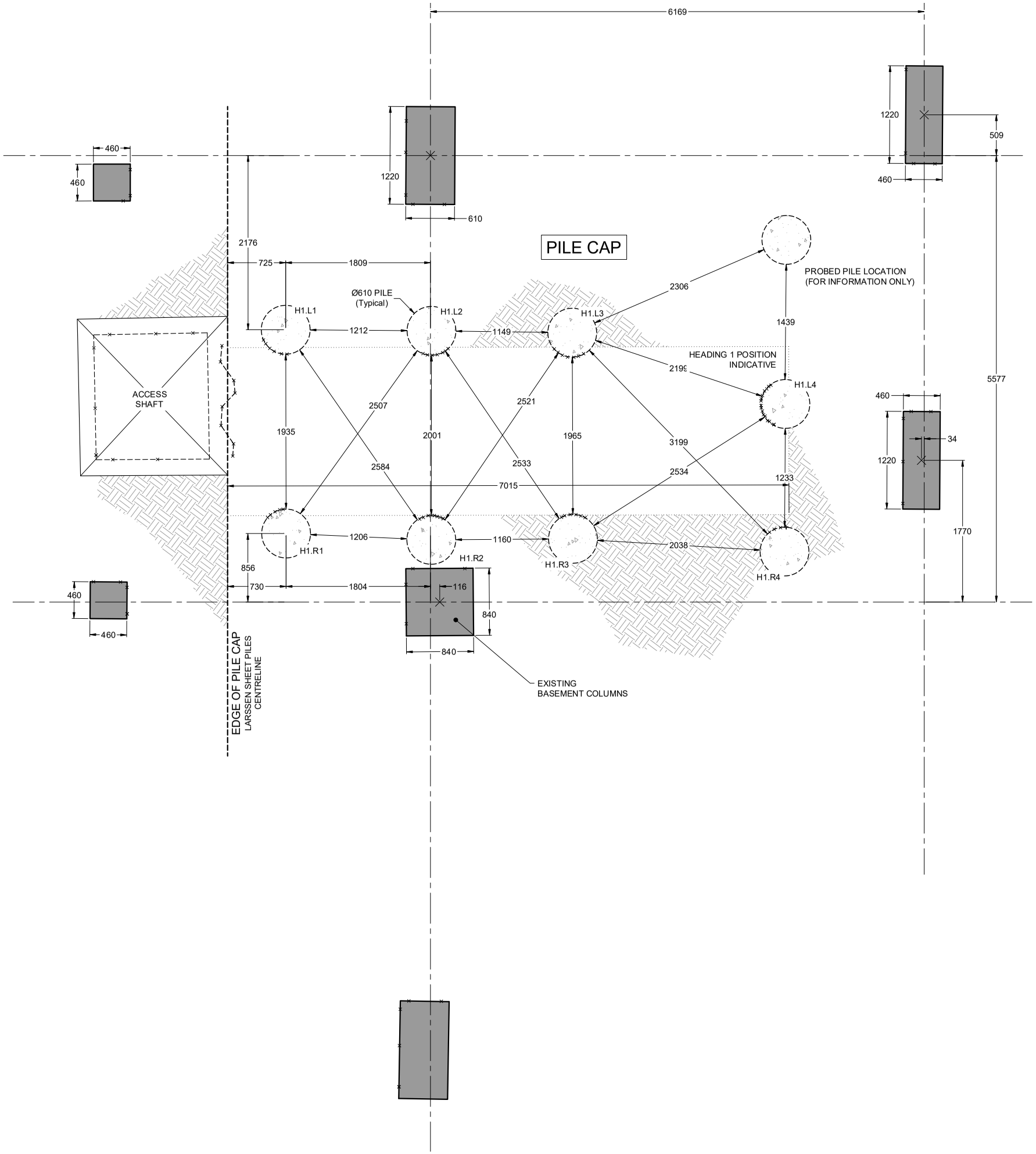


Notes:

1. Do not scale this drawing.
2. All dimensions are in millimeter unless noted otherwise.
3. Shown gridlines are arbitrary and to be used for the purpose of this survey only.
4. Position of piles surveyed in relation to existing columns at basement level (no visible cladding to RC elements).
5. Accuracy of survey below pile cap ±25 mm due to irregular pile surface. Pile diameter estimated from fully exposed pile at Location 2.
6. Access shaft formed as per McGee sketch ETF149-SK-003b (Rev -). For heading frame information refer to geometry sketch ETF149-SK-004 (Rev -) and fabrication drawings 3323-11-02-22-0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 and 11.
7. Total number of heading frames installed within Heading 1:
   - Standard 11 No @ 500mm c/c
   - Special 0 No.
8. Dry-packing thickness varies between 25 and 75mm, heading frames installed at approximate 500mm c/c.

Rev.	Date		By	Checked
B	21-06-22	Temporary works notes added	DF	-
A	01-06-22	ARUP comments addressed	DF	-

McGEE

Project:

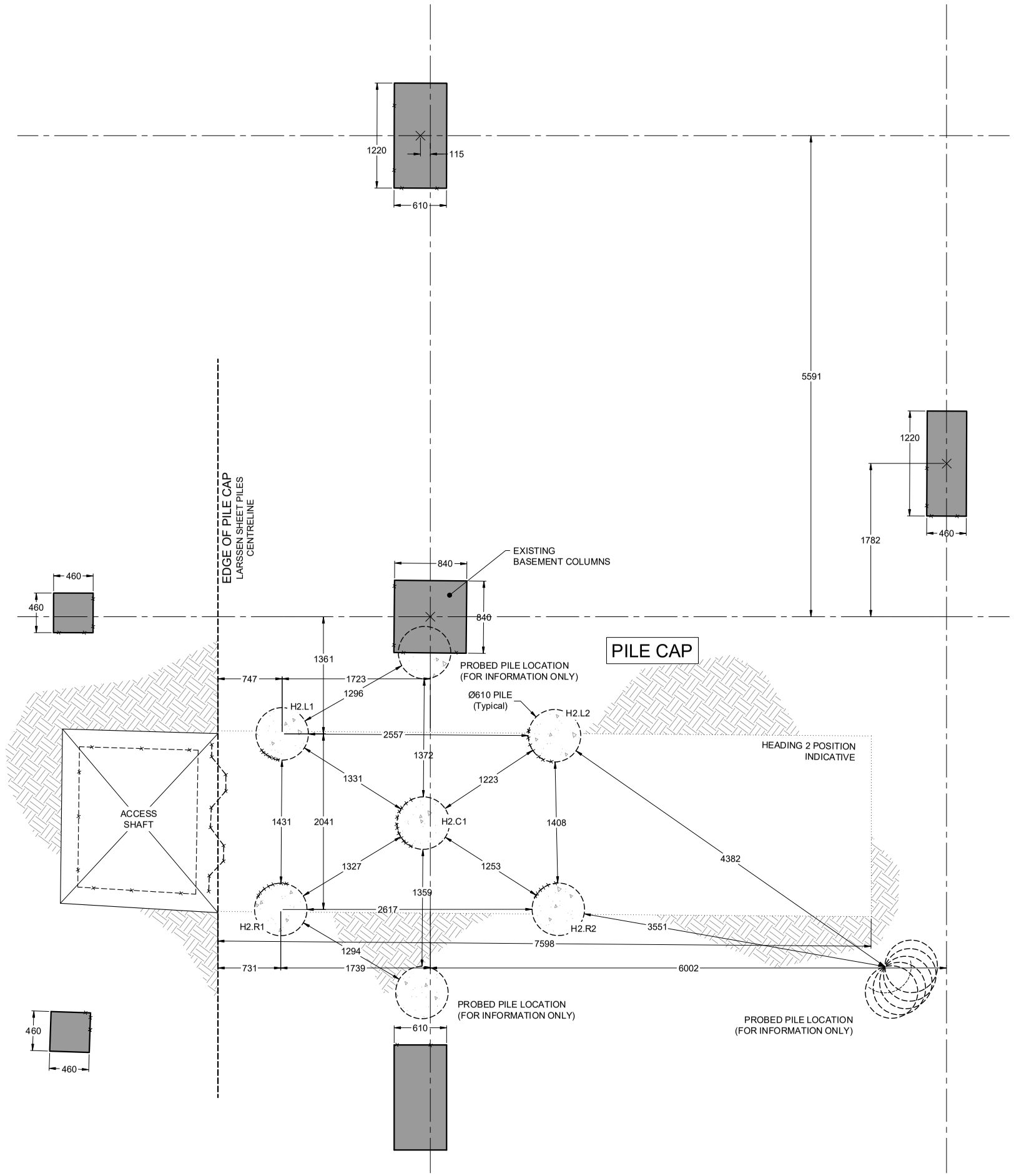
EUSTON TOWER

Drawing Title:

FOUNDATION SI WORK
LOCATION 1
SURVEY OF EXISTING PILES

Drawn:	Date:	Checked:
DF	22-04-2022	-

Scale:	Dwg No:	Revision:
NTS	ETF149-SK005a	B



Notes:

1. Do not scale this drawing.
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3. Shown gridlines are arbitrary and to be used for the purpose of this survey only.
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6. Access shaft formed as per McGee sketch ETF149-SK-003b (Rev -). For heading frame information refer to geometry sketch ETF149-SK-004 (Rev -) and fabrication drawings 3323-11-02-22-0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 and 11.
7. Total number of heading frames installed within Heading 2:
   - Standard 10 No.
   - Special 2 No.
8. Dry-packing thickness varies between 25 and 75mm, heading frames installed at approximate 500mm c/c.

Rev.	Date		By	Checked
B	21-06-22	Temporary works notes added	DF	-
A	01-06-22	ARUP comments addressed	DF	-

McGEE

Project:

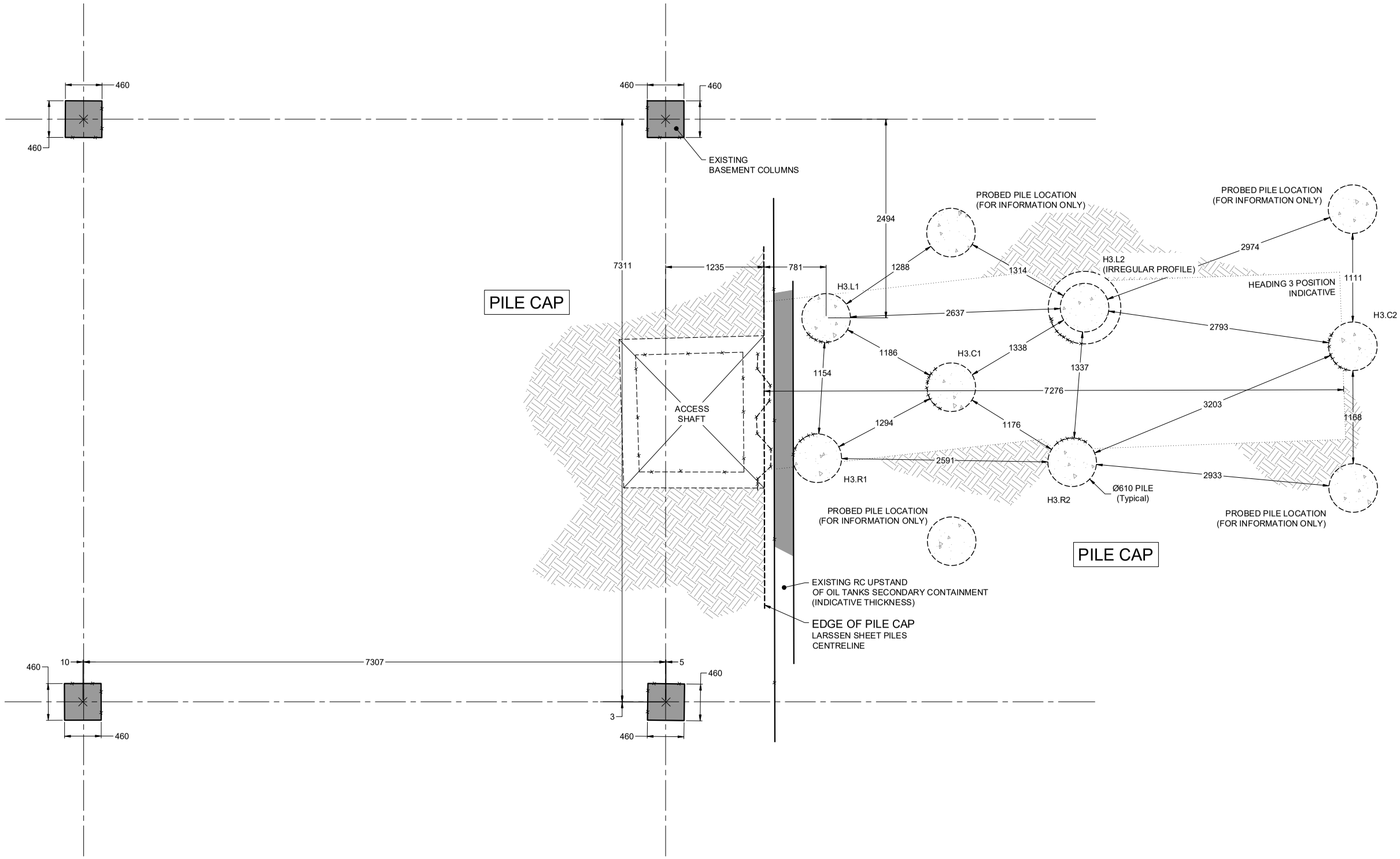
EUSTON TOWER

Drawing Title:

FOUNDATION SI WORK
LOCATION 2
SURVEY OF EXISTING PILES

Drawn:	Date:	Checked:
DF	22-04-2022	-

Scale:	Dwg No:	Revision:
NTS	ETF149-SK005b	B



Notes:

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7. Total number of heading frames installed within Heading 3:
   - Standard 10 No.
   - Special 0 No.
8. Dry-packing thickness varies between 25 and 75mm, heading frames installed at approximate 500mm c/c.

Rev.	Date		By	Checked
B	21-06-22	Temporary works notes added	DF	-
A	01-06-22	ARUP comments addressed	DF	-

McGEE

Project:

EUSTON TOWER

Drawing Title:

FOUNDATION SI WORK
LOCATION 3
SURVEY OF EXISTING PILES

Drawn:	Date:	Checked:
DF	21-05-2022	-

Scale:	Dig No:	Revision:
NTS	ETF149-SK005c	B

CONCEPT SITE INVESTIGATIONS

Site Name:	Euston Tower	**Job No.:**	22/3686
Client:	McGee	**Date Reported:**	09/06/2022

Summary Test Report

Determination of Moisture Content and Liquid and Plastic Limits by 4 Point Cone Method

Borehole No.	Sample Type	Sample No.	Depth m	Description	Natural Moisture Content %	Washed Natural	Passing 425 µm sieve %	Liquid Limit %	Plastic Limit %	Plasticity Index %	Remarks
Heading 1	D	Face S001A	0.15	Dark grey slightly micaceous silty CLAY	26	Natural	100	71	26	45	
Heading 1	D	Face S002A	0.80	Greyish brown slightly micaceous silty CLAY with rare pockets of light brown silty fine sand	26	Natural	100	71	26	45	
Heading 1	D	Face S003A	1.65	Greyish brown slightly micaceous silty CLAY	27	Natural	100	75	27	48	
Heading 2	D	Face S004A	0.10	Brown silty CLAY	29	Natural	100	75	27	48	
Heading 2	D	Face S005A	1.00	Greyish brown slightly micaceous slightly sandy silty CLAY with rare shell fragments and pockets of light grey silty fine sand	24	Natural	100	66	25	41	
Heading 2	D	Face S006A	2.00	Greyish brown slightly micaceous silty CLAY	27	Natural	100	73	26	47	

BS 1377: Part 2: Clause 4.3 & 4.4: 1990 Determination of the liquid limit by the cone penetrometer method

BS 1377: Part 2: Clause 5: 1990 Determination of the plastic limit and plasticity index

BS 1377: Part 2: Clause 3.2: 1990 Determination of the moisture content by the oven drying method

AGS ASSOCIATION OF GEOTECHNICAL & GEOENVIRONMENTAL SPECIALISTS

UKAS TESTING 4503

Remarks: The results reported relate only to the items tested or sampled.

Date - samples received:	20/04/2022		
Date - sample testing commenced :	24/05/2022	Checked / Approved by:	01/06/2022
Date - sample testing completed :	26/05/2022	Date Approved:	KM
Approved Signatories:	L Griffin LG (QA Technical & Lab Mngr) – K Mazerant KM (Lab Mngr)		

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47-49 Brunel Road, London W3 7XR
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CONCEPT SITE INVESTIGATIONS

Site Name:	Euston Tower	**Job No.:**	22/3686
Client:	McGee	**Date Reported:**	16/06/2022

Summary Test Report

Determination of Moisture Content and Liquid and Plastic Limits by 4 Point Cone Method

Borehole No.	Sample Type	Sample No.	Depth m	Description	Natural Moisture Content %	Washed Natural	Passing 425 µm sieve %	Liquid Limit %	Plastic Limit %	Plasticity Index %	Remarks
Heading 1	U38	Pile L3 S010 Disc 1	1.20	Greyish brown silty CLAY	26						
Heading 1	U38	Pile L3 S010 Disc 2	1.20	Greyish brown silty CLAY	26						
Heading 1	U38	Pile L3 S010 Disc 3	1.20	Greyish brown silty CLAY	27						
Heading 1	U38	Pile L3 S010 Disc 4	1.20	Greyish brown silty CLAY	32						
Heading 1	U38	Pile L3 S010 Disc 5	1.20	Greyish brown silty CLAY	29						
Heading 1	U38	Pile L3 S010 Disc 6	1.20	Greyish brown silty CLAY	28						
Heading 1	U38	Pile L3 S010 Disc 7	1.20	Greyish brown silty CLAY	29						

BS 1377: Part 2: Clause 4.3 & 4.4: 1990 Determination of the liquid limit by the cone penetrometer method

BS 1377: Part 2: Clause 5: 1990 Determination of the plastic limit and plasticity index

BS 1377: Part 2: Clause 3.2: 1990 Determination of the moisture content by the oven drying method

AGS ASSOCIATION OF GEOTECHNICAL & GEOENVIRONMENTAL SPECIALISTS

UKAS TESTING 4503

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CONCEPT SITE INVESTIGATIONS

Site Name:	Euston Tower	**Job No.:**	22/3686
Client:	McGee	**Date Reported:**	16/06/2022

Summary Test Report

Determination of Moisture Content and Liquid and Plastic Limits by 4 Point Cone Method

Borehole No.	Sample Type	Sample No.	Depth m	Description	Natural Moisture Content %	Washed Natural	Passing 425 µm sieve %	Liquid Limit %	Plastic Limit %	Plasticity Index %	Remarks
Heading 1	U38	Pile R3 S011 Disc 1	1.20	Greyish brown silty CLAY with rare pockets of grey silty sand	25						
Heading 1	U38	Pile R3 S011 Disc 2	1.20	Greyish brown silty CLAY with rare pockets of grey silty sand	26						
Heading 1	U38	Pile R3 S011 Disc 3	1.20	Greyish brown silty CLAY with rare pockets of grey silty sand	26						
Heading 1	U38	Pile R3 S011 Disc 4	1.20	Greyish brown silty CLAY with rare pockets of grey silty sand	26						
Heading 1	U38	Pile R3 S011 Disc 5	1.20	Greyish brown silty CLAY with rare pockets of grey silty sand	23						
Heading 1	U38	Pile R3 S011 Disc 6	1.20	Greyish brown silty CLAY with rare pockets of grey silty sand	25						
Heading 1	U38	Pile R3 S011 Disc 7	1.20	Greyish brown silty CLAY with rare pockets of grey silty sand	25						

BS 1377: Part 2: Clause 4.3 & 4.4: 1990 Determination of the liquid limit by the cone penetrometer method

BS 1377: Part 2: Clause 5: 1990 Determination of the plastic limit and plasticity index

BS 1377: Part 2: Clause 3.2: 1990 Determination of the moisture content by the oven drying method

AGS ASSOCIATION OF GEOTECHNICAL & GEOENVIRONMENTAL SPECIALISTS

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CONCEPT SITE INVESTIGATIONS

Site Name:	Euston Tower	**Job No.:**	22/3686
Client:	McGee	**Date Reported:**	16/06/2022

Summary Test Report

Determination of Moisture Content and Liquid and Plastic Limits by 4 Point Cone Method

Borehole No.	Sample Type	Sample No.	Depth m	Description	Natural Moisture Content %	Washed Natural	Passing 425 µm sieve %	Liquid Limit %	Plastic Limit %	Plasticity Index %	Remarks
Heading 1	U38	Pile L4 S012 Disc 1	1.20	Greyish brown silty CLAY with rare pockets of grey silty sand	26						
Heading 1	U38	Pile L4 S012 Disc 2	1.20	Greyish brown silty CLAY with rare pockets of grey silty sand	25						
Heading 1	U38	Pile L4 S012 Disc 3	1.20	Greyish brown silty CLAY with rare pockets of grey silty sand	26						
Heading 1	U38	Pile L4 S012 Disc 4	1.20	Greyish brown silty CLAY with rare pockets of grey silty sand	26						
Heading 1	U38	Pile L4 S012 Disc 5	1.20	Greyish brown silty CLAY with rare pockets of grey silty sand	25						
Heading 1	U38	Pile L4 S012 Disc 6	1.20	Greyish brown silty CLAY with rare pockets of grey silty sand	25						
Heading 1	U38	Pile L4 S012 Disc 7	1.20	Greyish brown silty CLAY with rare pockets of grey silty sand	25						
Heading 1	U38	Pile L4 S012 Disc 8	1.20	Greyish brown silty CLAY with rare pockets of grey silty sand	25						

BS 1377: Part 2: Clause 4.3 & 4.4: 1990 Determination of the liquid limit by the cone penetrometer method

BS 1377: Part 2: Clause 5: 1990 Determination of the plastic limit and plasticity index

BS 1377: Part 2: Clause 3.2: 1990 Determination of the moisture content by the oven drying method

4503

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CONCEPT SITE INVESTIGATIONS

Site Name:	Euston Tower	**Job No.:**	22/3686
Client:	McGee	**Date Reported:**	16/06/2022

Summary Test Report

Determination of Moisture Content and Liquid and Plastic Limits by 4 Point Cone Method

Borehole No.	Sample Type	Sample No.	Depth m	Description	Natural Moisture Content %	Washed Natural	Passing 425 µm sieve %	Liquid Limit %	Plastic Limit %	Plasticity Index %	Remarks
Heading 3	D	Face S030A	0.20	Dark grey slightly micaceous silty CLAY	34	Natural	100	86	29	57	
Heading 3	D	Face S031A	1.05	Greyish brown slightly micaceous silty CLAY with rare pockets of light brown silty fine sand	28	Natural	100	80	27	53	
Heading 3	D	Face S032A	1.95	Greyish brown slightly micaceous silty CLAY	30	Natural	100	80	28	52	

BS 1377: Part 2: Clause 4.3 & 4.4: 1990 Determination of the liquid limit by the cone penetrometer method

BS 1377: Part 2: Clause 5: 1990 Determination of the plastic limit and plasticity index

BS 1377: Part 2: Clause 3.2: 1990 Determination of the moisture content by the oven drying method

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Site Name:	Euston Tower	**Job No.:**	22/3686
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Summary Test Report

Determination of Moisture Content and Liquid and Plastic Limits by 4 Point Cone Method

Borehole No.	Sample Type	Sample No.	Depth m	Description	Natural Moisture Content %	Washed Natural	Passing 425 µm sieve %	Liquid Limit %	Plastic Limit %	Plasticity Index %	Remarks
Heading 3	U38	Pile C2 S035 Disc 1	3.50	Greyish brown silty CLAY	27						
Heading 3	U38	Pile C2 S035 Disc 2	3.50	Greyish brown silty CLAY	28						
Heading 3	U38	Pile C2 S035 Disc 3	3.50	Greyish brown silty CLAY	27						
Heading 3	U38	Pile C2 S035 Disc 4	3.50	Greyish brown silty CLAY	27						
Heading 3	U38	Pile C2 S035 Disc 5	3.50	Greyish brown silty CLAY	28						
Heading 3	U38	Pile C2 S035 Disc 6	3.50	Greyish brown silty CLAY	27						
Heading 3	U38	Pile C2 S035 Disc 7	3.50	Greyish brown silty CLAY	27						
Heading 3	U38	Pile C2 S035 Disc 8	3.50	Greyish brown silty CLAY	27						
Heading 3	U38	Pile C2 S035 Disc 9	3.50	Greyish brown silty CLAY	27						

BS 1377: Part 2: Clause 4.3 & 4.4: 1990 Determination of the liquid limit by the cone penetrometer method

BS 1377: Part 2: Clause 5: 1990 Determination of the plastic limit and plasticity index

BS 1377: Part 2: Clause 3.2: 1990 Determination of the moisture content by the oven drying method

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CONCEPT SITE INVESTIGATIONS

Site Name:	Euston Tower	**Job No.:**	22/3686
Client:	McGee	**Date Reported:**	16/06/2022

Summary Test Report

Determination of Moisture Content and Liquid and Plastic Limits by 4 Point Cone Method

Borehole No.	Sample Type	Sample No.	Depth m	Description	Natural Moisture Content %	Washed Natural	Passing 425 µm sieve %	Liquid Limit %	Plastic Limit %	Plasticity Index %	Remarks
Heading 3	U38	Pile C2 S035 Disc 10	3.50	Greyish brown silty CLAY with rare pockets of grey silty sand	27						

BS 1377: Part 2: Clause 4.3 & 4.4: 1990 Determination of the liquid limit by the cone penetrometer method

BS 1377: Part 2: Clause 5: 1990 Determination of the plastic limit and plasticity index

BS 1377: Part 2: Clause 3.2: 1990 Determination of the moisture content by the oven drying method

Remarks: The results reported relate only to the items tested or sampled.

4503

Date - samples received:	25/05/2022		
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CONCEPT SITE INVESTIGATIONS

Site Name:	Euston Tower	**Job No.:**	22/3686
Client:	McGee	**Date Reported:**	16/06/2022

Summary Test Report

Determination of Moisture Content and Liquid and Plastic Limits by 4 Point Cone Method

Borehole No.	Sample Type	Sample No.	Depth m	Description	Natural Moisture Content %	Washed Natural	Passing 425 µm sieve %	Liquid Limit %	Plastic Limit %	Plasticity Index %	Remarks
Heading 3	U38	Pile C2 S033 Disc 1	7.00	Brownish grey silty CLAY	28						
Heading 3	U38	Pile C2 S033 Disc 2	7.00	Brownish grey silty CLAY	28						
Heading 3	U38	Pile C2 S033 Disc 3	7.00	Brownish grey silty CLAY	29						
Heading 3	U38	Pile C2 S033 Disc 4	7.00	Brownish grey silty CLAY	28						
Heading 3	U38	Pile C2 S033 Disc 5	7.00	Brownish grey silty CLAY	27						
Heading 3	U38	Pile C2 S033 Disc 6	7.00	Brownish grey silty CLAY	28						
Heading 3	U38	Pile C2 S033 Disc 7	7.00	Brownish grey silty CLAY	28						
Heading 3	U38	Pile C2 S033 Disc 8	7.00	Brownish grey silty CLAY	27						
Heading 3	U38	Pile C2 S033 Disc 9	7.00	Brownish grey silty CLAY	27						

BS 1377: Part 2: Clause 4.3 & 4.4: 1990 Determination of the liquid limit by the cone penetrometer method

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BS 1377: Part 2: Clause 3.2: 1990 Determination of the moisture content by the oven drying method

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CONCEPT SITE INVESTIGATIONS

Site Name:	Euston Tower	**Job No.:**	22/3686
Client:	McGee	**Date Reported:**	16/06/2022

Summary Test Report

Determination of Moisture Content and Liquid and Plastic Limits by 4 Point Cone Method

Borehole No.	Sample Type	Sample No.	Depth m	Description	Natural Moisture Content %	Washed Natural	Passing 425 µm sieve %	Liquid Limit %	Plastic Limit %	Plasticity Index %	Remarks
Heading 3	U38	Pile C2 S033 Disc 10	7.00	Brownish grey silty CLAY	27						

BS 1377: Part 2: Clause 4.3 & 4.4: 1990 Determination of the liquid limit by the cone penetrometer method

BS 1377: Part 2: Clause 5: 1990 Determination of the plastic limit and plasticity index

BS 1377: Part 2: Clause 3.2: 1990 Determination of the moisture content by the oven drying method

Remarks: The results reported relate only to the items tested or sampled.

4503

Date - samples received:	20/04/2022		
Date - sample testing commenced :	06/06/2022	Checked / Approved by:	15/06/2022
Date - sample testing completed :	13/06/2022	Date Approved:	KM
Approved Signatories:	L Griffin LG (QA Technical & Lab Mngr) – K Mazerant KM (Lab Mngr)		

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Tel: 02087401553 Email: lab@conceptconsultants.co.uk

CONCEPT SITE INVESTIGATIONS

Site Name:	Euston Tower	**Job No.:**	22/3686
Client:	McGee	**Date Reported:**	16/06/2022

Summary Test Report

Determination of Moisture Content and Liquid and Plastic Limits by 4 Point Cone Method

Borehole No.	Sample Type	Sample No.	Depth m	Description	Natural Moisture Content %	Washed Natural	Passing 425 µm sieve %	Liquid Limit %	Plastic Limit %	Plasticity Index %	Remarks
Heading 3	U38	Pile C2 S034 Disc 1	1.40	Brownish grey silty CLAY	29						
Heading 3	U38	Pile C2 S034 Disc 2	1.40	Brownish grey silty CLAY	29						
Heading 3	U38	Pile C2 S034 Disc 3	1.40	Brownish grey silty CLAY	28						
Heading 3	U38	Pile C2 S034 Disc 4	1.40	Brownish grey silty CLAY	28						
Heading 3	U38	Pile C2 S034 Disc 5	1.40	Brownish grey silty CLAY	29						
Heading 3	U38	Pile C2 S034 Disc 6	1.40	Brownish grey silty CLAY	29						
Heading 3	U38	Pile C2 S034 Disc 7	1.40	Brownish grey silty CLAY	29						
Heading 3	U38	Pile C2 S034 Disc 8	1.40	Brownish grey silty CLAY	29						
Heading 3	U38	Pile C2 S034 Disc 9	1.40	Brownish grey silty CLAY	29						

BS 1377: Part 2: Clause 4.3 & 4.4: 1990 Determination of the liquid limit by the cone penetrometer method

BS 1377: Part 2: Clause 5: 1990 Determination of the plastic limit and plasticity index

BS 1377: Part 2: Clause 3.2: 1990 Determination of the moisture content by the oven drying method

AGS ASSOCIATION OF GEOTECHNICAL & GEOENVIRONMENTAL SPECIALISTS

UKAS TESTING 4503

Remarks: The results reported relate only to the items tested or sampled.

Date - samples received:	20/04/2022		
Date - sample testing commenced :	06/06/2022	Checked / Approved by:	15/06/2022
Date - sample testing completed :	13/06/2022	Date Approved:	KM
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CONCEPT SITE INVESTIGATIONS

Site Name:	Euston Tower	**Job No.:**	22/3686
Client:	McGee	**Date Reported:**	16/06/2022

Summary Test Report

Determination of Moisture Content and Liquid and Plastic Limits by 4 Point Cone Method

Borehole No.	Sample Type	Sample No.	Depth m	Description	Natural Moisture Content %	Washed Natural	Passing 425 µm sieve %	Liquid Limit %	Plastic Limit %	Plasticity Index %	Remarks
Heading 3	U38	Pile C2 S034 Disc 10	1.40	Brownish grey silty CLAY	30						

BS 1377: Part 2: Clause 4.3 & 4.4: 1990 Determination of the liquid limit by the cone penetrometer method

BS 1377: Part 2: Clause 5: 1990 Determination of the plastic limit and plasticity index

BS 1377: Part 2: Clause 3.2: 1990 Determination of the moisture content by the oven drying method

AGS ASSOCIATION OF GEOTECHNICAL & GEOENVIRONMENTAL SPECIALISTS

UKAS TESTING 4503

Remarks: The results reported relate only to the items tested or sampled.

Date - samples received:	20/04/2022		
Date - sample testing commenced :	06/06/2022	Checked / Approved by:	15/06/2022
Date - sample testing completed :	13/06/2022	Date Approved:	KM
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CONCEPT SITE INVESTIGATIONS

PARTICLE SIZE DISTRIBUTION

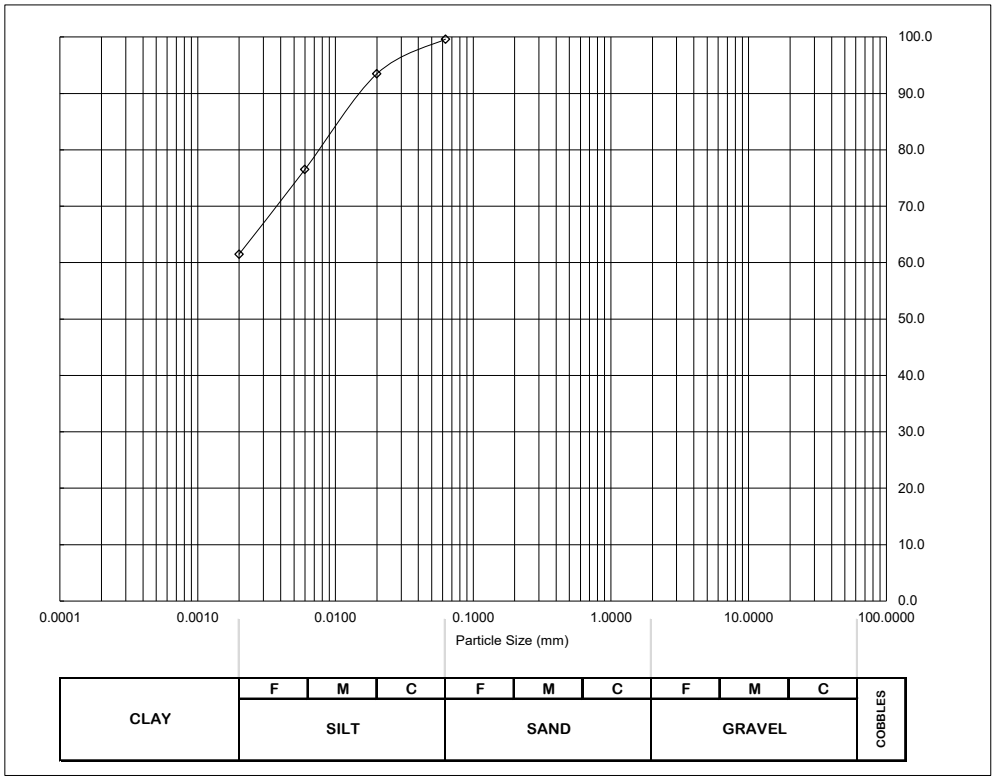
TEST REPORT

Site Name:	**Euston Tower**					**Job Number:**	**22/3686**
Client:	**McGee**					**Date Reported:**	**01/06/2022**
Borehole No:	**Heading 1**	**Sample Type/No.**	**D**	**Face S001A**	**Top Depth: 0.15 m**	**Bottom Depth:**	**m**

Soil Description:

Dark grey slightly micaceous silty CLAY

BS Test Sieves	
Size (mm)	% Passing
75.000	100
63.000	100
50.000	100
37.500	100
28.000	100
20.000	100
14.000	100
10.000	100
6.300	100
5.000	100
3.350	100
2.000	100
1.180	100
0.600	100
0.425	100
0.300	100
0.212	100
0.150	100
0.063	100



Sedimentation (*if applicable)	
Size (mm)	% Passing
0.020	93
0.006	77
0.002	61

Method/type:	
	Pipette

BS 1377: Part 2: Clause 9.4: 1990 Determination of sedimentation by the pipette method.

Particle Proportions %	
Cobbles	
Gravel	
Sand	0.4
Silt	38.2
Clay	61.5

4503

Remarks:

Particle size distribution by dry sieve was not carried out on sand fraction

The results reported relate only to the items tested or sampled.

Date - samples received:	20/04/2022		
Date - sample testing commenced :	24/05/2022	Checked / Approved by:	01/06/2022
Date - sample testing completed :	29/05/2022	Date Approved:	KM

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CONCEPT SITE INVESTIGATIONS

PARTICLE SIZE DISTRIBUTION

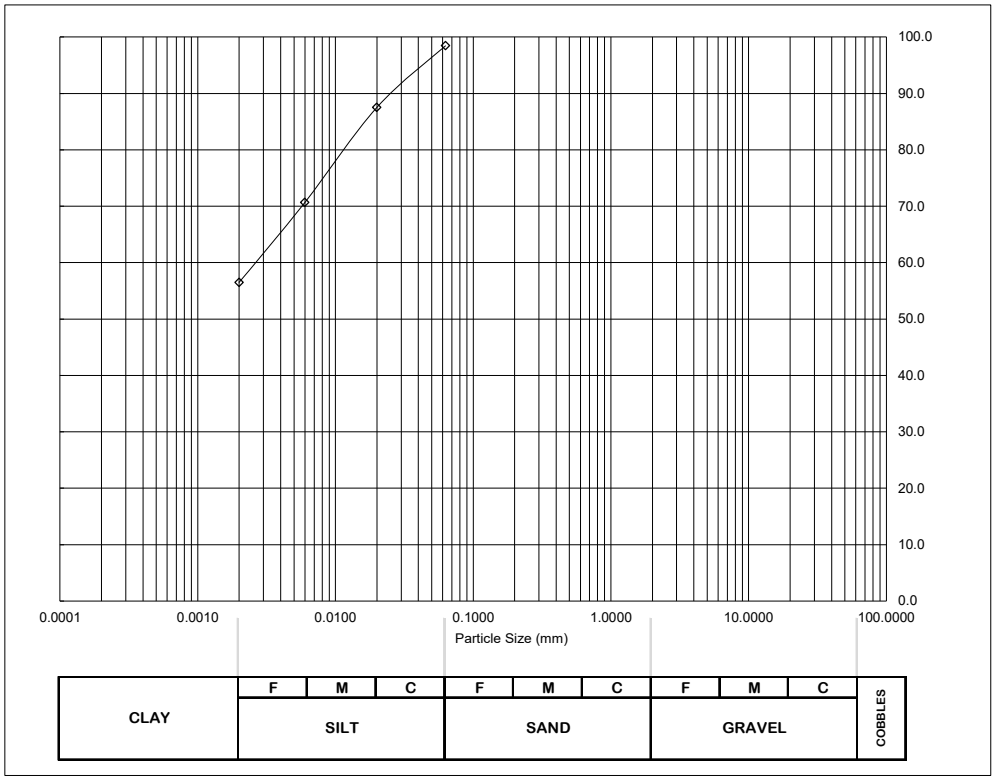
TEST REPORT

Site Name:	**Euston Tower**					**Job Number:**	**22/3686**
Client:	**McGee**					**Date Reported:**	**01/06/2022**
Borehole No:	**Heading 1**	**Sample Type/No.**	**D**	**Face S002A**	**Top Depth: 0.80 m**	**Bottom Depth:**	**m**

Soil Description:

Greyish brown slightly micaceous silty CLAY with rare pockets of light brown silty fine sand

BS Test Sieves	
Size (mm)	% Passing
75.000	100
63.000	100
50.000	100
37.500	100
28.000	100
20.000	100
14.000	100
10.000	100
6.300	100
5.000	100
3.350	100
2.000	100
1.180	100
0.600	100
0.425	100
0.300	100
0.212	100
0.150	100
0.063	98



Sedimentation (*if applicable)	
Size (mm)	% Passing
0.020	88
0.006	71
0.002	56

Method/type:	
	Pipette

BS 1377: Part 2: Clause 9.4: 1990 Determination of sedimentation by the pipette method.

Particle Proportions %	
Cobbles	
Gravel	
Sand	1.5
Silt	42.0
Clay	56.5

4503

Remarks:

Particle size distribution by dry sieve was not carried out on sand fraction

The results reported relate only to the items tested or sampled.

Date - samples received:	20/04/2022		
Date - sample testing commenced :	24/05/2022	Checked / Approved by:	01/06/2022
Date - sample testing completed :	29/05/2022	Date Approved:	KM

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CONCEPT SITE INVESTIGATIONS

PARTICLE SIZE DISTRIBUTION

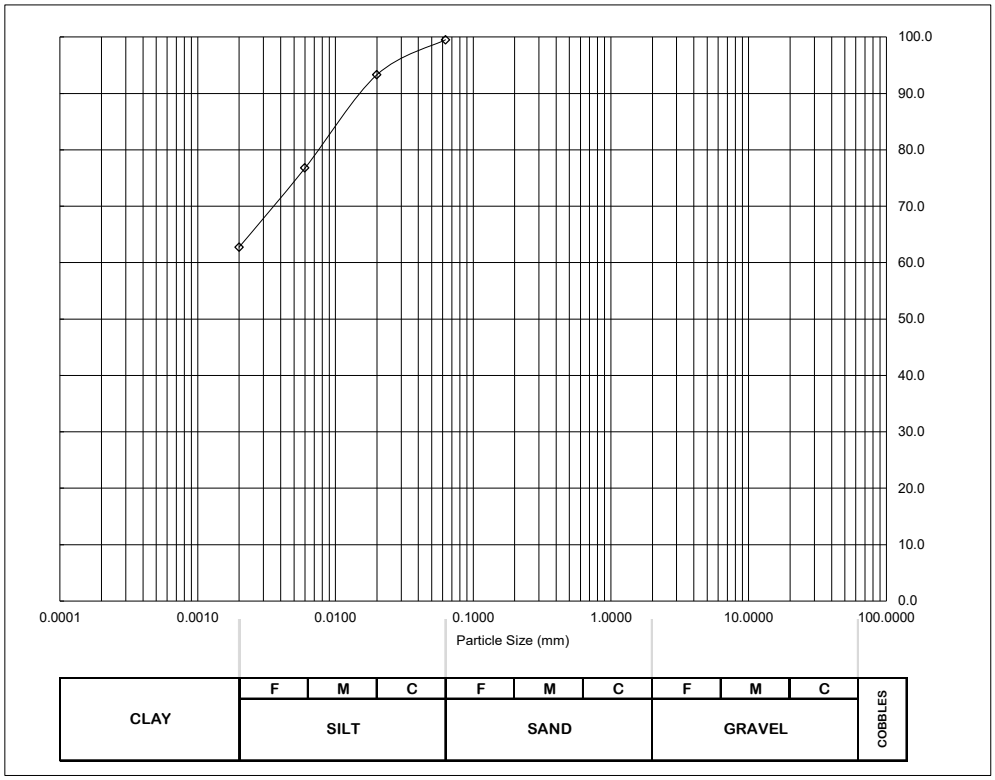
TEST REPORT

Site Name:	**Euston Tower**					**Job Number:**	**22/3686**
Client:	**McGee**					**Date Reported:**	**01/06/2022**
Borehole No:	**Heading 1**	**Sample Type/No.**	**D**	**Face S003A**	**Top Depth: 1.65 m**	**Bottom Depth:**	**m**

Soil Description:

Greyish brown slightly micaceous silty CLAY

BS Test Sieves	
Size (mm)	% Passing
75.000	100
63.000	100
50.000	100
37.500	100
28.000	100
20.000	100
14.000	100
10.000	100
6.300	100
5.000	100
3.350	100
2.000	100
1.180	100
0.600	100
0.425	100
0.300	100
0.212	100
0.150	100
0.063	99



Sedimentation (*if applicable)	
Size (mm)	% Passing
0.020	93
0.006	77
0.002	63

Method/type:	
	Pipette

BS 1377: Part 2: Clause 9.4: 1990 Determination of sedimentation by the pipette method.

Particle Proportions %	
Cobbles	
Gravel	
Sand	0.5
Silt	36.8
Clay	62.7

4503

Remarks:

Particle size distribution by dry sieve was not carried out on sand fraction

The results reported relate only to the items tested or sampled.

Date - samples received:	20/04/2022		
Date - sample testing commenced :	24/05/2022	Checked / Approved by:	01/06/2022
Date - sample testing completed :	29/05/2022	Date Approved:	KM

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CONCEPT SITE INVESTIGATIONS

PARTICLE SIZE DISTRIBUTION

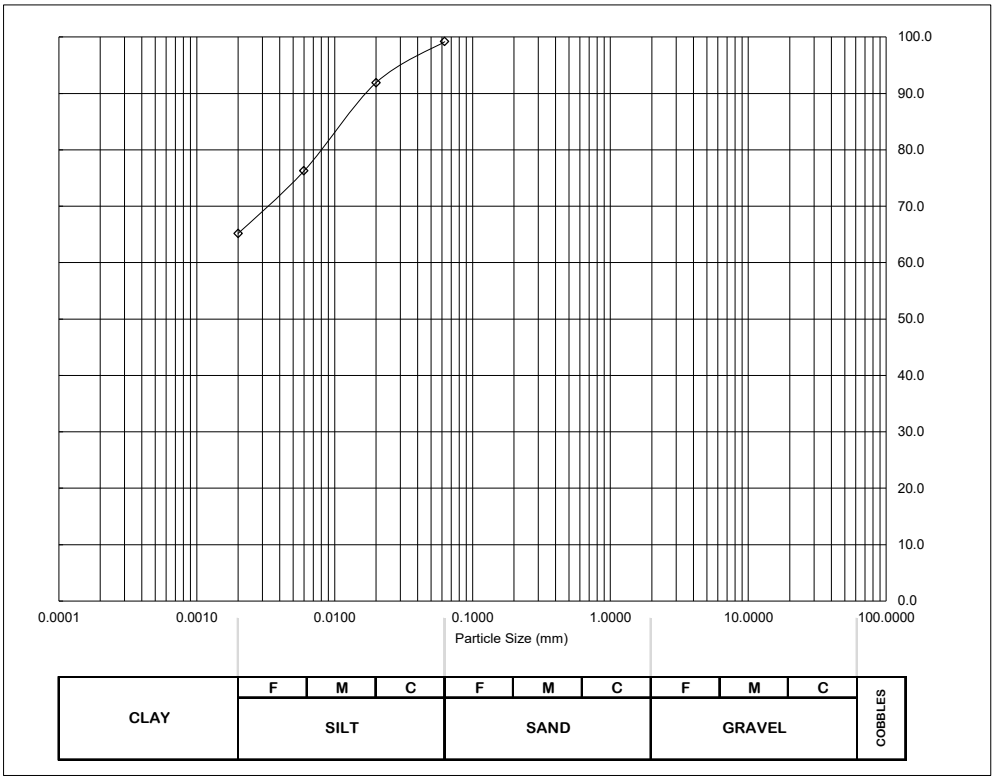
TEST REPORT

Site Name:	**Euston Tower**					**Job Number:**	**22/3686**
Client:	**McGee**					**Date Reported:**	**01/06/2022**
Borehole No:	**Heading 2**	**Sample Type/No.**	**D**	**Face S004A**	**Top Depth: 0.10 m**	**Bottom Depth:**	**m**

Soil Description:

Brown silty CLAY

BS Test Sieves	
Size (mm)	% Passing
75.000	100
63.000	100
50.000	100
37.500	100
28.000	100
20.000	100
14.000	100
10.000	100
6.300	100
5.000	100
3.350	100
2.000	100
1.180	100
0.600	100
0.425	100
0.300	100
0.212	100
0.150	100
0.063	99



Sedimentation (*if applicable)	
Size (mm)	% Passing
0.020	92
0.006	76
0.002	65

Method/type:	
	Pipette

BS 1377: Part 2: Clause 9.4: 1990 Determination of sedimentation by the pipette method.

Particle Proportions %	
Cobbles	
Gravel	
Sand	0.8
Silt	34.0
Clay	65.2

4503

Remarks:

Particle size distribution by dry sieve was not carried out on sand fraction

The results reported relate only to the items tested or sampled.

Date - samples received:	20/04/2022		
Date - sample testing commenced :	24/05/2022	Checked / Approved by:	01/06/2022
Date - sample testing completed :	29/05/2022	Date Approved:	KM

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CONCEPT SITE INVESTIGATIONS

PARTICLE SIZE DISTRIBUTION

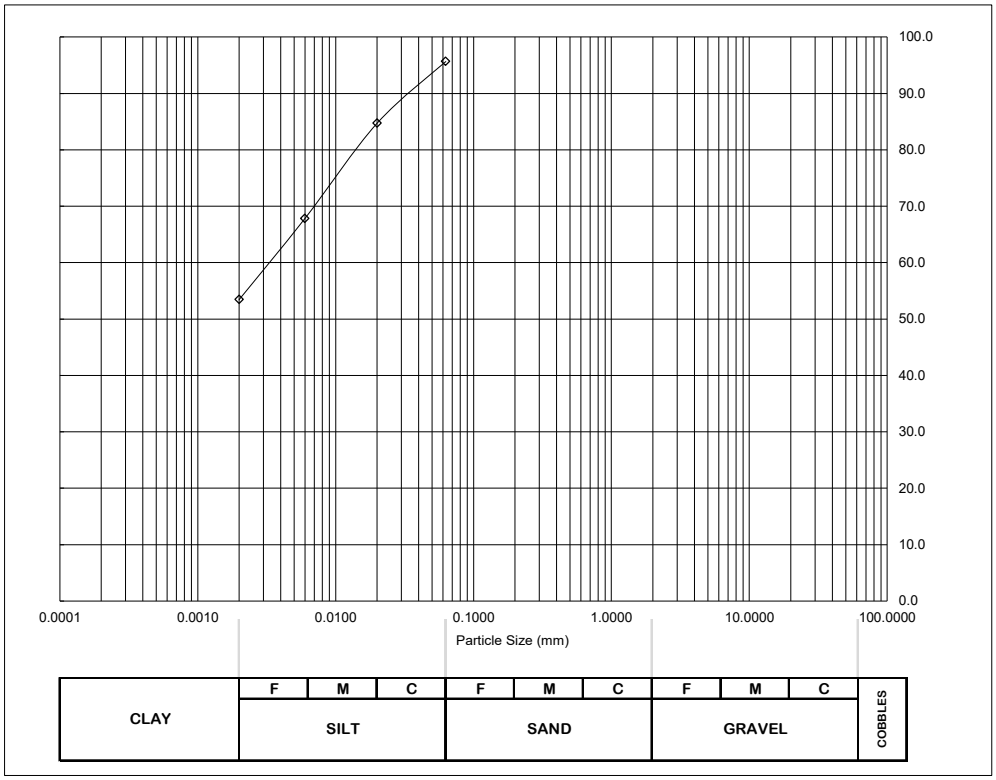
TEST REPORT

Site Name:	**Euston Tower**					**Job Number:**	**22/3686**
Client:	**McGee**					**Date Reported:**	**01/06/2022**
Borehole No:	**Heading 2**	**Sample Type/No.**	**D**	**Face S005A**	**Top Depth: 1.00 m**	**Bottom Depth:**	**m**

Soil Description:

Greyish brown slightly micaceous slightly sandy silty CLAY with rare shell fragments and pockets of light grey silty fine sand

BS Test Sieves	
Size (mm)	% Passing
75.000	100
63.000	100
50.000	100
37.500	100
28.000	100
20.000	100
14.000	100
10.000	100
6.300	100
5.000	100
3.350	100
2.000	100
1.180	100
0.600	100
0.425	100
0.300	100
0.212	100
0.150	100
0.063	96



Sedimentation (*if applicable)	
Size (mm)	% Passing
0.020	85
0.006	68
0.002	53

Method/type:	
	Pipette

BS 1377: Part 2: Clause 9.4: 1990 Determination of sedimentation by the pipette method.

Particle Proportions %	
Cobbles	
Gravel	
Sand	4.3
Silt	42.2
Clay	53.5

4503

Remarks: Particle size distribution by dry sieve was not carried out on sand fraction

The results reported relate only to the items tested or sampled.

Date - samples received:	20/04/2022		
Date - sample testing commenced :	24/05/2022	Checked / Approved by:	01/06/2022
Date - sample testing completed :	29/05/2022	Date Approved:	KM

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CONCEPT SITE INVESTIGATIONS

PARTICLE SIZE DISTRIBUTION

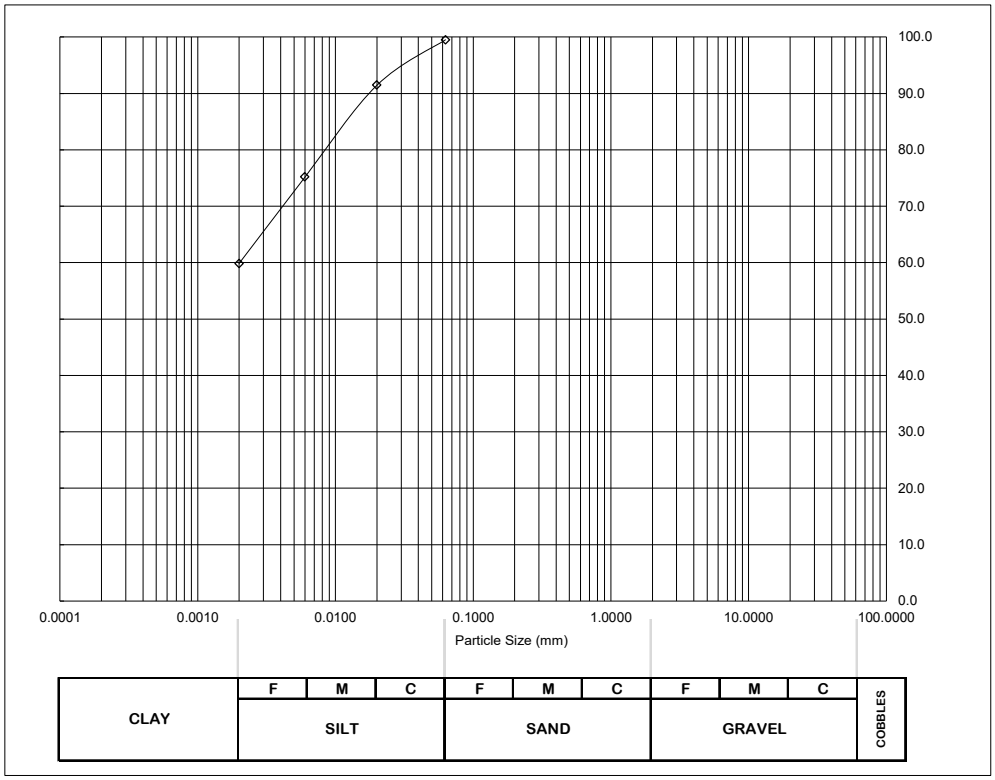
TEST REPORT

Site Name:	**Euston Tower**					**Job Number:**	**22/3686**
Client:	**McGee**					**Date Reported:**	**01/06/2022**
Borehole No:	**Heading 2**	**Sample Type/No.**	**D**	**Face S006A**	**Top Depth: 2.00 m**	**Bottom Depth:**	**m**

Soil Description:

Greyish brown slightly micaceous silty CLAY

BS Test Sieves	
Size (mm)	% Passing
75.000	100
63.000	100
50.000	100
37.500	100
28.000	100
20.000	100
14.000	100
10.000	100
6.300	100
5.000	100
3.350	100
2.000	100
1.180	100
0.600	100
0.425	100
0.300	100
0.212	100
0.150	100
0.063	100



Sedimentation (*if applicable)	
Size (mm)	% Passing
0.020	91
0.006	75
0.002	60

Method/type:	
	Pipette

BS 1377: Part 2: Clause 9.4: 1990 Determination of sedimentation by the pipette method.

Particle Proportions %	
Cobbles	
Gravel	
Sand	0.5
Silt	39.7
Clay	59.8

4503

Remarks:

Particle size distribution by dry sieve was not carried out on sand fraction

The results reported relate only to the items tested or sampled.

Date - samples received:	20/04/2022		
Date - sample testing commenced :	24/05/2022	Checked / Approved by:	01/06/2022
Date - sample testing completed :	29/05/2022	Date Approved:	KM

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CONCEPT SITE INVESTIGATIONS

PARTICLE SIZE DISTRIBUTION

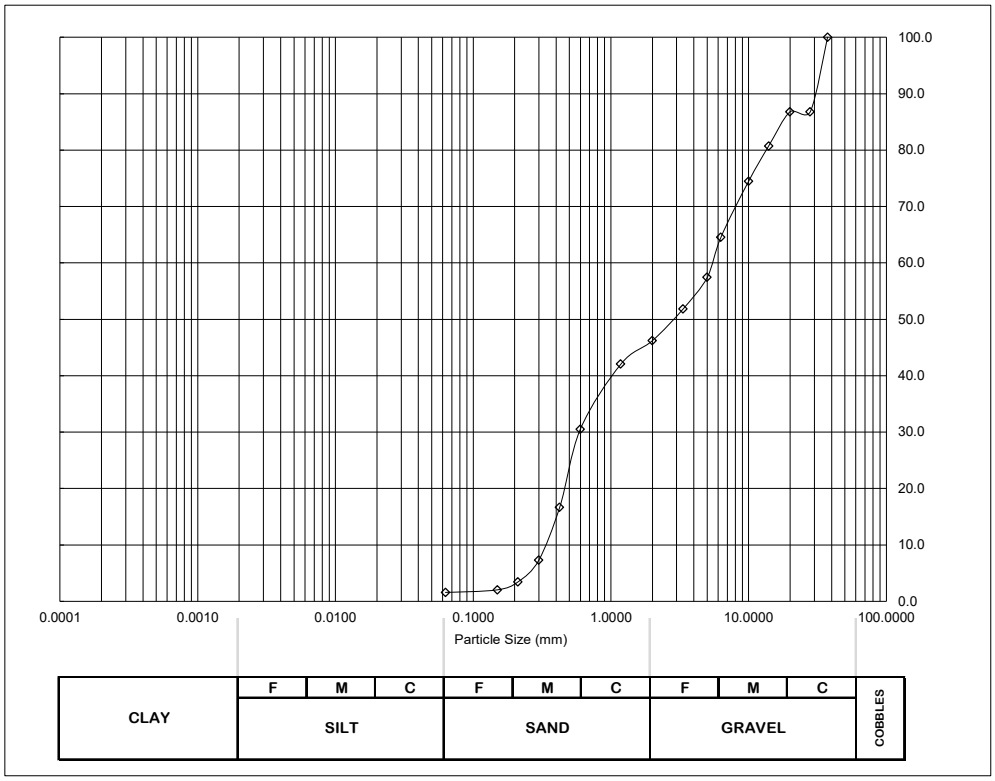
TEST REPORT

Site Name:	**Euston Tower**					**Job Number:**	**22/3686**
Client:	**McGee**					**Date Reported:**	**01/06/2022**
Borehole No:	**Heading 2**	**Sample Type/No.**	**D**	**Gravel spoil**	**Top Depth: 2.00 m**	**Bottom Depth:**	**m**

Soil Description:

Brown slightly silty very sandy fine to coarse flint GRAVEL

BS Test Sieves	
Size (mm)	% Passing
75.000	100
63.000	100
50.000	100
37.500	100
28.000	87
20.000	87
14.000	81
10.000	74
6.300	65
5.000	57
3.350	52
2.000	46
1.180	42
0.600	30
0.425	17
0.300	7
0.212	3
0.150	2
0.063	2



Sedimentation (*if applicable)	
Size (mm)	% Passing
0.020	
0.006	
0.002	

Method/type:	Wet Sieving

BS 1377: Part 2: Clause 9.2: 1990 Determination of particle size distribution - wet sieving method.

Particle Proportions %	
Cobbles	
Gravel	53.8
Sand	44.6
Silt and Clay	1.6

4503

Remarks:

Sample mass does not meet the requirements of BS1377: Part 2: 1990

The results reported relate only to the items tested or sampled.

Date - samples received:	20/04/2022		
Date - sample testing commenced :	24/05/2022	Checked / Approved by:	01/06/2022
Date - sample testing completed :	25/05/2022	Date Approved:	KM

Approved Signatories: L Griffin LG (QA Technical & Lab Mngr) – K Mazerant KM (Lab Mngr)

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CONCEPT SITE INVESTIGATIONS

PARTICLE SIZE DISTRIBUTION

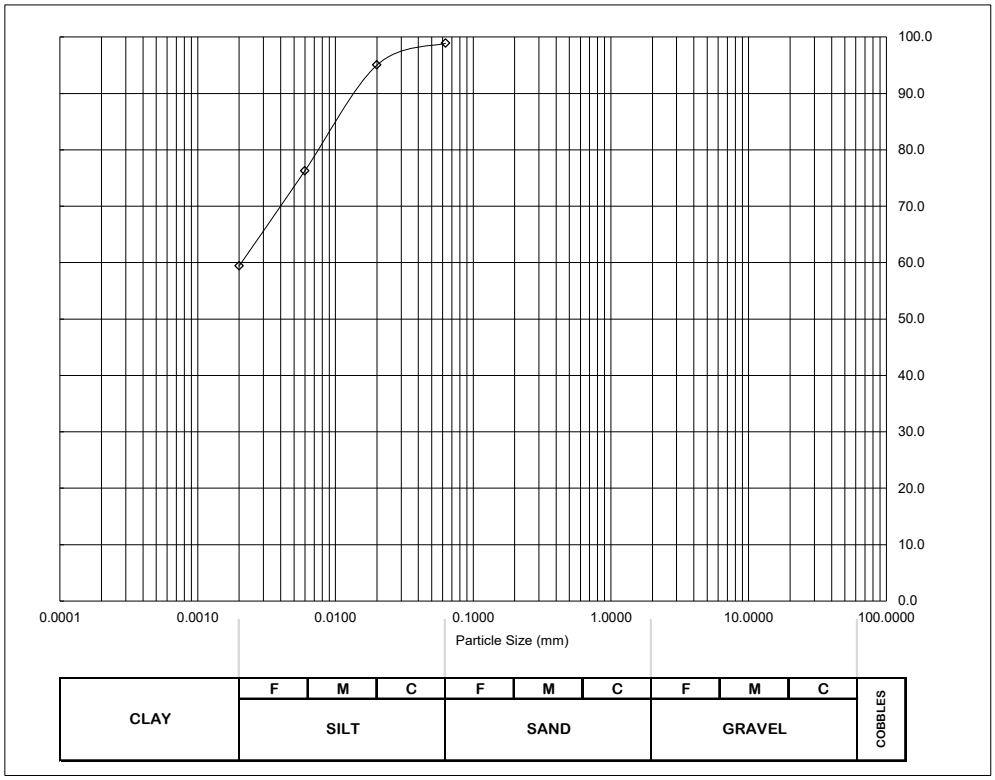
TEST REPORT

Site Name:	**Euston Tower**					**Job Number:**	**22/3686**
Client:	**McGee**					**Date Reported:**	**15/06/2022**
Borehole No:	**Heading 3**	**Sample Type/No.**	**D**	**Face S030A**	**Top Depth: 0.20 m**	**Bottom Depth:**	**m**

Soil Description:

Brownish grey silty CLAY with rare pockets of silty fine sand and fine flint gravel

BS Test Sieves	
Size (mm)	% Passing
75.000	100
63.000	100
50.000	100
37.500	100
28.000	100
20.000	100
14.000	100
10.000	100
6.300	100
5.000	100
3.350	100
2.000	100
1.180	100
0.600	100
0.425	100
0.300	100
0.212	100
0.150	100
0.063	99



Sedimentation (*if applicable)	
Size (mm)	% Passing
0.020	95
0.006	76
0.002	59

Method/type:	
	Pipette

BS 1377: Part 2: Clause 9.4: 1990 Determination of sedimentation by the pipette method.

Particle Proportions %	
Cobbles	
Gravel	
Sand	1.1
Silt	39.5
Clay	59.4

4503

Remarks:

Particle size distribution by dry sieve was not carried out on sand fraction

The results reported relate only to the items tested or sampled.

Date - samples received:	25/05/2022		
Date - sample testing commenced :	06/06/2022	Checked / Approved by:	KM
Date - sample testing completed :	13/06/2022	Date Approved:	15/06/2022

Approved Signatories: L Griffin LG (QA Technical & Lab Mngr) – K Mazerant KM (Lab Mngr)

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CONCEPT SITE INVESTIGATIONS

PARTICLE SIZE DISTRIBUTION

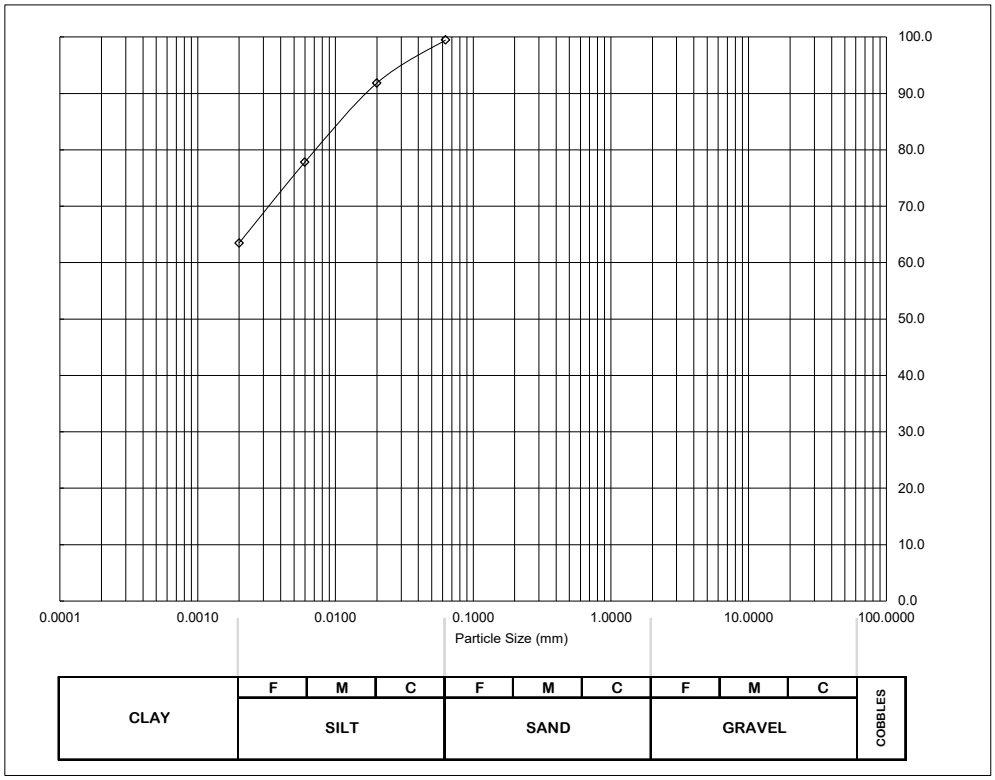
TEST REPORT

Site Name:	**Euston Tower**					**Job Number:**	**22/3686**
Client:	**McGee**					**Date Reported:**	**15/06/2022**
Borehole No:	**Heading 3**	**Sample Type/No.**	**D**	**Face S031A**	**Top Depth: 1.05 m**	**Bottom Depth:**	**m**

Soil Description:

Brownish grey slightly micaceous silty CLAY

BS Test Sieves	
Size (mm)	% Passing
75.000	100
63.000	100
50.000	100
37.500	100
28.000	100
20.000	100
14.000	100
10.000	100
6.300	100
5.000	100
3.350	100
2.000	100
1.180	100
0.600	100
0.425	100
0.300	100
0.212	100
0.150	100
0.063	99



Sedimentation (*if applicable)	
Size (mm)	% Passing
0.020	92
0.006	78
0.002	63

Method/type:	
	Pipette

BS 1377: Part 2: Clause 9.4: 1990 Determination of sedimentation by the pipette method.

Particle Proportions %	
Cobbles	
Gravel	
Sand	0.5
Silt	36.0
Clay	63.5

4503

Remarks:

Particle size distribution by dry sieve was not carried out on sand fraction

The results reported relate only to the items tested or sampled.

Date - samples received:	25/05/2022		
Date - sample testing commenced :	06/06/2022	Checked / Approved by:	KM
Date - sample testing completed :	13/06/2022	Date Approved:	15/06/2022

Approved Signatories: L Griffin LG (QA Technical & Lab Mngr) – K Mazerant KM (Lab Mngr)

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CONCEPT SITE INVESTIGATIONS

PARTICLE SIZE DISTRIBUTION

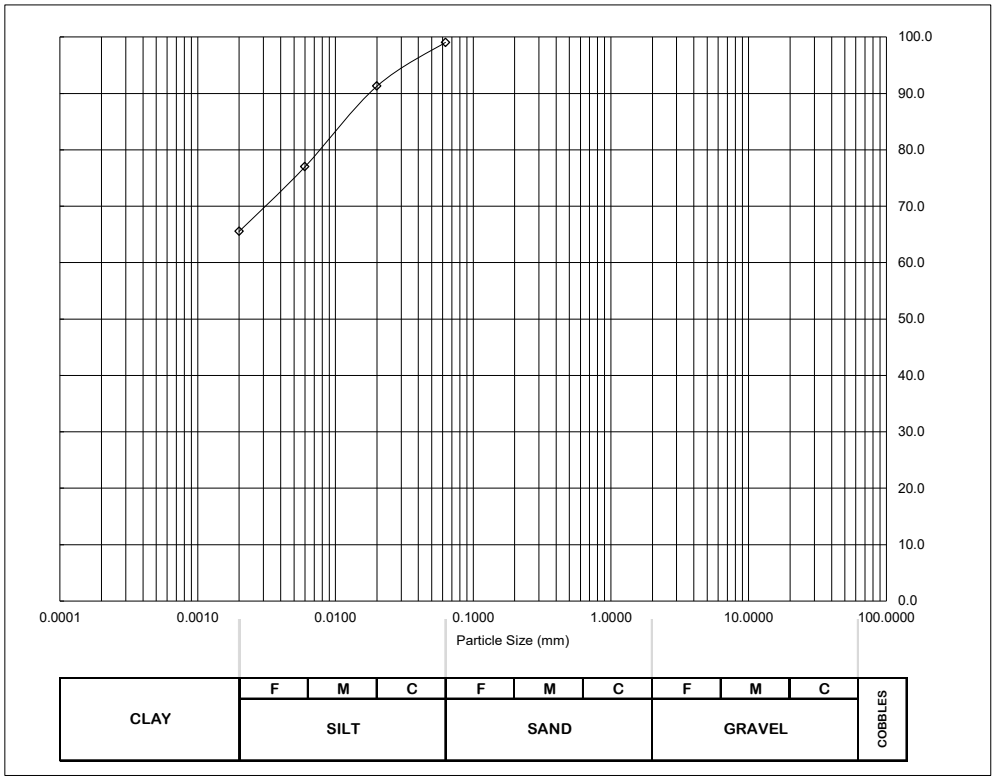
TEST REPORT

Site Name:	**Euston Tower**					**Job Number:**	**22/3686**
Client:	**McGee**					**Date Reported:**	**15/06/2022**
Borehole No:	**Heading 3**	**Sample Type/No.**	**D**	**Face S032A**	**Top Depth: 1.95 m**	**Bottom Depth:**	**m**

Soil Description:

Brownish grey slightly micaceous silty CLAY with rare pockets of light grey silt

BS Test Sieves	
Size (mm)	% Passing
75.000	100
63.000	100
50.000	100
37.500	100
28.000	100
20.000	100
14.000	100
10.000	100
6.300	100
5.000	100
3.350	100
2.000	100
1.180	100
0.600	100
0.425	100
0.300	100
0.212	100
0.150	100
0.063	99



Sedimentation (*if applicable)	
Size (mm)	% Passing
0.020	91
0.006	77
0.002	66

Method/type:	
	Pipette

BS 1377: Part 2: Clause 9.4: 1990 Determination of sedimentation by the pipette method.

Particle Proportions %	
Cobbles	
Gravel	
Sand	1.0
Silt	33.5
Clay	65.5

4503

Remarks:

Particle size distribution by dry sieve was not carried out on sand fraction

The results reported relate only to the items tested or sampled.

Date - samples received:	25/05/2022		
Date - sample testing commenced :	06/06/2022	Checked / Approved by:	KM
Date - sample testing completed :	13/06/2022	Date Approved:	15/06/2022

Approved Signatories: L Griffin LG (QA Technical & Lab Mngr) – K Mazerant KM (Lab Mngr)

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Analytical Report Number : 22-57065

Replaces Analytical Report Number: 22-57065, issue no. 2
Client references/information amended.

Project / Site name:	Euston Tower	**Samples received on:**	09/05/2022
Your job number:	22 3686	**Samples instructed on/ Analysis started on:**	09/05/2022
Your order number:	L2800	**Analysis completed by:**	17/05/2022
Report Issue Number:	3	**Report issued on:**	17/05/2022
Samples Analysed:	5 soil samples		

Signed:

Joanna Wawrzeczko
Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 22-57065
Project / Site name: Euston Tower
Your Order No: L2800

Lab Sample Number				2268489	2268490	2268491	2268492	2268493
Sample Reference				Heading 1	Heading 1	Heading 2	Heading 2	Heading 2
Sample Number				Face S001A	Face S003A	Face S004A	Face S006A	Gravel spoil S007
Depth (m)				0.15	1.65	0.10	2.00	2.00
Date Sampled				09/05/2022	09/05/2022	09/05/2022	09/05/2022	09/05/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	17	17	18	17	4.5
Total mass of sample received	kg	0.001	NONE	0.2	0.2	0.2	0.2	0.4

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.2	8.3	8.6	8.2	9
Total Sulphate as SO4	%	0.005	MCERTS	0.154	0.101	0.014	0.113	-
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.94	0.47	0.06	0.67	0.1
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	938	470	60.4	671	99.5
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	73	47	4.5	40	4.5
Total Sulphur	%	0.005	MCERTS	0.407	0.289	0.011	0.35	-
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0

Heavy Metals / Metalloids

Magnesium (water soluble)	mg/kg	5	NONE	69	56	8.2	77	< 5.0
Magnesium (leachate equivalent)	mg/l	2.5	NONE	34	28	4.1	39	< 2.5

U/S = Unsuitable Sample I/S = Insufficient Sample

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Analytical Report Number : 22-57065
Project / Site name: Euston Tower

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2268489	Heading 1	Face S001A	0.15	Grey clay.
2268490	Heading 1	Face S003A	1.65	Grey clay.
2268491	Heading 2	Face S004A	0.1	Brown clay.
2268492	Heading 2	Face S006A	2	Grey clay.
2268493	Heading 2	Gravel spoil S007	2	Brown sand with gravel.

Analytical Report Number : 22-57065
Project / Site name: Euston Tower

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Magnesium, water soluble, in soil	Determination of water soluble magnesium by extraction with water followed by ICP-OES.	In-house method based on TRL 447	L038-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total Sulphate in soil as %	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Total Sulphur in soil as %	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Water Soluble Nitrate (2:1) as N in soil	Determination of nitrate by reaction with sodium salicylate and colorimetry.	In-house method based on Examination of Water and Wastewatern & Polish Standard Method PN-82/C-04579.08, 2:1 extraction.	L078-PL	W	NONE
Chloride, water soluble, in soil	Determination of Chloride colorimetrically by discrete analyser.	In house method.	L082-PL	D	MCERTS
Sulphate, water soluble, in soil	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

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Analytical Report Number : 22-63057

Replaces Analytical Report Number: 22-63057, issue no. 1
Client sampling date amended.

Project / Site name:	Euston Tower	**Samples received on:**	07/06/2022
Your job number:	22 3686	**Samples instructed on/ Analysis started on:**	07/06/2022
Your order number:	L2825	**Analysis completed by:**	15/06/2022
Report Issue Number:	2	**Report issued on:**	15/06/2022
Samples Analysed:	2 soil samples		

Signed: Martyna Langer

Martyna Langer
Junior Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

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The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 22-63057
Project / Site name: Euston Tower
Your Order No: L2825

Lab Sample Number				2303222	2303223
Sample Reference				Heading 3	Heading 3
Sample Number				Face S030A	Face S032A
Depth (m)				0.20	1.95
Date Sampled				06/06/2022	06/06/2022
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**		
Stone Content	%	0.1	NONE	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	22	19
Total mass of sample received	kg	0.001	NONE	0.2	0.3

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.9	8.1
Total Sulphate as SO4	%	0.005	MCERTS	0.141	0.184
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.56	0.75
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	562	746
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	39	39
Total Sulphur	%	0.005	MCERTS	0.252	0.353
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	< 2.0	< 2.0

Heavy Metals / Metalloids

Magnesium (water soluble)	mg/kg	5	NONE	6.6	67
Magnesium (leachate equivalent)	mg/l	2.5	NONE	3.3	33

U/S = Unsuitable Sample I/S = Insufficient Sample

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Analytical Report Number : 22-63057
Project / Site name: Euston Tower

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Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2303222	Heading 3	Face S030A	0.2	Brown clay and loam.
2303223	Heading 3	Face S032A	1.95	Brown clay.

Analytical Report Number : 22-63057
Project / Site name: Euston Tower

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Magnesium, water soluble, in soil	Determination of water soluble magnesium by extraction with water followed by ICP-OES.	In-house method based on TRL 447	L038-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total Sulphate in soil as %	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Total Sulphur in soil as %	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Water Soluble Nitrate (2:1) as N in soil	Determination of nitrate by reaction with sodium salicylate and colorimetry.	In-house method based on Examination of Water and Wastewatern & Polish Standard Method PN-82/C-04579.08, 2:1 extraction.	L078-PL	W	NONE
Chloride, water soluble, in soil	Determination of Chloride colorimetrically by discrete analyser.	In house method.	L082-PL	D	MCERTS
Sulphate, water soluble, in soil	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

CONCEPT SITE INVESTIGATIONS

Summary Test Report - Undrained Triaxial Compression (Single-Stage)

BS 1377 : Part 7: 1990 Clause 8

Date Reported: 16/06/2022

Job No.: 22/3686

Site Location: Euston Tower

Client: McGee

BH No.	Sample Type	Sample No	Depth top (m)	Description	Cell pressure kN/m2	Strain at failure %	Bulk Density Mg/m3	Dry Density Mg/m3	NMC %	Max Dev. Stress kPa	Shear Strength kPa	Mode of failure/Comments
Heading 1	UT100	Face U1/5020	0.35	Very stiff, extremely closely fissured dark brown slightly micaceous silty CLAY with occasional pockets of light brown silty sand (<30mm)	75	3.8	2.00	1.58	27	245	123	Brittle
Heading 1	UT100	Face U25021	1.45	Very stiff, extremely closely fissured dark brown slightly micaceous silty CLAY with rare pockets of light brown silty sand (<25mm)	100	4.6	1.99	1.58	26	168	84	Brittle
Heading 2	UT100	Face U3/5022	0.15	Very stiff, dark brown slightly micaceous silty CLAY	75	4.0	1.97	1.54	28	126	63	Brittle
Heading 2	UT100	Face U4/5023	1.50	Very stiff, extremely closely fissured dark brown slightly micaceous silty CLAY with 1 No pocket (<65mm) of claystone fragments (<20mm) at 1.71m	100	4.1	2.00	1.58	27	242	121	Brittle

Remarks: The results reported relate only to the items tested or sampled.

Date - samples received:	20/04/2022		
Date - sample testing commenced:	27/05/2022	Checked/Approved by:	KM
Date - sample testing completed:	27/05/2022	Date Approved:	01/06/2022

Approved Signatories: L Griffin LG (QA Technical & Lab Mngr) – K Mazerant KM (Lab Mngr)

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AGS ASSOCIATION OF GEOTECHNICAL & GEOENVIRONMENTAL SPECIALISTS

UKAS TESTING 4503

CONCEPT SITE INVESTIGATIONS	Summary Test Report - Undrained Triaxial Compression (Single-Stage) BS 1377 : Part 7: 1990 Clause 8	Date Reported:	16/06/2022
		Job No.:	22/3686

Site Location: Euston Tower **Client:** McGee

BH No.	Sample Type	Sample No	Depth top (m)	Description	Cell pressure kN/m2	Strain at failure %	Bulk Density Mg/m3	Dry Density Mg/m3	NMC %	Max Dev. Stress kPa	Shear Strength kPa	Mode of failure/Comments
Heading 3	UT100	RHS OF PILE C2 S040	0.25	Stiff to very stiff, dark brown slightly micaceous silty CLAY with white flecks	75	7.6	1.98	1.54	28	168	84	Brittle
Heading 3	UT100	LHS OF PILE C2 S041	1.55	Very stiff, extremely closely fissured dark brown slightly micaceous silty CLAY with rare shell fragments (<1mm)	100	6.4	1.96	1.52	29	215	108	Brittle
Heading 3	UT100	LHS OF PILE R1 S042	0.10	Very stiff, dark brown mottled dark grey slightly micaceous silty CLAY with rare shell fragments (<1mm)	75	6.6	1.92	1.49	29	124	62	Brittle
Heading 3	UT100	LHS OF PILE R1 S043	1.40	Very stiff, dark brown slightly micaceous silty CLAY with rare shell fragments (<1mm) and rare pyrite nodules (<12mm)	100	2.8	1.98	1.55	28	186	93	Brittle

Remarks: The results reported relate only to the items tested or sampled.

Date - samples received:	25/05/2022		
Date - sample testing commenced:	09/06/2022	Checked/Approved by:	KM
Date - sample testing completed:	09/06/2022	Date Approved:	15/06/2022

Approved Signatories: L Griffin LG (QA Technical & Lab Mngr) – K Mazerant KM (Lab Mngr)

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AGS ASSOCIATION OF GEOTECHNICAL & GEOENVIRONMENTAL SPECIALISTS

UKAS TESTING 4503

TEST CERTIFICATE

DETERMINATION OF THE UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE

UKAS TESTING 4041

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Environmental Science

Tested in Accordance with: BS 1377-7: 1990: Clause 8

Client:	Concept Site Investigations	Client Reference:	22 3686
Client Address:	Unit 8, Warple Mews, Warple Way, London W3 0RF	Job Number:	22-60188
		Date Sampled:	Not Given
		Date Received:	18/05/2022
Contact:	Lynn Griffin	Date Tested:	03/06/2022
Site Address:	Euston Tower	Sampled By:	Not Given

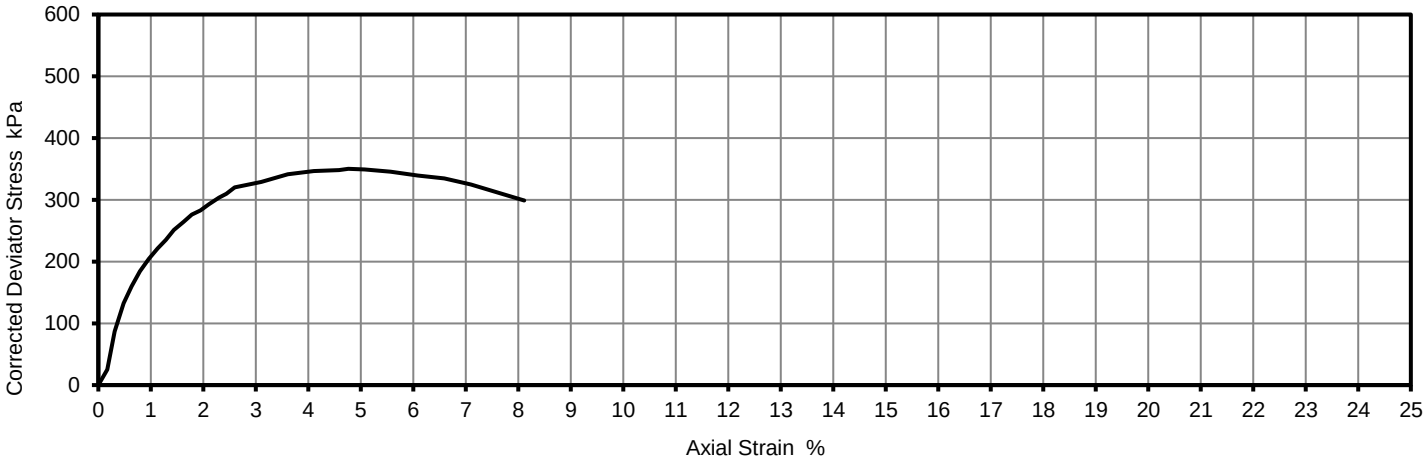
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

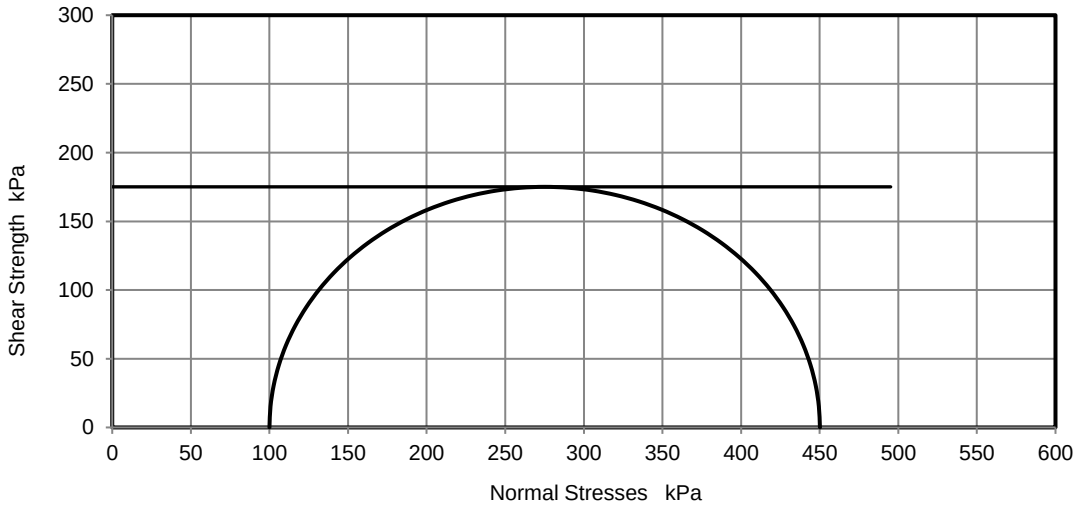
Laboratory Reference:	2286735	Depth Top [m]:	0.15
Hole No.:	Heading 1	Depth Base [m]:	Not Given
Sample Reference:	Face S001	Sample Type:	U
Sample Description:	Greyish brown CLAY		
Sample Preparation:	Sample prepared in accordance with BS 1377-1:2016 Clause 9.1.1.		

Test Number	1		Rate of Strain	2.00	%/min
Length	77.05	mm	Cell Pressure	100	kPa
Diameter	37.64	mm	Axial Strain at failure	4.8	%
Bulk Density	2.01	Mg/m3	Deviator Stress, (σ1 - σ3)f	350	kPa
Moisture Content	26	%	Undrained Shear Strength, cu	175	kPa ½(σ1 - σ3)f
Dry Density	1.59	Mg/m3	Mode of Failure	Brittle	
Membrane Correction	0.73	kPa	Membrane thickness	0.21	mm

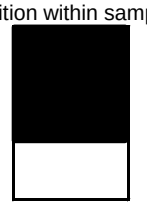
Deviator Stress v Axial Strain



Mohr Circles



Position within sample



Note: Deviator stress corrected for area change and membrane effects. Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

Remarks:

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.

Signed: Dudzińska Anna

Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

 Date Reported: 13/06/2022 **GF 184.12**

TEST CERTIFICATE

DETERMINATION OF THE UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE

UKAS TESTING 4041

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Environmental Science

Tested in Accordance with: BS 1377-7: 1990: Clause 8

Client:	Concept Site Investigations	Client Reference:	22 3686
Client Address:	Unit 8, Warple Mews, Warple Way, London W3 0RF	Job Number:	22-60188
		Date Sampled:	Not Given
		Date Received:	18/05/2022
Contact:	Lynn Griffin	Date Tested:	03/06/2022
Site Address:	Euston Tower	Sampled By:	Not Given

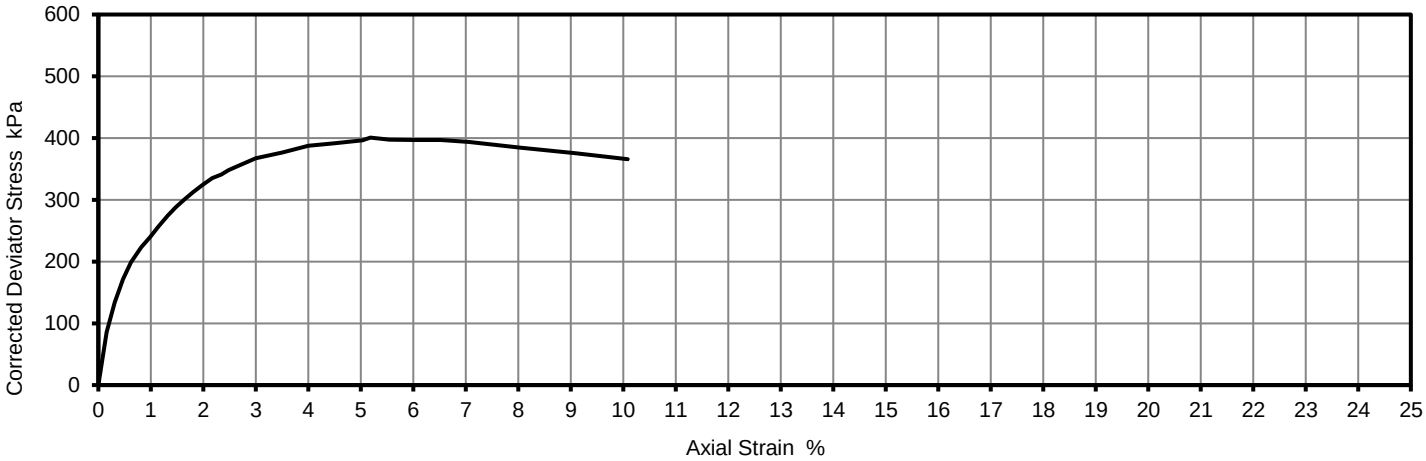
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

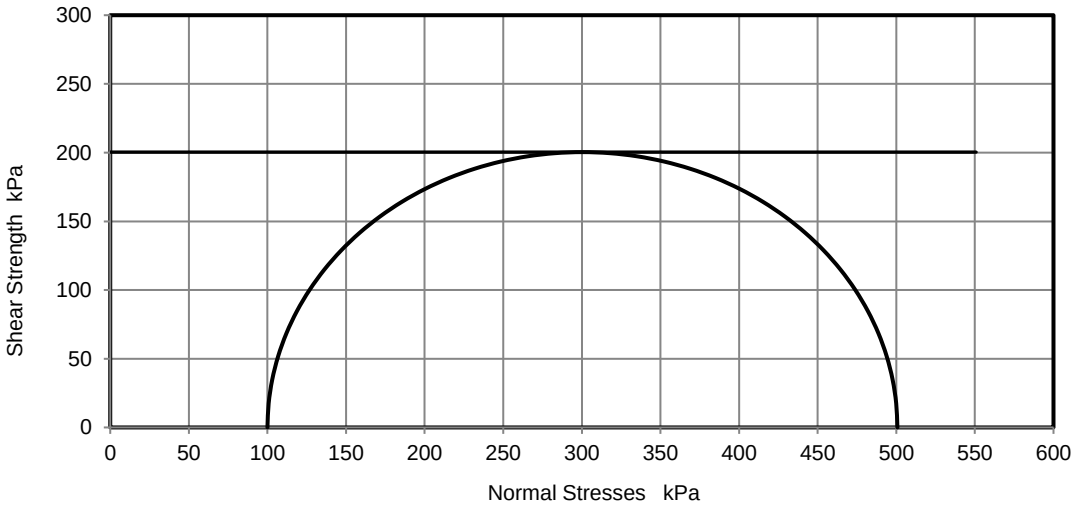
Laboratory Reference:	2286735_1	Depth Top [m]:	0.15
Hole No.:	Heading 1	Depth Base [m]:	Not Given
Sample Reference:	Face S001	Sample Type:	U
Sample Description:	Greyish brown CLAY		
Sample Preparation:	Sample prepared in accordance with BS 1377-1:2016 Clause 9.1.1.		

Test Number	1		Rate of Strain	2.00	%/min
Length	76.96	mm	Cell Pressure	100	kPa
Diameter	37.47	mm	Axial Strain at failure	5.2	%
Bulk Density	2.04	Mg/m3	Deviator Stress, (σ1 - σ3)f	401	kPa
Moisture Content	26	%	Undrained Shear Strength, cu	200	kPa ½(σ1 - σ3)f
Dry Density	1.62	Mg/m3	Mode of Failure	Brittle	
Membrane Correction	0.81	kPa	Membrane thickness	0.21	mm

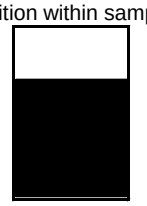
Deviator Stress v Axial Strain



Mohr Circles



Position within sample



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Signed: Dudzińska Anna

Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

 Date Reported: 13/06/2022 **GF 184.12**

TEST CERTIFICATE

DETERMINATION OF THE UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE

UKAS TESTING 4041

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Environmental Science

Tested in Accordance with: BS 1377-7: 1990: Clause 8

Client:	Concept Site Investigations	Client Reference:	22 3686
Client Address:	Unit 8, Warple Mews, Warple Way, London W3 0RF	Job Number:	22-60188
		Date Sampled:	Not Given
		Date Received:	18/05/2022
Contact:	Lynn Griffin	Date Tested:	03/06/2022
Site Address:	Euston Tower	Sampled By:	Not Given

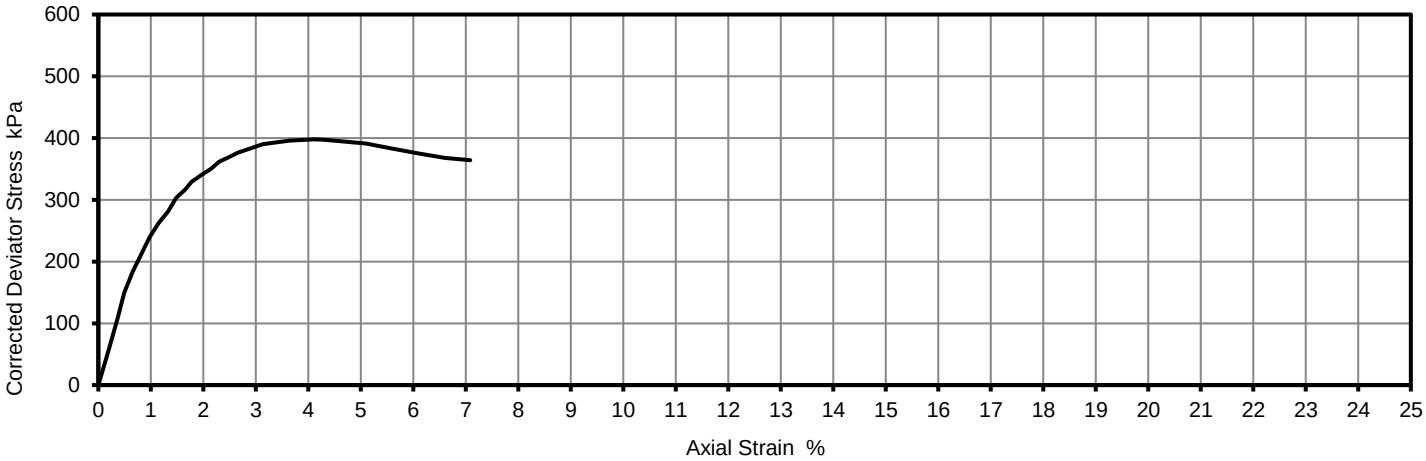
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

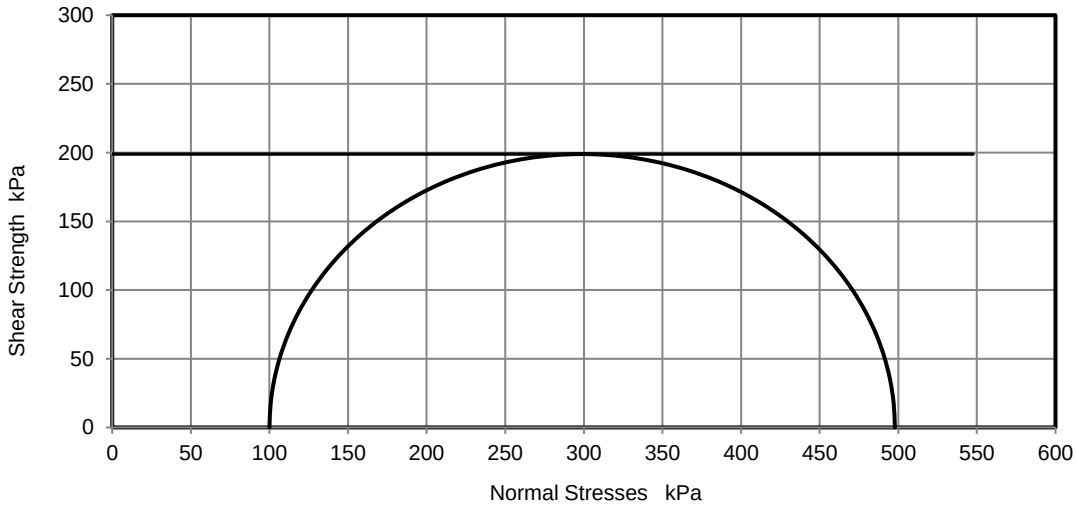
Laboratory Reference:	2286736	Depth Top [m]:	0.80
Hole No.:	Heading 1	Depth Base [m]:	Not Given
Sample Reference:	Face S002	Sample Type:	U
Sample Description:	Greyish brown CLAY		
Sample Preparation:	Sample prepared in accordance with BS 1377-1:2016 Clause 9.1.1.		

Test Number	1		Rate of Strain	2.00	%/min
Length	76.93	mm	Cell Pressure	100	kPa
Diameter	37.62	mm	Axial Strain at failure	4.1	%
Bulk Density	2.01	Mg/m3	Deviator Stress, (σ1 - σ3)f	398	kPa
Moisture Content	23	%	Undrained Shear Strength, cu	199	kPa ½(σ1 - σ3)f
Dry Density	1.63	Mg/m3	Mode of Failure	Brittle	
Membrane Correction	0.66	kPa	Membrane thickness	0.22	mm

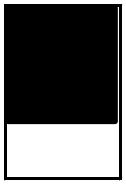
Deviator Stress v Axial Strain



Mohr Circles



Position within sample



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TEST CERTIFICATE

DETERMINATION OF THE UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE

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Northampton NN4 7EB

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Tested in Accordance with: BS 1377-7: 1990: Clause 8

Client:	Concept Site Investigations	Client Reference:	22 3686
Client Address:	Unit 8, Warple Mews, Warple Way, London W3 0RF	Job Number:	22-60188
		Date Sampled:	Not Given
		Date Received:	18/05/2022
Contact:	Lynn Griffin	Date Tested:	03/06/2022
Site Address:	Euston Tower	Sampled By:	Not Given

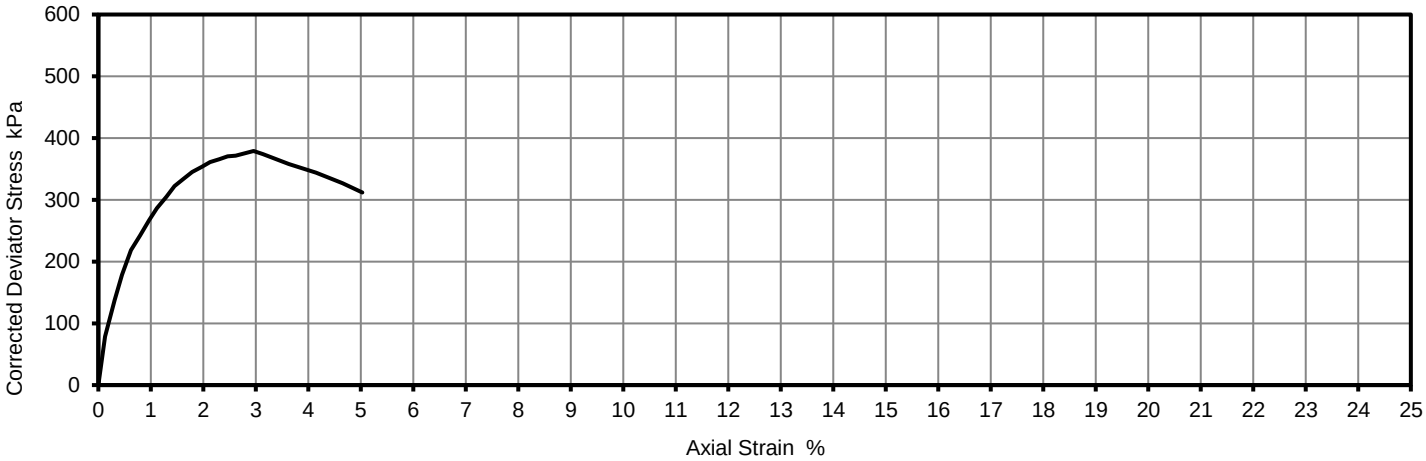
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

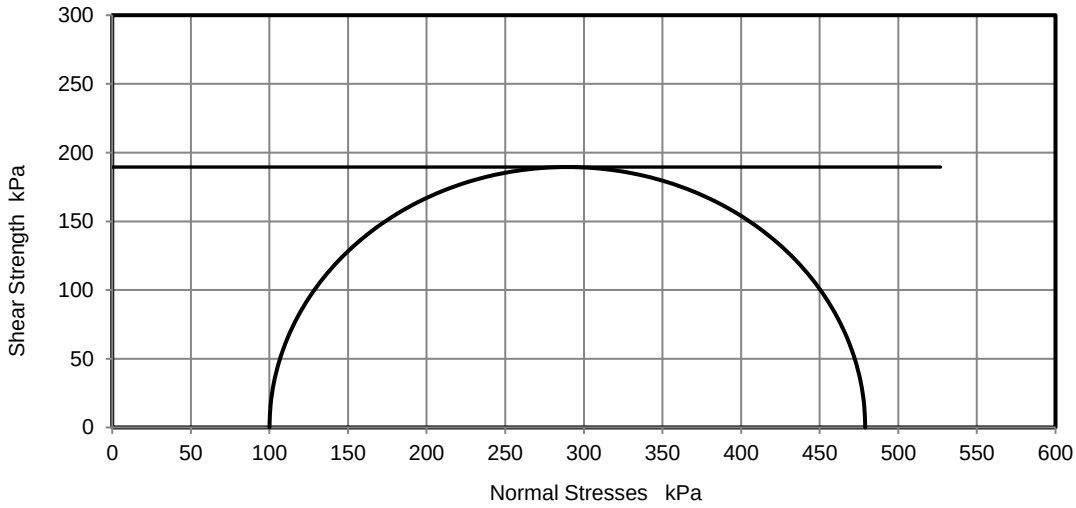
Laboratory Reference:	2286736_1	Depth Top [m]:	0.80
Hole No.:	Heading 1	Depth Base [m]:	Not Given
Sample Reference:	Face S002	Sample Type:	U
Sample Description:	Greyish brown CLAY		
Sample Preparation:	Sample prepared in accordance with BS 1377-1:2016 Clause 9.1.1.		

Test Number	1		Rate of Strain	2.00	%/min
Length	77.16	mm	Cell Pressure	100	kPa
Diameter	37.68	mm	Axial Strain at failure	3.0	%
Bulk Density	2.02	Mg/m3	Deviator Stress, (σ1 - σ3)f	379	kPa
Moisture Content	27	%	Undrained Shear Strength, cu	189	kPa ½(σ1 - σ3)f
Dry Density	1.59	Mg/m3	Mode of Failure	Brittle	
Membrane Correction	0.45	kPa	Membrane thickness	0.21	mm

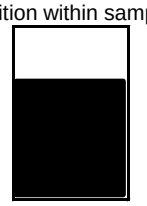
Deviator Stress v Axial Strain



Mohr Circles



Position within sample



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TEST CERTIFICATE

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UKAS TESTING 4041

i2 Analytical Ltd
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Brackmills Industrial Estate
Northampton NN4 7EB

Environmental Science

Tested in Accordance with: BS 1377-7: 1990: Clause 8

Client:	Concept Site Investigations	Client Reference:	22 3686
Client Address:	Unit 8, Warple Mews, Warple Way, London W3 0RF	Job Number:	22-60188
		Date Sampled:	Not Given
		Date Received:	18/05/2022
Contact:	Lynn Griffin	Date Tested:	03/06/2022
Site Address:	Euston Tower	Sampled By:	Not Given

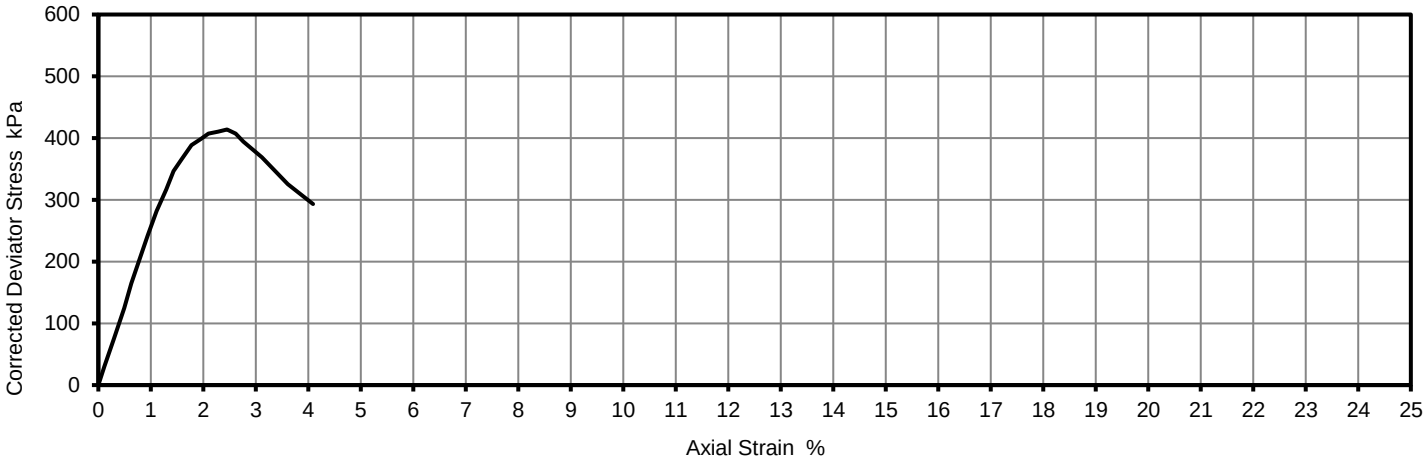
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

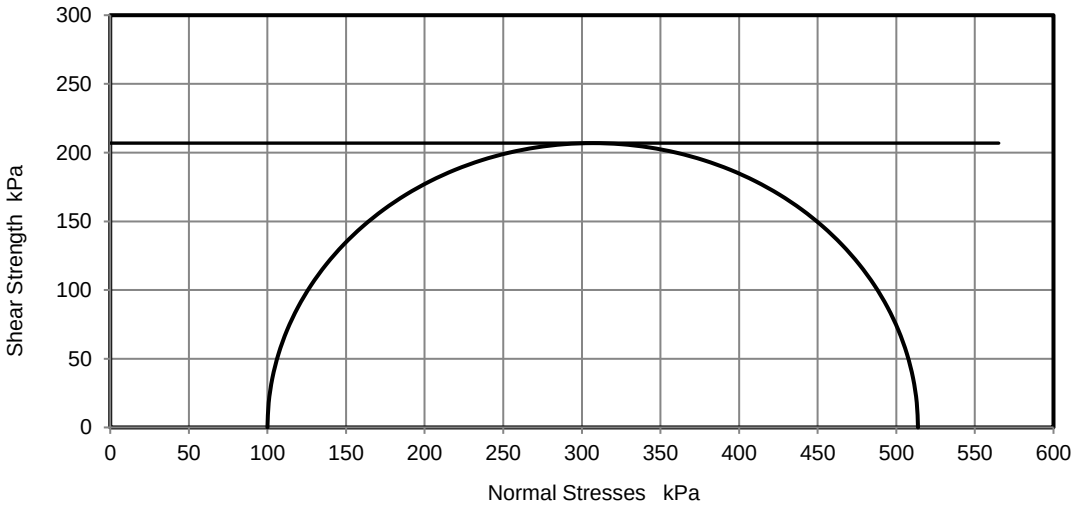
Laboratory Reference:	2286737	Depth Top [m]:	1.65
Hole No.:	Heading 1	Depth Base [m]:	Not Given
Sample Reference:	Face S003	Sample Type:	U
Sample Description:	Greyish brown CLAY		
Sample Preparation:	Sample prepared in accordance with BS 1377-1:2016 Clause 9.1.1.		

Test Number	1		Rate of Strain	2.00	%/min
Length	76.78	mm	Cell Pressure	100	kPa
Diameter	37.58	mm	Axial Strain at failure	2.4	%
Bulk Density	2.03	Mg/m3	Deviator Stress, (σ1 - σ3)f	414	kPa
Moisture Content	25	%	Undrained Shear Strength, cu	207	kPa ½(σ1 - σ3)f
Dry Density	1.62	Mg/m3	Mode of Failure	Brittle	
Membrane Correction	0.39	kPa	Membrane thickness	0.22	mm

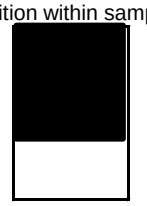
Deviator Stress v Axial Strain



Mohr Circles



Position within sample



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 Date Reported: 13/06/2022 **GF 184.12**

TEST CERTIFICATE

DETERMINATION OF THE UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE

UKAS TESTING 4041

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Environmental Science

Tested in Accordance with: BS 1377-7: 1990: Clause 8

Client:	Concept Site Investigations	Client Reference:	22 3686
Client Address:	Unit 8, Warple Mews, Warple Way, London W3 0RF	Job Number:	22-60188
		Date Sampled:	Not Given
		Date Received:	18/05/2022
Contact:	Lynn Griffin	Date Tested:	03/06/2022
Site Address:	Euston Tower	Sampled By:	Not Given

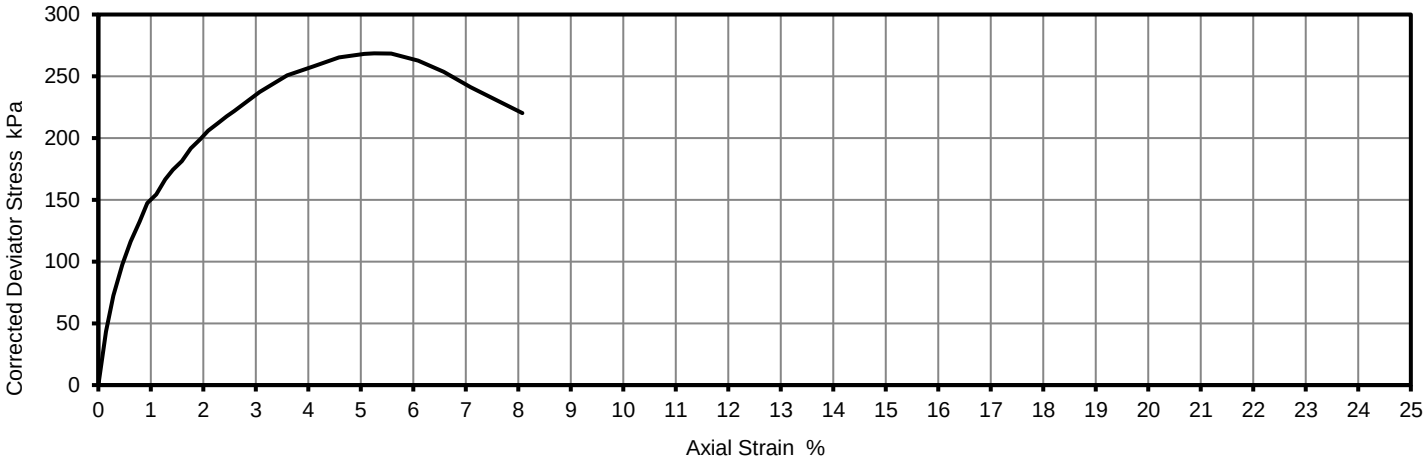
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

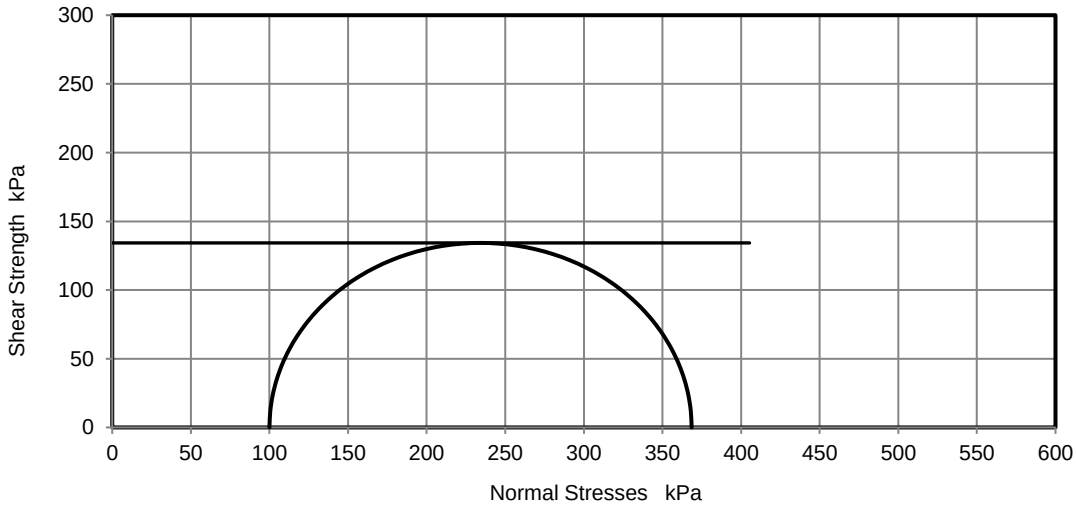
Laboratory Reference:	2286738	Depth Top [m]:	0.10
Hole No.:	Heading 2	Depth Base [m]:	Not Given
Sample Reference:	Face S004	Sample Type:	U
Sample Description:	Yellowish brown CLAY		
Sample Preparation:	Sample prepared in accordance with BS 1377-1:2016 Clause 9.1.1.		

Test Number	1		Rate of Strain	2.00	%/min
Length	76.15	mm	Cell Pressure	100	kPa
Diameter	37.44	mm	Axial Strain at failure	5.3	%
Bulk Density	1.97	Mg/m3	Deviator Stress, (σ1 - σ3)f	269	kPa
Moisture Content	29	%	Undrained Shear Strength, cu	134	kPa ½(σ1 - σ3)f
Dry Density	1.53	Mg/m3	Mode of Failure	Brittle	
Membrane Correction	0.78	kPa	Membrane thickness	0.20	mm

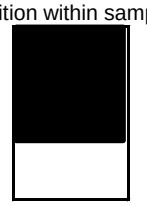
Deviator Stress v Axial Strain



Mohr Circles



Position within sample



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 Date Reported: 13/06/2022 **GF 184.12**

TEST CERTIFICATE

DETERMINATION OF THE UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE

UKAS TESTING 4041

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Environmental Science

Tested in Accordance with: BS 1377-7: 1990: Clause 8

Client:	Concept Site Investigations	Client Reference:	22 3686
Client Address:	Unit 8, Warple Mews, Warple Way, London W3 0RF	Job Number:	22-60188
		Date Sampled:	Not Given
		Date Received:	18/05/2022
Contact:	Lynn Griffin	Date Tested:	03/06/2022
Site Address:	Euston Tower	Sampled By:	Not Given

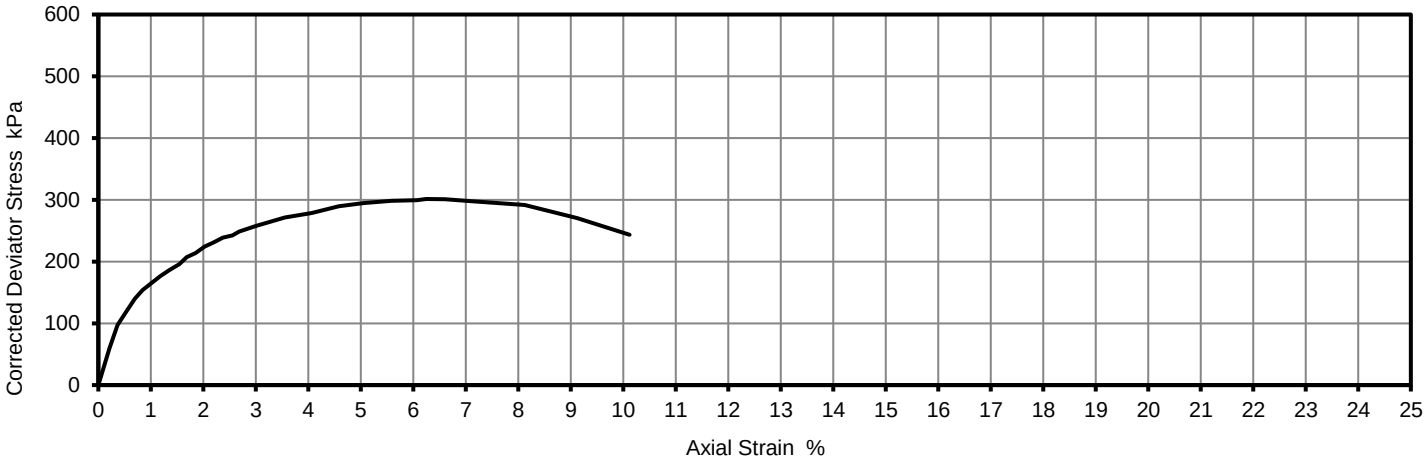
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

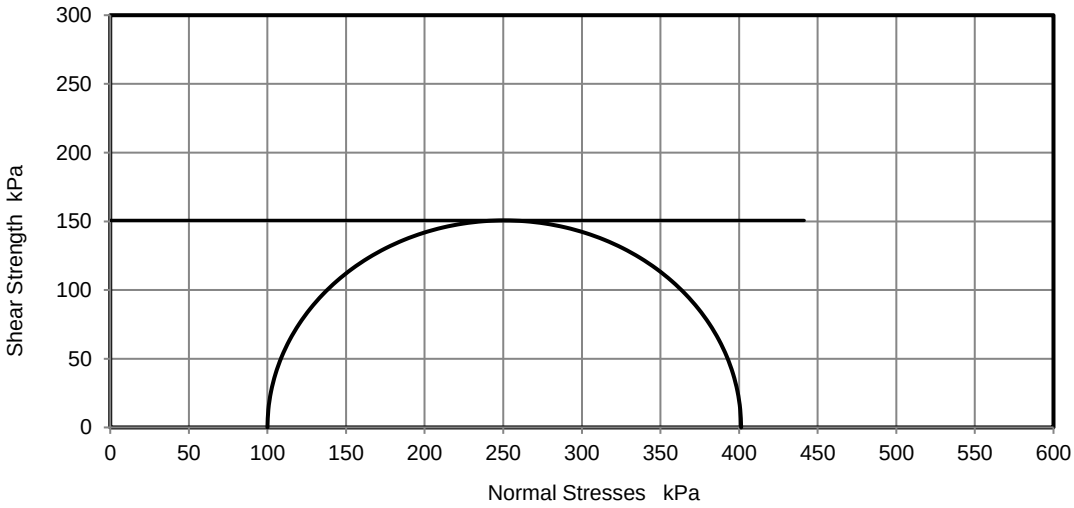
Laboratory Reference:	2286738_1	Depth Top [m]:	0.10
Hole No.:	Heading 2	Depth Base [m]:	Not Given
Sample Reference:	Face S004	Sample Type:	U
Sample Description:	Yellowish brown CLAY		
Sample Preparation:	Sample prepared in accordance with BS 1377-1:2016 Clause 9.1.1.		

Test Number	1		Rate of Strain	2.00	%/min
Length	76.00	mm	Cell Pressure	100	kPa
Diameter	37.34	mm	Axial Strain at failure	6.3	%
Bulk Density	1.95	Mg/m3	Deviator Stress, (σ1 - σ3)f	301	kPa
Moisture Content	30	%	Undrained Shear Strength, cu	151	kPa ½(σ1 - σ3)f
Dry Density	1.50	Mg/m3	Mode of Failure	Brittle	
Membrane Correction	0.91	kPa	Membrane thickness	0.21	mm

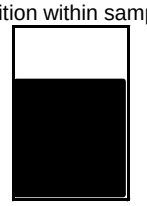
Deviator Stress v Axial Strain



Mohr Circles



Position within sample



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Date Reported: 13/06/2022

GF 184.12

TEST CERTIFICATE

DETERMINATION OF THE UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE

4041

Tested in Accordance with: BS 1377-7: 1990: Clause 8

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Environmental Science

Client:	Concept Site Investigations	Client Reference:	22 3686
Client Address:	Unit 8, Warple Mews, Warple Way, London W3 0RF	Job Number:	22-60188
		Date Sampled:	Not Given
		Date Received:	18/05/2022
Contact:	Lynn Griffin	Date Tested:	03/06/2022
Site Address:	Euston Tower	Sampled By:	Not Given

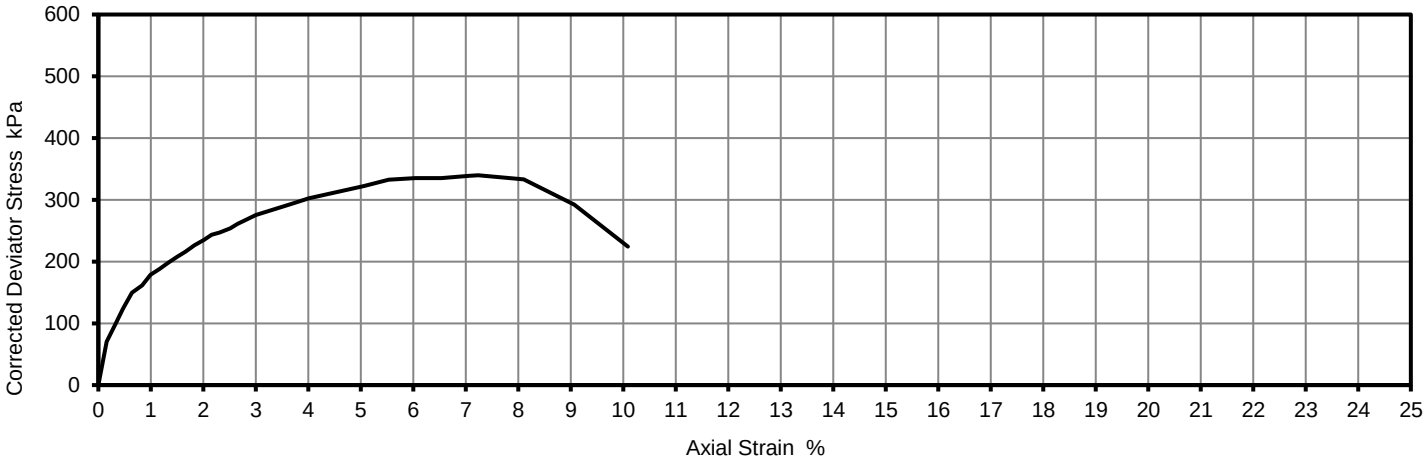
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

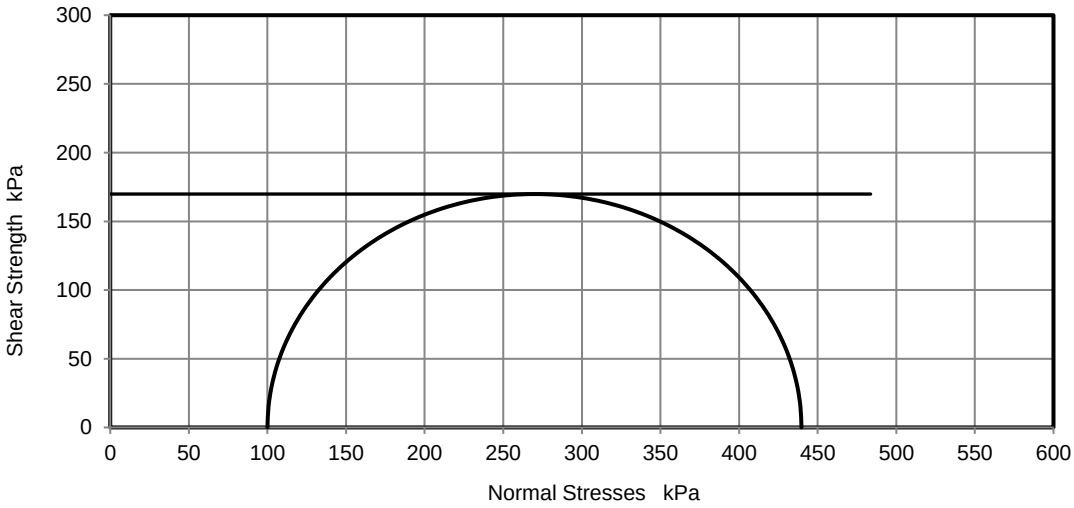
Laboratory Reference:	2286739	Depth Top [m]:	1.00
Hole No.:	Heading 2	Depth Base [m]:	Not Given
Sample Reference:	Face S005	Sample Type:	U
Sample Description:	Greyish brown CLAY		
Sample Preparation:	Sample prepared in accordance with BS 1377-1:2016 Clause 9.1.1.		

Test Number	1		Rate of Strain	2.00	%/min	
Length	76.54	mm	Cell Pressure	100	kPa	
Diameter	36.10	mm	Axial Strain at failure	7.2	%	
Bulk Density	2.08	Mg/m3	Deviator Stress, (σ1 - σ3)f	340	kPa	
Moisture Content	24	%	Undrained Shear Strength, cu	170	kPa	½(σ1 - σ3)f
Dry Density	1.69	Mg/m3	Mode of Failure	Brittle		
Membrane Correction	1.04	kPa	Membrane thickness	0.21	mm	

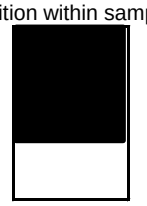
Deviator Stress v Axial Strain



Mohr Circles



Position within sample



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UKAS TESTING 4041

i2 Analytical Ltd
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Northampton NN4 7EB

Environmental Science

Tested in Accordance with: BS 1377-7: 1990: Clause 8

Client:	Concept Site Investigations	Client Reference:	22 3686
Client Address:	Unit 8, Warple Mews, Warple Way, London W3 0RF	Job Number:	22-60188
		Date Sampled:	Not Given
		Date Received:	18/05/2022
Contact:	Lynn Griffin	Date Tested:	03/06/2022
Site Address:	Euston Tower	Sampled By:	Not Given

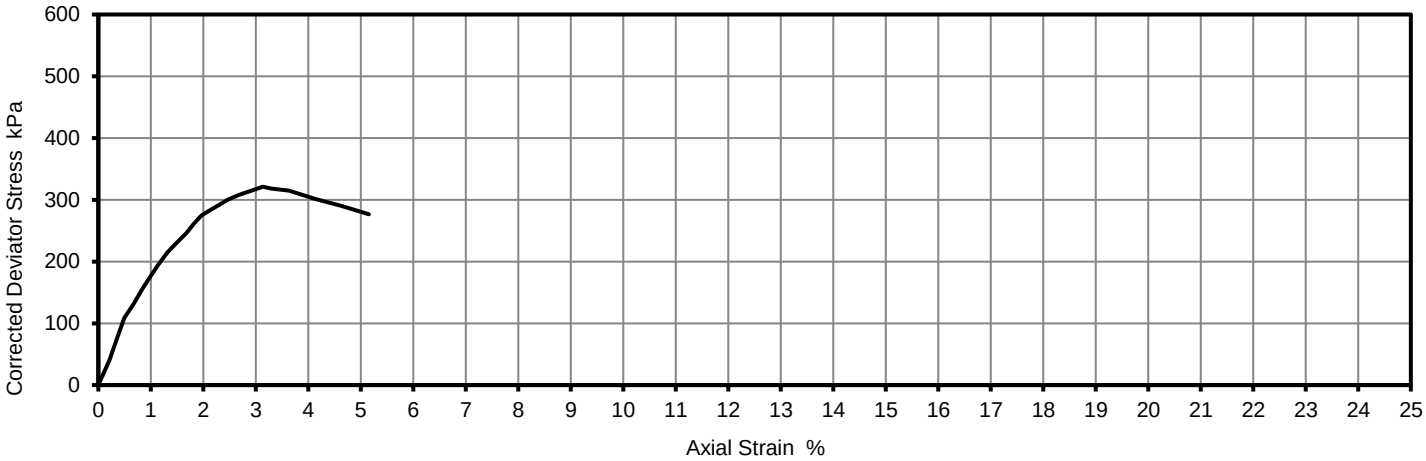
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

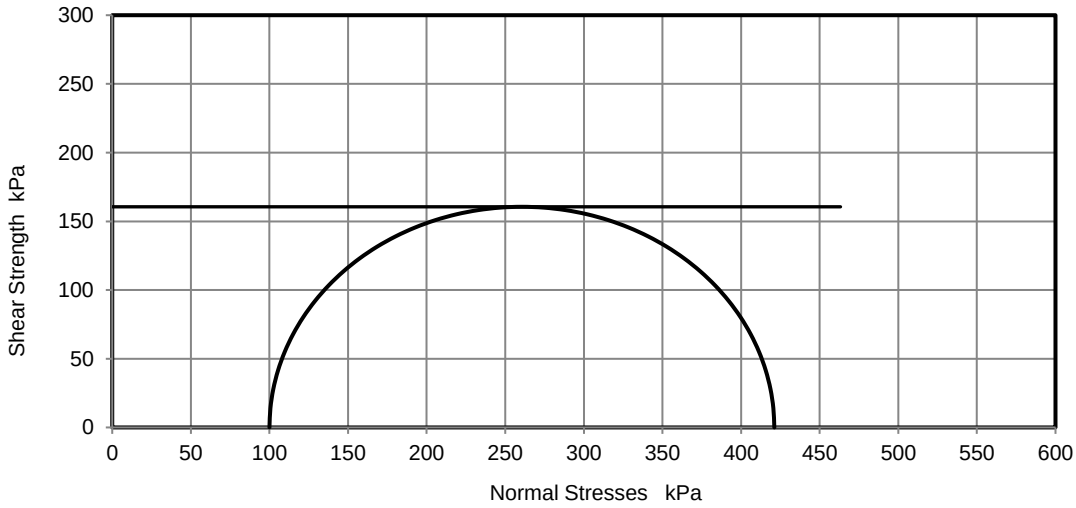
Laboratory Reference:	2286740	Depth Top [m]:	2.00
Hole No.:	Heading 2	Depth Base [m]:	Not Given
Sample Reference:	Face S006	Sample Type:	U
Sample Description:	Greyish brown CLAY		
Sample Preparation:	Sample prepared in accordance with BS 1377-1:2016 Clause 9.1.1.		

Test Number	1		Rate of Strain	2.00	%/min
Length	75.30	mm	Cell Pressure	100	kPa
Diameter	37.51	mm	Axial Strain at failure	3.1	%
Bulk Density	2.00	Mg/m3	Deviator Stress, (σ1 - σ3)f	321	kPa
Moisture Content	27	%	Undrained Shear Strength, cu	161	kPa ½(σ1 - σ3)f
Dry Density	1.57	Mg/m3	Mode of Failure	Brittle	
Membrane Correction	0.50	kPa	Membrane thickness	0.22	mm

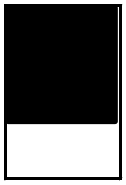
Deviator Stress v Axial Strain



Mohr Circles



Position within sample



Note: Deviator stress corrected for area change and membrane effects. Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

Remarks:

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.

Signed: Dudzińska Anna

Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

 Date Reported: 13/06/2022 **GF 184.12**

TEST CERTIFICATE

DETERMINATION OF THE UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE

UKAS TESTING 4041

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Environmental Science

Tested in Accordance with: BS 1377-7: 1990: Clause 8

Client:	Concept Site Investigations	Client Reference:	22 3686
Client Address:	Unit 8, Warple Mews, Warple Way, London W3 0RF	Job Number:	22-60188
		Date Sampled:	Not Given
		Date Received:	18/05/2022
Contact:	Lynn Griffin	Date Tested:	03/06/2022
Site Address:	Euston Tower	Sampled By:	Not Given

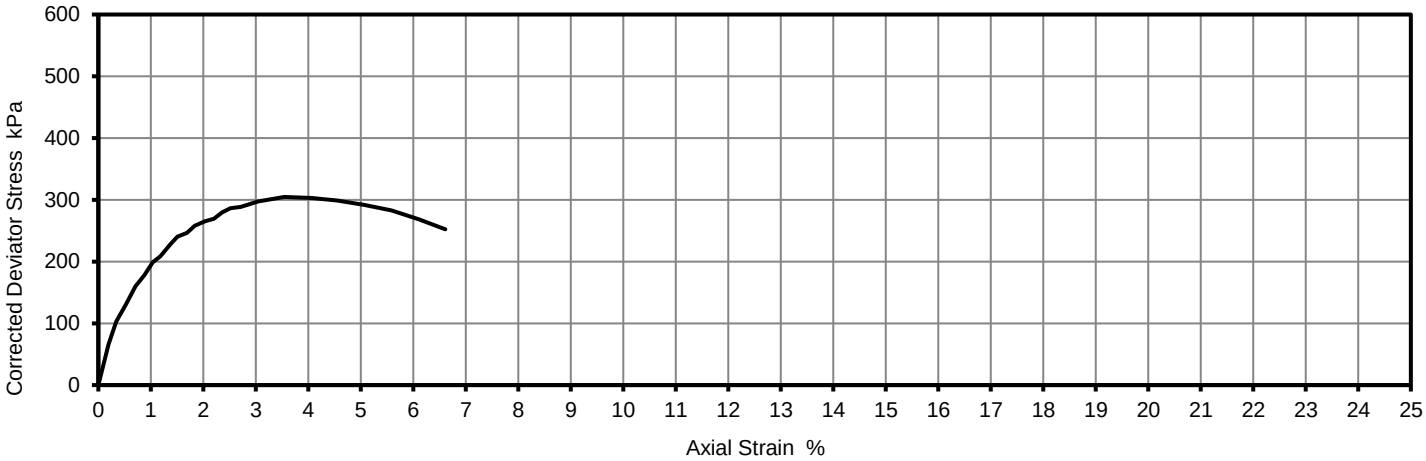
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

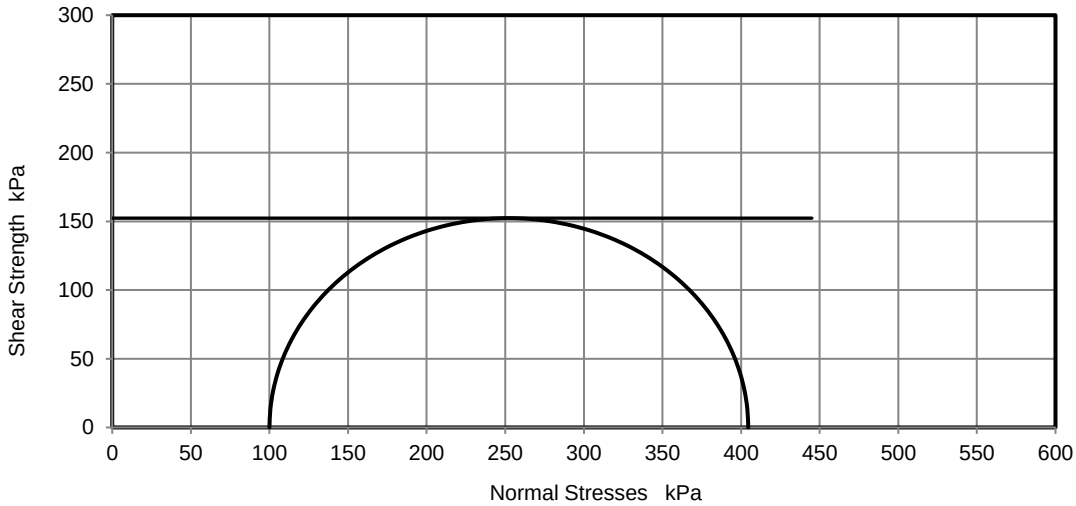
Laboratory Reference:	2286740_1	Depth Top [m]:	2.00
Hole No.:	Heading 2	Depth Base [m]:	Not Given
Sample Reference:	Face S006	Sample Type:	U
Sample Description:	Greyish brown CLAY		
Sample Preparation:	Sample prepared in accordance with BS 1377-1:2016 Clause 9.1.1.		

Test Number	1		Rate of Strain	2.00	%/min
Length	76.26	mm	Cell Pressure	100	kPa
Diameter	37.16	mm	Axial Strain at failure	3.5	%
Bulk Density	2.04	Mg/m3	Deviator Stress, (σ1 - σ3)f	305	kPa
Moisture Content	27	%	Undrained Shear Strength, cu	152	kPa ½(σ1 - σ3)f
Dry Density	1.60	Mg/m3	Mode of Failure	Brittle	
Membrane Correction	0.55	kPa	Membrane thickness	0.21	mm

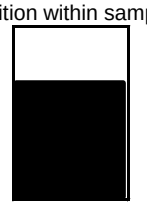
Deviator Stress v Axial Strain



Mohr Circles



Position within sample



Note: Deviator stress corrected for area change and membrane effects. Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

Remarks:

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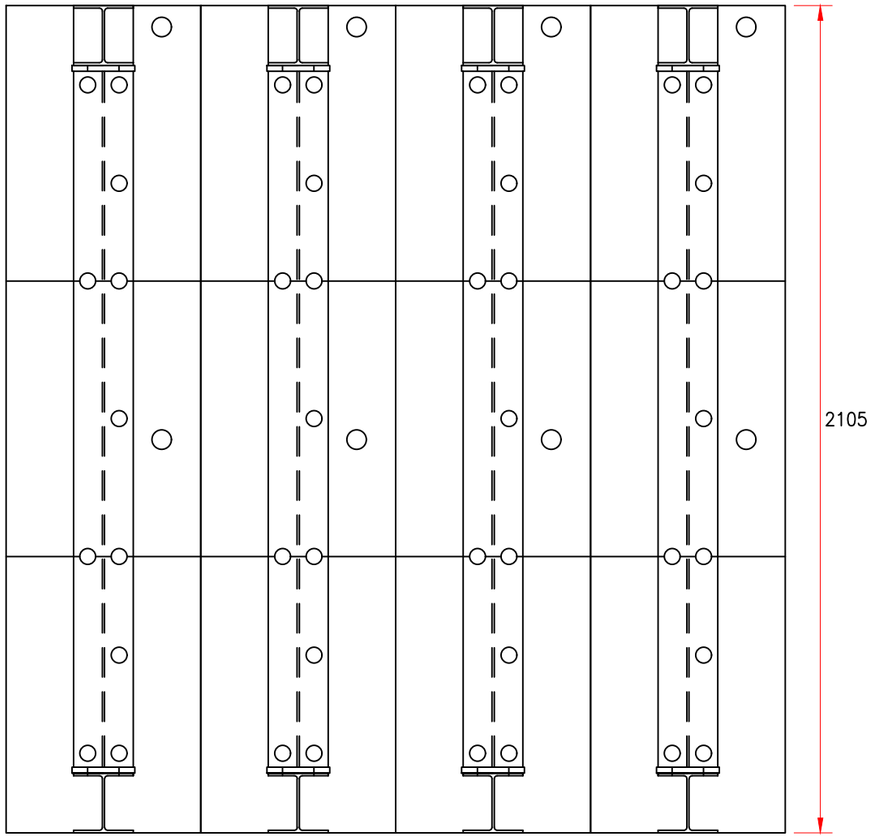
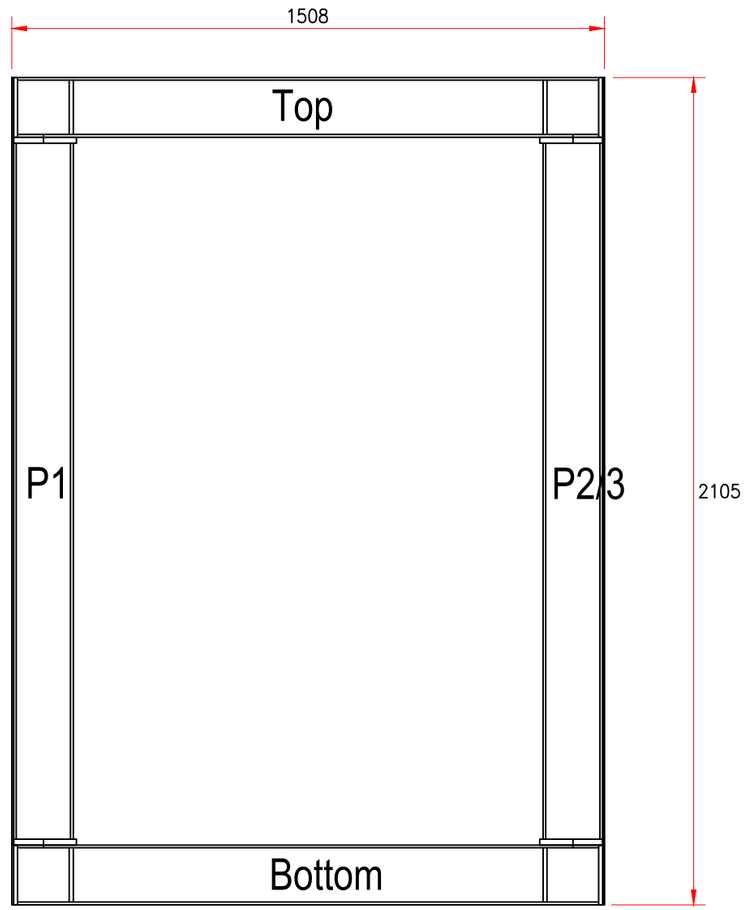
Signed: Dudzińska Anna

Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

 Date Reported: 13/06/2022 **GF 184.12**





Beams (B) Plates (P)	Sizes:	P/O no. or Cast No.	Initial	Date

Fabrication Status	
Saw by	Date:
Drill by	Date:
Fab by	Date:
Weld by	Date:
Painted by	Date:
Check by	Date:

General Notes
All dimetres in milimetres UNO
All holes 22 dia. UNO
All material min. S275 JR UNO
All weld leg lenght ≥5mm UNO
All butt weld full penetration UNO
All weld symbols to be in accordance with BS EN ISO 2553
Fabrication tolerance to be in accordance with BS EN1090-2 Annex B
Function tolerance class 1 UNO
Weld acceptance criteria to be BS EN 5817 class C
suplementary NDT to be in accordance with table 24 UNO
Hold times to be in accordance with table 23UNO

EXC 2 | Welding Wire batch 12125212

TITLE JN3323 / Mc Gee

ADDRESS Euston Tower

SCALE: N.T.S.

Draw by: G.K.

DRAWING No. 3323-11-02-22-0

Rev

ISSUE/DATE 11/020/2022

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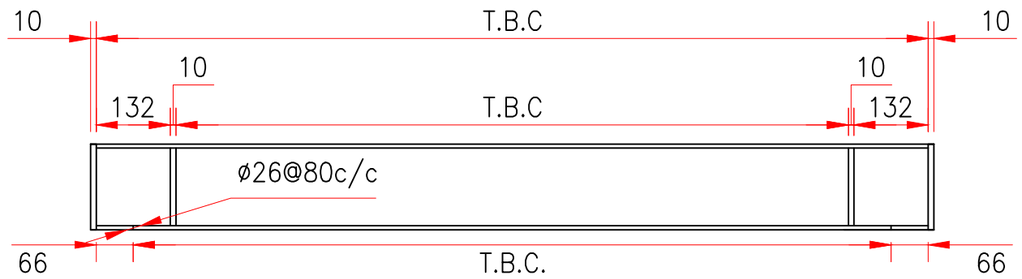
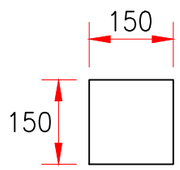
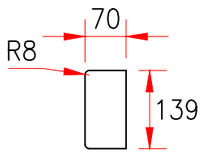


56no. 152x152x23 UC Top/Bottom

Plates Details





112no. 150x150x10 PLT

224no. 139x73x10 PLT

Beams (B) Plates (P)	Sizes:	P/O no. or Cast No.	Initial	Date

Fabrication Status	
Saw by	Date:
Drill by	Date:
Fab by	Date:
Weld by	Date:
Painted by	Date:
Check by	Date:

General Notes
All dimetres in milimetres UNO
All holes 22 dia. UNO
All material min. S275 JR UNO
All weld leg lenght z6mm UNO
All butt weld full penetration UNO
All weld symbols to be in accordance with BS EN ISO 2553
Fabrication tolerance to be in accordance with BS EN1090-2 Annex B
Function tolerance class 1 UNO
Weld acceptance criteria to be BS EN 5817 class C
suplementary NDT to be in accordance with table 24 UNO
Hold times to be in accordance with table 23UNO

EXC 2 | Welding Wire batch 12125212

TITLE JN3323 / Mc Gee

ADDRESS Euston Tower

SCALE: N.T.S.

Draw by: G.K.

DRAWING No. 3323-11-02-22-1

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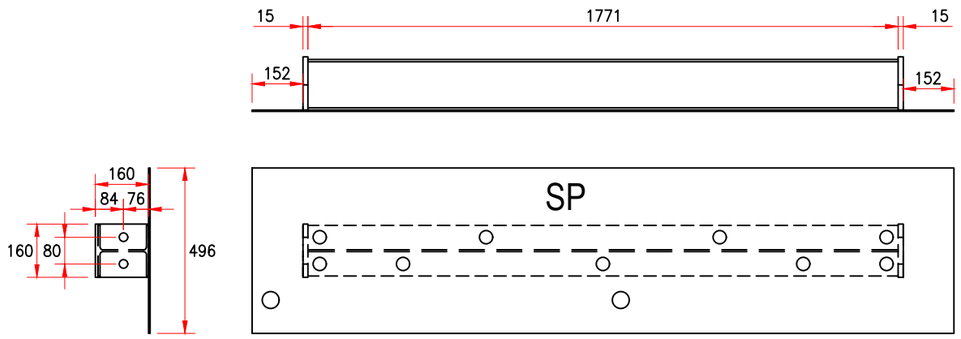
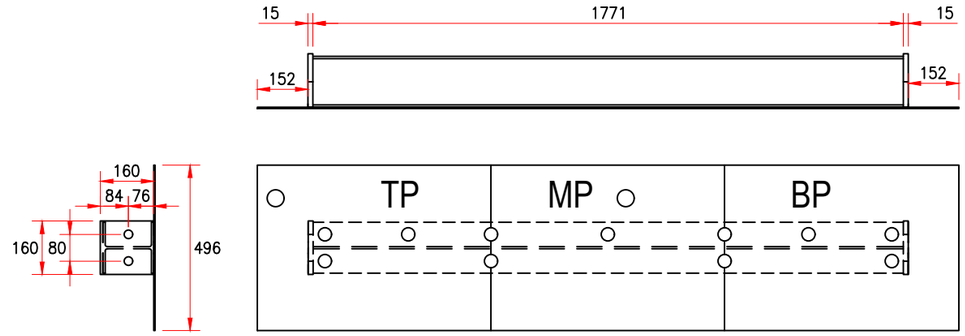


28no. 152x152x23 UC P1



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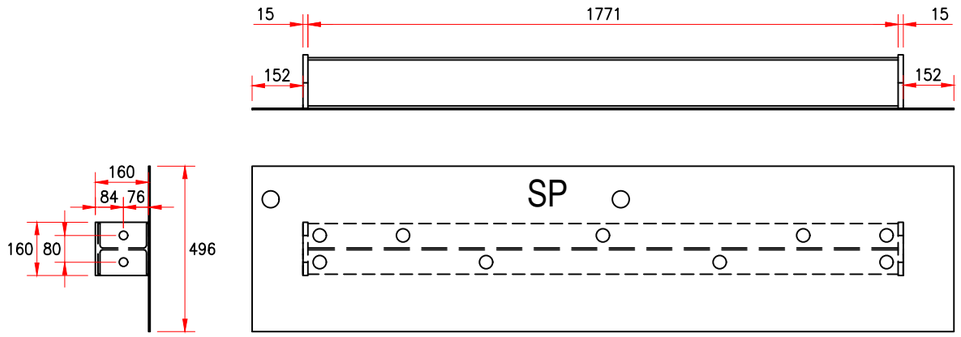

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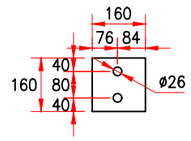
Plate Details



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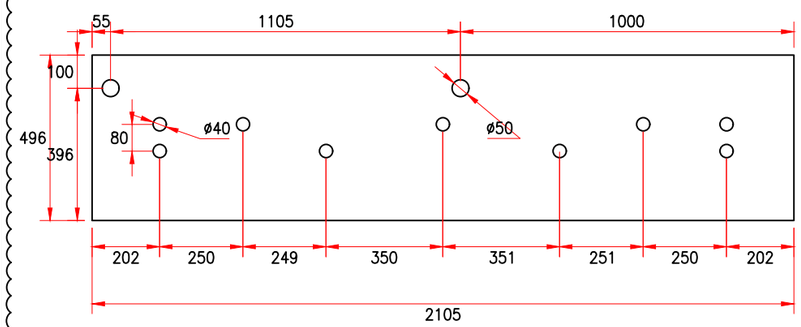
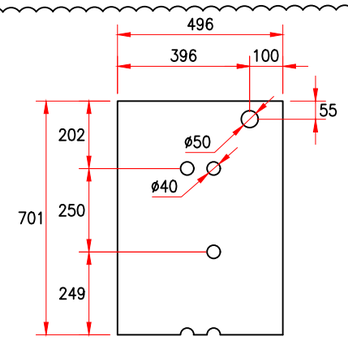


42no. 496x2105x4 PLT SP



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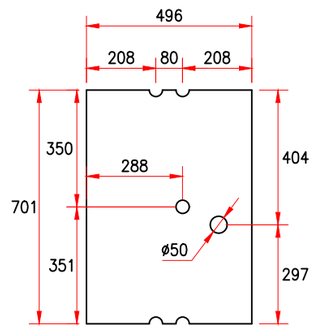

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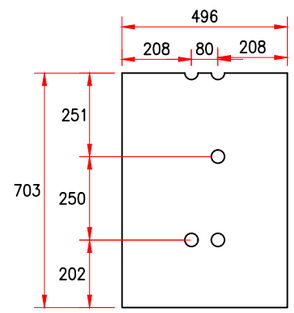

14no. 496x2105x4 PLT BP

Beams (B) Plates (P)	Sizes:	P/O no. or Cast No.	Initial	Date

Fabrication Status	
Saw by	Date:
Drill by	Date:
Fab by	Date:
Weld by	Date:
Painted by	Date:
Check by	Date:

General Notes
All dimetres in milimetres UNO
All holes 22 dia. UNO
All material min. S275 JR UNO
All weld leg lenght ±5mm UNO
All butt weld full penetration UNO
All weld symbols to be in accordance with BS EN ISO 2553
Fabrication tolerance to be in accordance with BS EN1090-2 Annex B
Function tolerance class 1 UNO
Weld acceptance criteria to be BS EN 5817 class C
suplementary NDT to be in accordance with table 24 UNO
Hold times to be in accordance with table 23UNO

EXC 2	Welding Wire batch 12125212			
TITLE	JN3323 / Mc Gee			
ADDRESS	Euston Tower			
SCALE: N.T.S.	Draw by: G.K.	DRAWING No. 3323-11-02-22-2	Rev	ISSUE/DATE 11/020/2022

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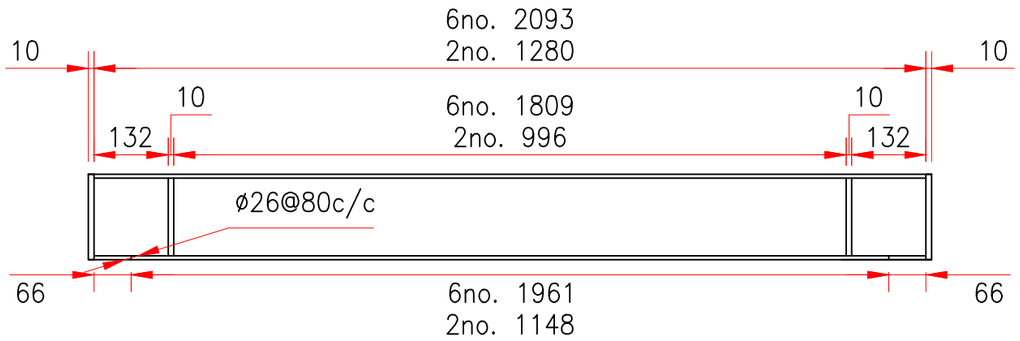

8no. 152x152x23 UC Top/Bottom

Plates from drawing 3323-11-02-22-1

112no. 150x150x10 PLT 224no. 139x73x10 PLT

Beams (B) Plates (P)	Sizes:	P/O no. or Cast No.	Initial	Date

Fabrication Status	
Saw by	Date:
Drill by	Date:
Fab by	Date:
Weld by	Date:
Painted by	Date:
Check by	Date:

General Notes
All dimetres in milimetres UNO
All holes 22 dia. UNO
All material min. S275 JR UNO
All weld leg lenght z6mm UNO
All butt weld full penetration UNO
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suplementary NDT to be in accordance with table 24 UNO
Hold times to be in accordance with table 23UNO

EXC 2 | Welding Wire batch 12125212

TITLE JN3323 / Mc Gee

ADDRESS Euston Tower

SCALE: N.T.S.

Draw by: G.K.

DRAWING No. 3323-11-02-22-3

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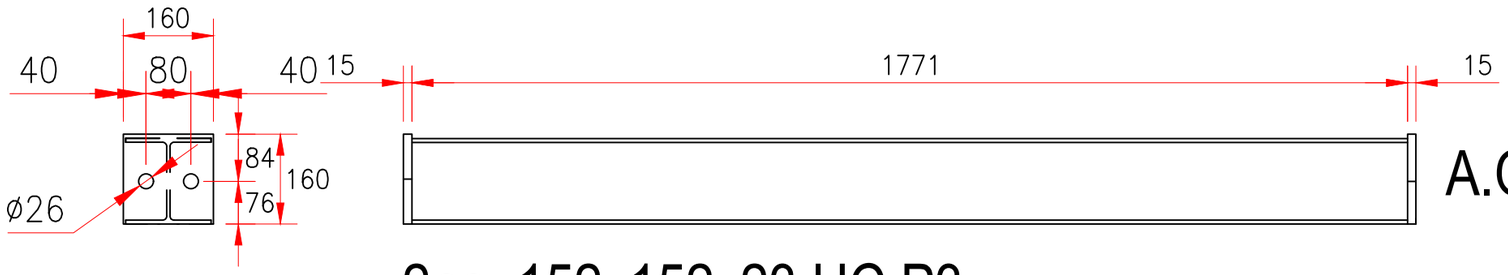

A.O.E.

2no. 152x152x23 UC P3

Beams (B) Plates (P)	Sizes:	P/O no. or Cast No.	Initial	Date

Fabrication Status	
Saw by	Date:
Drill by	Date:
Fab by	Date:
Weld by	Date:
Painted by	Date:
Check by	Date:

General Notes
All dimetres in milimetres UNO
All holes 22 dia. UNO
All material min. S275 JR UNO
All weld leg lenght z6mm UNO
All butt weld full penetration UNO
All weld symbols to be in accordance with BS EN ISO 2553
Fabrication tolerance to be in accordance with BS EN1090-2 Annex B
Function tolerance class 1 UNO
Weld acceptance criteria to be BS EN 5817 class C
suplementary NDT to be in accordance with table 24 UNO
Hold times to be in accordance with table 23UNO

EXC 2 | Welding Wire batch 12125212

TITLE JN3323 / Mc Gee

ADDRESS Euston Tower

SCALE: N.T.S.

Draw by: G.K.

DRAWING No. 3323-11-02-22-4

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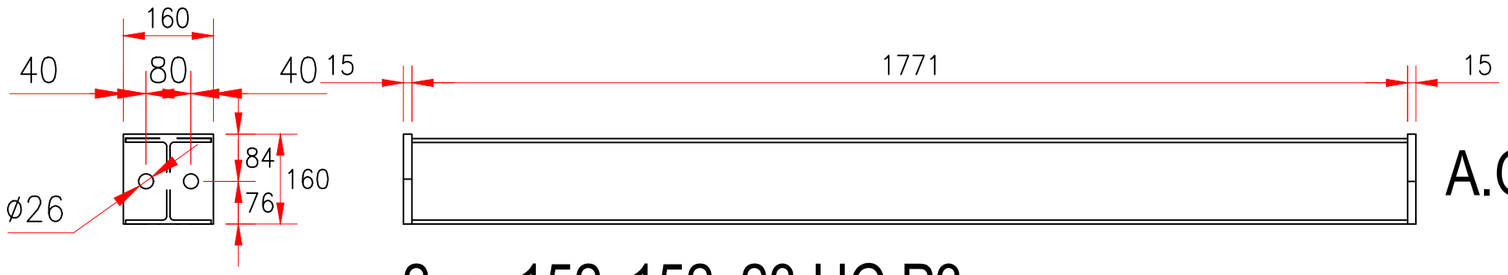

A.O.E.

2no. 152x152x23 UC P3

Beams (B) Plates (P)	Sizes:	P/O no. or Cast No.	Initial	Date

Fabrication Status	
Saw by	Date:
Drill by	Date:
Fab by	Date:
Weld by	Date:
Painted by	Date:
Check by	Date:

General Notes
All dimetres in milimetres UNO
All holes 22 dia. UNO
All material min. S275 JR UNO
All weld leg lenght z6mm UNO
All butt weld full penetration UNO
All weld symbols to be in accordance with BS EN ISO 2553
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Function tolerance class 1 UNO
Weld acceptance criteria to be BS EN 5817 class C
suplementary NDT to be in accordance with table 24 UNO
Hold times to be in accordance with table 23UNO

EXC 2

Welding Wire batch 12125212

TITLE JN3323 / Mc Gee

ADDRESS Euston Tower

SCALE: N.T.S.

Draw by: G.K.

DRAWING No. 3323-11-02-22-5

Rev

ISSUE/DATE 26/02/2022

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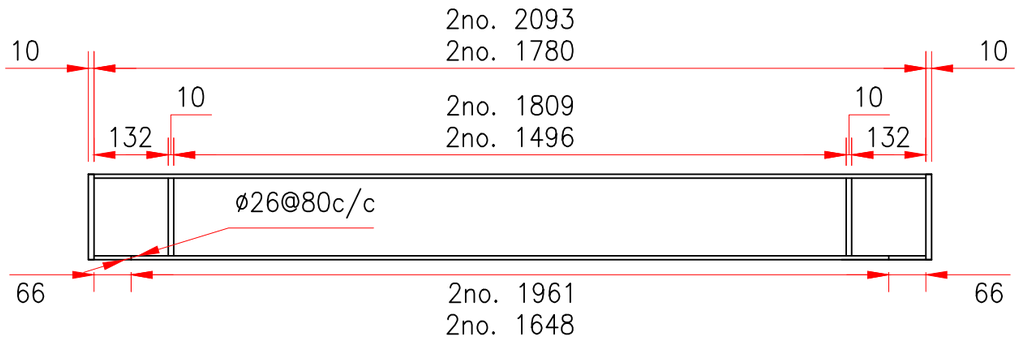
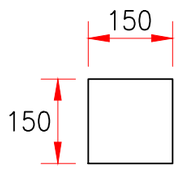
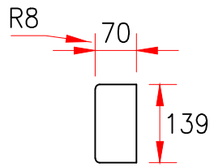


4no. 152x152x23 UC Top/Bottom

Plates from drawing 3323-11-02-22-1





112no. 150x150x10 PLT 224no. 139x73x10 PLT

Beams (B) Plates (P)	Sizes:	P/O no. or Cast No.	Initial	Date

Fabrication Status	
Saw by	Date:
Drill by	Date:
Fab by	Date:
Weld by	Date:
Painted by	Date:
Check by	Date:

General Notes
All dimetres in milimetres UNO
All holes 22 dia. UNO
All material min. S275 JR UNO
All weld leg lenght z6mm UNO
All butt weld full penetration UNO
All weld symbols to be in accordance with BS EN ISO 2553
Fabrication tolerance to be in accordance with BS EN1090-2 Annex B
Function tolerance class 1 UNO
Weld acceptance criteria to be BS EN 5817 class C
suplementary NDT to be in accordance with table 24 UNO
Hold times to be in accordance with table 23UNO

EXC 2 | Welding Wire batch 12125212

TITLE JN3323 / Mc Gee

ADDRESS Euston Tower

SCALE: N.T.S.

Draw by: G.K.

DRAWING No. 3323-11-02-22-6

Rev

ISSUE/DATE 26/02/2022

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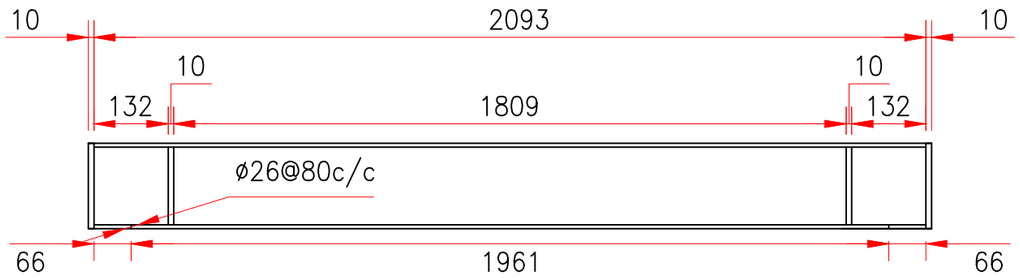
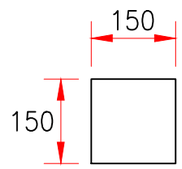
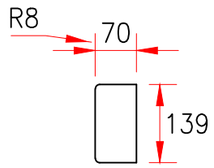


16no. 152x152x23 UC Top/Bottom

Plates from drawing 3323-11-02-22-1





112no. 150x150x10 PLT 224no. 139x73x10 PLT

Beams (B) Plates (P)	Sizes:	P/O no. or Cast No.	Initial	Date

Fabrication Status	
Saw by	Date:
Drill by	Date:
Fab by	Date:
Weld by	Date:
Painted by	Date:
Check by	Date:

General Notes
All dimetres in milimetres UNO
All holes 22 dia. UNO
All material min. S275 JR UNO
All weld leg lenght z6mm UNO
All butt weld full penetration UNO
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Fabrication tolerance to be in accordance with BS EN1090-2 Annex B
Function tolerance class 1 UNO
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suplementary NDT to be in accordance with table 24 UNO
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EXC 2 | Welding Wire batch 12125212

TITLE JN3323 / Mc Gee

ADDRESS Euston Tower

SCALE: N.T.S.

Draw by: G.K.

DRAWING No. 3323-11-02-22-7

Rev

ISSUE/DATE 03/03/2022

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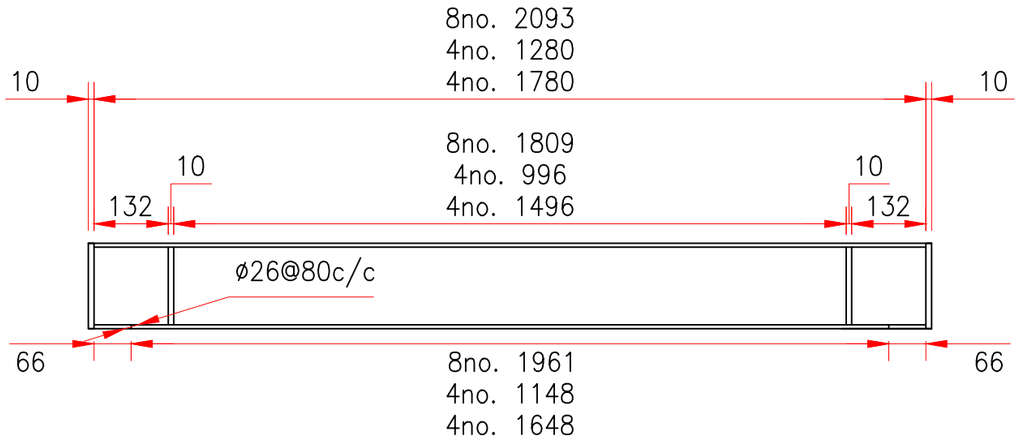

16no. 152x152x23 UC Top/Bottom

Plates from drawing 3323-11-02-22-1

112no. 150x150x10 PLT 224no. 139x73x10 PLT

Beams (B) Plates (P)	Sizes:	P/O no. or Cast No.	Initial	Date

Fabrication Status	
Saw by	Date:
Drill by	Date:
Fab by	Date:
Weld by	Date:
Painted by	Date:
Check by	Date:

General Notes
All dimetres in milimetres UNO
All holes 22 dia. UNO
All material min. S275 JR UNO
All weld leg lenght z6mm UNO
All butt weld full penetration UNO
All weld symbols to be in accordance with BS EN ISO 2553
Fabrication tolerance to be in accordance with BS EN1090-2 Annex B
Function tolerance class 1 UNO
Weld acceptance criteria to be BS EN 5817 class C
suplementary NDT to be in accordance with table 24 UNO
Hold times to be in accordance with table 23UNO

EXC 2 | Welding Wire batch 12125212

TITLE JN3323 / Mc Gee

ADDRESS Euston Tower

SCALE: N.T.S.

Draw by: G.K.

DRAWING No. 3323-11-02-22-8

Rev

ISSUE/DATE 08/03/2022

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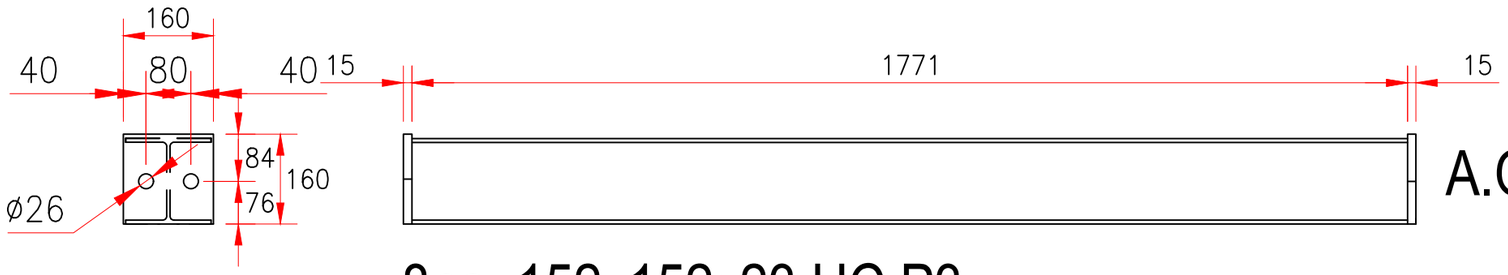

A.O.E.

8no. 152x152x23 UC P3

Beams (B) Plates (P)	Sizes:	P/O no. or Cast No.	Initial	Date

Fabrication Status	
Saw by	Date:
Drill by	Date:
Fab by	Date:
Weld by	Date:
Painted by	Date:
Check by	Date:

General Notes
All dimetres in milimetres UNO
All holes 22 dia. UNO
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suplementary NDT to be in accordance with table 24 UNO
Hold times to be in accordance with table 23UNO

EXC 2 | Welding Wire batch 12125212

TITLE JN3323 / Mc Gee

ADDRESS Euston Tower

SCALE: N.T.S.

Draw by: G.K.

DRAWING No. 3323-11-02-22-9

Rev

ISSUE/DATE 08/03/2022

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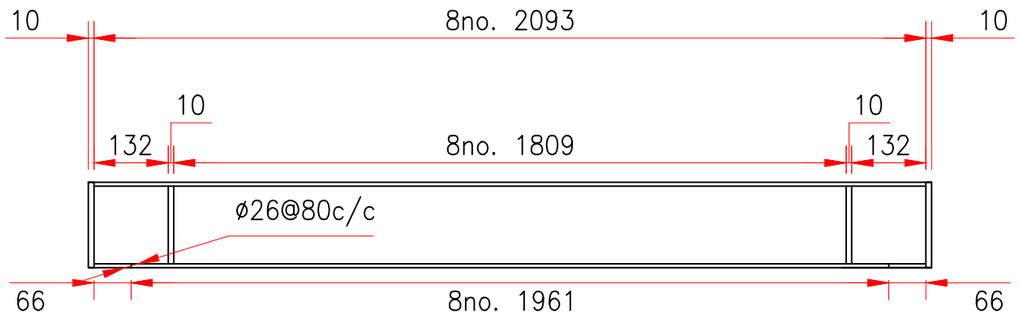

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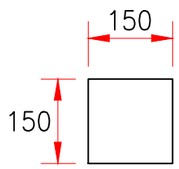
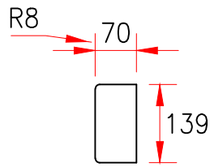
Plates from drawing 3323-11-02-22-1





112no. 150x150x10 PLT 224no. 139x73x10 PLT

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EXC 2 | Welding Wire batch 12125212

TITLE JN3323 / Mc Gee

ADDRESS Euston Tower

SCALE: N.T.S.

Draw by: G.K.

DRAWING No. 3323-11-02-22-10

Rev

ISSUE/DATE 14/03/2022

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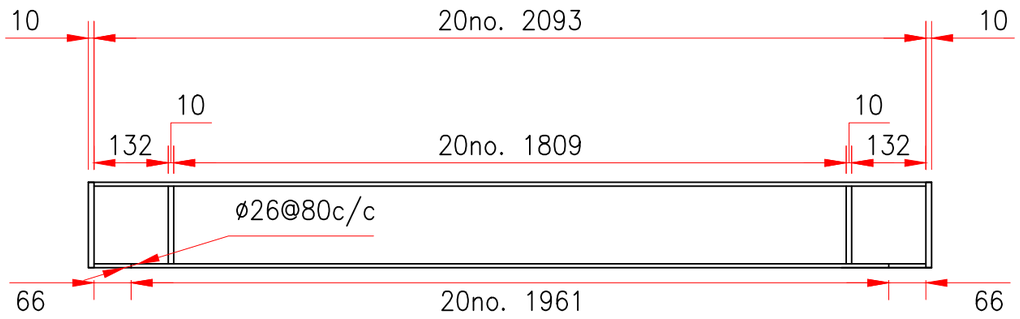

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TITLE JN3323 / Mc Gee

ADDRESS Euston Tower

SCALE: N.T.S.

Draw by: G.K.

DRAWING No. 3323-11-02-22-11

Rev

ISSUE/DATE 17/03/2022

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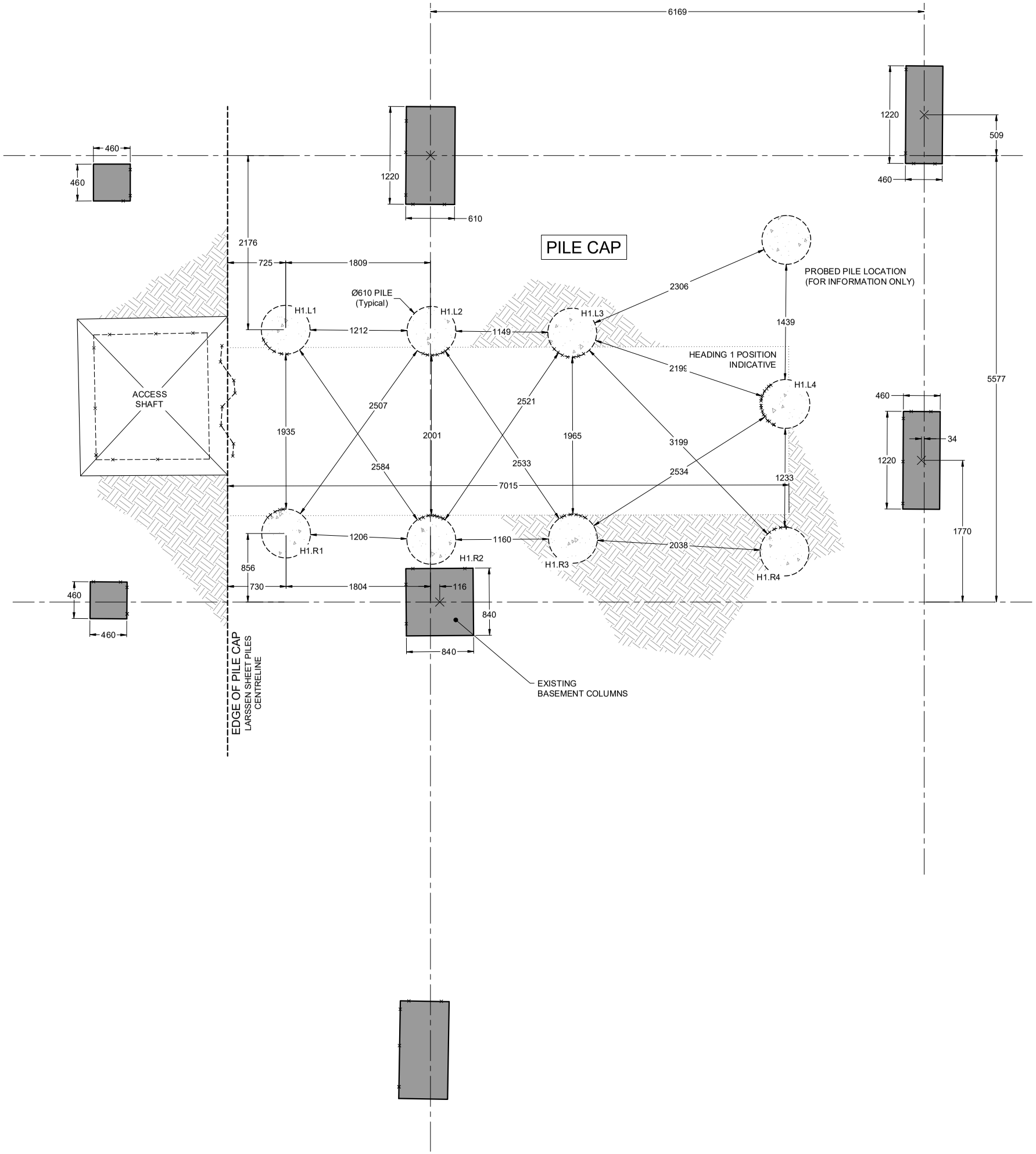


Notes:

1. Do not scale this drawing.
2. All dimensions are in millimeter unless noted otherwise.
3. Shown gridlines are arbitrary and to be used for the purpose of this survey only.
4. Position of piles surveyed in relation to existing columns at basement level (no visible cladding to RC elements).
5. Accuracy of survey below pile cap ±25 mm due to irregular pile surface. Pile diameter estimated from fully exposed pile at Location 2.
6. Access shaft formed as per McGee sketch ETF149-SK-003b (Rev -). For heading frame information refer to geometry sketch ETF149-SK-004 (Rev -) and fabrication drawings 3323-11-02-22-0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 and 11.
7. Total number of heading frames installed within Heading 1:
   - Standard 11 No @ 500mm c/c
   - Special 0 No.
8. Dry-packing thickness varies between 25 and 75mm, heading frames installed at approximate 500mm c/c.

Rev.	Date		By	Checked
B	21-06-22	Temporary works notes added	DF	-
A	01-06-22	ARUP comments addressed	DF	-

McGEE

Project:

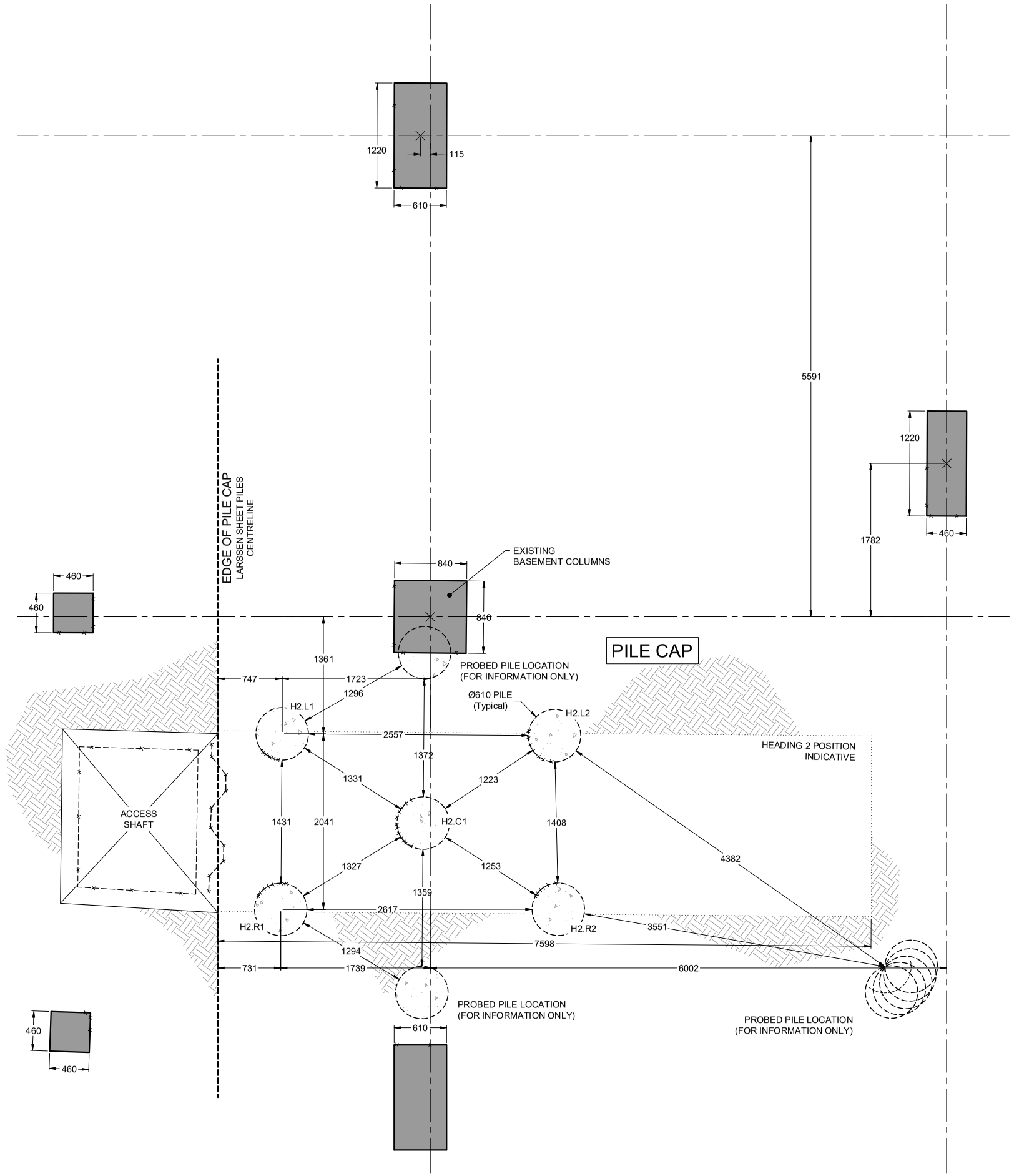
EUSTON TOWER

Drawing Title:

FOUNDATION SI WORK
LOCATION 1
SURVEY OF EXISTING PILES

Drawn:	Date:	Checked:
DF	22-04-2022	-

Scale:	Dwg No:	Revision:
NTS	ETF149-SK005a	B



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7. Total number of heading frames installed within Heading 2:
   - Standard 10 No.
   - Special 2 No.
8. Dry-packing thickness varies between 25 and 75mm, heading frames installed at approximate 500mm c/c.

Rev.	Date		By	Checked
B	21-06-22	Temporary works notes added	DF	-
A	01-06-22	ARUP comments addressed	DF	-

McGEE

Project:

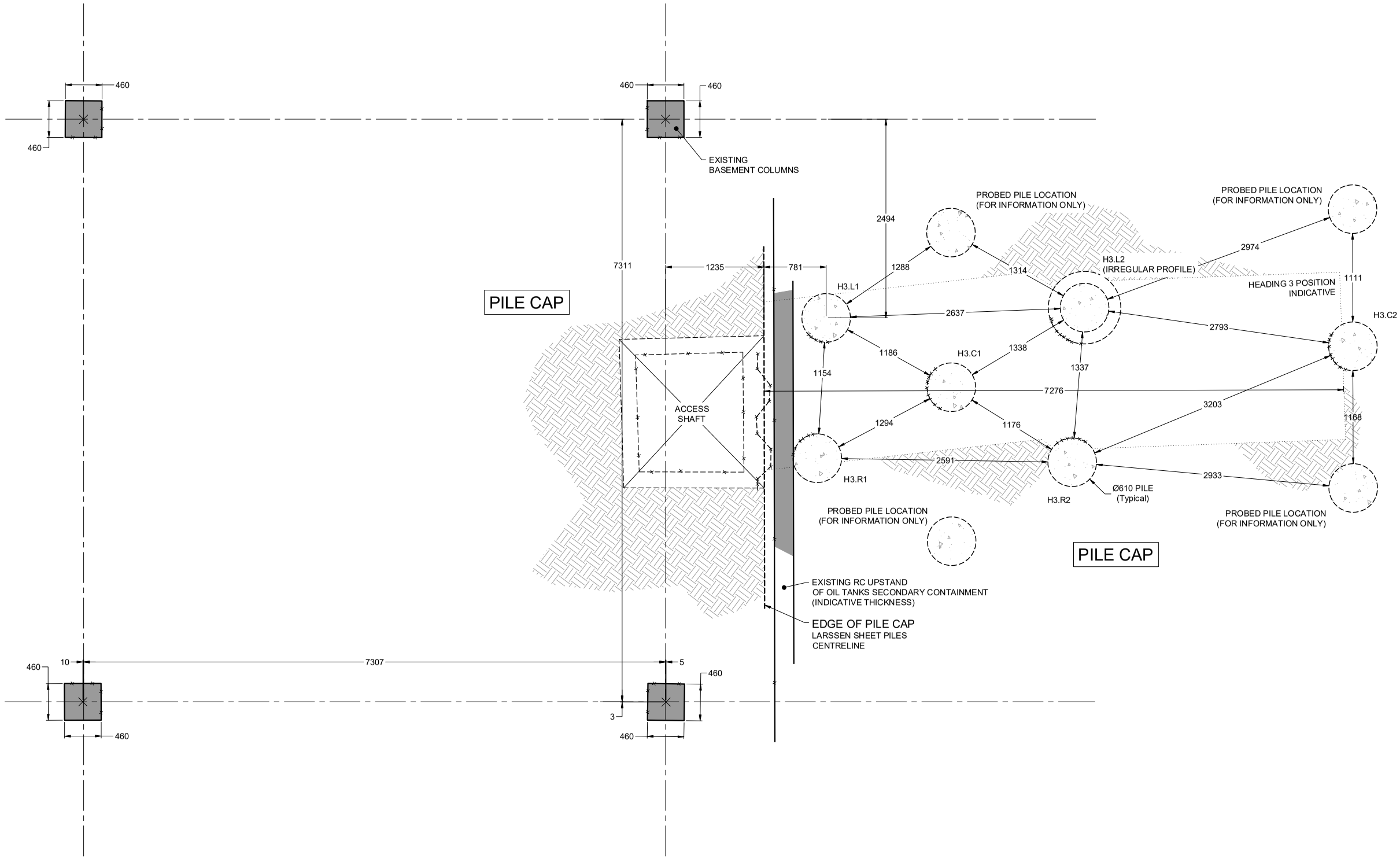
EUSTON TOWER

Drawing Title:

FOUNDATION SI WORK
LOCATION 2
SURVEY OF EXISTING PILES

Drawn:	Date:	Checked:
DF	22-04-2022	-

Scale:	Dwg No:	Revision:
NTS	ETF149-SK005b	B



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7. Total number of heading frames installed within Heading 3:
   - Standard 10 No.
   - Special 0 No.
8. Dry-packing thickness varies between 25 and 75mm, heading frames installed at approximate 500mm c/c.

Rev.	Date		By	Checked
B	21-06-22	Temporary works notes added	DF	-
A	01-06-22	ARUP comments addressed	DF	-

McGEE

Project:

EUSTON TOWER

Drawing Title:

FOUNDATION SI WORK
LOCATION 3
SURVEY OF EXISTING PILES

Drawn:	Date:	Checked:
DF	21-05-2022	-

Scale:	Dig No:	Revision:
NTS	ETF149-SK005c	B

FIRE SAFETY RISK ASSESSMENT
EUSTON TOWER

Created on:	Revision Number:	Latest Revision:
09/12/2015	00	09/12/2015

ac fire safety
protection through prevention

Quality Management

	Issue 1	Revision 1	Revision 2	Revision 3
Remarks:	**First Issue**			
Dated:	**13/12/15**			
Prepared by:	**Chris Stone**			

Author: Christopher Stone **Date: 13th December 2015**

Signed:

Verifier: Andrew Railton **Date: 13th December 2015**

Signed:

Document Version: ETFRA2015

Report Information

Fire Safety Report for:

Client [redacted]

Prepared by:

Consultant Christopher Stone BA (Hons), MPA, MIFSM, MIFPO

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1. Executive Summary

Fire safety in tall buildings present unique challenges to ensure compliance. Euston Tower was built in the late 1960s and has changed slightly since the original design.

There was no original design information for Euston Tower but plans from the 1990s in fire certificates were found and other information has helped to understand the building design of that period. Buildings built in London at this time were built with simultaneous evacuation as the main evacuation procedure. There have been significant enhancements in the building since it was originally built mainly in the form of a new L1 fire alarm system and 2 evacuation lifts.

This fire risk assessment has aimed to not only identify hazards and risks but also to provide solutions with a risk based approach for occupancy figures and recommendations on the set up of the fire alarm to reduce the impact on the building users whilst still taking into consideration the building design. This report takes into consideration the size and scale of the building to ensure the risk of the building is at a tolerable level and also takes into account the original design of the building and enhancements already in place.

The current maximum occupancy in the building is: **3873 persons**

The maximum recommended occupancy numbers for the building:

- No more than **165 people per floor** (office) excluding first floor.
- Maximum capacity in the building of **5300 persons**. This includes 300 persons on first floor.

Overall the level of fire safety in the building is good with good management procedures, an L1 fire alarm system and good compartmentation.

The main points from the action plan are:

- Long term solution for basement LV room;
- Improvements required to cleaners work patterns to prevent means of escape becoming blocked due to rubbish;
- Their needs to be 5/6 nominated fire marshals per floor and they need trained to ensure evacuation procedure is followed adequately.

2. Introduction

2.1 Purpose of Report

This risk assessment looks at all common areas and HMRC areas. The individual tenants are responsible for their own fire risk assessment and under article 22 of the Regulatory reform (Fire Safety) Order 2005 it is advisable to share risk assessments with other responsible persons to ensure all hazards have been identified and risks considered. The basement car park is managed by Regents Place and falls outside the scope of this risk assessment but any areas that would have a direct impact on Euston Tower that have been identified will form part of this document.

2.2 Layout of Report

This risk assessment follows the framework of PAS 79 which sets out the methodology for undertaking risk assessments. Although not a British Standard, it has been developed and published by the British Standards Institution, BSI. It was prepared with the support and encouragement of the Institution of Fire Engineers and the Northern Ireland Fire Safety Panel – we led the drafting of the guidance on fire risk assessment contained within the document.

PAS 79 is specifically aimed at ensuring that all necessary information relating to the fire risk assessment and its findings is recorded. The need to carry out a fire risk assessment and to document the significant findings from that assessment is fundamental to current fire law.

2.3 Building Information

Euston Tower consists of a basement, ground floor and 35 upper floors. There is an area on the penthouse level which could not be accessed. The building is primarily used as office space with tenanted shops on the ground floor. Management responsibility for these shops rests with the landlord Regents Place although the fire alarm is linked to Euston Tower fire alarm.

Plant rooms are located on the 12th floor, part of the 34th and all of the 35th floor levels. Other ancillary accommodation is provided in the basement area, which consists of the oil tank room, lift motor room, wet riser pump room, electrical intake, LV switch room, BT frame room & storage areas.

The basement car park area extends a significant distance horizontally and this is the owned by British Land but managed by Regents Place.

The building is served by 10 lifts in the central core, 5 high rise (Floors 20-34) & 5 low rise (Ground floor – 19). There are Evac/Fire fighting lifts in the East and West lobbies which serve the whole building.

There are four protected staircases utilised for escape purposes, these are the North, East, South and West, which all ultimately discharge directly into external areas outside the confines of the building. Each staircase is equipped with natural smoke vents at the head of the stairs, can be opened by the fireman's switch located in main reception if necessary to provide additional staircase ventilation in a fire situation.

The designated primary fire assembly point is located at Munster Square, off Laxton Place with alternative assembly points provided if required.

As stated earlier each stairwell is equipped with natural smoke vents, these being positioned at the head of each staircase enclosures. Additional, natural, manually-operated vents are provided within both the East & West fireman's lift lobbies. Furthermore, there is potential for additional venting of the staircases due to the fact that openable windows are provided at each floor level within each of the staircases.

Some areas on 36rd floor were inaccessible.

GENERAL INFORMATION

THE PREMISES

Number of floors:	38	
Approximate floor area:	1,150	m^2 per floor
	46,400	m^2 gross
	2,500	m^2 on ground floor *[enter units as appropriate]*

Brief details of building

Euston Tower is a high-rise building with a height of approximately 124 meters. The building is constructed with a steel frame and curtain walls. The building was built in the late 1960s and is made up of 4 wings which each have their own stairwell. The Ground Floor has an additional two stairs for escape.

Use of premises

The building is used as office space by different tenants:

Floors 1-19 HMRC

Floors 20 onwards have the following tenants

- Tom Tom
- T Systems Ltd
- ACAS
- Atkins
- Faithful & Gould
- Office Space in Town

Floors 12 & 35 are plant rooms only. 34th Floor combines office and plant space.

THE OCCUPANTS

Approximate maximum number:	5300 (see below)
Approximate number of employees at any one time:	2729 - 3373
Maximum number of members of public at any one time:	500 - 700
Associated times/hours of occupation:	Normal hours 0700-1900 Security 24/7

During the risk assessment the following numbers were provided to show the current occupancies per floor:

Floor	Numbers provided	Floor	Numbers provided
G	16	**19**	106
1	(300) Visitors	**20**	140
2	165	**21**	165
3	113	**22**	165
4	87	**23**	165
5	65	**24**	107
6	50	**25**	151
7	70	**26**	155
8	52	**27**	159
9	100	**28**	78
10	81	**29**	30

11	56	**30**	110
12	Plant	**31**	120
13	105	**32**	100
14	98	**33**	100
15	96	**34**	50
16	101	**35**	5
17	116	**Visitors (average)**	500
18	112	**Total**	3873

Yellow represents the floors where no occupancy figures were received. I have therefore presumed the maximum occupancy per floor. HMRC have approx. 300 visitors a day so this is presumed to be mainly on first floor. Floor 1 has zero occupancy as it's presumed that most HMRC visitors will go to this floor.

Some floors were undergoing refurbishments which means that the numbers of persons per floor were lower than normal.

Maximum occupancy for building

In order to provide a maximum operating figure for Euston Tower the following has been considered:

As the building was built in the 1960s it would have been designed for simultaneous evacuation. Tall buildings built today and over the last 20 years would have been built with phased evacuation in the design and would have been provided with the sprinkler protection throughout and compartmentation to achieve this aim. Without these in Euston Tower it is strongly recommended to simultaneously evacuate the building. The building is set up with staged simultaneous evacuation to reduce impact of false alarms.

Measurements for doors, stairs and final exits were taken using the methods of measurements in Appendix C from Approved document B (snapshot below).

Width

4. The width of:

a. a **door (or doorway)** is the clear width when the door is open (see Diagram C1);

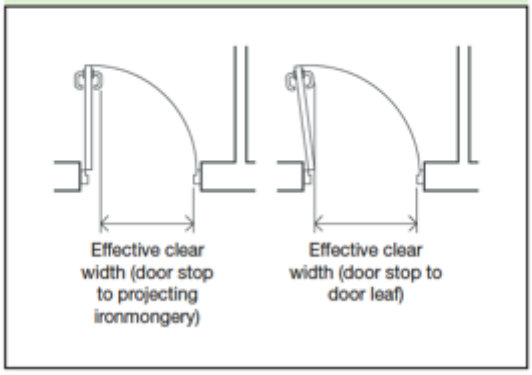
b. an **escape route** is the width at 1500mm above floor level when defined by walls or, elsewhere, the minimum width of passage available between any fixed obstructions;

c. a **stair** is the clear width between the walls or balustrades.

Note 1: In the case of escape routes and stairs, handrails and strings which do not intrude more than 100mm into these widths may be ignored (see Diagram C1).

Note 2: The rails used for guiding a stair-lift may be ignored when considering the width of a stair. However, it is important that the chair or carriage is able to be parked in a position that does not cause an obstruction to either the stair or landing.

Diagram C1 **Measurement of door width**



Stairwell	Door Width (mm)	Stair Width (mm)	Final Exit (mm)
South (Gold)	710	1130	1320
North (Black)	740	960	1320
East (Silver)	1020	1130	1320
West (Red)	1000	1120	1320

There is the potential to slightly increase the door width sizes by reconfiguring doors or doorstops but this would only slightly increase widths.

Maximum numbers of persons for simultaneous evacuation of a building

The following numbers are based on simultaneous evacuation (Table 7) of Approved document B using linear extrapolation:

Maximum number of persons served by a stair of 1100mm – 1540 persons

1540 persons x 3 stairwells = 4620 persons

Maximum number of persons served by a stair of 960mm (Stairs should be no smaller than 1000mm); so this calculation will be based on width of 1000mm = 1470

Therefore, maximum number of persons using 4 stairwells would be – **6090**

This number represents the maximum number of persons that can use the stairs in an emergency but additional factors need to be considered in determining a safe occupancy number:

- There are low ceilings in the stairwell (less than 2 meters in some areas), which will slow the safe egress time.
- Floor space factors. The table below shows the maximum number of persons based on floor space factors

Maximum Number of Persons based on Floor Space factors

Floor	Use	Available Floor space (m2)	Floor Space Factor (m2)	Maximum number of persons per floor
B	Plant/Storage			10
G	Offices/Circulation space	990	6	165
1	Office/Meeting rooms	1200	6 (office) & 1 (Meeting rooms)	300
2	Office	990	6	165
3	Office	990	6	165
4	Office	990	6	165
5	Office	990	6	165
6	Office	990	6	165
7	Office	990	6	165
8	Office	990	6	165
9	Office	990	6	165
10	Office	990	6	165
11	Office	990	6	165
12	Plant only			5
13	Office	990	6	165
14	Office	990	6	165
15	Office	990	6	165
16	Office	990	6	165
17	Office	990	6	165
18	Office	990	6	165

19	Office	990	6	165
20	Office	990	6	165
21	Office	990	6	165
22	Office	990	6	165
23	Office	990	6	165
24	Office	990	6	165
25	Office	990	6	165
26	Office	990	6	165
27	Office	990	6	165
28	Office	990	6	165
29	Office	990	6	165
30	Office	990	6	165
31	Office	990	6	165
32	Office	990	6	165
33	Office	990	6	165
34 (Office)	Office	500	6	83
34 (Plant)	Plant only			5
35	Plant/Engineers office			10
Total				**5693**

- Based on floor space factors alone the building could have 5693 persons occupying the building.
- Door widths including the discounting of the largest door would provide 230 persons but this is in excess of 165 persons allowed for floor space factors.
- Consideration is given to the size and use of the 1st floor and 2 additional escape routes from this area. The first floor has small offices and meeting rooms and a conference area and café/kitchen area. The conference area and restaurant would have a floor space factor of 1m2 per person therefore it would be reasonable to expect there to be in excess of 165 people on this floor. The conference room holds 100 persons, the restaurant if at full capacity could hold approximately 100 people and allowing for additional meeting rooms and offices a capacity of 300 would be reasonable for this floor given use and additional 2 escape stairs. If the two stand-alone stairs for the first floor were used as primary escape routes then this would ease the numbers of persons in main stairwells.

Therefore based on the figures on the methodology above I would recommend the following occupancy figures for the building:

- No more than **165 people per floor** (office) excluding first floor.
- Maximum capacity in the building of **5300 persons**. This includes 300 persons on First floor.

OCCUPANTS ESPECIALLY AT RISK FROM FIRE

Sleeping occupants: None

Disabled occupants: All occupiers provide building management with PEEPs of staff that require evacuation by lift. At present there was 120 PEEPs in place. A recent drill was carried out and all person were evacuated within 35 minutes. Regular monitoring of PEEPs will allow building management to plan and prepare for mobility impaired evacuation. It is the responsibility of the occupier to inform the building manager and this would affect the evacuation plan. These should be reviewed every 3 months.

Occupants in remote areas and lone workers: Lone worker procedure in place but no procedure verified. Lone workers will have radios.

Young persons: None

Others:

n/a

FIRE LOSS EXPERIENCE

No recent fire loss.

Fire Risk Assessments provided from other occupants

- Regents Place Estate, Fire Con, 09/06/2014
- Faithful & Gould covering floors 24 to 31, 30/10/2014
- Tom Tom, February 2012
- T Systems, 17/09/09

I would recommend that this risk assessment be shared with other occupants.

2.4 Legislation

The Regulatory Reform (Fire Safety) Order 2005

A review of fire safety law in the UK was undertaken using the mechanism of regulatory reform, introduced under the Regulatory Reform Act 2001. This provided a new flexible statutory system with the capability to reform existing primary and subsidiary law through regulatory reform orders.

The outcome was the Regulatory Reform (Fire Safety) Order 2005: Statutory Instrument 2005 No 1541. The Fire Safety Order was passed by Parliament on 7 June 2005 and came into force in England and Wales on 1 October 2006. Similar provisions in Northern Ireland and Scotland have extended this form of regime to all parts of the UK.

When introduced, it was stated that the Fire Safety Order would maintain the protection afforded to users of premises by existing legislation, and reduce difficulties by:

- So far as possible creating one simple fire safety regime applying to all workplaces and other non-domestic premises;
- Introducing a regime that is risk assessment-based with responsibility for the fire safety of the occupants of premises and people who might be affected;
- Ensuring that compliance for fire safety rests with a defined responsible person;
- Avoiding separate formal validation mechanisms for higher-risk premises (fire authorities are to base their inspection programs on their assessment of which premises they consider present the highest risk);
- Adding a duty to maintain those fire precautions required under the building regulations and other similar legislation, which are for the use and protection of the fire service; and
- Providing fire authorities with powers of entry for fire investigation and to obtain samples for testing.

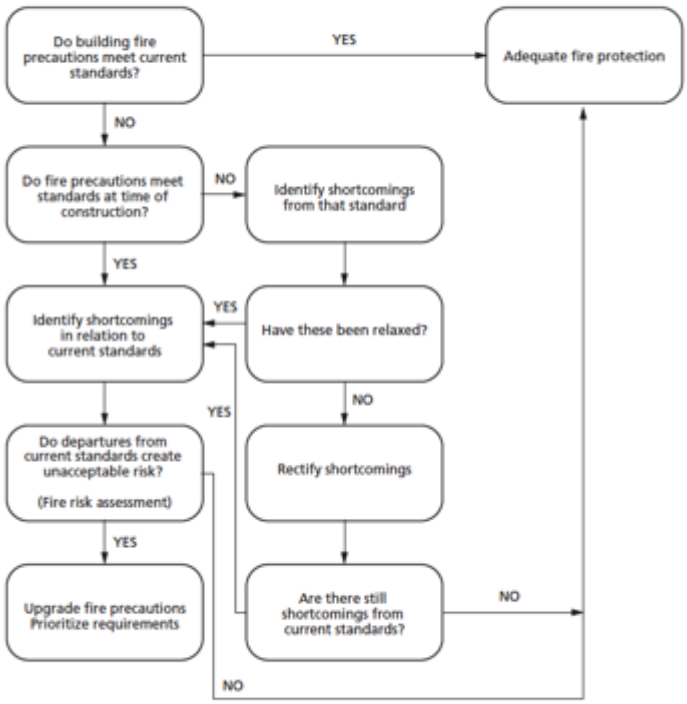
3. Methodology

The fire risk assessment is a bespoke risk assessment looking at the life risk within Euston Tower as well as making recommendations for property protection. The risk assessment is a qualitative risk assessment that uses the sections of PAS 79 but expands on this to create a bespoke holistic fire safety report.

The diagram below is a snapshot taken from PAS 79:2012 and shows the decision tree which should be followed when assessing buildings that do not comply with current standards and will be used to make decisions on risk and subsequent actions.

PAS 79:2012

Figure 2 – Decision Tree for action plan when existing premises do not comply with current standards



PAS 79: Fire risk assessment; Guidance and recommended methodology was prepared with support and encouragement by the Institute of Fire Engineers and the following organizations were consulted in the development of PAS 79:

- Association of Building Engineers (ABE)
- British Approvals for Fire Equipment (BAFE)
- British Broadcasting Corporation (BBC)

- Chief Fire Officers' Association (CFOA)
- Fire Industry Association (FIA)
- Fire Protection Association (FPA)
- Institution of Fire Engineers (IFE)
- Institute of Fire Prevention Officers (IFPO)
- Institute of Fire Safety Managers (IFSM)
- Northern Ireland Fire Safety Panel
- Odeon Cinemas Limited.

As stated within PAS 79, "there is no single perfect method of risk assessment", however for the purposes of this risk assessment PAS 79 provides a basic foundation for the risk assessment to be based on. Where necessary in the document areas of non compliances are justified using an the authors knowledge and experience.

4. Fire Risk Assessment

REGULATORY REFORM (FIRE SAFETY) ORDER 2005
FIRE RISK ASSESSMENT

Responsible person (e.g. employer) or person having control of the premises:	[redacted]
Address of premises:	Euston Tower, 286 Euston Road, London
Assessor:	Christopher Stone BA (Hons), MPA, MIFSM, MIFPO
Date of fire risk assessment:	09/12/2015
Date of previous fire risk assessment:	21/01/2015
Suggested date for review: [1]	December 2016

The purpose of this report is to provide an assessment of the risk to life from fire in these premises, and, where appropriate, to make recommendations to ensure compliance with fire safety legislation..

[Date] 09/12/2015

[1] The original fire risk assessment should be reviewed again by a competent person by the date indicated above or at such earlier time as there is reason to suspect that it is no longer valid or if there has been a significant change in the matters to which it relates, or if a fire occurs.

Responsible Person

The extract below is taken from Article 3 of The Regulatory Reform (Fire Safety) Order 2005 (RRFSO):

Meaning of "responsible person"

3. In this Order "responsible person" means—

(a) in relation to a workplace, the employer, if the workplace is to any extent under his control;

(b) in relation to any premises not falling within paragraph (a)—

(i) the person who has control of the premises (as occupier or otherwise) in connection with the carrying on by him of a trade, business or other undertaking (for profit or not); or

(ii) the owner, where the person in control of the premises does not have control in connection with the carrying on by that person of a trade, business or other undertaking.

Euston Tower has a number of Responsible Persons, these being:

[redacted]d;

- [redacted]
- [redacted]
- [redacted]
- [redacted]
- [redacted]

There are also a number of 'quasi' responsible persons or duty holders who have responsibility under The Regulatory Reform (Fire Safety) Order 2005 (RRFSO). These are:

- Engineering Team
- Cleaners
- Security
- Catering

In buildings where there is shared responsibility it is essential that cooperation and coordination is carried out between all Responsible Persons and where necessary duty holders to ensure compliance with legislation. Article 22 of the RRFSO states the following:

Co-operation and co-ordination

22.—(1) Where two or more responsible persons share, or have duties in respect of, premises (whether on a temporary or a permanent basis) each such person must—

(a) co-operate with the other responsible person concerned so far as is necessary to enable them to comply with the requirements and prohibitions imposed on them by or under this Order;

(b) (taking into account the nature of his activities) take all reasonable steps to co-ordinate the measures he takes to comply with the requirements and prohibitions imposed on him by or under this Order with the measures the other responsible persons are taking to comply with the requirements and prohibitions imposed on them by or under this Order; and

(c) take all reasonable steps to inform the other responsible persons concerned of the risks to relevant persons arising out of or in connection with the conduct by him of his undertaking.

(2) Where two or more responsible persons share premises (whether on a temporary or a permanent basis) where an explosive atmosphere may occur, the responsible person who has overall responsibility for the premises must co-ordinate the implementation of all the measures required by this Part to be taken to protect relevant persons from any risk from the explosive atmosphere.

4.1 Electrical Sources of Ignition

Reasonable measures taken to prevent fires of electrical origin?		**Yes**	☒	No
More specifically:				
Fixed installation periodically inspected and tested?	☒	**Yes**		No
Portable appliance testing (where appropriate) carried out?	☒	**Yes**		No
Suitable policy regarding the use of personal electrical appliances?	☒	**Yes**		No
Suitable limitation of trailing leads and adapters?		**Yes**	☒	No

Comments and Hazards Observed

The 5-year fixed wiring test carried out on 14th July 2015 by Phs compliance and showed a few remedials were outstanding. These are on track record and in progress.

In the basement electrical room there has previously been some water ingress but an interim measure is in place to contain and divert any potential water into this area. A long term solution is proposed for Feb/March on the LV which will allow the action to be closed down.

There are interim measures in place – contains and diverts so if fine.

There was daisy chaining of extension leads in the engineering office. The leads and adaptors in engineering office should be reviewed and electrical appliances either removed or additional sockets installed.

PAT testing is carried out on a periodic basis. There were some items in the building management office which haven't been PAT tested since 2009 - 2013 and these should be checked to confirm they are safe to use.

Due to the time of year this assessment has been undertaken there are Christmas decorations including Christmas lights on display. On a sample the lights haven't been PAT tested. Ensure Christmas lights are PAT tested and sockets are not overloaded. The following recommendations are made:

- Check Christmas lights conform to the British Standard
- Decorations can burn easily. Make sure they are kept away from lights and heaters
- Switch off Christmas lights at the end of the day
- Don't overload sockets.

4.2 Smoking

Reasonable measures taken to prevent fires as a result of smoking?		☒ **Yes**	No
More specifically:			
Smoking prohibited on the premises?		☒ **Yes**	No
Smoking prohibited in appropriate areas?	☒ **N/A**	Yes	No
Suitable arrangements for those who wish to smoke?		☒ **Yes**	No
This policy appeared to be observed at time of inspection?		☒ **Yes**	No

Comments and Hazards Observed

The building operates a no smoking policy throughout and this appeared observed during the fire risk assessment.

4.3 Arson

Does basic security against arson by outsiders appear reasonable?[2]	☒ **Yes**	**No**
Is there an absence of unnecessary fire load in close proximity to the premises or available for ignition by outsiders?	☒ Yes	**No**

Comments and Hazards Observed

There is security on site 24/7 and there was no fire loading around the building.

[2] Reasonable only in the context of this fire risk assessment. If specific advice on security (including security against arson) is required, the advice of a security specialist should be obtained.

4.4 Portable Heaters and Heating Installations

Is the use of portable heaters avoided as far as practicable?			Yes	☒	**No**
If portable heaters are used:					
Is the use of the more hazardous type (e.g. radiant bar fires or lpg appliances) avoided?	N/A	☒	**Yes**		No
Are suitable measures taken to minimize the hazard of ignition of combustible materials?	**N/A**		**Yes**	☒	**No**
Are fixed heating installations subject to regular maintenance?	**N/A**		**Yes**	☒	**? No**

Comments and Hazards Observed

Addler and Allan test the oil tanks and Salisbury Engineers test the boilers. I was informed that there were no outstanding remedial actions.

I was informed that the boiler would shut off on 2nd knock of the fire alarm and automatic shut off switches are provided.

The floor in the basement around the fuel rooms has become coated with diesel which has soaked into the concrete over a substantial period of time. It is hard to predict the effect that this could have in a fire situation but it would be expected that over time vapor would be created from the heating up of floor. As there is an L1 fire alarm system and if the foam inlet is confirmed as operational then it is likely that the fire service will attend in the early stages and flood the fuel storage areas with foam eliminating this risk. It is important to ensure that the bund in fuel storage areas is fully intact and further leaks don't occur.

There is an oil tank in the 35th floor plant room. This appeared well maintained with no build up of vapour within the room.

The fuel store areas had suitable signage and spill kits nearby. There were granules on the floor moping up leaks from the tank. An override was fitted on the outside of the room.

There were a number of portable heaters in the building. Consideration should be given to replacing these with oil or water based systems to reduce the risk.

There were electric heaters in the rear offices on floor 35. I would recommend that these be removed if feasible and replaced with a water or oil based system.

Confirm that electric heaters in the building have been cleaned and serviced.

There are fixed electric heaters in the foyer area with no combustibles nearby. Confirmation is required that these are cleaned and maintained.

4.5 Cooking

Are reasonable measures taken to prevent fires as a result of cooking?	N/A	☒	Yes	**No**
More specifically:				
Filters changed and ductwork cleaned regularly?	N/A	☒	Yes	**No**
Suitable extinguishing appliances available?	N/A	☒	**Yes**	No

Comments and Hazards Observed

The main kitchen in the building is located on the 1st floor. There is no fire separation between the kitchen and seating area but the restaurant area as a whole is separate from the rest of the building as a single compartment.

There is an office which is an inner room off the kitchen but this is generally left open and used infrequently. In addition there is detection in the access room which make this an acceptable risk.

The first floor is covered by a sprinkler system, which covers the kitchen area.

There is a wet chemical and Co2 extinguisher and a fire blanket provided which have been serviced within the last year.

The vents are cleaned weekly and a deep clean is done annually.

The kitchen is run on electricity only with no gas.

There is a small kitchen/tea point on all floors of the HMRC areas. These are low risk and contain microwaves, toasters and kettles.

4.6 Lightning

Do the premises have a lightning protection system?	N/A	☒	**Yes**	No

Comments and Hazards Observed

The building is provided with a lightning protection system, which is serviced periodically. I was informed the remedials had been completed which were identified on the last servicing report.

4.7 Housekeeping

Is the standard of housekeeping adequate?			Yes	☒ **No**
More specifically:				
Combustible materials appear to be separated from ignition sources?			Yes	☒ **No**
Avoidance of unnecessary accumulation of combustible materials or waste?			Yes	☒ **No**
Appropriate storage of hazardous materials?	N/A		Yes	☒ **No**
Avoidance of inappropriate storage of combustible materials?			Yes	☒ **No**

Comments and Hazards Observed

The housekeeping in the basement records store should be improved to reduce the chance of a small fire developing into a large fire.

There is a significant amount of storage in the 12th floor plant rooms. Other plant rooms are kept sterile. It is recommended that all combustible materials in the 12th floor plant room should be removed and plant rooms kept clear of combustibles.

The combustibles/paper next to the microwave and toaster in the engineering office kitchen should be removed and the area around kept clear.

There were combustibles in the fire pump room which should be removed.

4.8 Hazards Introduced by Outside Contractors and Building Works

Are fire safety conditions imposed on outside contractors?	N/A	☒	**Yes**	No
Is there satisfactory control over works carried out on the premises by outside contractors (including "hot work" permits)?	N/A	☒	**Yes**	No
If there are in-house maintenance personnel, are suitable precautions taken during "hot work", including use of "hot work" permits?	N/A	☒	**Yes**	No

Comments and Hazards Observed

All contractors are subject to a strictly enforced contractors procedure. No access can be gained in the building without going through security and then signing in with building management. Noland also have a separate permit to work system including hot works.

As part of the hot work permit security are responsible for doing a fire watch to ensure there are no residual embers or signs of fire.

Contractors will have a radio as lone workers and all have passes.

4.9 Dangerous Substances

Are the general fire precautions adequate to address the hazards associated with dangerous substances used or stored within the premises?	☒ N/A	**Yes**	No
If the above applies, has a specific risk assessment been carried out, as required by the Dangerous Substances and Explosive Atmospheres Regulations 2002?	☒ N/A	Yes	**No**

Comments and Hazards Observed

There are no dangerous substances in the building. A COSHH assessment should be carried out to cover relevant substances.

4.10 Other Significant Fire Hazards That Warrant Consideration Including Process Hazards That Impact On General Fire Precautions

Comments and Hazards Observed

None. Any dangerous substances in tenanted areas should be covered by their risk assessment.

Summary of Hazards

None

4.11 Means of Escape from Fire

It is considered that the premises are provided with reasonable means of escape in case of fire		☒	Yes		**No**
More specifically:					
Adequate design of escape routes?		☒	Yes		**No**
Adequate provision of exits?		☒	**Yes**		No
Exits easily and immediately openable where necessary?			Yes	☒	**No**
Fire exits open in direction of escape where necessary?		☒	Yes		**No**
Avoidance of sliding or revolving doors as fire exits where necessary?	N/A	☒	**Yes**		No
Satisfactory means for securing exits?		☒	Yes		**No**
Reasonable distances of travel:	N/A	☒	Yes		**No**
Where there is a single direction of travel?	N/A	☒	Yes		**No**
Where there are alternative means of escape?	N/A	☒	Yes		**No**
Suitable protection of escape routes?	N/A	☒	Yes		**No**
Escape routes unobstructed?		☒	Yes		**No**
It is considered that the premises are provided with reasonable arrangements for means of escape for disabled people.	N/A	☒	**Yes**		No

Comments and Hazards Observed

There are 4 means of escape on all floors which lead into 4 separate stairwells. Each stairwell is lobbied and designed to provide at least 120-minute fire resistance between stairwell and floor. The 1st floor has an additional 2 escape stairs.

The West & East goods lifts have been converted into Evac/firefighting lifts. In the event of a building evacuation one goods lift will be used for evacuation and one would be kept

available for firefighter use. These lifts are contained within their own protected lobbies and the lobbies act of refuge areas for persons required to use the evac lift.

The lift lobby space is small and would accommodate 3 persons maximum per lobby. If there were more than 3 wheelchair uses per floor then it would be difficult to accommodate these additional persons. Therefore in order to ensure the safety of disabled persons regular and accurate records of Personal Emergency Evacuation Plans (PEEPS) should be carried out. The records in the building managers office identified 120 persons who require the use of a lift. PEEPs should be reviewed on a 3 monthly basis to help building management plan and prepare for evacuations.

The height of the ceiling in the stairs is in some areas less than 2 metres. This could lead to a delay in evacuation times but are clearly marked with a foam covering on the edges of walls. The occupancy numbers at start of this risk assessment made some reduction in occupancy numbers as a result of ceiling height.

There is some carpet in lift lobbies. Confirm that this has been treated with fire resistant treatment to achieve the required class protection. This should include the adhesive used. Whilst some carpet on some floors doesn't present a high risk it is advised to remove and have sterile lobbies and stairwells. Tenants should address the risk of carpeted areas in their risk assessment but it is important that this considers not only the material but also the adhesive used.

There are large draughts and pressure build-ups throughout the building which could have an impact on smoke spread. The recent improvements to fire doors and compartmentation will help better protect the means of escape.

The loading bay is occupied by a member of security. The loading bay is openable via a key which security have on them and there are 2 escape routes from the lobby area to the loafing bay which is deemed an acceptable risk.

Green override switches are provide on escape routes which are fitted with electro-magnetic hold devices.

The fire shutters that were in place on the first floor have been removed as they are not required. Fire shutters in basement are retained and serviced periodically.

The exit door to floor 19-west stairwell was stuck during this assessment. This has been logged and alternative escape routes were available within travel distance limits.

On the first floor there is a dead end corridor from room 1.22 of approximately 20 meters which is deemed satisfactory due to the area being covered by an L1 fire alarm, sprinklers and high ceiling.

Building Works and the impact on the means of escape.

The building was built in the late 1960s and opened in 1970. At this time most offices would not have been open plan. The current floor configuration for higher floors is open plan office space. Floors 1-19 doesn't appear to have changed much since the building was first designed although no plans were seen of the building on its first inception. Floors 20 + are generally open plan with no lift lobby protection. Therefore a fire on any of these floors could potentially spread into the lift shaft and travel through the building. With the draughts and pressures the smoke would then by spread into the open plan offices above with little to no smoke protection. The oldest plans I could see were from fire certificate drawings in 1996 and these had most of these higher floors with some form of lift lobby protection although some floors were open plan. With the building operating on two staged simultaneous evacuation as long as the numbers of disabled persons per floor is low then most people can reach safe areas within travel distance limits quite quickly. However if possible confirmation should be sought that the changes to these floors went through building control. Although the risk to life is low an argument could be made that the building has been altered and compartmentation worsened as the lifts provide no smoke protection and little fire protection that the risk to firefighters is increased. This includes the recent addition of a stair between the 33rd and 34th floor. Confirmation is required that building control has been notified and confirm compartmentation has not been made worse.

Accurate floor plans are essential for the fire service and should be retained at security with all building risk information.

Confirm the process in place for alterations in the building involves contacting a local building inspector or AI to comply with building regulations to reduce the chance of compartmentation becoming worsened in future.

I was informed that the doors from outside the podium will open on fire alarm activation therefore the window cleaners could escape once they have descended. A management procedure should be considered to contact window cleaners via radios to confirm doors have opened.

The fire doors in the basement are constantly wedged by cardboard and are not closed after being opened. The half leave at the side of the door and a half are always open and would not be adequate in a fire situation. A self closer should be put onto the half leave door and consider fitting hold open devices to allow the doors to be open but that are linked to the fire alarm so would close on activation of the fire alarm.

Some of this assessment was conducted after 17:00 when the cleaners start their shift. The cleaners put all the bags of rubbish into the lift lobbies and these block the means of escape for any persons working past 17:00 and make the refuge point unavailable which has a significant impact on the buildings fire strategy. No rubbish should be stored on means of escape and a new procedure discussed and implemented to prevent a reoccurrence.

4.12 Measure to Limit Fire Spread and Development

It is considered that there is:

Compartmentation of a reasonable standard[3]		☒ Yes	**No**
Reasonable limitation of linings that might promote fire spread [2,4]		☒ **Yes**	No
As far as can reasonably be ascertained, fire dampers are provided as necessary to protect critical means of escape against passage of fire, smoke and combustion products in the early stages of a fire?	N/A	☒ Yes	**No**

Comments and Hazards Observed

The building has recently undergone a large compartmentation project which has improved the compartmentation throughout. A full survey has been carried out and breaches infilled with suitable fire stopping in line with the fire strategy requirements.

There are some areas which still require some improvements including the removal of foam and replacement with a suitable intumescing material. There are also some door which require intumescent strips and cold smoke seals added or replaced. These are to be completed as part of the project which should be finished before the end of December.

Good compartmentation is essential for a building of Euston Towers size and complexity and combined with an L1 voice fire alarm improves the safety to persons in the building. Regular checks of compartmentation should be carried out to ensure all compartmentation on completion of this project is maintained. A permit to work which involves any work on fire walls should be checked afterwards to make the fire stopping has been replaced to the same standard.

<u>Lifts, lift lobbies and compartmentation in building</u>

The lifts on the HMRC floors 1-19 (except 12th floor) are all provided with lift lobbies made up of fire doors which provide protection against the travel of smoke and fire through the central lifts.

[3] Based on visual inspection of readily accessible areas, with a degree of sampling where appropriate.

[4] A full investigation of the design of HVAC systems is outside the scope of this fire risk assessment.

There are no lift lobbies on most floors above floor 19. The lifts don't provide any smoke protection and a fire on any floor without the lobbies will potentially enter the lift shaft and spread throughout the building. Lift lobbies are recommended to stop the spread of fire and smoke but within the scope of this risk assessment is seen as a property protection feature as long as all other actions are completed. There is the potential that Local Authority fire safety officers could insist on their reinstatement to provide compartmentation between floors.

There are green override buttons to allow entry into the main offices if a fire alarm activated as people enter the lift lobby.

Fire Shutters

There are fire shutters provided to the basement doors. These were part of the original building design under Section 20 of the London Act and are being maintained to ensure compliance. A door with a large vent was recently replaced to restrict the movement of smoke through the basement and into the building.

A sprinkler system is installed in the lower floors which will provide some protection to reduce the spread of fire but this is only on the basement to 2nd floor.

Fire doors

Regular fire door checks should be carried out to ensure doors are closing fully and should have:

- Three hinges;
- Intumescent trips and cold smoke seals;
- Self closers;
- Pyro glazing (where applicable)
- No gaps should be excess of 4mm around the sides and 10mm at the base of the door;

The fire strategy shows which doors should be fire doors and each door should be fitted with a fire door keep shut sign.

There are a number of self closers in the building which need replaced as they are not able to fully close the fire doors. Regular maintenance checks will identify these doors and the self closers should be repaired or replaced.

The building is partially fitted with sprinklers to the basement, ground and first floor. Whilst it is recommended that sprinklers be provided throughout the cost is potentially prohibitive therefore it is essential that good compartmentation is maintained.

4.13 Emergency Escape Lighting

Reasonable standard of emergency escape lighting system provided?[5]	N/A	☒	Yes	**No**

Comments and Hazards Observed

The emergency lighting appeared of a reasonable standard and coverage through the premises.

[5] Based on visual inspection, but no test of illuminance levels or verification of full compliance with relevant British Standards carried out.

4.14 Fire Safety Signs and Notices

Reasonable standard of fire safety signs and notices? N/A Yes ☒ **No**

Comments and Hazards Observed

Overall the escape signage throughout the building was to a good standard however the following were noted and need actioned:

The signage on the 34th floor with no running man signage should either by replaced or supplemented with a running man. Some signage is also peeling away from the wall and needs replaced.

Additional escape directional signage should be provided throughout the plant room areas.

Running man escape signage required alongside existing signage in basement.

Signage in basement is peeling off the walls and needs replaced or reapplied.

Additional signage required on West Stairwell GF

Signage was peeling of the walls and should be refixed.

Do not use lift in event of fire signage should be provided to central core lifts.

4.15 Means of Giving Warning In Case of Fire

Reasonable manually operated electrical fire alarm system provided?[6]	N/A	☒	Yes	**No**
Automatic fire detection provided?	**Yes** (throughout premises)	☒	Yes (part of premises only)	No
Extent of automatic fire detection generally appropriate for the occupancy and fire risk?	N/A	☒	Yes	**No**
Remote transmission of alarm signals?	N/A	☒	Yes	**No**

Comments and Hazards Observed

The current fire alarm system is an L1 voice fire alarm system which was installed in 2012. Provision of an L1 fire alarm system is a significant enhancement to what would have been originally installed when the building was first built.

There is a VESDA system on the ground floor covering the room off the foyer.

There are a number of rooms in the plant rooms which are inner rooms. As the building has an L1 fire alarm system there is detection within the access rooms. There us a washroom on 34th floor and confirmation should be gained of the fire audibility if someone were to be using the shower or consider additional beacons for early warning.

Machinery in Boiler room had a sound level of 87dB. Confirm that fire alarm can be heard or beacons seen from this area.

The risers which contain only cables don't have any detection within them. However on the 14th floor there is a DB board so detection should be provided. No access was available so confirmation is required that a detector has been installed.

The detection in some risers is not mounted correctly. Wall mounted detectors should be sited such that the top of the detection element is between 150mm and 300mm below the ceiling, and the bottom of the detection element is above the level of the door opening. As the compartmentation in the risers was good and the doors are fitted with intumescent strip

[6] Based on visual inspection, but no audibility tests or verification of full compliance with relevant British Standard carried out.

and cold smoke seals this should not result in a delay to the fire alarm and is considered acceptable.

The detection in the basement is not at the highest point which could lead to a delay in detection of a fire.

There was a detector head covered in the fire pump room. The building management were aware of this issue and an action was in place to rectify issue. There was another detector nearby.

I was not able to confirm if there was void detection above ceilings. The ground floor ceiling void in places appeared above 800mm so confirmation should be sought that there is void detection.

The Fire Alarm panel was showing 3 faults. These should be investigated and repaired as soon as practicable. It is important that anytime a detector is at fault or becomes disabled the building management is informed so that can carry out a risk assessment to see if interim measures are required.

The redundant microphones in the GF stairwells and redundant systems in security should be removed.

4.16 Manual Fire Extinguishing Appliances

Reasonable provision of portable fire extinguishers?		N/A	☒	**Yes**		No
Hose reels provided?	☒	N/A		**Yes**		No
Are all fire extinguishing appliances readily accessible?		N/A		Yes	☒	**No**

Comments and Hazards Observed

There was good coverage of extinguishers throughout the building with CO2 and water extinguishers. The plant rooms mainly have a CO2 and powder extinguishers.

Some extinguishers in plant rooms were missing from their bracket. The extinguishers should be kept on brackets and reported if they are missing to be replaced.

Water extinguishers in plant rooms should be removed and replaced by Powder extinguishers.

Combination of Powder/Foam & CO2 extinguishers in basement.

Remove all extinguishers from electrical intake room except for CO2 extinguishers.

The foam extinguisher in the loading bay had not been serviced since 09/13. This should be serviced in line with other extinguisher extinguishers on an annual basis.

There was foam, water and co2 extinguishers next to S.E plant which is excessive but worth retaining for additional coverage for that floor.

Remove the water extinguisher next to the chiller room.

The extinguisher and bracket were missing from the wall outside R13.4 and should be found and reinstalled.

4.17 Relevant Automatic Fire Extinguishing Systems

Type of System

Boiler Room Suppression

Sprinkler System

Wet Riser

Comments and Hazards Observed

Boiler Room Suppression

There is a suppression system fitted in the boiler room which operates by a fusible link. There is an automatic activation switch for the suppression and there is also a handle which can be operated from the office area on floor 34. There is a shut off switch for the boiler room.

Sprinkler System

The sprinkler system covers parts of the basement, ground and first floor in the building but there is not 100% coverage. There is an external sprinkler tank room which is part of the Regents Place.

I wasn't able to find the hazard type for the sprinkler system but offices would normally be OH3. All the bulbs appeared red which would operate around 68C (155F).

Wet Riser

The straps to the wet risers are not suitably fixed as most can easily be removed. A review of all straps should be carried out and they should be secured to prevent people maliciously opening the risers. Signage should also be reviewed and a wet riser sign provided at all points.

4.18 Other Relevant Fixed Systems and Equipment

Type of System

Foam Inlet

Smoke vents

Suitable provision of fire-fighters switch(es) for high voltage luminous tube signs, etc.	☒	**N/A**	Yes	No

Comments and Hazards Observed

N/A

Summary of Hazards

<u>Foam Inlet</u>

There is a foam inlet on the ground floor which appears to cover the fuel storage areas in the basement. Confirmation should be sought that this is still fully functional, details on coverage with plans showing inlet/outlets and also arrangements made to ensure that regular serving is carried out and the fire service are aware of this facility and the location of fuel in basement.

<u>Smoke Vents</u>

There are smoke vents at the top of each stairwell for fire service use via the fireman's switch in reception.

There are hand operated smoke vents throughout the building which need maintained. These include smoke vents on each floor in both the east and west goods lobbies. There are a number of remedial actions outstanding for these but are in the process.

There are firefighter windows to remove smoke on all the upper floors and in plant rooms which should be opened and maintained on a regular basis and a record kept of the servicing.

There are smoke vents in basement. Some are open grill therefore smoke would naturally vent out of these and there are other breakable vents for the fire service including glass and solid slabs which can be broken to allow the escape of smoke. Some of these vents are within the Euston Tower demise itself including the glass basement vents above the BT Frame Room.

The snapshot is taken from the fire risk assessment carried out by Broadgate Estates on behalf of British Land to how they have deemed the smoke ventilation in the basement adequate.

FireCon™ Fire Risk Assessment

Topic Area	The Prevention of the Spread of Fire and Smoke.					
Item	**Smoke control/management systems.**					
No.	**Risk Level**	**Result**	**Responsibility**	**Control Description**	**Comments**	**Person in Danger**	**Image Ref**
	2	A	Owner/Manager	Smoke ventilation systems are in place to control and manage the spread of smoke within the building.	Documented evidence provided during the documentation review confirmed that the Smoke ventilation and dual fan systems installed at the premises are subject to servicing as part of the Planned Preventative Maintenance regime, which is managed by Cofely.	Employees, Tenants, Contractors, Visitors, Public	
	2	A	Owner/Manager	The covered car park has adequate mechanical ventilation	The basement car parking areas for example, have a mechanical extract system installed as appropriate. This is maintained by Cofely as part of the PPM programme.	Employees, Tenants, Contractors, Visitors, Public	
	2	A	Owner/Manager	The covered car park has adequate natural ventilation	The car park has also been provided with natural ventilation which appeared to be suitable and sufficient.	Employees, Tenants, Contractors, Visitors, Public	

The smoke vent switches on the first floor to the smoke vents, which were sealed in collaboration with the fire service, should be blanked off to remove any confusion. The fire strategy confirms that they are not required.

4.19 Procedures and Arrangements

Fire Safety is managed by[7]:

Suzanne Floyd – Building (Facilities) Manager for Salisbury
HMRC – Pam Witter has just taken over with fire safety as part of her remit. The Incident Control Officer (ICO) in a fire situation would take control (HMRC only).
Tenant Floors – To be confirmed.
Security will take control of the evacuation in the event of a fire alarm.

Competent person(s) appointed to assist in undertaking the preventive and protective measures (i.e. relevant general fire precautions)?	N/A	☒ Yes	**No**

Comments

The tenant evacuation manual expects a minimum of 5/6 fire marshals per floor and a minimum of 1 fire leader per floor. It is recommended that a list be obtained from each floor to identify the numbers of fire marshals/leaders and training received and training arranged. As Euston Tower has protracted evacuation times owing to height and numbers of people it is essential that there is good management of the building evacuation with a key element being fire warden training. Training should include the use of extinguishers, as there is a requirement for some designated persons to receive extinguisher training.

There are some areas which are not occupied by permanent members of staff (1st & 2nd floor) and a procedure for checking these floors in an emergency should be discussed and agreed to ensure that all persons are accounted for.

Is there a suitable record of the fire safety arrangements?	N/A	☒ Yes	**No**

Comments

There is fire safety information contained within the following documents on site:

- Clients Handbook
- Contractor information Pack

[7] This is not intended to represent a legal interpretation of responsibility, but merely reflects the managerial arrangement in place at the time of this risk assessment.

- Tenant evacuation manual
- Fire Emergency Plan
- Crisis Management plan
- Fire Strategy (completed 2015)

These should be reviewed on a regular basis.

A fire strategy is in place for the building detailing the passive and active fire safety systems in the building and provides a holistic approach to a tall building which was built in the 1960s.

I recommend that an overarching fire policy should be in place for the company. I was informed that this is in the process of being produced.

The information below is taken from PAS 7 (Fire Risk Management System) and provides a guide on what is required:

Top management shall establish a fire safety policy that:

a) is appropriate to the purpose of the organization;

b) provides a framework for setting fire safety objectives;

c) includes a commitment to satisfy applicable requirements; and

d) includes a commitment to continual improvement of the Fire Risk Management System.

The fire safety policy shall:

a) be available as documented information;

b) be communicated and understood throughout the organization;

c) be available to interested parties, as appropriate.

The organization shall review the fire safety policy at planned intervals.

A person authorized by top management shall sign and authorize the fire safety policy.

Appropriate fire procedures in place? N/A ☒ Yes **No**

More specifically:

Are procedures in the event of fire appropriate and properly documented?	N/A	☒	Yes	**No**
Are there suitable arrangements for summoning the fire and rescue service?	N/A	☒	Yes	**No**
Remote transmission of alarm signals?	N/A	☒	Yes	**No**
Are there suitable arrangements to meet the fire and rescue service on arrival and provide relevant information, including that relating to hazards to fire-fighters?	N/A	☒	Yes	**No**
Are there suitable arrangements for ensuring that the premises have been evacuated?	N/A	☒	Yes	**No**
Is there a suitable fire assembly point(s)?	N/A	☒	**Yes**	No
Are there adequate procedures for evacuation of any disabled people who are likely to be present?	**N/A**	☒	Yes	No

Comments

The building evacuation procedures are detailed within the tenant's evacuation manual and in the emergency response plan.

The building operates a two-staged simultaneous evacuation procedure (as shown in figure below), which reduces the impact of false alarms whilst ensuring that the building is evacuated on a double knock.

12.3 Total evacuation

12.3.1 Simultaneous evacuation

NOTE Recommendations for widths of escape stairs for simultaneous evacuation are given in 18.4.2.

Simultaneous evacuation is a common approach adopted in premises where it would be unreasonable to expect the occupants to remain in an affected area for a prolonged time when there is a fire. This takes into account not only the physical effects of the fire, but the psychological response of occupants confronted by an outbreak of fire.

There are two categories of simultaneous evacuation.

a) *Single-staged evacuation*
In a single-staged evacuation, the activation of a call point or detector gives an instantaneous warning from all fire alarm sounders for an immediate evacuation.

b) *Two-staged evacuation*
In a two-staged evacuation, there is an investigation period (or grace period) before the fire alarm sounders are activated. A typical sequence of events for two-staged evacuation is as follows.

1) Initially a coded staff alert is given.
2) There is then an investigation period (or grace period).
3) The evacuation signal is broadcast:
   - if a fire is confirmed; or
   - if an agreed investigation period lapses without the alarm being cancelled; or
   - if a second detector is activated, "break glass" operated or sprinkler flow switch operated during the investigation period.

This is detailed in full including the buildings cause and effect in the tenant evacuation manual. There is a 10-minute delay in the event of a single knock. The use of two-staged simultaneous evacuation and a 10-minute investigation period is identified as being appropriate for the risk in the building and the building compartmentation and fire alarm. The building has an L1 fire alarm system and 90-120 minutes fire resistance to lobbies and stairs and therefore this evacuation procedure is identified as adequate from a risk assessment perspective taking into account the following:

- Occupancy Numbers in building
- Age of building
- Design of building
- Fire Alarm system (Voice Alarm)

As previously stated the building when designed was probably designed on simultaneous evacuation. Buildings designed today and over the last 20 years would be designed as phased evacuation to reduce disruption to occupants for false alarms and also allows for larger numbers of people with smaller stairwells. Buildings that adopt phased evacuation are fitted with sprinkler systems, good compartmentation and smoke control throughout the

building. As the building only has sprinkler control in parts of the basement, ground and first floor then I would recommend that phased evacuation is not used.

As the building has a voice alarm installed this provides an additional benefit in an evacuation. The effectiveness of the AFD will be greatly enhanced as the alarm signal is given through a voice alarm system. A research project undertaken by the Building Research Establishment (BRE) proved the effectiveness of this measure in comparison to the traditional bell alarm. This looked at the percentage of people who instantly responded to different types of alarm signals. The results are shown below:

Type of Alarm Signal	Percentage of Immediate Response
Alarm Bells	13%
Text Messages	45-55%
Voice Alarms	70%

The fire alarm on second knock will notify London Fire & Rescue Service. A fire station is located approximately 800 metres away and response times historically have been quite quick.

On arrival the fire service would proceed to the security control. Security control has recently undergone improvements in compartmentation to ensure its full functionality in a fire situation for a minimum of 90 minutes. Fire boarding and cavity barriers are in place to provide a protected compartment. The fire panel and fire service information is provided within the security control.

Fire Marshals sweep the floor to ensure they have been evacuated and report to the fire leader who will inform security who will manage the evacuation. Although some training has been provided all persons as identified as fire marshals (5/6 per floor) should receive annual training.

A review of all fire service information should be required and risk information compiled using the template provided in this reports appendix and the information contained in the fire strategy.

The primary assembly point is situated at Munster Square. There is an out of hours (19:00-07:00) assembly point at the east point of the building and if required alternative assembly

points at Cumberland Market and Regents Park. A mobility impaired assembly point is located in the Plaza.

All mobility impaired persons receive a Personal Emergency Evacuation Plan (PEEP) and these should be sent to the building management team to help them plan and prepare for evacuations. These should be carried out on a quarterly basis and there are currently approximately 120 PEEPs for the building.

Evacuation Times

The building through carrying out full evacuations during fire drills takes between 30 minutes and 60 minutes to fully evacuate (Required Safe Escape Time). There is 120 minutes fire resistance provided to the stairwell so the times for full evacuation are well within the limits of building design (Available Safe Escape Time). Therefore based on ASET/RSET (Diagram below) evacuation times are well within the margin of safety.

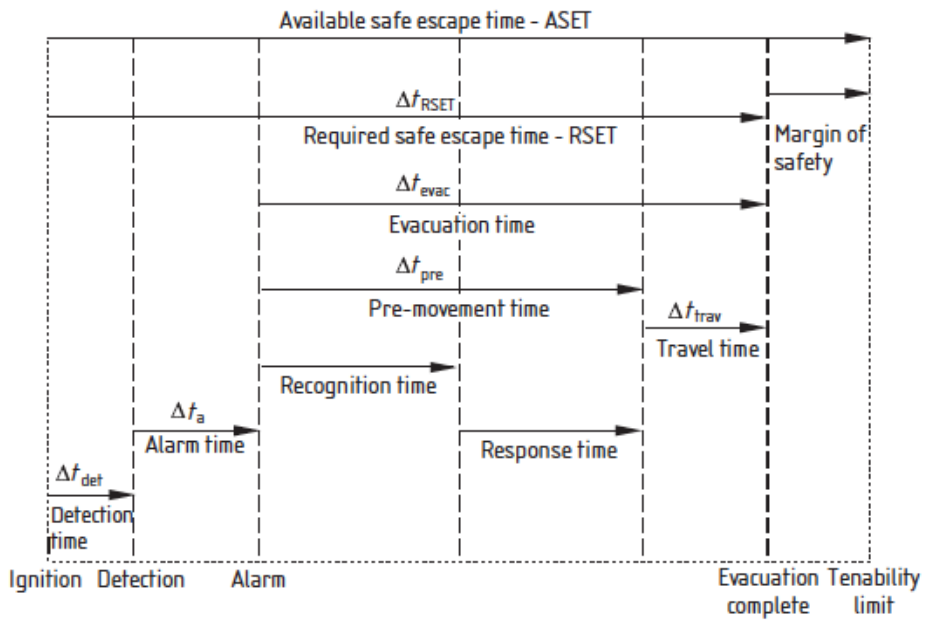


Figure 1 — Simplified schematic of processes involved in escape time compared to available safe escape time

Evacuation of disabled persons

The evacuation lifts are lobbied so perform the function of a disabled refuge in the event of a full evacuation. The lobby is relatively small and will accommodate approximately 3 persons in wheelchairs. Communication is therefore essential to ensure those on fire floor

are evacuated first as other floors where there is no fire can spill into main office near lobby if there are more than 3 persons who require escape via Evac lift.

Persons nominated and trained to use fire extinguishing appliances?	N/A	Yes	☒ **No**

Comments

Nominated persons from all floors should receive some fire safety training including the use of extinguishers. I would recommend training fire marshals in the use of fire extinguishers and training should be carried out annually. Training persons in the use of fire extinguishers will potentially reduce the impact of a fire by preventing a small fire developing into a large fire.

Persons nominated and trained to assist with evacuation, including evacuation of disabled people?	N/A	Yes	☒ **No**

Comments

Each floor should have nominated fire marshals to assist in the evacuation procedure including the movement of disabled persons to a refuge (evac lift lobby).

Appropriate liaison with fire and rescue service (e.g. by fire and rescue service crews visiting for familiarization visits)?	N/A	Yes	☒ **No**

Comments

There are some fire alarm drawings and some information provided at security for the fire service however this needs to be reviewed. There are also plans in east and west stairwells which need updated. A review of all documentation and additional information should be provided to ensure that the fire service have all relevant information to keep them safe and reduce the chance of any delay in firefighting. Information that should be made available at security should include the following:

- Accurate plans of each floor;

- Wet riser keys;
- Information on hazards in the building including location of fuel stores, cylinders etc;
- Accurate plans showing fire fighting features including location of foam inlet and smoke vents;
- Information on location of isolation switches for water, electricity, fuel etc;
- Location of some vents and sprinkler controls;
- Information and keys for sprinkler areas;
- Keys for access to risers, lifts etc.

Some of the above information can be obtained from the buildings fire strategy.

Need to update London Fire Brigade plans in Ground Floor stairwells

Routine in-house inspections of fire precautions (e.g. in the course of health and safety inspections)?	N/A	☒ **Yes**	No

Comments

There are annual audits which are carried out which includes checking:

- Fire alarm
- Emergency lighting
- Lightning Protection
- Extinguishers
- Fixed Electrical & PAT.

There are routine inspections twice a year and a monthly cleaning audit of 2 floors.

4.20 Training and Drills

Are all staff given adequate fire safety instruction and training on induction?	N/A	Yes	☒ **No**

Comments

Induction training is provided to all staff. All staff on all floors should be familiar with the tenant evacuation manual and receive building familarisation.

Are all staff given adequate periodic "refresher training" at suitable intervals?	N/A		Yes	☒ **No**

Comments

Regular refresher training should be provided to all persons. All relevant persons including Salisbury FM, Security and HMRC should receive training on a periodic basis. I recommend that basic training should be provided every 3 years and those persons with designated duties in evacuation procedure should receive annual training. Some fire marshals have received training but further training is required.

Does all staff training provide information, instruction or training on the following:

Fire risks in the premises?	N/A	☒	Yes	**No**
The fire safety measures on the premises?	N/A	☒	Yes	**No**
Action in the event of fire?	N/A	☒	Yes	**No**
Action on hearing the fire alarm signal?	N/A	☒	Yes	**No**
Method of operation of manual call points?	N/A	☒	Yes	**No**
Location and use of fire extinguishers?	N/A	☒	Yes	**No**
Means for summoning the fire and rescue service?	N/A	☒	Yes	**No**
Identity of persons nominated to assist with evacuation?	N/A	☒	Yes	**No**
Identity of persons nominated to use fire extinguishing appliances?	N/A	☒	Yes	**No**

Comments

As above.

Are staff with special responsibilities (e.g. fire wardens) given additional training?	**N/A**	☒	Yes	No

Comments

The tenant evacuation manual expects a minimum of 5/6 fire marshals per floor and a minimum of 1 fire leader per floor. It is recommended that a list be obtained from each floor to identify the numbers of fire marshals/leaders and training received and training arranged. As Euston Tower has protracted evacuation times owing to height and numbers of people it is essential that there is good management of the building evacuation with a key element being fire warden training. Training should include the use of extinguishers, as there is a requirement for some designated persons to receive extinguisher training.

Security staff receive training on evacuation procedures as they are key to the evacuation process. I was informed that training was provided last week.

Are fire drills carried out at appropriate intervals?	**N/A**	☒	Yes	No

Comments

Building management organize 2 drills a year. The last drill was carried out on 20/10/15 and a full evacuation lasted 35 minutes. It is important that a debrief is carried out as part of the drill and recorded. These records were seen to confirm this is happening.

All false alarms are recorded and debriefed.

When the employees of another employer work in the premises:

Is their employer given appropriate information (e.g. on fire risks and general fire precautions)?	N/A	☒	**Yes**	No
Is it ensured that the employees are provided with adequate instructions and information?	N/A	☒	**Yes**	No

Comments

There is a good induction procedure for contractors.

4.21 Testing and Maintenance

Adequate maintenance of premises? N/A Yes ☒ **No**

Comments

There are some fire safety systems which are not getting tested as detailed below.

Weekly testing and periodic servicing of fire detection and alarm system? N/A ☒ Yes **No**

Comments

The fire alarm is being tested at 14:00 on a Wednesday to ensure all persons are familiar with the voice alarm, can check the audibility and ensure door release on fire alarm activation. A longer test is carried out on a Saturday at 14:00 for Engineering to test a number of floors and record the test outcomes. The result is recorded on a log sheet and there is a good history that also identifies issued which have subsequently been rectified.

The VESDA system was last serviced by FCF on 20/05/15. Confirm that any remedials from this test were rectified.

I was informed that the fire alarm has received periodic testing. Some records indicate this was carried out in August but the paperwork was unclear that the building had been fully checked. Confirm that a 100% check has been carried out within the last 6 months and that if there are variations on the report then these have subsequently been rechecked so that there are no gaps in the servicing.

Monthly and annual testing routines for emergency escape lighting? N/A ☒ Yes **No**

Comments

The emergency lighting was last inspected on 13/02/15 by EPT and I was informed all remedials were completed. Emergency lighting receives testing monthly, 6 monthly and 12 monthly and these are recorded as PPMs.

Annual maintenance of fire extinguishing appliances? N/A ☒ Yes **No**

Comments

Overall the maintenance of fire extinguishers is good with the servicing of extinguishers last carried out by Tyco 19/06/15. I would recommend local monthly checks are carried out to ensure extinguishers are in the correct position and not damaged. This could be included as part of the fire warden checks.

Periodic inspection of external escape staircases and gangways? ☒ **N/A** Yes No

Comments

There are no external gangways or staircases.

Six-monthly inspection and annual testing of rising mains? **N/A** ☒ Yes No

Comments

The Wet Riser has been tested and inspected including the fire pump. The fire pump was tested on 26/08/15. Confirm there are no outstanding remedial actions outstanding. UK Dry risers carried out maintenance of the wet risers 11/08/15.

Weekly testing and periodic inspection of sprinkler installations? N/A ☒ Yes **No**

Comments

The weekly sprinkler tests are carried out by on site engineers on a Saturday at 14:00 with the fire alarm test. The last sprinkler system maintenance was carried out by FCF plc on 21/10/15. Confirmation is required that all remedial works from recent maintenance checks have been actioned.

Routine checks of final exit doors and/or security fastenings? N/A ☒ Yes **No**

Comments

Security carry out regular checks of final exits and escape routes and security fastenings are checked at the same time as weekly fire alarm test by fire wardens and any defects should be reported.

Annual inspection and test of lightning protection system? N/A ☒ **Yes** No

Comments

The lightning protection was inspection by Penrich on 27/11/14 and there were 2 remedial actions. Confirmation is required these actions have been completed.

Are suitable systems in place for reporting and subsequent restoration of safety measures that have fallen below standard? N/A ☒ Yes **No**

Comments

[redacted]

Other relevant inspections or tests: N/A Yes ☒ **No**

Comments

The Pyrene foam tank suppression in boiler room on 34th floor does not appear to have been tested since 27/05/12 when it was tested by Fire Check Contracts Ltd. Tyco have been asked to look into the maintenance and confirmation is required that this has been completed and a PPM created to provide on going maintenance of the system.

Confirmation is required as to the current condition of the foam inlet and this should be inspected on a regular basis. The foam inlet is accessible from the ground floor (External good lift) and appears to cover the basement fuel areas. Tyco have been asked to look into the maintenance and confirmation is required that this has been completed and a PPM created to provide on going maintenance of the system.

There are approx. 700 fire dampers in the building. A recent report identified remedial action on approx. 60 dampers. These actions should be completed and confirmation required that a PPM is in place for annual serving of all fire dampers.

The vents at the top of each stairwell have recently been serviced by Colt and the service sheet identified these as being satisfactory. The service sheet had no date on so confirmation of the exact date for this assessment couldn't be provided. The testing had been confirmed by more than one source.

The manual smoke vents in the lift lobbies should be subject to periodic testing. There are some outstanding remedials which need to be completed and confirmation is required that a PPM is in place for periodic serving of manual smoke vents.

There are a number of doors which are not closing fully. Confirmation is required that a PPM is in place for periodic inspections of fire doors in the building.

Salisbury Engineers last serviced the gas on 16/03/15.

Fire shutters in the basement have been recently inspected but no records were seen. This was confirmed by engineering supervisor. Confirmation is required that a PPM is in place for the servicing of fire shutters in the basement.

I was informed that the back up generator that serves the lifts had been serviced but no records were seen to verify.

4.22 Records

Appropriate records of:

Fire drills?	N/A	Yes	☒	No
Fire training?	N/A	Yes	☒	**No**
Fire alarm tests?	N/A	Yes	☒	**No**
Emergency escape lighting tests?	N/A	**Yes**	☒	No
Maintenance and testing of other fire protection systems?	N/A	Yes	☒	**No**

Comments

There are 2 drills a year carried out and records are kept in the fire manuals in the building management office.

Some fire marshal training has been provided to HMRC, Atkins and Tom Tom and certificates were provided and are there verified.

The weekly fire alarm log sheet is kept in the fire files in building management office.

Track record is used for PPM and keep track of maintenance and records. The section above details further information required with regards to fire protection maintenance.

5. Risk Level Estimator

FIRE RISK ASSESSMENT

The following simple fire risk level estimator is based on a commonly used health and safety risk level estimator.

Likelihood of fire	Potential consequences of fire		
	Slight harm	**Moderate harm**	**Extreme harm**
Low	Trivial risk	Tolerable risk	Moderate risk
Medium	Tolerable risk	Moderate risk	Substantial risk
High	Moderate risk	Substantial risk	Intolerable risk

Taking into account the fire prevention measures observed at the time of this risk assessment, it is considered that the hazard from fire (likelihood of fire) at these premises is:

☐ Low ☒ Medium ☐ High

In this context, a definition of the above terms is as follows:

Low Unusually low likelihood of fire as a result of negligible potential sources of ignition.

Medium Normal fire hazards (e.g. potential ignition sources) for this type of occupancy, with fire hazards generally subject to appropriate controls (other than minor shortcomings).

High Lack of adequate controls applied to one or more significant fire hazards, such as to result in significant increase in likelihood of fire.

Taking into account the nature of the premises and the occupants, as well as the fire protection and procedural arrangements observed at the time of this fire risk assessment, it is considered that the consequences for life safety in the event of fire would be:

☐ Slight harm ☒ Moderate harm ☐ Extreme harm

In this context, a definition of the above terms is as follows:

Slight harm Outbreak of fire unlikely to result in serious injury or death of any occupant (other than an occupant sleeping in a room in which a fire occurs).

Moderate harm Outbreak of fire could foreseeably result in injury (including serious injury) of one or more occupants, but it is unlikely to involve multiple fatalities.

Extreme harm Significant potential for serious injury or death of one or more occupants.

Accordingly, it is considered that the risk to life from fire at these premises is:

☐ Trivial	☐ Tolerable	X Moderate	☐ Substantial	☐ Intolerable

Comments:

The reason for a **Moderate** risk to life. This is based on good management in the building with the provision of an L1 fire alarm system and good compartmentation. The risk is still classed as moderate and there are still a number of actions but for a building of this age and height this is quite normal and constant review of fire safety precautions will ensure the risk level remains at a moderate level.

A suitable risk-based control plan should involve effort and urgency that is proportional to risk. The following risk-based control plan is based on one that has been advocated for general health and safety risks:

Risk level	Action and timescale
Trivial	No action is required and no detailed records need be kept.
Tolerable	No major additional fire precautions required. However, there might be a need for reasonably practicable improvements that involve minor or limited cost.
Moderate	It is essential that efforts are made to reduce the risk. Risk reduction measures, which should take cost into account, should be implemented within a defined time period. Where moderate risk is associated with consequences that constitute extreme harm, further assessment might be required to establish more precisely the likelihood of harm as a basis for determining the priority for improved control measures.

Substantial	Considerable resources might have to be allocated to reduce the risk. If the premises are unoccupied, it should not be occupied until the risk has been reduced. If the premises are occupied, urgent action should be taken.
Intolerable	Premises (or relevant area) should not be occupied until the risk is reduced.

(Note that, although the purpose of this section is to place the fire risk in context, the above approach to fire risk assessment is subjective and for guidance only. All hazards and deficiencies identified in this report should be addressed by implementing all recommendations contained in the action plan. The fire risk assessment should be reviewed regularly.)

6. Action Plan

ACTION PLAN

It is considered that the following recommendations should be implemented in order to reduce fire risk to, or maintain it at, the following level:

	Trivial	X	Tolerable

Definition of priorities (where applicable):

The priorities from the action plan are to provide a long term solution for the basement electrics and this should be addressed within the next couple of months and improvements to the cleaners routine to ensure the means of escape are maintained at all times. Confirmation is also important that all areas of maintenance highlighted in this report are on Track Record as planned maintenance.

Action Plan

Priority – Life

High - The identified deficiency should be prioritized and completed as soon as possible.

Medium – Every effort should be taken to complete actions once high risk actions have been completed. Where difficult to achieve consideration should be given to programming improvements works when other works are carried out. Ideally complete within 12 months.

Low – If low cost then carry out. Where cost would be prohibitive then carry out action in

collaboration with other works. No timescale to improvement works if High & Medium are completed.

Property

Advice on property protection will be provided in the main body of the report.

Number	Hazard	Priority
1	The 5 year fixed wiring test carried out on 14th July 2015 showed a few remedials which are outstanding. These are on track record and in progress. Close action down when complete.	Medium
2	In the basement electrical room there has previously been some water ingress but an interim measure is in place to contain and divert any potential water into this area. A long term solution is proposed for Feb/March on the LV which will allow the action to be closed down.	Medium
3	There was daisy chaining of extension leads in the engineering office. The leads and adaptors in engineering office should be reviewed and electrical appliances either removed or additional sockets installed.	Medium
4	PAT testing is carried out on a periodic basis. There were some items in the building management office which haven't been PAT tested since 2009 -2013 and these should be checked to confirm they are safe to use.	Low
5	Due to the time of year this assessment has been undertaken there are Christmas decorations including Christmas lights on display. On a sample the lights haven't been PAT tested. Ensure Christmas lights are PAT tested and sockets are not overloaded. The following recommendations are made:	Low
	• Check Christmas lights conform to the British Standard	

	• Decorations can burn easily. Make sure they are kept away from lights and heaters • Switch off Christmas lights at the end of the day • Don't overload sockets.	
6	Confirmation is required that electrical heaters are cleaned and maintained.	Low
7	There were a number of portable heaters in the building. Consideration should be given to replacing these with oil or water based systems to reduce the risk.	Low
8	The housekeeping in the basement records store should be improved to reduce the chance of a small fire developing into a large fire.	Medium
9	There is a significant amount of storage in the 12th floor plant rooms. Other plant rooms are kept sterile. It is recommended that all combustible materials in the 12th floor plant room should be removed and plant rooms kept clear of combustibles. Furniture with torn fabric in plant room should be repaired or replaced.	Medium
10	The combustibles/paper next to the microwave and toaster in the engineering office kitchen should be removed and the area around kept clear.	Medium
11	There were combustibles in the fire pump room which should be removed.	Medium
12	Some of this assessment was conducted after 17:00 when the cleaners start their shift. The cleaners put all the bags of rubbish into the lift lobbies and these block the means of escape for any persons working past 17:00 and make the refuge point unavailable which has a significant impact on the buildings fire strategy. No rubbish should be stored on means of escape and a new procedure discussed and implemented to prevent a reoccurrence.	High
13	The fire doors in the basement are constantly wedged by cardboard and are not closed after being opened. The half leaf at the side of the basement door are always open and would not be adequate in a fire situation. A self closer should be put onto the half leaf door and consider fitting hold open devices to allow the doors to be open but that are linked to the fire alarm so would close on activation of the fire alarm.	Medium

14	There are a number of self closers in the building which need replaced as they are not able to fully close the fire doors. Regular maintenance checks will identify these doors and the self closers should be repaired or replaced.	Medium
15	The signage on the 34th floor with no running man signage should either by replaced or supplemented with a running man. Some signage is also peeling away from the wall and needs replaced.	Medium
16	Additional escape directional signage should be provided throughout the plant room areas.	Medium
17	Running man escape signage required alongside existing signage in basement.	Medium
18	Signage in basement is peeling off the walls and needs replaced or reapplied.	Low
19	Additional signage required on West Stairwell GF	Medium
20	Do not use lift in event of fire signage should be provided to central core lifts.	Low
21	Signage was peeling of the walls and should be refixed.	Low
22	There is a wash room on 34th floor and confirmation is required of the fire audibility if someone were to be using the shower or consider additional beacons for early warning.	Medium
23	Machinery in Boiler room had a sound level of 87dB. Confirm that fire alarm can be heard or beacons seen from this area.	Medium
24	The risers which contain only cables don't have any detection within them. However on the 14th floor there is a DB board so detection should be provided. No access was available so confirmation is required that a detector has been installed.	Medium
25	The detection in the basement is not at the highest point which could lead to a delay in detection of a fire.	Medium
26	I was not able to confirm if there was void detection above ceilings. The ground floor ceiling void in places appeared above 800mm so confirmation should be sought that there is void detection.	Medium

27	The Fire Alarm panel was showing 3 faults. These should be investigated and repaired as soon as practicable. It is important that anytime a detector is at fault or becomes disabled the building management is informed so that can carry out a risk assessment to see if interim measures are required.	Medium
28	The redundant microphones in the GF stairwells and redundant systems in security should be removed.	Low
29	Some extinguishers in plant rooms were missing from their bracket. The extinguishers should be kept on brackets and reported if they are missing to be replaced.	Low
30	Water extinguishers in plant rooms should be removed and replaced by Powder extinguishers.	Medium
31	Remove all extinguishers from electrical intake room except for CO2 extinguishers.	Medium
32	Remove the water extinguisher next to the chiller room.	Medium
33	The extinguisher and bracket were missing from the wall outside R13.4 and should be found and reinstalled.	Medium
34	The straps to the wet risers are not suitably fixed as most can easily be removed. A review of all straps should be carried out and they should be secured to prevent people maliciously opening the risers. Signage should also be reviewed and a wet riser sign provided at all points.	Medium
35	There is a foam inlet on the ground floor which appears to cover the fuel storage areas in the basement. Confirmation should be sought that this is still fully functional, details on coverage with plans showing inlet/outlets and also arrangements made to ensure that regular serving is carried out and the fire service are aware of this facility and the location of fuel in basement.	Medium
36	There are hand operated smoke vents throughout the building which need maintained. These include smoke vents on each floor in both the east and west goods lobbies. There are a number of remedial actions outstanding for these but are in the process.	Medium

37	The smoke vent switches on the first floor to the smoke vents, which were sealed in collaboration with the fire service, should be blanked off to remove any confusion. The fire strategy confirms that they are not required.	Low
38	The tenant evacuation manual expects a minimum of 5/6 fire marshals per floor and a minimum of 1 fire leader per floor. It is recommended that a list be obtained from each floor to identify the numbers of fire marshals/leaders and training received and training arranged. As Euston Tower has protracted evacuation times owing to height and numbers of people it is essential that there is good management of the building evacuation with a key element being fire warden training. Training should include the use of extinguishers, as there is a requirement for some designated persons to receive extinguisher training.	Medium
39	There are some areas which are not occupied by permanent members of staff (1st & 2nd floor) and a procedure for checking these floors in an emergency should be discussed and agreed to ensure that all persons are accounted for.	Medium
40	I recommend that an overarching fire policy should be in place for the company. I was informed that this is in the process of being produced.	Low
41	A review of all fire service information should be required and risk information compiled using the template provided in this reports appendix and the information contained in the fire strategy.	Medium
42	Need to update LFB plans in Ground Floor stairwells	Medium
43	I was informed that the fire alarm has received periodic testing. Some records indicate this was carried out in August but the paperwork was unclear that the building had been fully checked. Confirm that a 100% check has been carried out within the last 6 months and that if there are variations on the report then these have subsequently been rechecked so that there are no gaps in the servicing.	Medium

44	Overall the maintenance of fire extinguishers is good with the servicing of extinguishers last carried out by Tyco 19/06/15. I would recommend local monthly checks are carried out to ensure extinguishers are in the correct position and not damaged. This could be included as part of the fire warden checks.	Medium
45	The last sprinkler system maintenance was carried out by FCF plc on 21/10/15. Confirmation is required that all remedial works from recent maintenance checks have been actioned.	Medium
46	The lightning protection was inspection by Penrich on 27/11/14 and there were 2 remedial actions. Confirmation is required these actions have been completed.	Medium
47	The Pyrene foam tank suppression in boiler room on 34th floor does not appear to have been tested since 27/05/12 when it was tested by Fire Check Contracts Ltd. Tyco have been asked to look into the maintenance and confirmation is required that this has been completed and a PPM created to provide on going maintenance of the system.	Medium
48	Confirmation is required as to the current condition of the foam inlet and this should be inspected on a regular basis. The foam inlet is accessible from the ground floor (External good lift) and appears to cover the basement fuel areas. Tyco have been asked to look into the maintenance and confirmation is required that this has been completed and a PPM created to provide on going maintenance of the system.	Medium
49	There are approx. 700 fire dampers in the building. A recent report identified remedial action on approx. 60 dampers. These actions should be completed and confirmation required that a PPM is in place for annual serving of all fire dampers.	Medium
50	The manual smoke vents in the lift lobbies should be subject to periodic testing. There are some outstanding remedials which need to be completed and confirmation is required that a PPM is in place for periodic serving of manual smoke vents.	Medium

51	There are a number of doors which are not closing fully. Confirmation is required that a PPM is in place for periodic inspections of fire doors in the building.	Medium
52	Fire shutters in the basement have been recently inspected but no records were seen. This was confirmed by engineering supervisor. Confirmation is required that a PPM is in place for the servicing of fire shutters in the basement.	Medium

7. Conclusion

The standard of fire safety in the building is good and due to the size and complexities of the building it is vital to continue to monitor fire safety in the building to ensure the risk remains the same. The provision of an L1 voice fire alarm significantly enhances safety alongside good compartmentation protection to the stairwells.

Training and good management is essential to maintain and improve on current standards and steps should be taken to ensure all floors have sufficient numbers of fire marshals and that they have received the appropriate training.

8. Risk Management

Current fire safety legislation and guidance is based on risk and focuses on individual premises and facilities. It is less specific about managing this risk from fire at an organizational level. In many cases, the person(s) with duties under legislation might be part of a larger organization with multiple sites and facilities with common working practices and procedures. This can present challenges with regard to translating fire safety policy into effective strategies throughout the organization, where fire safety is unlikely to be the key driver.

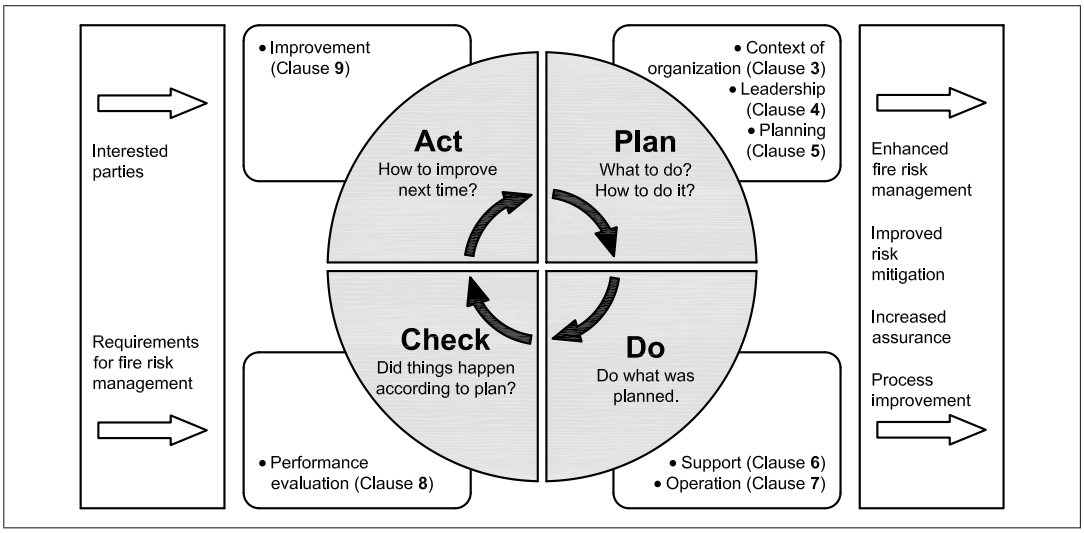
A documented FRMS provides a means of demonstrating that fire safety policy is translated into action to ensure that the fire risk to people and the business are reduced as far as reasonably practicable while ensuring that the legislative requirements are met. The extent of the management system should be proportionate to the level of risk arising from the organization's activities and subsequent level of assurance sought. It should be noted that an organization's risk tolerance (that is its readiness to bear risk, after risk treatment, in order to achieve its objectives) can be limited by legal or regulatory requirements.

[redacted] produce a fire risk management system plan with a clear fire safety policy and the information. There are a number of documents that can help in the production of this plan. The information in the methodology section of this document on BS 9999 Management provides some information and documents like PAS 7:2013 Fire risk management system are useful to provide a framework to develop the plan.

PAS 7 applies the "plan, do, check, act" (PDCA) model to implementing, maintaining and improving an FRMS. The basis of the approach is shown in Figure 1 below, which sets out the requirements of the FRMS in the context of the PDCA model, and is also briefly described as follows:

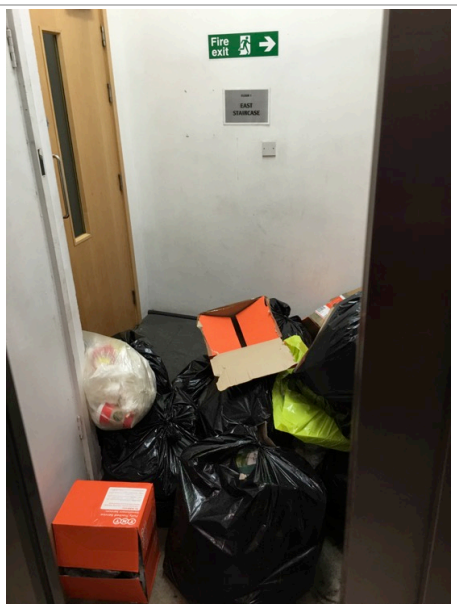
Plan: establish the objectives and processes necessary to deliver results in accordance with the organization's fire policy.
Do: implement the processes.
Check: monitor and measure processes against fire policy, strategic objectives, legal and other requirements, and report the results.
Act: take actions to improve fire risk management performance continually.

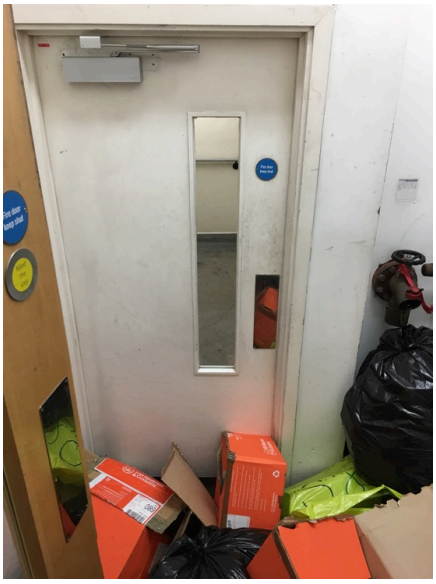
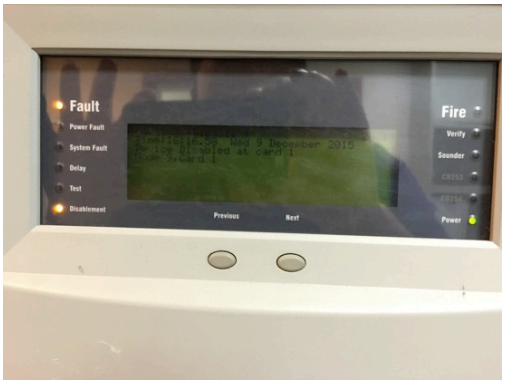
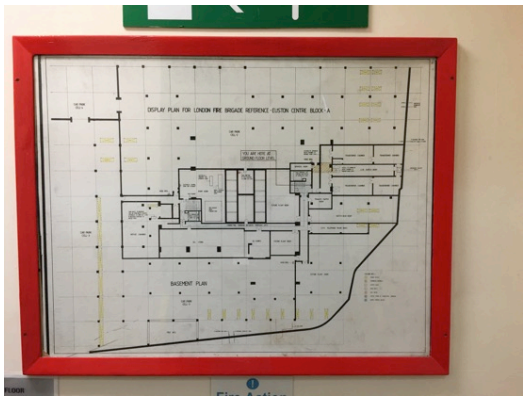
Figure 1 **Fire risk management "plan, do, check, act" model**

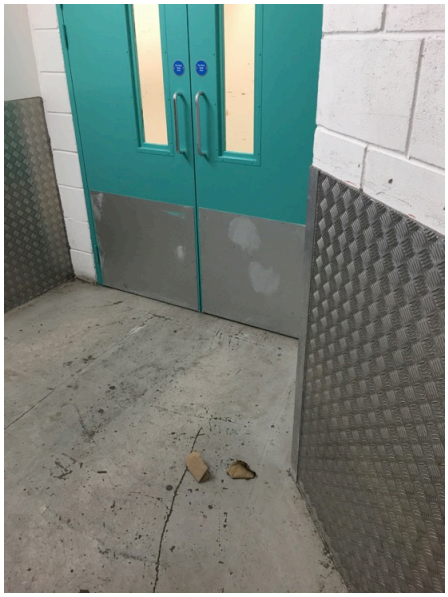


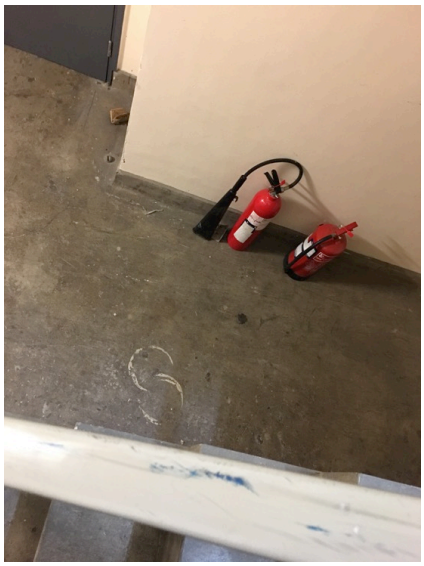
[redacted].

9. Photos

	
Escape door not opening. Defect had been submitted and alternative escapes were available.	Rubbish blocking means of escape.
Some water ingress into electrics.	Extinguisher should be fixed on a bracket.

	
Rubbish blocking means of escape	3 faults on the fire panel
	
Some signage is peeling away and should be repaired or replaced.	LFB plan should be updated.

Furniture with torn fabric should be repaired or replaced.	Combustibles in plant room.
	
A self closer should be added to half leaf of door.	Consider fitting hold open devices to prevent doors in basement being wedged.

	
Fit extinguishers to brackets.	Christmas lights should be PAT tested and decorations should be kept away from lights

Straps need installed correctly	Some doors not closing fully due to faulty self closers

10. Fire Service Information: Site Specific Risk Information (SSRI) Template

Fire Services gather information called site specific risk information for key buildings such as Euston Tower. The purpose of this document is to understand the risks, building layout and identify keys passive and active fire systems which will allow the fire service to make informed decisions to safeguard their safety. This link below is to a document, which Fire Services use to obtain information for buildings.

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/5914/2124406.pdf

The information below is information that the fire service would require if they attended the site. I have provided a simplified format and would strongly recommend using this and inviting the fire service to attend the building to familarise themselves with the building.

The sheet below includes examples of information required in *italics.* Note these are examples and shouldn't be taken as correct information.

SSRI Example

Contact Name	Chris Stone
Telephone Number	07850 938057
Evacuation Type	Simultaneous
Hazards (Location)	Small quantities of flammables
Information Box (Location)	Held at Gatehouse with all fire service information. To be provided by security
Site Access	Different points of access. Security to confirm access points for fire service. As default head to main gatehouse.
Gas Isolation Location	At front of building
Water Isolation Location	At rear of building
Electricity Isolation Location	At side of buildings
Environmental Considerations	None

CONSTRUCTION

Location	
Building Length	52 metres
Building Width	40 metres
Floors	3 – GF, FF & Plant
Basements	None
Construction Type (Steel frame, concrete, timber)	Concrete with steel frame

Internal Configuration (Compartmented, atrium columns)	Atrium covering 2 stories with 2 compartments either side of atrium
External Configuration (Detached)	Stand alone building. Small supporting buildings at rear.
Floor Construction	Concrete
Compartmentation	No compartmentation in building
Sandwich Panels	None
Roof Type (A Frame, Flat)	A Frame
Roof Materials (Metal sheet, tile/slate)	Metal sheet
Firefighting Shafts, Lifts (Location)	No firefighting shafts or lifts. Customer lift in building not used in event of a fire
Wet/Dry Risers (Location & Charging Point)	None
Sprinklers (Stop valve location)	None
Smoke Control (Plant Location)	Located next to fire alarm panel in atrium
Firefighter Switches (Locations)	None
Open Water Supplies (Rivers, Lakes)	River runs at rear of site
Hydrant Location	2 hydrants – one at front and one at rear of building
Water Meter Bypass	Located next to Gatehouse
On site Foam Installation (Details, Location)	None

AC Fire Safety Ltd

Protection through Prevention

Fire Risk Assessment

Euston Tower

Version 2

10 September 2020

Review Date: 10 September 2021

Score: Moderate Risk

Assessor: Christopher Stone

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Assessor Profile

Christopher Stone

MSc, MIFireE, MSFPE, MIFSM, MIFPO
Fire Engineer/Risk Assessor

Christopher Stone has been involved in the Fire Safety industry for over 19 years having started his career with Tyne and Wear Fire & Rescue Service. During his 14 years service, the majority of time was served as a Fire Safety Manager responsible for Fire Engineering/Building Regulation submissions and managing a team of Fire Safety Managers. During this time he was seconded to produce an investigation/enforcement process for the Fire Service to assist Inspecting Officers in prosecuting The Regulatory Reform (Fire Safety) Order 2005.

In 2009 he set up the company AC Fire Safety Ltd and for over a decade they have provided a range of services including:

• Fire Risk Assessments
• Fire Engineering
• Fire Training
• Fire Managers role
• Compartmentation/Fire door surveys
• CFD modelling

Through AC Fire Safety he has travelled and consulted on a wide range of complex buildings both nationally and internationally . This includes:
• Hospitals and Healthcare Premises
• Tall Buildings
• Scientific Research facilities
• High Security Facilities
• Prisons
• Construction site coordination (Pre planning of fire plans and partially occupied sites)
• Educational establishments
• Preparation of fire strategies for various building projects
• Wind turbines and renewable energy projects
• Heritage buildings
• Sleeping Accommodation
• COMAH Sites

Organisations:

Member of The Institute of Fire Engineers (MIFireE) – 00068821
Member of The Society Fire Protection Engineers (MSFPE)– 36911529
Member of The Institute of Fire Safety Managers (MIFSM) – Member Number – 867
Member of the Institute of Fire Prevention Officers (MIFPO) – Member Number – M2060
Member of The International Association for Fire Safety Science (IAFSS)
Chartered Association of Building Engineers (CABE) – 60836793
Former Executive Committee (Fire) representative for North East CDM Group
Former Executive Committee USHA (University Safety & Health Association) Fire Group

Action Plan Summary

Task No.	Category	Sub Category	Action Required	Priority	Status	Action Taken	Date Completed
1	Fire Management	Testing & Maintenance	PAVA: no recent history of maintenance/servicing of PAVA (over last 2 years). This needs carried out ASAP and PPM and contract put in place.	Critical	Identified		
2	Escape Routes & Fire Spread	Fire Doors	A number of fire doors are not closing fully. Review all fire doors and repair as required. These are due for maintenance within the coming weeks. Stairwell fire doors should be prioritised for first inspection.	High	Identified		
3	Fire Management	Testing & Maintenance	No fire alarm maintenance has been carried out since August 2019. Churches have recently been on site and have completed approx. 3 floors of fire alarm maintenance. No records were available to review for these visits. 100% review of fire alarm should be carried out as soon as possible and any actions acted upon. Confirm with Churches their maintenance programme to ensure maintenance is carried out ASAP.	High	Identified		

4	Detection & Warning	Control Equipment	Confirm status and impact of fire alarm system on 16th floor where cables have been cut off and left and junction boxes are open and not secured correctly.	High	Identified
5	Escape Routes & Fire Spread	Construction and Glazing	During the assessment contractors employed by the MOD were removing cable and equipment from the areas they occupied in the roof and cable runs through the building. On a sample of a few areas there were areas breaches in fire compartmentation which needs repaired. A survey should be carried out and all fire stopping made good.	High	Identified
6	Detection & Warning	Control Equipment	The fire alarm panel is in a fault condition. The fault should be investigated and repaired. An order is in place for churches to attend site to clear faults. Close action once faults are closed.	High	Identified
7	Detection & Warning	Control Equipment	Review cabling and fire alarm system in MOD areas as there is damage and cut cables. A review of the existing provision of fire alarm in these areas should be carried out and detection installed in line with L1 in accordance with BS5839 part 1 reinstated. A fire alarm contractor should review the current fire alarm arrangements in this area to determine extent of risk.	High	Identified

8	Escape Routes & Fire Spread	Fire Doors	A number of doors on 16/17th floor were wedged open. Wedges into the stairs should not be used to hold open fire doors.	High	Identified
9	Fire Prevention	Housekeeping	The storage of combustibles in the following locations was excessive and should be significantly reduced: 12th floor plant room.	Medium	Identified
10	Fire Management	Testing & Maintenance	There are remedial actions required for the wet riser from the last service visit. These should be completed.	Medium	Identified
11	Fire Management	Testing & Maintenance	Confirm manual smoke vents are serviced and are part of PPM schedule.	Medium	Identified
12	Fire Management	Testing & Maintenance	Extinguishers remedials identified on paperwork from May 2020 need completed.	Medium	Identified
13	Fire Management	Testing & Maintenance	Review emergency lighting paperwork as sheets are not completed as per procedure. Consider retraining of staff in line with procedures put in place in 2018/19 after inspection by Crown Fire Inspectors.	Medium	Identified
14	Fire Management	Testing & Maintenance	Confirm PAT testing has been completed. Some items have a date of March 2020 but some appliances are out of date (March 2018).	Medium	Identified

15	Fire Prevention	Electrical	An electrical appliance in grown floor office has failed its PAT test and should be removed or repaired.	Medium	Identified
16	Fire Management	Record Keeping	Fire alarm weekly: review procedure to ensure all faults are logged on weekly alarm records. Current records don't provide an overview of the faults from fire alarm and therefore make it difficult to manage actions and understand status of faults.	Medium	Identified
17	Fire Prevention	Housekeeping	The storage of combustibles in the following locations was excessive and should be significantly reduced: apex room	Medium	Identified
18	Fire Prevention	Housekeeping	The storage of combustibles in the following locations was excessive and should be significantly reduced: sprinkler/wet riser room.	Medium	Identified
19	Fire Prevention	Heating	Remove heater from lift engineers room in 35th plant room. The heater appeared to have slight damage to from of heater. If heater is required replace with an oil filled heater.	Medium	Identified

20	Emergency Lighting	Emergency Lighting	There are 483 defects in the emergency lighting. These are to be completed as part of lifecycle project. An investigation should be carried out to determine the issues around the large number of defects and consider more frequent maintenance to identify and remedy defects.	Medium	Identified
21	Fire Management	Procedures & Arrangements	Confirm with contractor procedure for raising fire alarm when fire alarm disablements are in place.	Medium	Identified
22	Detection & Warning	Audibility	Two fire alarm sounders on the roof were dangling from cable and not fixed to the wall. These should be repaired and fixed to the wall.	Medium	Identified
23	Escape Routes & Fire Spread	Fire Doors	Fire doors in basement need repaired and replaced. Fire doors are damaged, hinges twisted and don't close fully. All basement doors need reviewed and repaired/replaced. These are high use doors and should be designed to take this into account.	Medium	Identified
24	Fire Prevention	Housekeeping	The storage of combustibles in the following locations was excessive and should be significantly reduced: Plant room 34th floor.	Medium	Identified

25	Fire Prevention	Electrical	The electrical sockets in the lift engineers room is overloaded. This should be reviewed and additional sockets provided where required.	Medium	Identified
26	Fire Fighting	Fire Service Access & Facilities	Repair manual smoke handles where defective within the firefighting/evacuation lift lobbies. These are required for use by the fire service for smoke removal when fire fighting to prevent smoke spread into the stair. Confirm PPM is set up for regular maintenance.	Medium	Identified
27	Fire Fighting	Extinguishers	A number of extinguishers were marked with defective stickers but had been left in place. These should be removed and replaced.	Medium	Identified
28	Escape Routes & Fire Spread	Construction and Glazing	Survey breaches in fire compartmentation which is evident after the strip out of the false ceiling on floors occupied by Google. Once surveyed fire stopping should be actioned.	Medium	Identified
29	Fire Prevention	Housekeeping	Remove furniture in the lift engineers room which has exposed foam or repair to comply with the furniture and fixing regulations.	Low	Identified
30	Fire Fighting	Extinguishers	Extinguishers in basement (which appear to have been used as wedges) should be relocated and installed on brackets.	Low	Identified

31	Fire Fighting	Fixed Systems	The suppression in the boiler room appears to have had a visual only test. Churches have provide a quote to make the system suitable to be fully tested. This should be carried out in line with the relevant British standard.	Low	Identified
32	Fire Fighting	Fire Service Access & Facilities	Provide security straps to dry riser outlets.	Low	Identified
33	Fire Prevention	Electrical	The following portable electrical appliances do not appear to have been recently tested (March 2018), and should therefore be tested (for testing frequencies, reference should be made to the IEE document In Service Inspection & Testing of Electrical Equipment): engineers office, plant room.	Low	Identified

Introduction

This document is intended to assist you in compliance with Article 9 of the Regulatory Reform (Fire Safety) Order 2005 (the 'Fire Safety Order'), which requires that a risk assessment be carried out.

Recommendations are outlined in an Action Plan. This sets out the measures it is considered necessary for you to take to satisfy the requirements of the Fire Safety Order and to protect people from fire (life safety). It is important that you study the Action Plan, and, if any recommendation in the Action Plan is unclear, you should seek clarification.

The Fire Safety Order requires that you keep your fire risk assessment under review. A review date is provided at the start of this document. You should review the report sooner should there be any reason to suspect it is no longer valid, if a significant change takes place or if a fire occurs.

The Fire Safety Order requires that you give effect to 'arrangements for the effective planning, organization, control, monitoring and review of the preventive and protection measures'. These are the measures that have been identified by the risk assessment as the general fire precautions you need to take to comply with the Fire Safety Order. You must record these arrangements. While this fire risk assessment is not the record of the fire safety arrangements to which the Fire Safety Order refers, much of the information contained in this report will coincide with the information in that record.

We have conducted the fire risk assessment in accordance with the Fire Industry Association's publication 'Fire Risk Assessors – Standard Scope of Services'. The fire risk assessor meets the criteria set out by the Fire Risk Assessment Competency Council, 'Competency criteria for the Fire Risk Assessors'.

We have based our assessment on the situation we were able to observe while at the premises and on information provided to us, either verbally or in writing. Our surveys do not involve destructive exposure, and it is not always possible to inspect all rooms and areas, nor inspect less readily accessible areas, such as voids above ceilings. It is therefore necessary to rely on a degree of sampling and also reasonable assumptions and judgement.

The purpose of this report is to provide an assessment of the risk to life from fire, and, where appropriate, to make recommendations to ensure compliance with fire safety legislation. The report does not address the risk to property or business continuity from fire.

Where two or more responsible persons share, or have duties in respect of, premises whether on a temporary or a permanent basis) each such person must—
(a) co-operate with the other responsible person concerned so far as is necessary to enable them to comply with the requirements and prohibitions imposed on them by or under this Order;
(b) (taking into account the nature of his activities) take all reasonable steps to co-ordinate the measures he takes to comply with the requirements and prohibitions imposed on him by or under this Order with the measures the other responsible persons are taking to comply with the requirements and prohibitions imposed on them by or under this Order;
and
(c) take all reasonable steps to inform the other responsible persons concerned of the risks to relevant persons arising out of or in connection with the conduct by him of his undertaking.
(2) Where two or more responsible persons share premises (whether on a temporary or a permanent basis) where an explosive atmosphere may occur, the responsible person who has overall responsibility for the premises must co-ordinate the implementation of all the measures required by this Part to be taken to protect relevant persons from any risk from the explosive atmosphere.

Premises Details

Building Information

Address line 1	Euston Road
Managing agent	SFM
Occupier	HMRC & tenants
Use	Office
Number of floors - ground and above	36
Number of floors - below ground	1
Approximate floor area per floor	1500
Approximate period of construction	1960-1980

Construction details

Euston Tower is a high-rise building with a height of approximately 124 meters. The building is constructed with a steel frame and curtain walls. The building was built in the late 1960s and is made up of 4 wings which each have their own stairwell. The Ground Floor has an additional two stairs for escape.

Occupants

Maximum number of public at any time	50
Are there any occupants especially at risk from fire?	No

Fire loss experience

After discussing with relevant persons on site there have been no fires in the building.

Comments

Euston Tower consists of a basement, ground floor and 35 upper floors. The building is primarily used as office space with tenanted shops on the ground floor. Management responsibility for these shops rests with the landlord Regents Place although the fire alarm is linked to Euston Tower fire alarm.

Plant rooms are located on the 12th floor, part of the 34th and all of the 35th floor levels. Other ancillary accommodation is provided in the basement area, which consists of the oil tank room, lift motor room, wet riser pump room, electrical intake, LV switch room, BT frame room & storage areas.

The basement car park area extends a significant distance horizontally and this is the owned by British Land but managed by Regents Place.

The building is served by 10 lifts in the central core, 5 high rise (Floors 20-34) & 5 low rise (Ground floor – 19). There are Evac/Fire fighting lifts in the East and West lobbies which serve the whole building.

There are four protected staircases utilised for escape purposes, these are the North, East, South and West, which all ultimately discharge directly into external areas outside the confines of the building. Each staircase is equipped with natural smoke vents at the head of the stairs, can be opened by the fireman's switch located in main reception if necessary to provide additional staircase ventilation in a fire situation.

Each stairwell is equipped with natural smoke vents, these being positioned at the head of each staircase enclosures. Additional, natural, manually-operated vents are provided within both the East & West fireman's lift lobbies. Furthermore, there is potential for additional venting of the staircases due to the fact that openable windows are provided at each floor level within each of the staircases.

Reduced occupancy in the building due to Covid. All persons with PEEPS are still working from home and will reassessed if circumstances changed.

Current occupants are:
HMRC
Google
Boohoo
Pinnacle
ACAS
Pupil
Office, Space and Town
GMP Orphan
Hastee
EuroCentre

Request updated FRAs from tenants.

Legislation

Fire safety legislation which applies to these premises	• Regulatory Reform (Fire Safety) Order 2005
This legislation is enforced by	Other
Other fire safety enforcement bodies	CPFSI

Details of any other legislation that makes significant requirements for fire precautions in these premises (other than the Building Regulations)

Equality Act
Building Regulations

Is there an alterations notice in force?	Not Known
Do licensing laws apply to the premises?	No

Fire Prevention

Electrical

Are electrical installations and appliances free from any obvious defect?	Yes
Are fixed installations periodically inspected and tested?	Yes
Is the use and type of portable appliances reasonable?	Yes
Are there suitable limitations on the use of trailing leads and adapters?	Yes
Is there a suitable regime for portable appliance testing?	Yes
Is there a suitable policy regarding the use of personal electrical appliances?	Yes

Comments

The electrical installations and appliances appeared to be in good condition and were used appropriately. Ignition sources observed were also kept clear from combustibles.

Portable appliances appeared to be in good condition and were used appropriately. Ignition sources observed were also kept clear from combustibles.

There is no formal personal electrical equipment policy in place but staff are informed when PAT is to be carried out and are encouraged to get their personal electrical equipment (mobile phone plugs etc tested).

Gas

Are gas installations and appliances free from any obvious defect?	Yes
Is gas equipment protected/located so as not to be prone to accidental damage?	Yes

Heating

Are fixed heating installations free from any obvious defect?	Yes
Are portable heaters used?	Yes
Are portable heaters free from any obvious defect?	No
Is the use of the more hazardous types of heater (e.g. radiant bar fires or LPG appliances) avoided?	Yes
Is the use and type of portable heaters reasonable?	No

Comments

The heating appliances appeared to be in good condition and used appropriately.

Cooking

Does cooking take place on the premises?	Yes
Are reasonable measures taken to prevent fires as a result of cooking?	Yes
Are filters changed and ductwork cleaned regularly?	Yes

Comments

The main kitchen in the building is located on the 1st floor. There is no fire separation between the kitchen and seating area but the restaurant area as a whole is separate from the rest of the building as a single compartment.

There is an office which is an inner room off the kitchen but this is generally left open and used infrequently. In addition there is detection in the access room which make this an acceptable risk.

The first floor is covered by a sprinkler system, which covers the kitchen area.

There is a wet chemical and Co2 extinguisher and a fire blanket provided which have been serviced within the last year.

The vents are cleaned weekly and a deep clean is done annually.

The kitchen is run on electricity only with no gas.

There is a small kitchen/tea point on all floors of the HMRC areas. These are low risk and contain microwaves, toasters and kettles.

Arson

Is security against arson reasonable?	Yes
Is there a reasonable absence of external fuels and ignition sources?	Yes

Comments

The tenant was not aware of any fire incidents in or around the building.

There is CCTV or security provided for the building.

Housekeeping

Is accumulation of combustibles or waste avoided?	No
Are there appropriate storage facilities for combustible & hazardous materials?	Yes

Comments

Upholstered furniture was noted in the public areas. It could not be identified as being to the current standard (BS7176:2007+A1:2011), but was in good condition with no rips or exposed foam. The risk is considered tolerable with no further control measures considered necessary. Any furniture purchased in the future should conform to the recommendations given for medium hazard category in BS7176:2007+A1:2011

Waste materials are removed from the building regularly; combustible material is kept to reasonable quantities, clear from ignition sources and stored in appropriate containers.

There is a significant amount of storage in the 12th & 34th floor plant rooms. Other plant rooms are kept sterile. It is recommended that all combustible materials in the 12th floor plant room should be removed and plant rooms kept clear of combustibles.

The storage in the Apex room & Sprinkler/Wet riser should be significantly reduced.

Building Works

Are there any hot works being carried-out at this time?	No
Are the premises free of any obvious signs of incorrect hot work procedures in the past?	Yes

Comments

There were no building or hot works being carried out at the time of the visit.

There is a contractor policy in place and risk assessments are undertaken prior to commencing works.

Smoking

Are there suitable arrangements taken to prevent fires caused by smoking?	Yes

Comments

Smoking is prohibited within the public areas, commensurate with the requirements of the Health Act 2006. There were no signs of smoking occurring in the public area of the building. Ashtrays are provided and are used in the smoking area which is situated outside in the smoking area. Ashtrays are emptied on a regular basis.

Dangerous Substances

Are dangerous substances present, or liable to be present?	No

Comments

This risk assessment only considers the impact of the use or storage of dangerous substances to the extent necessary to determine the adequacy of the general fire precautions required under the Regulatory Reform (Fire Safety) Order 2005 to safeguard the safety of relevant persons in the event of fire.

Only small quantities of cleaning products and other low risk chemicals are stored and do not present a hazard in terms of general fire precautions.

This risk assessment only considers the impact of the use or storage of dangerous substances to the extent necessary to determine the adequacy of the general fire precautions required under the Order to ensure the safety of relevant persons in the event of fire.

Lightning

Is a lightning protection system installed?	Yes
Is the lightning protection system free from any obvious defect?	Yes
Is the lightning protection system periodically inspected?	Yes

Comments

The provision of a lightning protection in the building, was not apparent. Although the provision of a lighting protection system is not considered essential in the context of this risk assessment, the provision of a lightning protection system would need to be assessed through the risk assessment process detailed in BSEN 62305:2011. If the client considers the premises to be at undue risk from lightning strike then an assessment will need to be carried out by a competent person in accordance with the standard given above.

Escape Routes & Fire Spread

Ease of Use

Are exits easily and immediately openable?	Yes
Do fire exits open in direction of escape where necessary?	Yes
Are escape routes unobstructed and safe to use?	Yes
Are there reasonable measures for the evacuation of disabled people?	Yes

Comments

There are 4 means of escape on all floors which lead into 4 separate stairwells. Each stairwell is lobbied and designed to provide at least 90-minute fire resistance between stairwell and floor. The 1st floor has an additional 2 escape stairs.

The West & East goods lifts have been converted into Evac/firefighting lifts. In the event of a building evacuation one goods lift will be used for evacuation and one would be kept available for firefighter use. These lifts are contained within their own protected lobbies and the lobbies act of refuge areas for persons required to use the evac lift.

The lift lobby space is small and would accommodate 3 persons maximum per lobby. If there were more than 3 wheelchair uses per floor then it would be difficult to accommodate these additional persons. Therefore in order to ensure the safety of disabled persons regular and accurate records of Personal Emergency Evacuation Plans (PEEPS) should be carried out. The records in the building managers office identified 120 persons who require the use of a lift. PEEPs should be reviewed on a 3 monthly basis to help building management plan and prepare for evacuations.

The height of the ceiling in the stairs is in some areas less than 2 metres. This could lead to a delay in evacuation times but are clearly marked with a foam covering on the edges of walls. The occupancy numbers at start of this risk assessment made some reduction in occupancy numbers as a result of ceiling height.

There are large draughts and pressure build-ups throughout the building which could have an impact on smoke spread. The recent improvements to fire doors and compartmentation will help better protect the means of escape.

The loading bay is occupied by a member of security. The loading bay is openable via a key which security have on them and there are 2 escape routes from the lobby area to the loafing bay which is deemed an acceptable risk.

Green override switches are provide on escape routes which are fitted with electro-magnetic hold devices.

The fire shutters that were in place on the first floor have been removed as they are not required. Fire shutters in basement are retained and serviced periodically.

On the first floor there is a dead end corridor from room 1.22 of approximately 20 meters which is deemed satisfactory due to the area being covered by an L1 fire alarm, sprinklers and high ceiling.

It is recommended that all escape routes are checked on a daily basis to ensure they remain available at all times although it is not a requirement to record daily checks. It is recommended that this forms part of the day to day checks of building fire marshals.

There are no persons with disabilities employed in the building. However there is the potential for disabled visitors attending site. Carrying out Personal or General Emergency Evacuation plans (PEEP & GEEP) will assist with providing safe evacutiion for any visitors or future staff. Further information if required is available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/886446/9446_Means_of_Escape_v2_.pdf

Where access control is installed there are green override points installed. It is also expected that the fire doors held closed on mag-locks disengage on activation of the fire alarm or failure of power as required.

Building Works and the impact on the means of escape.

The building was built in the late 1960s and opened in 1970. At this time most offices would not have been open plan. The current floor configuration for higher floors is open plan office space. Floors 1-19 doesn't appear to have changed much since the building was first designed although no plans were seen of the building on its first inception. Floors 20 + are generally open plan with no lift lobby protection. Therefore a fire on any of these floors could potentially spread into the lift shaft and travel through the building. With the draughts and pressures the smoke would then by spread into the open plan offices above with little to no smoke protection. The oldest plans I could see were from fire certificate drawings in 1996 and these had most of these higher floors with some form of lift lobby protection although some floors were open plan. With the building operating on two staged simultaneous evacuation as long as the numbers of disabled persons per floor is low then most people can reach safe areas within travel distance limits quite quickly.

Dimensions

Is there adequate provision of exits?	Yes
Do escape routes have sufficient capacity?	Yes
Are single direction travel distances reasonable?	Yes
Are multi-direction travel distances reasonable?	Yes

Comments

There is good provision of escape routes with travel distances met for single direction and multi-direction escape. The door/stair and final exit width appear suitable for occupancy of the building.

There is good means of escape in the building. All escape routes are within reasonable travel distances and occupancy capacity for the building exceeds actual capacity within the building.

Fire Doors

Are fire doors to a suitable standard?	Minor Defects
Is there suitable provision of self-closing devices?	Minor Defects
Is there suitable provision of hold-open devices?	Yes
Are doors kept locked where appropriate?	Yes

Comments

Fire doors considered as notionally fire resisting due to no identifying marking or certification. The doors appear to be of solid construction and are provided with a suitable self-closing device and intumescent strips/smoke seals. Consequently, the existing provision is considered reasonable.

A number of fire doors are not closing fully. Review all fire doors and repair as required. These are due for maintenance within the coming weeks. Stairwell fire doors should be prioritised for first inspection.

Fire doors in basement need repaired and replaced. Fire doors are damaged, hinges twisted and don't close fully. All basement doors need reviewed and repaired/replaced. These are high use doors and should be designed to take this into account.

A number of doors on 16/17th floor were wedged open. Wedges into the stairs should not be used to hold open fire doors.

Construction & Glazing

Are escape routes protected with suitable walls and floors?	No
Is there adequate compartmentation?	Minor Defects
Is there reasonable limitation of linings that might promote fire spread?	Yes
Is glazing reasonable and free from any obvious defects?	Yes

Comments

During the assessment contractors employed by the MOD were removing cable and equipment from the areas they occupied in the roof and cable runs through the building. On a sample of a few areas there were areas breaches in fire compartmentation which needs repaired. A survey should be carried out and all fire stopping made good.

Survey breaches in fire compartmentation which is evident after the strip out of the false ceiling on floors occupied by Google. Once surveyed fire stopping should be actioned.

Surface spread of flame appeared satisfactory. Wall linings were in good condition and appear to be commensurate with surface spread of flame ratings for Class 1 in escape routes and Class 3 in circulation areas.

The lifts on the HMRC floors 1-19 (except 12th floor) are all provided with lift lobbies made up of fire doors which provide protection against the travel of smoke and fire through the central lifts.

There are no lift lobbies on most floors above floor 19. The lifts don't provide any smoke protection and a fire on any floor without the lobbies will potentially enter the lift shaft and spread throughout the building. Lift lobbies are recommended to stop the spread of fire and smoke but within the scope of this risk assessment is seen as a property protection feature as long as all other actions are completed. There is the potential that Local Authority fire safety officers could insist on their reinstatement to provide compartmentation between floors.

Dampers, Ducts & Chutes

Are there suitable measures to restrict fire spread via ducts and concealed spaces?	Minor Defects

Comments

The assessment has been performed as a non-intrusive survey. Therefore, no reasonable comment can be passed on the provision of hidden ducting.

There is a lifecycle project carrying out repairs to the fire dampers currently in progress.

Smoke Ventilation

Is there reasonable provision of smoke ventilation from escape routes?	Yes
Is there reasonable provision of smoke ventilation for the fire service?	Yes
Is there reasonable provision of smoke ventilation from basement or car parks?	Yes

Comments

There is manual and automatic smoke ventilation in the building. There are some maintenance improvements required and this is addressed in the maintenance section.

Detection & Warning

Control Equipment

Is an electrical fire alarm system expected?	Yes
Is a fire detection and/or alarm system provided?	Yes
Nominal system category	• BS 5839 Pt1 Category L1

System details

The current fire alarm system is an L1 voice fire alarm system which was installed in 2012. Provision of an L1 fire alarm system is a significant enhancement to what would have been originally installed when the building was first built.

The fire alarm panel is in a fault condition. The fault should be investigated and repaired. An order is in place for churches to attend site to clear faults. Close action once faults are closed.

Review cabling and fire alarm system in MOD areas as there is damage and cut cables. A review of the existing provision of fire alarm in these areas should be carried out and detection installed in line with L1 in accordance with BS5839 part 1 reinstated. A fire alarm contractor should review the current fire alarm arrangements in this area to determine extent of risk.

Confirm status and impact of fire alarm system on 16th floor where cables have been cut off and left and junction boxes are open and not secured correctly.

There is a VESDA system on the ground floor covering the room off the foyer.

There are a number of rooms in the plant rooms which are inner rooms. As the building has an L1 fire alarm system there is detection within the access rooms.

Is the control equipment suitably located?	Minor Defects
Is the control equipment free from any obvious fault or defect?	Minor Defects

Comments

The current fire alarm system is an L1 voice fire alarm system which was installed in 2012. Provision of an L1 fire alarm system is a significant enhancement to what would have been originally installed when the building was first built.

There is a VESDA system on the ground floor covering the room off the foyer.

There are a number of rooms in the plant rooms which are inner rooms. As the building has an L1 fire alarm system there is detection within the access rooms.

Any works to the fire alarm system should be in accordance with BS5839:pt1 and undertaken by a competent fire alarm engineer, preferably with Third Party Accreditation.

Manual Fire Alarms

Are there sufficient means of manually raising an alarm?	Yes
Are manual callpoints appropriately located and free from obvious defect?	Yes

Comments

There are manual call points provided throughout with call points provided on escape routes where required and all clearly visible with a fire action notice or signage adjacent.

Automatic Fire Detection

Is there sufficient provision of automatic fire detection?	Yes
Is the type of automatic fire detection suitable and free from obvious defect?	Yes

Comments

There is good levels of detection throughout which would provide early warning of smoke/fire to occupants.

Audibility

Are there adequate means of alerting all relevant persons?	Minor Defects

Comments

The audibility of the system was not verified at the time of this visit, but the system is subject to routine inspection and service. Therefore, it is likely that the audibility is reasonable.

Two fire alarm sounders on the roof were dangling from cable and not fixed to the wall. These should be repaired and fixed to the wall.

Firefighting

Fire Extinguishers

Are fire extinguishers provided?	Yes
Predominant types of fire extinguisher:	• Carbon dioxide - 2kg • Foam - 6L • Water additive - 6L
Last test date of extinguishers:	May 2020
Are fire extinguishers readily accessible?	Yes
Is the provision of fire extinguishers reasonable?	Yes

Comments

There was a good provision of extinguishers throughout.

A number of extinguishers were marked with defective stickers but had been left in place. These should be removed and replaced.

Extinguishers in basement (which appear to have been used as wedges) should be relocated and installed on brackets.

Fixed Systems

Are any fixed systems provided?	Yes
Types of system	• Other
Is provision of fixed systems reasonable?	Minor Defects

Comments

Ensure suppression's systems are tested fully to British standard. The suppression in the boiler room appears to have had a visual only test. Churches have provide a quote to make the system suitable to be fully tested. This should be carried out in line with the relevant British standard.

Fire Service Facilities

Are any fire service facilities provided?	Yes
Types of facility	• Smoke ventilation
Is provision of fire service facilities reasonable?	Minor Defects

Comments

Repair manual smoke handles where defective within the firefighting/evacuation lift lobbies. These are required for use by the fire service for smoke removal when fire fighting to prevent smoke spread into the stair. Confirm PPM is set up for regular maintenance.

Provide security straps to dry riser outlets.

Lighting

Normal Lighting

Is there adequate lighting of internal escape routes?	Yes
Is there adequate lighting of external escape routes?	Yes
Is there adequate lighting in risk critical areas?	Yes

Comments

General lighting provision appeared reasonable. However, this assessment was carried out in daylight hours. It is advised that if there any concerns over the lack of general lighting in areas of the building, then the provision of either general or emergency lighting should be assessed by a competent person.

Overall, emergency escape lighting appeared adequate, particularly in areas that are frequently occupied.

Emergency Lighting

Method of emergency lighting of internal escape routes:	• Maintained emergency lighting (local) • Non-maintained emergency lighting (local)
Is this provision reasonable?	Yes
Method of emergency lighting of external escape routes:	• Maintained emergency lighting (local) • Non-maintained emergency lighting (local)
Is this provision reasonable?	Yes
Method of emergency lighting of other areas:	• Borrowed light
Is this provision reasonable?	Yes

Comments

There are 483 defects in the emergency lighting. These are to be completed as part of lifecycle project. An investigation should be carried out to determine the issues around the large number of defects and consider more frequent maintenance to identify and remedy defects.

Any works to the emergency lighting system should be completed by a competent person and in accordance with BS5266. Also, it is recommended that Third Party Approved contractors are used.

Signs & Notices

Escape Routes

Is escape route signage necessary?	Yes
Is escape route signage provided?	Yes
Is provision of escape route signage suitable?	Yes

Comments

Suitable fire exit signage is displayed above all other final exits and indicates the escape routes.

Fire Doors

Is there signage suitable for self-closing fire doors?	Yes
Is there signage suitable for locked fire doors?	Yes
Is there signage suitable for automatic fire doors?	Yes

Comments

The provision of signage will assist in identifying doors that should be subject to routine interim fire safety inspection but the lack of signage is not considered to have a significant impact on life safety. Relevant doors should be provided with appropriate signage as part of any proposed refurbishment.

Other Signs & Notices

Is there suitable signage for fire service facilities?	Yes
Are fire action notices suitable?	Yes
Are there suitable notices for fire extinguishers?	Yes
Is there suitable zone information for the fire alarm system?	Yes

Comments

Fire alarm zone information is covered in the Detection & Warning section.

Appropriate signs are provided and located in suitable positions for the fire extinguishers.

Fire action notices are to be provided and located in appropriate positions by call points in staff controlled areas.

Fire Safety Management

Procedures & Arrangements

Are fire action procedures suitable and appropriately documented?	Yes
Are there suitable arrangements for calling and meeting the fire service?	Yes
Is there a suitable fire assembly point?	Yes
Location of assembly point:	Munster Square/disperse
Are there suitable arrangements for the evacuation of disabled people?	Yes

Comments

Confirm with contractor procedure for raising fire alarm when fire alarm disablements are in place.

The evacuation plan should be communicated to all staff. The procedure highlights the actions to be taken in the event of a fire.

There is a PEEP plan in place on site.

Familiarization visits are carried out at the discretion of the fire and rescue service.

There are formal annual health and safety inspections, but other arrangements are unclear.

Training & Drills

Do staff receive suitable training on the following areas:

Fire risks on the premises & fire prevention measures?	Yes
Action to take on discovering a fire?	Yes
How to raise an alarm?	Yes
Responding to the fire alarm?	Yes
Calling the fire service?	Yes
Location & use of fire fighting equipment?	Yes
Are fire drills carried out at appropriate intervals?	Yes
Are employees from outside organisations given appropriate fire safety information?	Yes

Comments

Due to Covid there is a reduced occupancy in the building. This is being managed by tenants and it is their responsibility to ensure they have adequate coverage of Fire marshals.

Evacuation is via disperse procedure. One tenant is still using Munster Point assembly point and this is being managed by tenant in communication with building management.

Testing & Maintenance

Is there suitable testing & maintenance of the following fire safety measures:

Fire alarm system?	No
Emergency lighting?	No
Smoke ventilation systems?	Yes
Fixed fire-fighting installations?	Yes
Fire mains?	Yes
Fire-fighting lifts?	Yes
Other fire safety measures?	Yes
Are there routine in-house fire safety inspections?	Yes
Are fire extinguishers subject to suitable test & maintenance?	Yes

Comments

No fire alarm maintenance has been carried out since August 2019. Churches have recently been on site and have completed approx. 3 floors of fire alarm maintenance. No records were available to review for these visits. 100% review of fire alarm should be carried out as soon as possible and any actions acted upon. Confirm with Churches their maintenance programme to ensure maintenance is carried out ASAP.

Confirm PAT testing has been completed. Some items have a date of March 2020 but some appliances are out of date (March 2018).

Review emergency lighting paperwork as sheets are not completed as per procedure. Consider retraining of staff in line with procedures put in place in 2018/19 after inspection by Crown Fire Inspectors.

Extinguishers remedials identified on paperwork from May 2020 need completed.

Confirm manual smoke vents are serviced and are part of PPM schedule.

There are remedial actions required for the wet riser from the last service visit. These should be completed.

PAVA: no recent history of maintenance/servicing of PAVA (over last 2 years). This needs carried out ASAP and PPM and contract put in place.

Record Keeping

Are appropriate records kept of the testing & maintenance of:

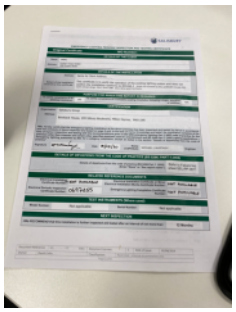
Fire alarm system (inc false alarms)?	No
Emergency lighting?	No
Smoke ventilation?	Yes
Fixed fire-fighting systems?	No
Fire mains?	Yes
Fire-fighting lifts?	Yes
Other fire safety measures?	No
Are records kept of fire drills and training?	Yes

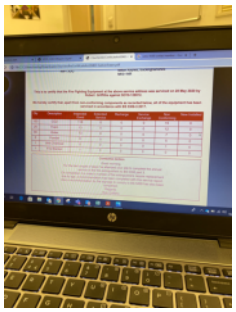
Comments

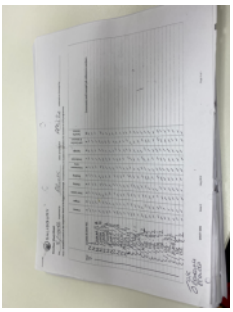
There is a PPM in place and all maintenance is subject to checks and balances with all recording carried out through a performance management system.

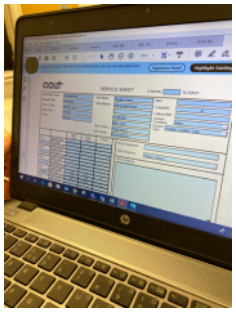
Fire alarm weekly: review procedure to ensure all faults are logged on weekly alarm records.
Fire alarm periodic: Churches: no sheets have been received as recently completed. Tyco serviced on August 2019.
PAVA: no recent history of maintenance of PAVA.
Emergency lighting monthly: review procedure.
Emergency lighting annual: 18/05/20
Fixed wiring: 28/02/19 & 06/08/20. Remedials being completed and within timescales.
Heating system (Oil): weekly and annual. 05/04/20
Lightning protection: 22/01/20
Smoke control (manual): outstanding.
Sprinklers (if applicable): 26/03/20.
Smoke control: 14/01/20
Fire dampers: 30/04/20. Remedials with lifecycle.
Kitchen extract: March 2020. No remedials.
Fire doors: April 2020.
Extinguishers: May 2020. Remedials need completed
Evacuation chairs: None.
Wet riser: July 2020. Remedials outstanding

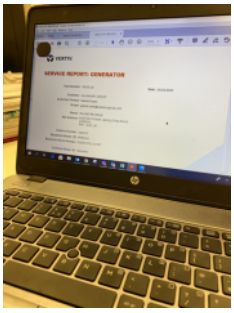
PAT: March 2020. Some areas including 35th don't appear to have been completed.











Tasks

Task 1

Ref	443708
Source Version	1
Category	Fire Management
Sub Category	Testing & Maintenance
Action Required	PAVA: no recent history of maintenance/servicing of PAVA (over last 2 years). This needs carried out ASAP and PPM and contract put in place.
Priority	Critical
Status	Identified
Due Date	10 September 2020

Task 2

Ref	443688
Source Version	1
Category	Escape Routes & Fire Spread
Sub Category	Fire Doors
Action Required	A number of fire doors are not closing fully. Review all fire doors and repair as required. These are due for maintenance within the coming weeks. Stairwell fire doors should be prioritised for first inspection.
Priority	High
Status	Identified
Due Date	8 October 2020

Task 3

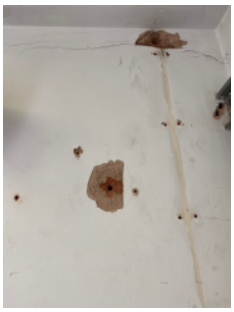
Ref	443701
Source Version	1
Category	Fire Management
Sub Category	Testing & Maintenance
Action Required	No fire alarm maintenance has been carried out since August 2019. Churches have recently been on site and have completed approx. 3 floors of fire alarm maintenance. No records were available to review for these visits. 100% review of fire alarm should be carried out as soon as possible and any actions acted upon. Confirm with Churches their maintenance programme to ensure maintenance is carried out ASAP.
Priority	High
Status	Identified
Due Date	8 October 2020

Task 4

Ref	443694
Source Version	1
Category	Detection & Warning
Sub Category	Control Equipment
Action Required	Confirm status and impact of fire alarm system on 16th floor where cables have been cut off and left and junction boxes are open and not secured correctly.
Priority	High
Status	Identified
Due Date	8 October 2020

Task 5

Ref	443677
Source Version	1
Category	Escape Routes & Fire Spread
Sub Category	Construction and Glazing
Action Required	During the assessment contractors employed by the MOD were removing cable and equipment from the areas they occupied in the roof and cable runs through the building. On a sample of a few areas there were areas breaches in fire compartmentation which needs repaired. A survey should be carried out and all fire stopping made good.
Priority	High
Status	Identified
Due Date	8 October 2020



Task 6

Ref	443676
Source Version	1
Category	Detection & Warning
Sub Category	Control Equipment
Action Required	The fire alarm panel is in a fault condition. The fault should be investigated and repaired. An order is in place for churches to attend site to clear faults. Close action once faults are closed.
Priority	High
Status	Identified
Due Date	8 October 2020

Task 7

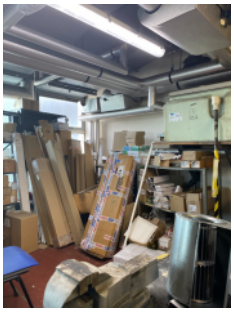
Ref	443678
Source Version	1
Category	Detection & Warning
Sub Category	Control Equipment
Action Required	Review cabling and fire alarm system in MOD areas as there is damage and cut cables. A review of the existing provision of fire alarm in these areas should be carried out and detection installed in line with L1 in accordance with BS5839 part 1 reinstated. A fire alarm contractor should review the current fire alarm arrangements in this area to determine extent of risk.
Priority	High
Status	Identified
Due Date	8 October 2020

Task 8

Ref	443692
Source Version	1
Category	Escape Routes & Fire Spread
Sub Category	Fire Doors
Action Required	A number of doors on 16/17th floor were wedged open. Wedges into the stairs should not be used to hold open fire doors.
Priority	High
Status	Identified
Due Date	8 October 2020

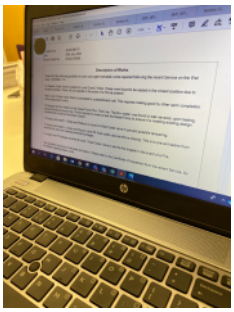
Task 9

Ref	443696
Source Version	1
Category	Fire Prevention
Sub Category	Housekeeping
Action Required	The storage of combustibles in the following locations was excessive and should be significantly reduced: 12th floor plant room.
Priority	Medium
Status	Identified
Due Date	2 December 2020



Task 10

Ref	443707
Source Version	1
Category	Fire Management
Sub Category	Testing & Maintenance
Action Required	There are remedial actions required for the wet riser from the last service visit. These should be completed.
Priority	Medium
Status	Identified
Due Date	2 December 2020

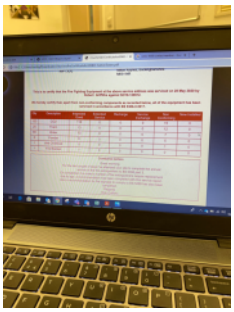


Task 11

Ref	443706
Source Version	1
Category	Fire Management
Sub Category	Testing & Maintenance
Action Required	Confirm manual smoke vents are serviced and are part of PPM schedule.
Priority	Medium
Status	Identified
Due Date	2 December 2020

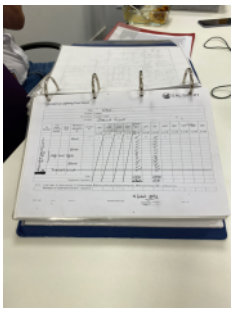
Task 12

Ref	443705
Source Version	1
Category	Fire Management
Sub Category	Testing & Maintenance
Action Required	Extinguishers remedials identified on paperwork from May 2020 need completed.
Priority	Medium
Status	Identified
Due Date	2 December 2020



Task 13

Ref	443704
Source Version	1
Category	Fire Management
Sub Category	Testing & Maintenance
Action Required	Review emergency lighting paperwork as sheets are not completed as per procedure. Consider retraining of staff in line with procedures put in place in 2018/19 after inspection by Crown Fire Inspectors.
Priority	Medium
Status	Identified
Due Date	2 December 2020



Task 14

Ref	443703
Source Version	1
Category	Fire Management
Sub Category	Testing & Maintenance
Action Required	Confirm PAT testing has been completed. Some items have a date of March 2020 but some appliances are out of date (March 2018).
Priority	Medium
Status	Identified
Due Date	2 December 2020

Task 15

Ref	443702
Source Version	1
Category	Fire Prevention
Sub Category	Electrical
Action Required	An electrical appliance in grown floor office has failed its PAT test and should be removed or repaired.
Priority	Medium
Status	Identified
Due Date	2 December 2020

Task 16

Ref	443700
Source Version	1
Category	Fire Management
Sub Category	Record Keeping
Action Required	Fire alarm weekly: review procedure to ensure all faults are logged on weekly alarm records. Current records don't provide an overview of the faults from fire alarm and therefore make it difficult to manage actions and understand status of faults.
Priority	Medium
Status	Identified
Due Date	2 December 2020

Task 17

Ref	443699
Source Version	1
Category	Fire Prevention
Sub Category	Housekeeping
Action Required	The storage of combustibles in the following locations was excessive and should be significantly reduced: apex room
Priority	Medium
Status	Identified
Due Date	2 December 2020

Task 18

Ref	443698
Source Version	1
Category	Fire Prevention
Sub Category	Housekeeping
Action Required	The storage of combustibles in the following locations was excessive and should be significantly reduced: sprinkler/wet riser room.
Priority	Medium
Status	Identified
Due Date	2 December 2020

Task 19

Ref	443682
Source Version	1
Category	Fire Prevention
Sub Category	Heating
Action Required	Remove heater from lift engineers room in 35th plant room. The heater appeared to have slight damage to from of heater. If heater is required replace with an oil filled heater.
Priority	Medium
Status	Identified
Due Date	2 December 2020

Task 20

Ref	443679
Source Version	1
Category	Emergency Lighting
Sub Category	Emergency Lighting
Action Required	There are 483 defects in the emergency lighting. These are to be completed as part of lifecycle project. An investigation should be carried out to determine the issues around the large number of defects and consider more frequent maintenance to identify and remedy defects.
Priority	Medium
Status	Identified
Due Date	2 December 2020

Task 21

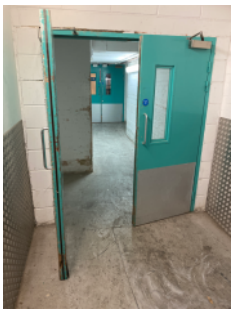
Ref	443693
Source Version	1
Category	Fire Management
Sub Category	Procedures & Arrangements
Action Required	Confirm with contractor procedure for raising fire alarm when fire alarm disablements are in place.
Priority	Medium
Status	Identified
Due Date	2 December 2020

Task 22

Ref	443680
Source Version	1
Category	Detection & Warning
Sub Category	Audibility
Action Required	Two fire alarm sounders on the roof were dangling from cable and not fixed to the wall. These should be repaired and fixed to the wall.
Priority	Medium
Status	Identified
Due Date	2 December 2020

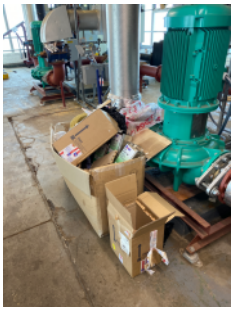
Task 23

Ref	443691
Source Version	1
Category	Escape Routes & Fire Spread
Sub Category	Fire Doors
Action Required	Fire doors in basement need repaired and replaced. Fire doors are damaged, hinges twisted and don't close fully. All basement doors need reviewed and repaired/replaced. These are high use doors and should be designed to take this into account.
Priority	Medium
Status	Identified
Due Date	2 December 2020



Task 24

Ref	443690
Source Version	1
Category	Fire Prevention
Sub Category	Housekeeping
Action Required	The storage of combustibles in the following locations was excessive and should be significantly reduced: Plant room 34th floor.
Priority	Medium
Status	Identified
Due Date	2 December 2020

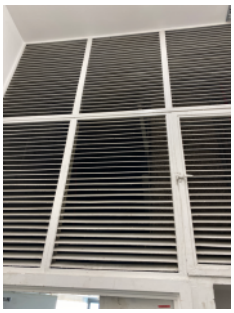


Task 25

Ref	443681
Source Version	1
Category	Fire Prevention
Sub Category	Electrical
Action Required	The electrical sockets in the lift engineers room is overloaded. This should be reviewed and additional sockets provided where required.
Priority	Medium
Status	Identified
Due Date	2 December 2020

Task 26

Ref	443686
Source Version	1
Category	Fire Fighting
Sub Category	Fire Service Access & Facilities
Action Required	Repair manual smoke handles where defective within the firefighting/evacuation lift lobbies. These are required for use by the fire service for smoke removal when fire fighting to prevent smoke spread into the stair. Confirm PPM is set up for regular maintenance.
Priority	Medium
Status	Identified
Due Date	2 December 2020

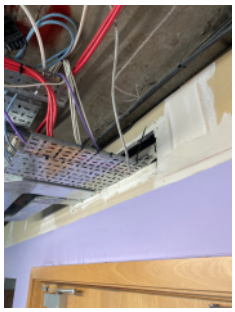


Task 27

Ref	443684
Source Version	1
Category	Fire Fighting
Sub Category	Extinguishers
Action Required	A number of extinguishers were marked with defective stickers but had been left in place. These should be removed and replaced.
Priority	Medium
Status	Identified
Due Date	2 December 2020

Task 28

Ref	443695
Source Version	1
Category	Escape Routes & Fire Spread
Sub Category	Construction and Glazing
Action Required	Survey breaches in fire compartmentation which is evident after the strip out of the false ceiling on floors occupied by Google. Once surveyed fire stopping should be actioned.
Priority	Medium
Status	Identified
Due Date	2 December 2020

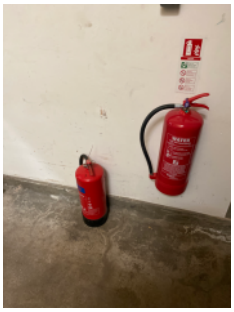


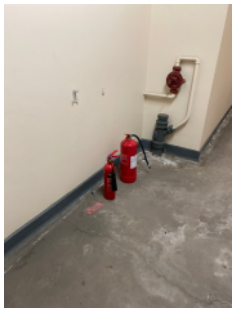
Task 29

Ref	443683
Source Version	1
Category	Fire Prevention
Sub Category	Housekeeping
Action Required	Remove furniture in the lift engineers room which has exposed foam or repair to comply with the furniture and fixing regulations.
Priority	Low
Status	Identified
Due Date	10 September 2021

Task 30

Ref	443697
Source Version	1
Category	Fire Fighting
Sub Category	Extinguishers
Action Required	Extinguishers in basement (which appear to have been used as wedges) should be relocated and installed on brackets.
Priority	Low
Status	Identified
Due Date	10 September 2021





Task 31

Ref	443689
Source Version	1
Category	Fire Fighting
Sub Category	Fixed Systems
Action Required	The suppression in the boiler room appears to have had a visual only test. Churches have provide a quote to make the system suitable to be fully tested. This should be carried out in line with the relevant British standard.
Priority	Low
Status	Identified
Due Date	10 September 2021

Task 32

Ref	443687
Source Version	1
Category	Fire Fighting
Sub Category	Fire Service Access & Facilities
Action Required	Provide security straps to dry riser outlets.
Priority	Low
Status	Identified
Due Date	10 September 2021

Task 33

Ref	443685
Source Version	1
Category	Fire Prevention
Sub Category	Electrical
Action Required	The following portable electrical appliances do not appear to have been recently tested (March 2018), and should therefore be tested (for testing frequencies, reference should be made to the IEE document In Service Inspection & Testing of Electrical Equipment): engineers office, plant room.
Priority	Low
Status	Identified
Due Date	10 September 2021

Risk Score

Risk Score	Moderate Risk
Next Assessment Due	10 September 2021

Likelihood	Potential Consequence		
	Slight Harm	Moderate Harm	Extreme Harm
High	Moderate	Substantial	Intolerable
Medium	Tolerable	**Moderate**	Substantial
Low	Trivial	Tolerable	Moderate

Likelihood

Low	Unusually low likelihood of fire as a result of negligible potential sources of ignition.
Medium	Normal fire hazards (e.g. potential ignition sources) for this type of occupancy, with fire hazards generally subject to appropriate controls (other than minor shortcomings).
High	Lack of adequate controls applied to one or more significant fire hazards, such as to result in significant increase in likelihood of fire.

Consequence

Slight	Outbreak of fire unlikely to result in serious injury or death of any occupant (other than an occupant sleeping in a room in which a fire occurs).
Moderate	Outbreak of fire could foreseeably result in injury (including serious injury) of one or more occupants, but it is unlikely to involve multiple fatalities.
Extreme	Significant potential for serious injury or death of one or more occupants.

PFP Specialists

Initial PFP Evaluation Report for Euston Tower:

Commentary on the Investigation of an Existing Spray Fire Resistive Material Applied to Concrete Structural Elements

PFP Specialists Ltd.
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Report No.	PFPS-TR-2037-2
Issue	01
Date of Issue	26th March 2021

Document History			
Issue	**Date**	**Prepared by**	**Comments**
01	2021-03-26	*Written by: -* **Edward Walker** Associate Consultant *Checked by: -* **John Dunk** Director **Allan Jowsey** PhD CEng MEng FIFireE PMSFPE MASCE Director Chartered Engineer	First issue

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EXECUTIVE SUMMARY

PFP Specialists Ltd. were instructed by British Land to carry out an investigation of the Sprayed Fire Resistive Material (SFRM) at Euston Tower with specific focus given to an assessment of it condition as applied to the underside of the concrete ribbed floor slab and floor beams on Floors 3 to 13.

A first-stage report with reference PFPS-TR-2037 has previously been issued to British Land which documented findings by visual inspection only. The first stage report included: -

a) Comments on the scope of the SFRM application in Euston Tower
b) An opinion that the same material has been used for the full scope
c) Collection of samples for first-stage laboratory analysis testing
d) Conducting a survey of the extent of the material application on each level with the view to lead into a future condition report and associated advice on the capability of the installed material to protect the substrate to which is attached.
e) Recommendations to further develop the initial work conducted and provide more definitive data relating to the installed product throughout the building.

This second-stage report builds on the findings of the first-stage report to provide British Land with a conclusive identification of the SFRM material type and manufacturer and verify its fire resistance capability and functionality.

A four-stage investigation process has been adopted as follows: -

1. Visual and tactile observations of the material on each level
2. A bulk density and material binder broad synopsis to shortlist possible proprietary products for consideration.
3. A FT-IR spectroscopy analysis of a specimen of material and a benchmark product sample
4. A Condition Survey to assess that the SFRM is functional and remains robust

This report has identified the material as Cafco MANDOLITE® CP2 which is manufactured by Promat.

The minimum coating thickness recorded in the inspection, when cross-checked against the Cafco MANDOLITE®-CP2 literature, shows that it would be sufficient to upgrade the insulation requirement of concrete soffits and compensate for lack of concrete cover to reinforcement for 120 minutes fire resistance.

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1 TERMS AND ABBREVIATIONS

CS **Condition Survey**

Inspection of in service SFRM is better described as "Condition Survey" as it involves making judgement when assessing the severity of anomalies.

CVI / Major CS **Close Visual Inspection**

A close examination by visual and/or tactile means of an SFRM to detect anomalies (damage, failure, or irregularity).

This level of inspection may require the use of specific inspection equipment, magnifying lenses, or other aids to provide a means to accomplish a focused inspection.

GVI / Interim CS **General Visual Inspection**

A general examination by visual means of the SFRM to identify type and detect obvious anomalies (damage, failure, or irregularity).

This level of inspection is made from within touching distance unless otherwise specified. While maintaining this level of inspection, use of a specific inspection equipment or other aids may be necessary to allow visual access to exposed surfaces in the inspection area.

PFP **Passive Fire Protection**

A barrier, coating or other safeguard which provides protection against the heat from a fire without additional intervention.

PFPS **PFP Specialists Ltd**

Providing a service for passive fire protection, including design, fire engineering, product selection and installation.

SDI **Special Detailed Inspection**

An intensive examination of an SFRM to detect anomalies (damage, failure, or irregularity) that is not evident through visual and/or tactile means.

This level of inspection requires the use of specialized techniques and/or equipment (thickness measurement methodology and equipment)

SFRM **Spayed Fire Resistive Material**

Sprayed Fire-Resistive Material (SFRM), more commonly referred to as spray-applied fireproofing, is a passive fire protection material intended for direct application to structural building members. The intent of this material is to increase the fire resistance characteristics of those members, primarily through insulation.

SFRM materials come predominantly in cementitious, gypsum mineral-fibre or intumescent paint-based forms

VGP **Vermiculite Plaster**

Vermiculite plasters can be made with either gypsum or Portland cements and comprise a relatively simple mixture. Usually factory made they can also be batched on site and spray applied.

MBTL Manchester Building and Testing Laboratories Limited

NDE Non-Destructive Examination*, e.g., GVI, and CVI*

No. Number

SGS SGS INTRON Laboratory

RAMS Risk Assessment Method Statement

2 REFERENCES

[1] Manchester Building and Testing Laboratories Limited (MBTL) Report
Consultant Analytical Investigation Laboratories Materials Testing Service
Report, 18 February 2021
(*Appendix A*)

[2] SGS INTRON Laboratory Report
Consultant Analytical Investigation Laboratories Materials Testing Service
Results laboratory testing sprayed fire-resistive material (MATERIAL) Report 09 March 2021
(*Appendix B*)

[3] Promat Cafco MANDOLITE® CP2 technical Data Sheet TDS136
Cafco MANDOLITE® CP2 to upgrade the fire resistance of Concrete and Composite Soffits
(*Appendix C*)

[4] PFPS-TR-2037 Issue 01. Initial PFP Evaluation Report for Euston Tower: General Visual Inspection of Existing Sprayed Fire Resistive Material. PFP Specialists. 24th November 2020.

[5] Fire protection for structural steel in buildings (Yellow Book). 2nd Edition. Association of Specialists Fire Protection (ASFP). Circa 1980s. Note that 5th Edition (2018) is current.

3 INTRODUCTION

PFP Specialists Ltd. (PFPS) were instructed by British Land to carry out an assessment of the spray fire resistive material (SFRM) at Euston Tower.

The investigation concerned a sprayed material applied to the underside of the concrete ribbed floor slab and floor beams supporting floors 3 to 13. Access to the material is from the level below.

The details of the material, including product, manufacturer, and application date, were unknown to British Land.

The SFRM could have been applied at the time of the construction of the building (completion 1970) or during a reported refurbishment in 1993/4.

It is understood ARUP suggested the material may likely to have been installed as a retrofit acoustic treatment.

This investigation by PFP Specialists was commissioned by British Land Company PLC, to provide condition reports, give an estimate of the level of fire protection provided and if it is insufficient, to make recommendations for upgrading.

The investigation consists of four stages:

1. An Interim Condition Survey. General visual inspection (GVI) on October 22, 2020 which ascertained the scope and collected specimens of the material for analysis.
2. Desk based/secondary research
3. Consultant analytical materials testing and benchmarking of specimens from Euston Tower
4. Major Condition Survey consisting of a General Visual Inspection (GVI) and Close Visual Inspection (GVI) of the material on March 11, 2021.

Figure 1 and Figure 2 are extracted from the ARUP Invasive Survey report to aid understanding.

Figure 1: Soffit of Level 5 slab showing sprayed material on ribbed slab applied around ceiling and services supports (image courtesy of 190925 ARUP Invasive Survey Report)

Figure 2: Soffit of Level 17 slab as-struck concrete ribs with some cast-in channels and some surface-fixed services (image courtesy of 190925 ARUP Invasive Survey Report)

4 INFORMATIVE CLIENT REFERENCES

The client documents referenced in Table 1 were provided by British Land and have been used in the scope of work for this production of this report.

Table 1: Documentation provided by British Land

Author	Filename
IDF	2020.10.14 Euston Tower - Feasibility study (003)
SANDBERG	66429s Spray Material (002)
SANDBERG	66429s1 Euston Tower Sandberg Report Summary
SANDBERG	67629S-K Report
ARUP	190925 ARUP Invasive Survey Report
ARUP	Arup Commentary on Structural Investigations
McGEE	Euston Tower site investigation 003
NDY - Google	NDY - Google Structural Fire Resistance Consultant Advice
SANDBERG	P5851s-rl-Euston Tower Add Cores

5 INTERIM CONDITION SURVEY

Stage 1 of the investigation consisted of an Interim Condition Survey. A general visual inspection (GVI) of the material on October 22, 2020. The key aspects of this study included: -

- **Scope**
  The SFRM material was observed on the underside of the concrete floor slabs at Level 13 viewed from the plant room area and all levels down to and including Level 3.

- **Material type**
  The visual and tactile observations of the material on each level are similar indicating the same product was used throughout at floor levels within the scope.

- **Sample removal**
  Material samples were removed on Level 4 for the purposes of analytical testing. The removal of these samples is not expected to have a detrimental impact of the performance of the remaining SFRM material. These samples were subsequently sent to Manchester Building and Testing Laboratories Ltd. (MBTL) on Tuesday 27 October 2020 and SGS INTRON on 3 February 2021.

6 DESK BASED/SECONDARY RESEARCH

A review of available product literature from circa. 1992 [5] is presented in Table 2 together with the product's associated density value or range. 1992 has been taken as representative date to align with the refurbishment of Euston Tower, during which the application of SFRM was likely.

The purpose of this table is to provide a basis by which laboratory testing

Table 2: Common SFRM material product names and their respective densities. These are understood to have been commercially available circa. 1992

SFRM Products available circa. 1992	Density (kg/m³)
AUDEXG	516
CBLAZE	180-300
C280	-
C800	800
C4FP	205-300
DARFIBRE	220-360
DSPRAY HD	700
DSPRAY LD	380-450
HS3	750
CP2	390
MKV	325
MKBI	266
CV25	775
CV27	450
P720	690
RCEM	-
SDON FG	200
SLMW	-
SLVE	715-720
SLVI	350-400
VULTEX	715
Z105	350

7 CONSULTANT ANALYTICAL MATERIAL INVESTIGATION

7.1 Assessment of bulk-density and binder type

Manchester Building and Testing Laboratories Ltd. (MBTL) were requested to undertake testing to ascertain the bulk density of the samples and their associated binder type. This information would then be used to cross-check against the products in desk-based research presented in Section 6.

The results of the testing are summarized in Table 3 and provided in full in Appendix A.

Table 3: Summary of density and binder agent testing

Sample	Mass (g)	Density (kg/m³)	Binder agent
A	87.1	385	Ordinary Portland cement
B	61.8	400	Ordinary Portland cement
C	58.6	370	Ordinary Portland cement

The testing concluded that the indicative average density is 386 kg/m³ and the major binding agent is ordinary Portland cement.

Of the products in Table 2, it is possibly to identify potential products based on their density profile. These are given as: -

- Darspray LD
- MANDOLITE CP2 (CP2)
- Sprayed Limpet Vermiculite Internal (SLVI)

All three of these products use ordinary Portland cement as their binding agent.

7.2 Assessment of FT-IR spectroscopy

In order to further conclusively identify the product, FT-IR spectroscopy was undertaken as SGS INSTON laboratories. Theis assessment allows for the direct comparison of two samples to provide an opinion on their similarity.

A sample from Euston Tower was tested together with a benchmark MANDOLITE CP2 sample. The CP2 sample was proposed for testing based on assumption of this being the actual material as presented and discussed in PFPS-TR-2037 Issue 01 [4].

The Euston Tower specimen was taken from the underside of the Level 5 floor in the East spur.

The MANDOLITE CP2 sample was provided to PFP Specialists by the distributer Reppel.

The findings of the FT-IR spectroscopy are summarised below, but can be found in full in Appendix B.

- Both samples consist of a Portland cement-based material.
- In both samples, fire retardant minerals like Hydrophlogopite, Phlogopite and Vermiculite are present.
- The two samples are identical

The testing concludes that the two samples are identical which infers that the product in Euston Tower is MANDOLITE CP2.

It is of note that MANDOLITE P20 and MANDOLITE CP2 were developed by Mandoval Coatings Ltd. in the 1970s and 1990s, respectively. MANDOLITE CP2 superseded MANDOLITE P20.

The products are virtually identical in physical and mechanical properties; additives differ which affect the rheological properties.

The SFRM product name in Euston Tower, will likely depend on the date at which it was installed: -

- Material applied during construction is likely MANDOLITE P20
- Material applied during refurbishment in 1994/5 is likely MANDOLITE CP2

In essence, both products are the same and they both provide fire resistance, thermal and acoustic insulation functionality.

Promat acquired the intellectual property in 2007 and currently manufacture MANDOLTE CP2.

8 MAJOR CONDITION SURVEY

The purpose of the survey is to establish as far as practical, the condition of the SFRM and provide assurance and verification that it is functional and remains robust.

The survey consists of two aspects: -

1. Inspection of SFRM anomalies and their severity levels
2. SFRM Thickness readings

8.1 Methodology

Figure 3 shows a typical floor plan of Euston Tower.

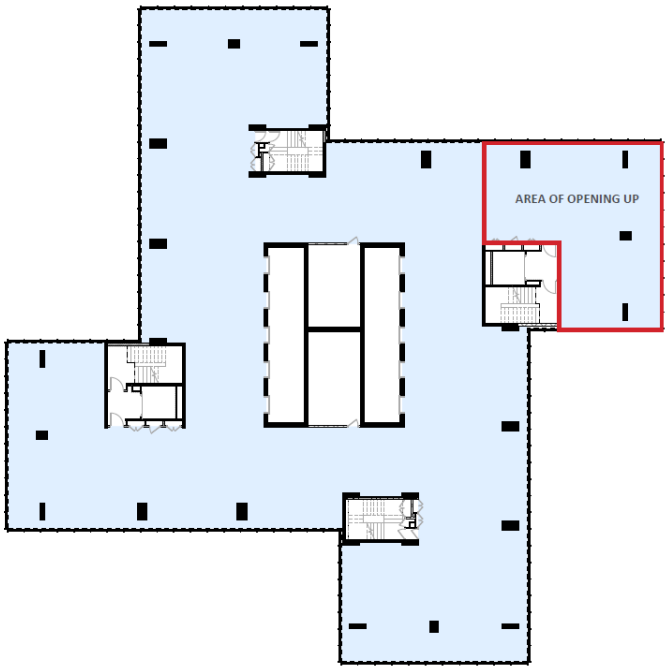


Figure 3: Existing typical floor plan. The spurs are known as North, East, South and West (image courtesy of 190925 ARUP Invasive Survey Report)

The scope of the survey includes the following: -

- On each level select one location in each of the four spurs
- Identify the locations selected
- General visual inspection of the SFRM at 4 locations levels 3-13 (11 floors)
- Close visual inspection of any anomalous areas identified
- Close visual inspection - measurement of the coating thickness using a needle depth gauge
- Any restrictions to the condition survey plan are noted accordingly

Anomalies are listed and categorised. The criteria are specific to a cement based SFRM applied to concrete structural/ compartmentation components the inside of a building. Five anomaly severity levels are used for condition assessment as shown in Table 4. It is of note that there is no standard to undertake this type of assessment. Instead, best practice industry principles have been adopted.

Table 4: Description of anomaly severity levels

Anomaly Severity Level	Description
1	Severe or immediate
2	Major
3	Significant
4	Minor
5	Acceptable

The severity levels presented in Table 4 are further clarified in Table 5.

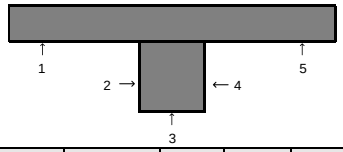
Table 5: PFP anomalies and their severity level

Anomaly Type	Anomaly Description		Severity	Implications	Possible Cause
Disbonded or Delaminated	Disbonded from substrate (extent ascertained by tap testing for hollow boss)	≤1m^2	1	SFRM coatings should be sufficiently well bonded to the substrate to resist elastic deformation (flexure) and a degree of plastic deformation of the substrate in use and fire events	Poor surface preparation, dusty or contaminated substrate, spray application non conformance
		>1m^2	3-5		
	Delaminated from previous spray pass/coat	≤1m^2	1	Premature failure in fire event. Dropped object risk	Spray application non conformance
		>1m^2	3-5		
Missing SFRM	Physical damage or areas where SFRM has been removed and not replaced	≤3000 mm^2	1	Can cause localised hot spots in event of fire leading to premature failure of item protected	Mechanical damage or not replaced after removal
		>3000 mm^2	3-5		
Repairs	Repair with different product		3	Performance of the detail may not be tested or certified	Non-conformance, original SFRM material obsolete or unknown
Cracking	≤3mm		1	Can cause localised hot spots in event of fire leading to premature failure of item protected. Note that for cracks <3mm you will get limited hot spots in the event of fire	Poor surface preparation, vibration, mechanical damage, or thermal expansion/cycling
	>3mm		3-5		
Remaining material < required thickness	≤10%loss		2	Reduced thickness of the PFP will, in case of fire, lead to faster temperature rise of the substrate, reducing the protective performance of the PFP.	Reduced thickness can be due to application non-conformance or mechanical damage
	>10% loss		3-5		
Appearance	Significant difference in appearance or colour to other areas of same SFRM		1-5	Fire rating may be compromised. CVI of PFP required to determine cause	Poor workmanship or spray application non conformance

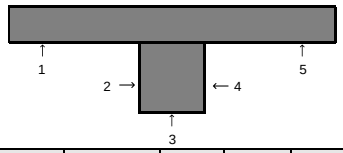
8.2 Inspection Assessment

Table 6: Assessment results

Minimum Inspection Activities / Requirements
Comments on the condition of the SFRM applied to floor slab and rib at the 4 selected inspection locations on each floor. The SFRM applied to the underside of the floor slab on each level was viewed from the floor below for example the underside of floor 13 was viewed from level 12
The inspection checked at each location against all anomaly criteria, as listed in Section 8.1.

Minimum Inspection Requirements & Location Reference		Disbonded (DB)	Delaminated (DL)	Missing SFRM (CM)	Incompatible Repairs (IR)	Cracking (C)	Appearance (A)	Average thickness (mm)	Coating thickness measurement (mm) & Locations (stylised Section) 					Comments
Item/ location	Severity Assessment	*≤1m² 1 >1m² 3-5*	*≤1m² 1 >1m² 3-5*	≤3000 1 >3000 3-5	3	≤3mm 1 *>3mm 3-5*	1-5	-	Slab 1	Rib 2	Rib 3	Rib 4	Slab 5	
Level 12 US/F13	North Spur							35	40	30	35	na	na	Plant room height and access restricted CVI
Level 12 US/F13	East Spur							45	45				45	No rib at location
Level 12 US/F13	South Spur							35	35				35	No rib at location
Level 12 US/F13	West Spur							27	25				30	No rib at location
Level 11 US/F12	North Spur							38	35	30	35	55	37	
Level 11 US/F12	East Spur							31	40	35	29	25	27	
Level 11 US/F12	South Spur							31	25	37	33	na	na	No access (na)
Level 11 US/F12	West Spur							40	35	35	50	na	na	No access (na) small patch repair
Level 10 US/F11	North Spur							38	40	40	36	na	42	No access (na)
Level 10 US/F11	East Spur							38	35	42	40	42	35	
Level 10 US/F11	South Spur						5	31	30	30	35	30	30	Heavy texture appearance
Level 10 US/F11	West Spur							33	40	30	32	na	31	No access (na)
Level 9 US/F10	North Spur							38	30	40	45	35	41	
Level 9 US/F10	East Spur							40	40	40	36	45	40	Grey coloured overspray
Level 9 US/F10	South Spur						5	38	47	28	40	43	36	Heavy texture appearance
Level 9 US/F10	West Spur						5	35	40	32	40	30	35	Heavy texture appearance
Level 8 US/F9	North Spur						5	36	30	30	43	33	46	Patch repair around hanger. Heavy texture
Level 8 US/F9	East Spur							38	43	35	38	35	37	Patch repair
Level 8 US/F9	South Spur					5		39	39	35	46	35	40	Large Patch repair, Minor crazing
Level 8 US/F9	West Spur							38	40	37	43	36	35	Large patch repair
Level 7US/F8	North Spur							30	30	25	33	26	35	Patch repair
Level 7US/F8	East Spur							43	40	43	45	40	47	
Level 7US/F8	South Spur						5	32	30	32	25	31	40	Heavy texture appearance
Level 7US/F8	West Spur							38	35	35	39	42	40	Patch repair
Level 6 US/F7	North Spur							33	35	31	35	35	30	
Level 6 US/F7	East Spur						5	45	44	45	47	41	46	Heavy texture appearance
Level 6 US/F7	South Spur							43	40	39	50	43	41	
Level 6 US/F7	West Spur			5				42	45	36	46	40	43	Minor scuff
Level 5 US/F6	North Spur							-	-	-	-	-	-	Occupied no access for CVI
Level 5 US/F6	East Spur							41	50	40	45	37	35	
Level 5 US/F6	South Spur							-	-	-	-	-	-	Occupied no access for CVI
Level 5 US/F6	West Spur							-	-	-	-	-	-	Occupied no access for CVI

Minimum Inspection Activities / Requirements
Comments on the condition of the SFRM applied to floor slab and rib at the 4 selected inspection locations on each floor. The SFRM applied to the underside of the floor slab on each level was viewed from the floor below for example the underside of floor 13 was viewed from level 12
The inspection checked at each location against all anomaly criteria, as listed in Section 8.1.

Minimum Inspection Requirements & Location Reference		Disbonded (DB)	Delaminated (DL)	Missing SFRM (CM)	Incompatible Repairs (IR)	Cracking (C)	Appearance (A)	Average thickness (mm)	Coating thickness measurement (mm) & Locations (stylised Section) 					Comments
Item/ location	Severity Assessment	*≤1m² 1 >1m² 3-5*	*≤1m² 1 >1m² 3-5*	≤3000 1 >3000 3-5	3	≤3mm 1 *>3mm 3-5*	1-5	-	Slab 1	Rib 2	Rib 3	Rib 4	Slab 5	
Level 4 US/F5	North Spur							45	35	48	47	50	45	
Level 4 US/F5	East Spur			1				40	34	42	40	37	45	CM; large area removed for CVI by others – see Figure 10 and Figure 11
Level 4 US/F5	South Spur					5		46	40	40	45	50	55	C&DB; cracking 300x300
Level 4 US/F5	West Spur							43	45	33	50	40	46	Area sprayed with a white paint coating
Level 3 US/F4	North Spur						5	36	32	38	42	34	32	Large rib, heavy texture appearance
Level 3 US/F4	East Spur					5	5	36	35	30	44	35	35	C; heavy texture appearance
Level 3 US/F4	South Spur						5	37	46	45	35	35	25	Heavy texture appearance
Level 3 US/F4	West Spur					5		44	30	45	55	45	47	C
Level 2 US/F3	North Spur							-	-	-	-	-	-	Floor height prevented access CVI
Level 2 US/F3	East Spur							-	-	-	-	-	-	Floor height prevented access CVI
Level 2 US/F3	South Spur							-	-	-	-	-	-	Floor height prevented access CVI
Level 2 US/F3	West Spur							-	-	-	-	-	-	Floor height prevented access CVI

8.3 Associated Images

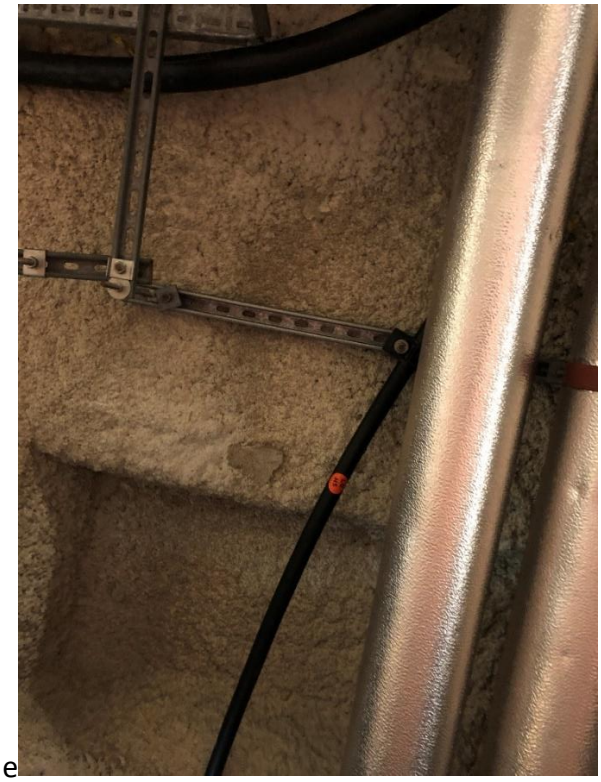
e 

Figure 4: Minor patch repair

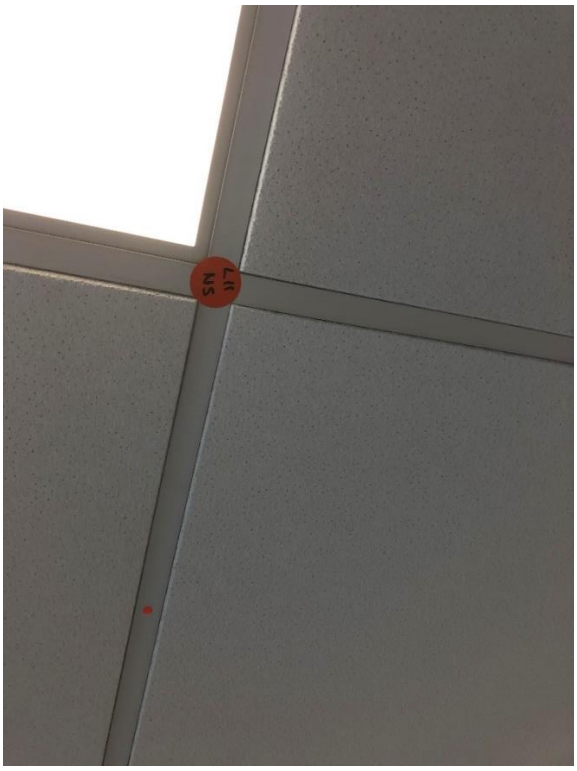


Figure 5: Adhesive label identifying the inspective location (L11 NS)

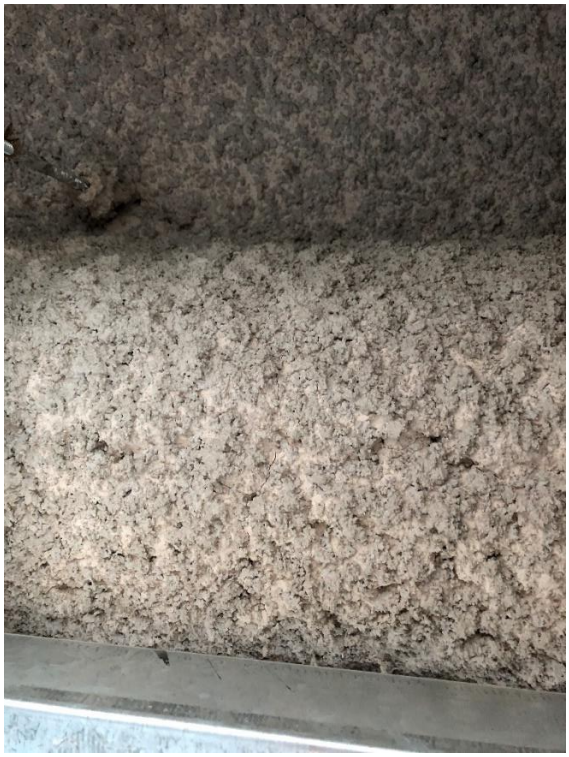


Figure 6: Heavy texture appearance

Figure 7: Small patch repair

Figure 8: Large patch repair

Figure 9: Needle gauge coating thickness measurement to slab rib

Figure 10: Level 4 East spur – large area of SFRM removed for CVI by others as part of the structural investigation

Figure 11: Level 4 East spur showing the cohesive failure of the SFRM on removal with mechanical tools – indicating good adhesion

9 FINDINGS AND SUMMARY

The survey results presented in Table 6 found one anomaly level 1 (severe or immediate) where McGee (see reference in Table 1) had carried out "*insulation breakout as part of Euston Tower site investigations*". For this area, the manufacturer of the product should be able to provide a standard repair procedure which a recognised specialist contractor will incorporate into a method statement.

All other anomalies assessments were categorised as '5', i.e., acceptable.

The average thickness of the SFRM ranged from 27mm to 46mm.

It is common practice to use SFRM materials to upgrade concrete components in buildings. Promat provide guidance on the use of MANDOLITE® CP2 to upgrade the insulation requirement of concrete soffits and compensate for lack of concrete cover. An extract of the relevant thicknesses is shown in Figure 12, while the full datasheet is provided in Appendix C of this document.

TABLE 1

Thickness of Cafco MANDOLITE® CP2 (in mm) required to upgrade the fire insulation requirements for concrete soffits

Existing Slab Thickness (mm)	Total Required Fire Resistance to BS476:Part 21 (minutes)					
	30	60	90	120	180	240
75		9.5	15	20	29	37
80		8	13	18	27	35
90		8	9.5	14	23	31
100			8	10	19	27
110				9.5	15	23
120				8	11	19
130					9.5	15
140					8	11
150						9.5
165						8

TABLE 2

Thickness of Cafco MANDOLITE® CP2 (in mm) required to compensate for lack of concrete cover to reinforcement

Existing Cover (mm)	Total Required Fire Resistance to BS476:Part 21 (minutes)					
	30	60	90	120	180	240
10	9.5	9.5	9.5	13	18	22
15	8	8	9.5	11	16	20
20		8	8	9.5	14	18
25			8	8	12	16
30				8	10	14
40					8	10
50					8	9.5
60						8

Figure 12: Excepts from [4] Promat Cafco MANDOLITE® CP2 technical Data Sheet TDS136

In can be seen in the tables above, the minimum measured thickness of MANDOLITE CP2 of 27mm would be sufficient to upgrade the insulation requirement of concrete soffits and compensate for lack of concrete cover to reinforcement for 120 minutes fire resistance.

10 APPENDIX A: MANCHESTER BUILDING AND TESTING LABORATORIES REPORT

Manchester Building and Testing Laboratories Limited

Consultant Analytical Investigation Laboratories
Materials Testing Service

Priory Grange, Watling Street, Old Roman Road
Affetside Bury, Manchester BL8 3QJ
Telephone & Fax : 01204-886677
Email : mbtlabs@btinternet.com
Web site : www.mbtlabs.co.uk
www.mbtl.co.uk

18 February 2021

Re: 3 Samples submitted for analysis

Dear Eddie,

Please find written confirmation of test results as discussed for samples submitted.

Your reference :- SFRM Investigation Chemical Analysis & Physical Properties.

Introduction

Three separate samples of Sprayed Fire-Resistive Material were further submitted for density measurement and binder typing with as-received weights as follows:-

A - 87.1 grams
B - 61.8 grams
C - 58.6 grams

Directors: Brian Timperley, F.C.S., J. Timperley, S.R.Ch.
Manchester Building and Testing Laboratories Ltd. is a limited company registered in England and Wales.
Company No. 00954353. Registered office: 114 Drake St, Rochdale, Lancs, OL16 1PN.

Test Results and Conclusions

Test results of sample submitted

	ASTM C642-13
% Water Absorption of Sample 24 Hours Cold	173.42 %
% Water Absorption of Sample Saturated	216.39 %
Dry Bulk Density of Sample in KG/m^3	386
Bulk Density after Cold Immersion KG/m^3	1056
Saturated Bulk Density of Sample in KG/m^3	1223
Apparent Specific Gravity of Sample	2.36
Percentage Volume of Voids in Sample	83.6
Saturation Coefficient	0.80

The as-received mass of the main sample was 87.1 grams and all three samples were conditioned at 43°C and ≤60% RH to virtual constant weight at 8-hour intervals.

The minimum volume for testing density is 0.35 litres for an alternative referee-standard test method for density in hardened concrete with strict reference to ASTM C642-13.

The chemical analysis with strict reference to BS 4551:2005+A2:2013 indicated that the major binding agent was found to be based largely on Ordinary Portland Cement.

The analysis also indicated that significantly higher aluminium content (as Al_2O_3) when compared to the iron content (as Fe_2O_3) and higher silica contents (as SiO_2) tended to indicate that the majority of the lightweight aggregate could be mainly based on Perlite.

Sulphur trioxide (SO_3) is low eliminating the binder being based on calcium sulphate ($CaSO_4$). It is more in line with the ($CaSO_4$) being added to ordinary Portland cement to prevent flash-set.

The dry bulk density of the three different samples

A - 385 kg/m^3

B - 400 kg/m^3

C - 370 kg/m^3

The dry bulk density of the sample A carried out by the alternative referee test method ASTMC642-13 in the previous table. Sample 'D' shows remarkably good correlation with sample 'A' by two different methods, 'D' being a 'referee' displacement method.

D - 386 kg/m^3

Confirmatory measurement methods appear to be in very good correlation to the displacement methods.

Note that the same ASTM analytical specification indicates a huge 83.6% voids, presumably mainly due to the lightweight aggregate.

Manchester Building and Testing Laboratories Limited

Brian Timperley.

11 APPENDIX B: SGS INTRON LABORATORY – CERTIFICATE OF ANALYSIS

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P.O. box 5187
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tel: +31 (0) 88 - 2 145 204

SGS

Certificate Of Analysis

PFP Specialists Ltd
attn. Mr. J.V. Dunk
Willowbrook, The Street, Preston St Mary
C0109NG SUFFOLK
UNITED KINGDOM

Date	:	09-03-2021
Subject	:	Results laboratory testing sprayed fire-resistive material (SFRM)
Your Code	:	No reference supplied
Laboratory Number	:	204727
Sampling	:	By client
Period of Investigation	:	03-02-2021 until 22-02-2021

SAMPLE DATA

Sample No	Sample Type	Sample Code	Date of Acceptance
1	SFRM	ET21012021	03-02-2021
2	SFPM	MM25-2212021	03-02-2021
3	SFRM	RCP2 21012021 (Reference)	25-01-2021

METHODS

Analyses		Used method	Q	S
Visual assessment	Optical microscopy	SGS INTRON		
Identification	Infrared spectrometry (ATR/FTIR)	SGS INTRON		
Identification and quantification	XRD	In house method		s

'Q = ISO 17025 accredited, s = subcontracted, Qs = ISO 17025 accredited subcontractor

SUMMARY RESULTS COMPOSITION

The two samples (1 and 3) consist of a Portland cement-based material. In both samples fire retardant minerals like Hydrophlogopite, Phlogopite and Vermiculite are present. The quantities can not be determined without further testing. There is always the possibility that the samples are inhomogenous.

Author:	ing. S.P.M.L. Benders projectmanager	Authorisation:	H.P.H. Creemers accountmanager

Page 1 of 4

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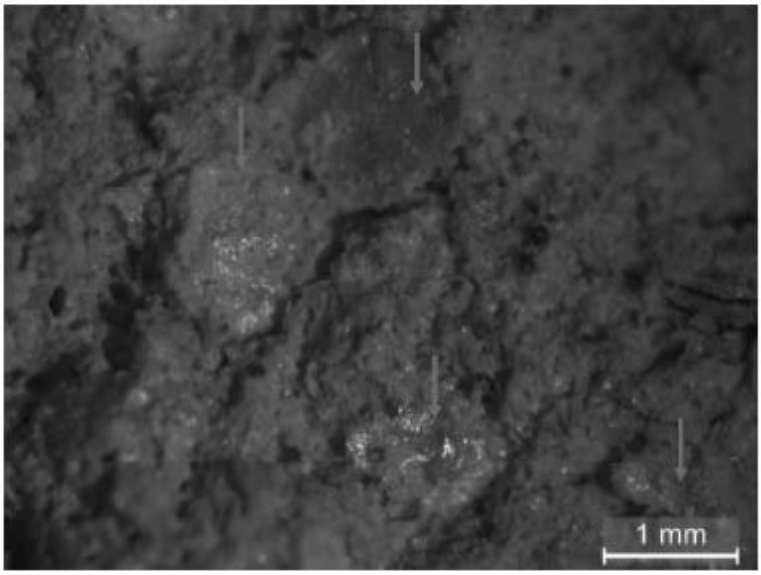
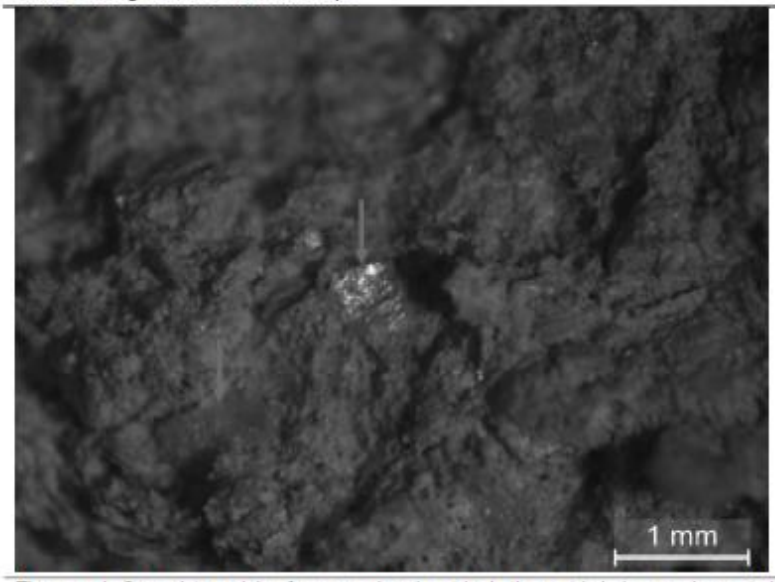
SGS

RESULTS OPTICAL MICROSCOPY



The sample 1 consists mainly of a grey colored matrix. In the matrix beige pearlescent plate like grains are embedded (some marked with a red arrow). The layers are easily pulled apart with a scalpel. It looks like a mica. These grains have a round shape.



The sample 3 consists mainly of a grey colored matrix. In the matrix beige pearlescent plate like grains are embedded (some marked with a red arrow). The layers are easily pulled apart with a scalpel. It looks like a mica. These grains have a angular shape.

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SGS

RESULTS & OPINION/INTERPREATATIE ATR/FTIR ANALYSIS

The results of the ATR/FTIR analysis are depicted in the image below.

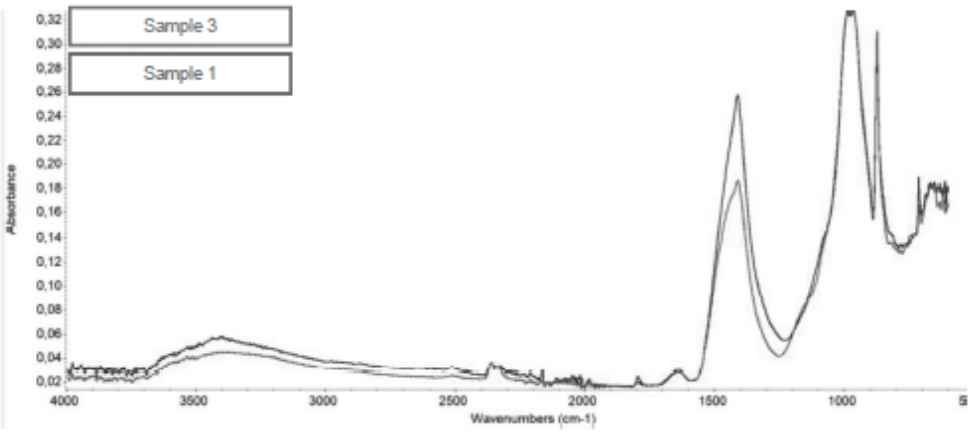

Image: ATR-FTIR spectrum of the two samples

The ATR/FTIR spectrum of the two samples are identical. The two samples consist of a Portland based cement. The reference spectrum of Portland cement is not depicted. In general quantities in lower concentrations than 10 % of unknow components cannot be detected with ATR/FTIR.

RESULTS XRD ALALYSIS

The results of the XRD analysis are presented in the image below.

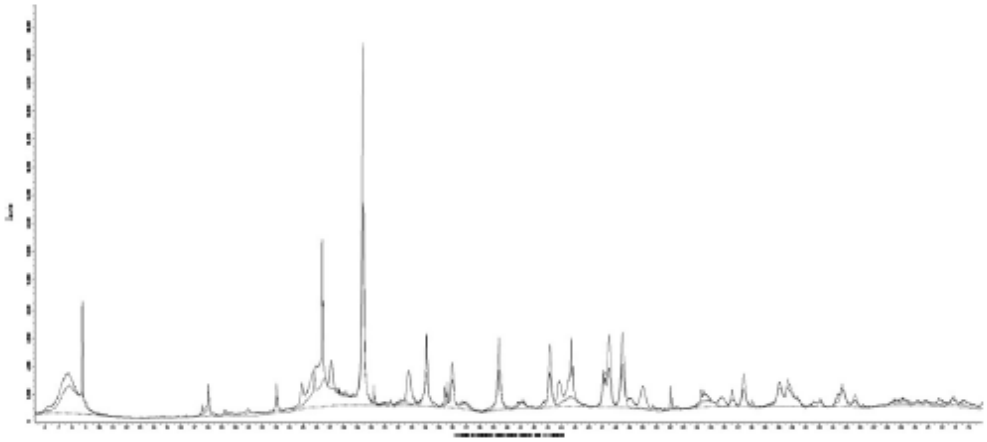

Image: Results XRD analysis, overlay of the two XRD spectra of the two samples.

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Sample 1 & 3 consists of:

Sample 1	Sample 3
C: Calcite	C: Calcite
H: Hydrophlogopite	H: Hydrophlogopite
P: Phlogopite	P: Phlogopite
Po: Portlandite	Po: Portlandite.
V: Vermiculite	V: Vermiculite
Va: Vaterite	

The quantities of minerals differ in the two samples. However fire retardant minerals like Hydrophlogopite, Phlogopite and Vermiculite are present in both samples. Both their amount differs. A quantification is without further testing not possible. There is always the possibility that the samples are inhomogenous.

INFORMATION ON THE SUITABILITY OF THE SAMPLES FOR ANALYSIS

According to international regulation (NEN-EN-ISO/IEC 17025) SGS INTRON is obliged to control if the samples are suitable for the intended analyses and should ensure that the samples do not degrade before the content is determined. It is requested that the suppliers of samples deliver the samples packed and, if applicable, conserved in a manner that is suitable for the intended analyses.

DISCLAIMER

- This report may only be reproduced in its entirety without the written permission of the SGS INTRON laboratory.
- The results are only related to the investigated samples.
- The scope of the NEN-EN-ISO/IEC 17025 accreditation includes all results associated with analyzes that are marked with a Q for analysis methods.
- The uncertainty of measurement of the reported results and other performance data can be requested at SGS INTRON.
- On request, a list of accredited analysis methods can be requested, which describes the relationship (compliant, equivalent, own method) with the underlying standard.

12 APPENDIX C: CAFCO MANDOLITE®-CP2 TECHNICAL DATA SHEET

Promat

Cafco MANDOLITE® CP2 to Upgrade the Fire Resistance of Concrete and Composite Soffits

Technical Data Sheet_136
April 2017 (Page 1 of 2)

INTRODUCTION

Concrete slabs and steel and concrete composite slabs have an inherent amount of fire resistance, dependant upon their construction. However there are times where this fire resistance needs to be upgraded (for example, from 1 to 2 hours). This is usually due to insufficient cover to the reinforcement or the thickness of the slab will not provide the required level of fire insulation. The information on this TDS covers upgrades to BS476:Part 21.

For this application Promat recommend the use of Cafco MANDOLITE® CP2, a spray- applied, factory controlled, premix of vermiculite and cement.

1. UPGRADING CONCRETE SOFFITS

The thickness of Cafco MANDOLITE® CP2 required to upgrade the fire resistance depends on the following factors.

1. Thickness of the concrete slab
2. Cover to the steel reinforcement
3. Total period of fire resistance required

Tables 1 and 2 should be read together and the additional amount of Cafco MANDOLITE® CP2, required to upgrade the thickness or cover to the reinforcement, determined. The higher of the amounts should be used to ensure that both criteria are met. The minimum thickness of Cafco MANDOLITE® CP2 which can practically be applied is 8mm.

TABLE 1

Thickness of Cafco MANDOLITE® CP2 (in mm) required to upgrade the fire insulation requirements for concrete soffits

Existing Slab Thickness (mm)	Total Required Fire Resistance to BS476:Part 21 (minutes)					
	30	60	90	120	180	240
75		9.5	15	20	29	37
80		8	13	18	27	35
90		8	9.5	14	23	31
100			8	10	19	27
110				9.5	15	23
120				8	11	19
130					9.5	15
140					8	11
150						9.5
165						8

TABLE 2

Thickness of Cafco MANDOLITE® CP2 (in mm) required to compensate for lack of concrete cover to reinforcement

Existing Cover (mm)	Total Required Fire Resistance to BS476:Part 21 (minutes)					
	30	60	90	120	180	240
10	9.5	9.5	9.5	13	18	22
15	8	8	9.5	11	16	20
20		8	8	9.5	14	18
25			8	8	12	16
30				8	10	14
40					8	10
50					8	9.5
60						8

AUTHORITY: WARRES 52925, WF AR 328526, SCI/RT/316, BS 8110-2 SECTION 4

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etex building performance

continued

EXAMPLE

A concrete slab which is 110mm thick with 15mm cover to the reinforcement requires upgrading to 120 minutes.

From Table 1 an additional 9.5mm is required and, from Table 2, an additional 11mm is required. Therefore 11mm of Cafco MANDOLITE® CP2 is required for the upgrade.

2. UPGRADING STEEL AND CONCRETE COMPOSITE SLABS

The application of 18mm Cafco MANDOLITE® CP2 to an existing 1 hour rated steel and concrete floor will upgrade the fire resistance to 4 hours. This can be used on both open and re-entrant profile steel sheets.

SUBSTRATE PREPARATION

Substrates need to be clean and free from dust, debris, release agents, contaminants and impurities. Steel substrates also need to be free from oil, grease or anything that could prevent good adhesion.

If the applicator finds "contamination", local degreasing may be required and if it is more extensive, the entire substrate may need to be degreased and allowed to dry before application.

When used in construction specifications (cellulosic fire risk) where Cafco MANDOLITE® CP2 is to be applied onto clean concrete or clean bare steel in good condition, the use of a keycoat and mesh reinforcement is not required. For application to galvanized steel, mesh reinforcement is not required but a keycoat is.

For soffits in poor condition or those that have been painted or cannot successfully be cleaned, expanded metal lathing (BB264 or equal), or Riblath 271, must be fixed to the soffit to provide an independent support for the Cafco MANDOLITE® CP2. The minimum thickness of Cafco MANDOLITE® CP2 that can be successfully applied to expanded metal lathing is 13mm and this thickness is measured "proud of lath"

For more information regarding keycoats and application to expanded metal lathing please contact the Etex Building Performance technical team or refer to the Cafco MANDOLITE® CP2 Application Manual.

AUTHORITY: WARRES 52925, WF AR 328526, SCI/RT/316, BS 8110-2 SECTION 4

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Report

B5642r

Condition Survey

Euston Tower, London

18 October 2019

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SVM Associates is the trading name of NCW Associates Ltd. Registered Office: 3 Greenfield Crescent, Birmingham, B15 8BE. Registered No. 5118389

Report Reference: I:\05\B5642\7\B5642r.docx

If the document is marked "draft" it is deemed to be uncontrolled and is issued for comment and further development only.

Revision	Date	Scope of Revision	Prepared by	Approved by	Issued on
	17/10/19	Issue	RPW/JH	MC	18/10/19
a					
b					
c					

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EXECUTIVE SUMMARY

We have reviewed condition of the MEP and lift services at Euston Tower in line with British Land's brief. This being to identify the funds required to maintain the existing MEP and lift services for a three year period from 2021, and to consider the building being retained indefinitely. After clarification from British Land, we have taken this indefinite period as ten years from 2021. This report also considers the wider impact of carbon reduction policies on the future design and selection of the MEP systems. These considerations are outside of the scope of our brief but unavoidable when developing replacement strategies.

It is our option that before fully committing to either option. British Land will need to agree the longer-term use for the building and their aspirations for the building's carbon and energy reduction strategies.

To meet our brief and to provide an idea of cost, we have included for replacement of the MEP and lift services on a like-for-like basis, albeit that current technology would be specified. Where we feel that further feasibility studies are required, they have been noted.

The first option to extend the life of the existing services for three years, generally includes for a variety of refurbishment and overhaul projects. Where there is evidence of equipment failure or non-compliance, an immediate cost is shown. This short term strategy does not allow for re-design of the systems and may not meet British Land's carbon reduction aspirations. [redacted]

For the longer ten year strategy, a number of major MEP and lift services in the building will require full replacement. We have generally shown these at the start of the ten year timescale. This will both immediately improve efficiency and resilience of the services and also maximise their useful life over the ten year period. As with the shorter strategy, these replacement projects need to be reviewed against the long term aspirations for the property and its use. Due to the size and cost of these projects, detailed feasibility studies will be required to determine the correct solutions. [redacted]

The Energy Performance Certificate (EPC) for the building as a whole was original undertaken in April 2009, this expired in April 2019. We advise that a detailed EPC is carried out prior to the building being handed back to British Land. This will allow British Land to immediately undertake the improvements, such that letting could be enabled as soon as possible following the current lease expiry.

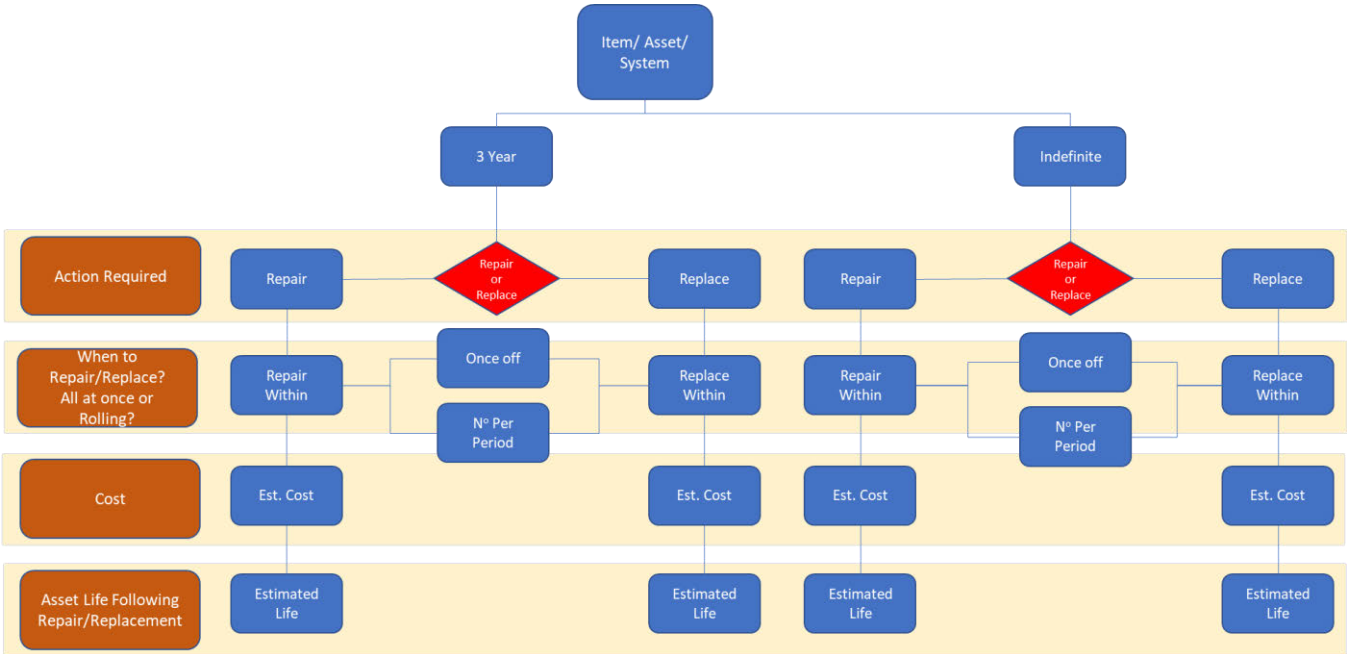
1 INTRODUCTION

This report has been provided at the instruction of Stuart Ball of British Land to undertake a condition survey on the mechanical, electrical and public health (MEP) building engineering services serving Euston Tower, London. We have been instructed to consider extending the lifecycle of the mechanical, electrical and plumbing (MEP) services by either three years, after April 2021, or indefinitely (we have presumed ten years) from the same date. This report has been produced to inform British Land when they make their investment decisions on the building services and systems, subject to the form of lease.

We have been advised that:

- All the current leases are likely to be terminated by April 2021.
- The building is likely to remain as commercial office space, with retail on the ground floors.
- There is no plan to alter the office density from the existing.

The flowchart below has been issued by British Land and sets out the thought process to be followed:



2 INSPECTION

The inspection of the MEP services was undertaken on the 2nd and 11th October 2019. The survey was undertaken by Richard Wilmot, Jim Hamilton and Jack Seddon.

The survey of the building focussed on the existing landlord's MEP services. Floor plates were generally available, and a random sample of these typical floors was taken to generally represent the services. The main plant rooms on floors 1, 12, 34 and 35, together with some basement switch rooms, were accessible during our inspection. We did not gain access to the ground floor retail units, and therefore these have been excluded from this report. The survey was visual only and non-intrusive. Separately we have been instructed to undertake a brief review of the lifts and to undertake non-destructive testing (NDT) of the following pipework systems;

- Medium temperature hot water (MTHW).
- Chilled Water (CHW).
- Condensate Water.

Together with a chemical analysis of the water within them, this report will be updated once these surveys have been completed and the results reviewed.

No other invasive or plant performance tests were undertaken. The limitations of this report are detailed in our standard clauses located within the appendices of this report.

When referencing the projected works required, we have assumed that year one will be the year the building is handed back to British Land.

3 BUILDING DESCRIPTION

Euston Tower comprises of 33,460 (m^2) usable space, constructed in the 1970s and situated in the centre of London. It appears to be constructed from reinforced concrete columns and floors, with curtain external walls and steel framed single glazed casement windows. These have subsequently been provided with secondary double-glazing to some floors. The premises consist of a 34-storey tower standing on top of a ground and first floor podium, which extends beyond the tower footprint.

The ground floor level is occupied by retail outlets, along with the main reception entrance, facilities maintenance offices and goods inwards; the first-floor level consists of seven plant rooms, which service both the ground and first floors, a gymnasium, a restaurant and several meeting rooms. There is also a basement and sub-basement level primarily for the back of house amenities, sub-station, switchgear, meters, water and gas services etc.

The building is serviced by two separate banks of lifts, identified as "Low Rise" and "High Rise"; the low-rise lifts serve floors ground to 19, whilst the high-rise lifts serve ground, 20 to 34. There are two goods lifts, which serve all floors from basement to 35th. The 36th floor is only accessible by stairs.

The 34th floor contains the main heating boiler plant, the air handling plant that serves floors 23 to 34, the water-cooled chillers, chilled water and condenser water pumps. The 35th floor contains the cooling towers, ancillary plant and equipment.

4 REPORT STRUTURE

Our report is structured to show the condition of the MEP services along with our recommendations for a) maintaining the services over the initial three years once handed back to British Land and b) for a longer period of ten years.

Maintaining the services over the ten-year period involves some major plant replacement, this will have to consider changes in available technology, carbon reduction targets and British Land's own strategies. These are likely to include significant re-engineering of the building services, following detailed feasibility studies and design reviews. These fall outside of the scope of this report, and for the purposes of this report we have shown replacement costs for similar technology to the existing, albeit to current standards. Where further feasibility studies are required, we have shown an estimated cost for these and introduced some of the possible options.

5 THREE YEAR PLAN

5.1 General

The following sections provide a brief description of the installed MEP services in the building. A more detailed description of the MEP services is within appendix B.

5.2 Cooling Towers

5.2.1 General

There are four open circuit cooling towers which serve the four main chillers in the plantroom below. In 2005/6 the cooling towers were extensively refurbished, and the cooling tower matrix packs have recently undergone a full replacement. During our survey we did not observe any leaks from the cooling towers.

Due to the age of the cooling towers and taking into consideration their refurbishment in 2005/6. It is our opinion that the cooling towers will operate during years one to three, subject to an increased level of maintenance. However, we recommend that an allowance is set aside for the replacement of one fan motor and the relining of one collection tank during this period.

5.2.2 Water Treatment Plant

The water treatment equipment is located on the 34th floor plantroom. The chemical storage and the injection pumps are showing signs of wear and tear and it is our opinion that the water treatment equipment will require replacement in years one to three.

5.2.3 Condenser Pipework

The condenser pipework date from the original installation. However, some section of the pipework has been replaced as part of the chiller and condenser water pump replacement works. However, there are sections of the pipework showing minor signs of external corrosion. It is our opinion that the condenser water pipework will continue to operate during years one to three.

5.2.4 Condenser Water Pumps

The condenser water pumps have been replaced in the past five years. We do not envisage any works being required to the pumps in years one to three.

5.3 Chillers

5.3.1 34th Floor Plantroom

The four chillers in the chiller plantroom provide CHW to all floors from the 2nd to the 34th floor. Each chiller has a duty of 1,240kW and based upon the estimated cooling requirement of the floors, three chillers are required to meet the cooling demand. The remaining chiller is used as a standby unit.

The installation dates for the chillers range from 1997 up to 2018. This makes the oldest chiller, the York Millennium, 22 years old and at present this chiller is currently switched off. In addition to this, the York MAXE chiller, installed in 2007, is also switched off due to an issue with its controls and it is reaching the end of its economic lifecycle. It is our opinion that both these chillers are in a poor condition.

Based upon the estimated cooling capacity of the building and with only two operational chillers, the building has two-thirds of its cooling capacity with no standby provision. To meet the building's maximum cooling provision for the short term, we recommend that both the York MAXE and the York Millennium chillers are replaced. To ensure that the maximum cooling provision is available during years one to three we recommend that both chillers are replaced.

5.3.2 1st Floor Plantroom

With regards to the two Carrier chillers, these units are 19 to 20 years old and there are obsolescence issues with spare parts for their controls. They have reached the end of their economic life and based on this; it is our opinion that an allowance is set aside for the replacement of one of the units in year one. This will allow for the removed chiller to be used for spare parts for the remaining unit which then can be replaced after year three.

5.3.3 12th Floor Plantroom

On the 12th floor plantroom there are two Carrier chillers. These units serve the comms rooms installed on the 2nd to 12th floors. During our survey we were advised that one of the chillers has failed. It is our opinion that when the tenant vacates these floors after the present lease, the comms rooms will become redundant and that they will be removed.

5.3.4 Refrigerant Gas

All the chillers on site operate with R407c refrigerant gas. Currently there is no ban in place for the use of R407c as it has a global warming potential of 1774. However, there is in place a phase down of the use of refrigerant gas with a GWP of 2500 in 2020. It is our opinion that the GWP may be reduced in the future to a level that it will require the phase down of R407c. If this occurs, then the cost of replacing R407c will increase and this may have an impact on the remaining economic lifecycle of the chillers.

5.4 Boilers

5.4.1 MTHW Boilers

The main heating boilers for the tower are in the boiler room, on the 34th floor. There are eight boilers in total and they are double stacked. The boilers are shell and tube boilers. The boilers are fitted with oil fired, pressure jet burners as there is no gas provision to the boiler room.

The MTHW boilers are oil fired and there is no gas supply in the boiler room to convert them to gas fired boilers. However, to convert the boilers to a gas fired option will require a significant increase to the current gas supply to the building. In addition to the increase in the gas supply, new gas boosters will be required in the basement to ensure that there is enough volume of gas and at a suitable pressure on the 34th floor for use with the new boilers. A new gas distribution riser will be required from the basement to the 34th floor.

The mayor of London has identified that London will become a zero-carbon city by 2050. As part of this plan it is intended that central London will be an Ultra-Low Emission Zone (ULEZ) in 2019 and between 2018 and 2022 there will be a 40% reduction of CO_2.

The boilers are 25 years old and based on this, it is our opinion that the replacement of the oil fired boilers could be initiated in year one on a like for like basis. This will extend the operation of the current oil fired installation by another 15 years. However, this option will only delay the replacement of the boilers with a zero carbon option.

5.4.2 LTHW Boiler

The boiler room on the 1st floor contains a Hamworthy gas fired low temperature hot water (LTHW) boiler, which is operational. However, the boiler is over 25 years old and it is not supported by the manufacturer and there are no readily available spare parts for the boiler. It is our opinion that the boiler will require replacement in year one if the floor is retained in its current configuration. However, if this floor is converted to an open plan layout, we recommend that a design review of the heating and cooling to the floor is carried out.

5.5 Ventilation

5.5.1 Air Handling Units

For the purpose of this report we have assumed that there will not be a significant increase in the occupancy level on the floor plates. The air handling units (AHUs) are original to the building. However, it is our opinion that they are in a reasonable condition. However, it is our opinion that to prevent the premature failure of an AHU during year one to three that they are subjected to a general service. The service of the AHUs could include, but are not restricted to, the following:

- Replace all door seals and door handles.
- Internal remedial works to the AHUs.
- Cleaning and repairing of all filter frames and associated filter replacement.
- Cleaning, repairing of the heating and cooling coils.
- Remedial works to the steam humidifiers.

The overhaul of the AHUs will ensure their continued operation during years one and three. However, after year three it is our opinion that the AHUs will require replacement.

5.5.2 Extract Systems

The extract fans which serve the extract to the floor plates are in the 35th and 12th floor plantrooms. The extract fans are original to the building. The extract systems which serve all the floors have been provided with run round coils.

The toilets are provided with their own dedicated extract systems. It is our opinion that these systems will continue to operate for the next three to five years. However, we recommend that an allowance is made for the replacement of some fan motors in years one to three to cover any unexpected failure of the extract fans.

5.6 Building Pipework

5.6.1 Heating and Cooling

The pipework systems are being subjected to non-destructive testing and the findings from this exercise will form part of a separate report.

5.6.2 Drainage Pipework

The main drainage stacks are contained within the service riser. During our survey, no major issues were observed with the drainage stacks. However, it is our recommendation that a full CCTV survey is carried out on the drainage system and an allowance is set aside for some remedial works in year one.

5.7 Hot Water Calorifiers

5.7.1 DHW Calorifiers

The main DHW calorifiers are in the 12th and 25th floor plantrooms. It is our opinion the calorifiers are 19 years old. The calorifiers are fully insulated and therefore we were unable to confirm if they were constructed from copper or galvanised steel. There were several defects observed with the calorifiers and these are detailed in appendix B. It is our opinion that the DHW calorifiers are replaced in year one.

5.7.2 Plate Heat Exchangers

There are two chilled water (CHW) plate heat exchangers (PHE) which serve the fan coil units on the 2nd to 11th floors and the 13th to 19th floors of the tower. The PHEs date from the 2000 fit out and, we recommend that they are subjected to a detailed examination in year one to establish their overall condition. This will involve the removal of the insulation and a visual examination of the PHEs plates for damage, corrosion or leaks.

5.7.3 Gas Fired Water Heater

There is a gas fired domestic hot water (DHW) heater in the 1st floor boiler room. It is our opinion that the heater has been replaced in the past 10 years. The heater serves the DHW for the kitchen area. However, during our survey there was a pool of water adjacent to the safety valve discharge. We recommend that the safety valve is replaced to prevent its premature activation during years one to three.

5.8 Pumps

The heating and cooling pumps are generally contained within the following plantrooms:

- 35th floor plantroom, the AHU CHW pumps.
- 34th floor plantroom, the MTHW pumps, CHW pumps and condenser water pumps.
- 12th floor plantroom. CHW pumps and LTHW pumps.
- 1st floor plantrooms, CHW and LTHW pumps.
- The basement area, cold water booster sets, wet riser pumps and oil pumps.

Generally, there were no major water leaks from the mechanical seals of the heating and cooling pumps. It is our opinion that it will be possible to maintain the operation of the pumps in years one to three.

The oil pumps which serve the boiler have been replaced in the past five years and we do not anticipate any cost expenditure on these pumps in years one to three.

5.9 Valves

Most of the valves are original to the building. However, there are a number of valves which have been replaced in the past. Generally, the valves which have been replaced have formed part of the lifecycle replacement of the chillers. Given that some of the valves are circa 40 years old we recommend that an allowance is allocated during years one to three for servicing and a 5% replacement of the existing valves.

5.10 Ductwork

The supply and extract ductwork are original to the building. During our survey we did not observe any damaged ductwork. It is our opinion that the ductwork will continue to function during years one to three. However, due to the city centre location of the building, and as there is no record of previous internal cleaning of the ductwork, we recommend that the internal ductwork surface is surveyed, samples taken from the internal surfaces, sampled and fully cleaned in year one in accordance with the BESA TR19 Internal Cleanliness of Ventilation Systems:2013.

5.11 Dampers

5.11.1 Fire Dampers

During our survey we were unable to examine any of the existing fire dampers or their service records. It is our experience that fire dampers are not regularly tested in accordance with BS 9999:2017, code of practice for fire safety in the design, management and use of buildings. It is our opinion that several of the fire dampers will have failed in the past or alternatively a significant number of them would fail to activate in a fire condition. Based on this, we

recommend that a detailed survey is carried out, in year one, on all the installed fire dampers and an allowance is set aside for future remedial works.

Following the survey and repair of the fire dampers they should continue to operate for a considerable period, subject to them being inspected and tested on a yearly basis. However, if there are significant changes to the operation or use of the building, this may impact on the current fire damper configuration.

5.11.2 Volume Control Dampers

During our survey we were unable to gain access to the ceiling voids or access the internals of the supply and extract ductwork to establish the condition of the volume control dampers. It is our opinion that these dampers are original to the building. We recommend that a detailed survey is carried out, in year one, on all the installed dampers and an allowance is set aside for future remedial works.

5.12 Floor Plates

5.12.1 General

It is our understanding that there is an issue with poor heating to the 1st floor perimeter offices. Based on this we recommend that a detailed inspection is undertaken to establish what remedial works will be required to improve the heating in these offices. We recommend that the survey is carried out now so that remedial works can be undertaken in year one.

5.12.2 Fan Coil Units

The heating and cooling to the floor plates is by four pipe fan coil units (FCUs). Generally, the FCUs were installed in 2000, but there are FCUs installed on the 2nd to the 12th floors which are original to the building. It is our opinion that the FCUs will continue to operate over the next one to three years. However, we recommend that the FCUs are subjected to a major servicing and cleaning exercise in year one.

5.12.3 Risers

The ductwork service risers are located within the floor plates and are in builders work enclosures; these appear to be original to the building. No major issues were noted in the risers.

5.13 Fire Stopping

As part of our survey we were unable to fully survey the fire stopping of the mechanical services. However, from the areas in which we were able to observe in the risers, the general condition of the fire stopping was poor. During our survey we were unable to view any record drawings which detailed the location of the ceiling smoke barriers or the fire

rated walls. Therefore, we recommend that a detailed survey is carried to identify all the areas where the fire barriers have been breached. We recommend that the survey is carried out in year one.

5.14 Wet Riser

The main pumps which serve the wet risers are in the basement plantroom. The electrical pump set that serves the wet risers is original. However, it is our opinion that the sprinkler pump will continue to operate in years one to three.

The diesel driven unit was replaced in 2010 and no major issues were observed with this unit. It is our opinion that the diesel pump set will continue to operate over the next one to three years without any major expenditure.

With regards to the distribution pipework, we were unable to determine if the pipework was galvanised as it was contained within service risers with no access. Based upon the final connections to the wet riser pumps it is our opinion that the pipework is carbon steel. We recommend, that random samples of pipework sections are removed from the system for testing in year one. This will allow for the detailed inspection of the pipework (internal surface condition and wall thickness). This will allow the determination of the remaining economic life of the wet riser.

The wet riser storage tank is a GRP sectional tank and it is adjacent to the wet riser pumps. There was no suitable access to inspect the internal condition of the tank. However, during our survey we did not observe any water leaks below the tank. It is our opinion that the water tank is in a fair condition.

5.15 Sprinklers

There is a cold-water mains supplied sprinkler system which serves the ground, 1st and 2nd floors of the building. The sprinkler system is approximately 19 years old. During our survey we were unable to review any records on the sprinkler installation. Due to the age of the installation and to comply with the requirements of BS EN 12845:2015 Annexe K, we recommend that the following works are carried out on the sprinkler installation:

- The system is fully drained down, flushed, refilled and pressure tested to 12bar.
- That samples of the existing distribution pipework are removed and subjected to non-destructive testing.
- A sample number of the sprinkler heads are removed and inspected.

The above works will need to be carried out in year one. Any remedial works that arise after carrying out these duties will also need to be carried out in year one.

5.16 Storage Tanks

5.16.1 Oil Storage Tanks

The 35 sec fuel oil tanks in the basement and 35th floor plantroom serve the oil fired boilers. The tanks are fully bunded and they are original to the building and they are constructed from a single skin, rather than double bunded which is typical for modern oil storage tanks. We don't envisage any major works to be carried out on the tanks or their associated plant and equipment in years one to three. However, the retention of the oil storage tanks after year three will be dependent upon the proposed boiler strategy.

5.16.2 Cold Water Tanks

During our survey we were unable to gain access to the maintenance records and the water risk assessments for the cold water storage tanks on the 35th floor and in the basement. During our survey we did not observe any water leaks from the tanks. It is our opinion that the water tanks are in a fair condition and that they continue to operate during years one to three, but we recommend that an allowance is set aside for the internal cleaning and inspection of all the water tanks in year one.

5.17 Building Management System (BMS)

The BMS dates from the 2000 fit out of the building. The BMS outstations are in the motor control centres (MCCs) in each plantroom. The BMS is contained within its own section of the MCC and there are hand/off/auto selector switches, run and trip lights fitted to the doors of the BMS section. There are no digital displays or touch screens fitted to the BMS access doors. The BMS outstations are manufactured by Sauter.

The field devices have been replaced in the past when they have failed or went out of calibration. It is our opinion that the field devices will require Ad Hoc replacement when they fail in years one to three. However, it is our opinion that their replacement costs will be included in any future maintenance contract for the existing BMS installation.

The head end supervisor comprises of a Niagara Framework as supplied and manufactured by Tridium. The head end supervisor has recently been installed in the past five years and it is fully supported by the manufacturer. From our review of the supervisor it is our opinion that the network wiring is operational as the system schematics showed dynamic updating of the graphic pages.

Due to the age of the outstations and that the controllers are no longer supported; we recommend that an allowance is set aside for the replacement of two outstations in years one to three. Any outstations replaced during this period can be reused for spares during years one to three.

5.17.1 Motor Control Centres (MCC)

The MCC panels installed in the 12th, 34th and 35th floor plantrooms date from the 1997 fitout of the M&E services. There is an immediate requirement to rectify the water leaking from the roof onto the MCC located in the 35 plantroom. Due to the potential water damage to the control panel we recommend the MCC panel is replaced. Due to the age and condition of the MCCs within the 12th, 34 and 35th plantrooms we have made allowance to replace them over years one to three. We have assumed to retain the field wiring although original to the 1997 fitout. It has passed the electrical testing and inspection so will remain functional for the next one to three years subject to good maintenance.

The MCCs installed in the first floor plantrooms date from approximately 2000. The MCC panels are in good condition and operational, it is our opinion that the MCC can be maintained during years one to three, subject to them being maintained and serviced in accordance with industry standards.

5.17.2 Inverters

Inverters have been installed to some of the main circulation pumps and AHU plant. The majority of the inverters date from approximately 2005, with the remainder being fitted in more recent years. During the survey the inverters were operational. However, given the age of the earliest installed inverters we recommend that an allowance is made for the replacement of five inverters over years one to three.

5.17.3 Main LV Distribution Panels

The original LV switch panels in the basement have been replaced within the last five years. The condition of all six LV distribution panels is very good. We have made allowance to undertake general planned preventive maintenance to the main switch panels over years one to three.

During the site inspection we noted that there are several pools of rainwater on the floor of the electrical intake room, we did not see any evidence that the water has ingressed or damaged the LV panels. The water appears to be entering the plantroom from the pedestrian footpath above. Given the nature of the equipment located in the area we recommend that further investigation is made to stop the water entering the area.

5.17.4 Electrical Intake Room

There are two main electrical switch panels and associated cabling installed with the electrical intake room, these appear to form part of a previous tenant's fitout. We recommend that these are subject to a detailed investigation, safely isolated, removed, and the electrical services made good.

5.17.5 Standby Generator

The standby generator was installed in 2008. The generator appears to be in good condition with no obvious defects noted at the time of the survey. Given that the generator is maintained and serviced regularly in line with the manufacturer's recommendation, we do not envisage any additional costs to maintain this asset over years one to three.

5.17.6 Tenant's Distribution Boards and Busbar

The tenant's electrical distribution boards and busbar systems vary in age, with floors 2 – 11 being original to the construction of the building in the 1970s. The busbar and distribution boards are manufactured by Ottermill, these are obsolete, and spares are not available. The installation is in good working order with the last electrical test and inspection carried out in February 2019. We recommend that the existing rising bus bar and tenant distribution boards are replaced throughout floors 2 -11 in years one to three due to their obsolescence.

The tenant's electrical distribution busbar system for floors 12 – 19 again is original, however the distribution boards have been replaced in approximately 2001. We have been unable to determine the manufacturer of the distribution boards. The installation is in good working order with the last electrical test and inspection carried out in February 2019. The rising busbar is manufactured by Ottermill and dates from the 1970, and given we are unable to identify the manufacture of the distribution boards. We recommend that the existing rising bus bar and tenant distribution boards are replaced throughout floors 12 -19 in years one to three due to the busbar being obsolete and parts availability for the distribution boards.

The tenant's electrical distribution boards and bus bar serving floors 20-34 was replaced in approximately 2010. The installation is in good working order with the last electrical test and inspection carried out in February 2019. We do not envisage any additional costs to maintain these assets during years one to three, subject to regular maintenance.

5.17.7 Landlord Sub Distribution Boards

The majority of the Landlord's sub distribution boards are manufactured by Square D and are still supported by the manufacture. We see no further investment required in years one to three other than normal repairs and general maintenance.

5.17.8 Small Power

The small power serving the tenant's floor plates 2 -11 is general in fair condition and dates from approximately 2001. During the survey the majority of the socket outlets were operational, although a small percentage of sockets have been damaged. We have therefore made an allowance for the repair of the defective power points. It is our opinion that small power can be maintained for the next one to three years, subject to it being maintained and serviced in accordance with industry best practices.

The small power serving the tenant's floor plates 13-34 is general in good condition and dates form approximately 2010. During the survey the majority of the socket outlets were operational, although a small percentage of sockets have been damaged. We have therefore made an allowance for the repair of the defective power points. It is our opinion that small power can be maintained for years one to three, subject to it being maintained and serviced in accordance with the manufacturer's requirements.

5.17.9 Lighting

Lighting within the floors occupied by the tenant's, i.e. floors 2 to 33, is predominantly the old CIBSE Lighting Design Guide category 2 type of fluorescent luminaires, flush within the suspended ceilings. The lighting is in a varying level of condition, dependant on the floor level. The majority of the light luminaires are fitted with T5 type tubes and running gear, therefore not as energy efficient as LEDs. Generally, the lighting system has been modified and replaced during varying refurbishment of the floor plates. It is our opinion that the general lighting can be maintained for years one to three, subject to it being maintained and serviced in accordance with the manufacturer's requirements.

The general lighting within the majority of plant rooms is baton type fluorescent luminaires fitted with T5 tubes, therefore not as energy efficient as LEDs. In general, the lighting is in fair condition, and when luminaires fail, we recommend that these are replaced with LED type luminaires. It is our opinion that the plant room lighting can be maintained for the next one to three years, subject to it being maintained and serviced in accordance with the manufacturer's requirements.

Emergency lighting is provided by a combination of self-contained bulkhead luminaires distributed throughout the back of house areas, floor plates, and recessed luminaires fitted with emergency battery conversion packs. Given the various ages and quantity of emergency lighting we have made an allowance for replacement of a percentage of luminaires with energy efficient units on an annual basis. In general, it is our opinion that the emergency lighting can be maintained for years one to three, subject to it being maintained and serviced in accordance with the manufacturer's requirements.

5.17.10 Chiller HV Electrical Power Supply

The four chillers located in the 34th floor plantroom is electrically fed via a dedicated high voltage power supply located in a substation on the same floor. The two HV transformers, HV switches and associated LV switchgear all date from the original construction of the building in the 1970s. Although the electrical equipment is 50 years old, it has been regularly maintained. We see no further investment required in years one to three other than regular maintenance.

In addition to the transformers and associated switchgear, two power factor correction units have been installed. These are manufactured by PFC Engineering and date from approximately 2014. They are both in good condition and have been regularly maintained, with no defects noted. We see no further investment required in years one to three other than regular general maintenance of the electrical equipment.

5.17.11 Fire Alarm

The fire alarm system was replaced throughout the building in 2012 and is approximately 7 years old, it should note that the recommended period for the replacement of a fire alarm system's smoke detectors and associated devices is every 10 years. For Euston Tower this requirement to replace the field devices will fall in 2022. We consider that the fire alarm system shall then require significant maintenance works in year one.

5.17.12 High Rise Passenger Lifts

The lifts in their present state should prove relatively reliable for the next three-year period. This is dependent on intensive and good quality maintenance being provided, along with expert product knowledge, technical support and parts continuing to be available. Additional expenditure on proposed upgrades or improvements other than maintenance and safety items during this period will not be cost effective.

The existing critical spares stored on site are the property of Mapeley. It will be prudent to purchase the parts to ensure a speedy resolution to particular fault conditions as they arise. This will also help to mitigate immediate obsolescence risks.

5.17.13 Low Rise Passenger Lifts

The low-rise lifts were installed at the same time as the high rise lifts and are in a similar condition and have similar equipment installed. The description of the maintainability is the same for the low rise as the high rise as described in the sub-section above.

It will be prudent to purchase the critical spares for these lifts as well.

5.17.14 Goods Lifts

These lifts were modernised 10 years ago in existing shafts and are generally in good condition.

The lifts will provide a good level of service depending on a good quality of maintenance being provided during the next three years. There is a low risk of any obsolescence issues.

The lifts have been installed to provide firefighting and evacuation service for the building. However, the water management of the lifts in terms of prevention of water entering the lift shafts from the building entrance area requires addressing. The lift entrances either require drain gulley's to be installed across the threshold of each entrance or a bund ramp to be installed. This will reduce the risk of water entering the lift shaft during a fire incident.

6 TEN YEAR PLAN

The age, condition and technology of the building services serving Euston Tower makes planning for a replacement over an indefinite period a complex process. After discussions with British Land since our instruction, we consider this indefinite period to be ten years from the end of the present lease.

The basis of the future strategy will have to refer to:

- British Land's Sustainability Policy.
- British Land's Sustainability Brief for Developments and its minimum requirements based on project value.
- British Land's Office Design Guide.
- British Council for Offices Guide to Specification – Best Practice for Offices.
- Approved Document L2B: Conservation of fuel and power in existing buildings or dwellings.
- The Mayor of London's Energy Assessment Guidance.
- Ultra-Low Emission Zones.

As well as the usual regulations, standards, approved codes of practice and guidance notes.

These prevent like-for-like replacement of many of the existing systems. To meet British Land's aspirations, the replacement of the systems is likely to require an integrated approach.

For example, the existing oil fired boilers will need to be replaced in year one of a ten year programme. Replacing them with similar oil fired boilers is problematic due to their emissions characteristics, which do not satisfy The Mayor of London's Energy Assessment Guidance. If natural gas technology is then considered, whilst meeting the present low NOx requirements for London, it does not meet British Land's aspirations to be natural gas free.

This therefore requires an alternative means of generating heat which could be through electric boilers, heat pumps or a combination of both. Installing this type of technology has a knock on effect on the cooling towers, circulation pumps and electrical power supplies. Investigating, reviewing and selecting these systems is a project in itself and falls outside of the brief of this report. In these instances, and to meet our brief, in the longer term cost schedule we have shown like for like replacement costs for similar technology along with a feasibility study cost in the short term. Our report is generally based on retaining the existing methods of providing building services.

Outside of the current short term scenario, addressed within the earlier section of this report, the indefinite (ten year) period from the end of the present lease is discussed below.

6.1.1 Cooling Towers

The present cooling towers reject heat from the existing water cooled chillers. So, unless there is a fundamental shift in how cooling is provided to the building, we have allowed to retain them. To ensure they are reliable for the foreseeable future, a cost for their replacement is included within the schedule. As the chiller replacement strategy for the property may result in a change in the cooling duty to accurately match the building load and the perceived standby capacity, the cooling tower duty will need to be reviewed at that point. The structure of the cooling towers is enclosed/restricted by the building structure, and as they are located on the building roof, their replacement will require careful consideration and planning.

6.1.2 Chillers

The four existing main chillers in the 34th floor plant room are of differing ages ranging from 1997 to 2018. Due to their age and condition the two older units should be replaced in year one. This will maximise their use. We have shown costs for their direct replacement, but as with the boilers, a feasibility study should be carried out to investigate alternative solutions. As an example, simultaneous heating and cooling units could be installed. These would produce both chilled water for cooling and heating water to supplement the boiler plant.

Replacing the chillers will involve dismantling of the new equipment and the transporting of the compressors, condensers, and evaporators through the lift shafts. This will cause disruption to tenants who use the high rise lifts to access their floors. Typically, this disruption will be for three to four weeks whilst the chiller sections are moved through the lift shafts. Once in the plant rooms, the chillers have to be rebuilt by the manufacturer and tested prior to their installation. For this instance, we have shown costs for replacing the three oldest units with similar equipment.

The four existing chillers in the 1st and 12th floor plant rooms provide cooling to the local areas, comms rooms in the case of the 12th floor. These units are air cooled and much smaller than the 34th floor units. Due to their age and condition these four units should be replaced in year one of the longer term scenario to maximise their use. The 12th floor units serve tenant's comms rooms which we feel could be removed at the end of the current lease so their replacement may not be required. But if replacing, units with a lower global warming potential to the existing (R407c) should be selected. This is subject to a feasibility study.

Should the areas served by these units alter, then the use of VRF/hybrid VRF system could be investigated. This would reduce the reliance on the centralised boiler plant as the system will provide both heating and cooling to the areas.

6.1.3 Boilers

The eight existing (MTHW) boilers serving Euston Tower are oil fired and due to their age, condition and technology require replacing in year one. As discussed earlier, the low emissions aspirations for London and British Land's decarbonisation targets will have a major effect upon selecting a suitable heating source for Euston Tower in the longer term. For the purpose of this report and to meet the brief, we have shown costs for replacement of the existing boilers

with similar technology. However, it is important to consider the following points concerning the heating strategy for the building.

At present and in terms of emissions, the Mayor of London's Energy Assessment Guidance (2018), low NOx (nitrogen oxides) plan states that plant NOx emissions should not exceed 40 (mg/kWh). At present, oil fired boilers only achieve 120 (mg/kWh) at best, although they are termed as low NOx.

Traditional thinking would replace these existing oil fired boilers with gas fired technology. Current low NOx gas boilers have NOx figures lower than 40 (mg/kWh), circa 38 (mg/KWh) is achievable, they are modular and efficient. However, as they are gas fired, they do not meet British Land's gas free aspirations. Also, in this case, installing new gas fired boilers may involve upgrading the existing gas supply to the building and will involve extending the new gas main to the 34th floor plantroom by the formation of a new ventilated gas riser running from a new gas booster room in the basement area.

Another logical stage in achieving a low carbon solution is to consider electric hot water boilers. Whilst electric water boilers of this capacity are unusual in commercial offices, they are used within process industries. Installing electric hot water boilers as a replacement of the existing oil fired boilers will require a number of major considerations. There is insufficient power local to the boiler house and probably to the building as a whole. Therefore, the supply authority's approved supply capacity for the building needs to be determined and an increase may need to be applied for. Furthermore, moving any new boilers up to the 34th floor plant room will involve a similar methodology as the chillers (i.e. via a lift shaft). New three phase power supplies will also need to be run from the basement to the 34th floor. As described in the chiller section, it is possible that simultaneous heating cooling water sourced heat pumps could be installed to efficiently supplement whichever boiler option is chosen

The existing LTHW boiler serving the lower floors, due to its age, condition and technology requires replacing in year one of the longer term scenario. This boiler is gas fired so does not suffer the same restrictions as the oil fired units. However, being gas fired, it still suffers the same restrictions in terms of British Land's zero gas aspirations and in the longer term, an electric boiler may be a consideration along with heat pump technology integrating it with the local chiller equipment. It is possible that the use of the existing area may change once the current lease expires, as it is heavily cellularised. Therefore, the heating strategy for the area may alter and alternative low carbon technologies can be considered.

6.1.4 Air Handling Units

The main AHUs are designed and sized to suit the existing use and occupancy density for the property. From our brief, we understand the longer term use and occupancy density of the building will not alter. As described elsewhere in this report, the ventilation systems serving the building require an overhaul to ensure their continual use during years one to three. It is our opinion that all the AHUs are replaced in the long term to comply with current regulations and in line with the proposed long-term energy strategy for the building.

The floor plates at Euston Tower are served by FCU terminal units, elsewhere in this report we have recommended that the FCUs are subject to a major service and clean in the short term. Within the longer term scenario, the FCUs should be replaced due to their technology, age and condition. These costs are calculated from a m^2 rate within our cost schedule. Again, this replacement should be in year one of the period to maximise the useful operational life and the benefits of the improved efficiency.

6.1.5 Building Pipework

Our survey on site did not identify any immediate problems with the building pipework. As a separate instruction, we are completing non-destructive testing of the chilled, heating and condense water systems within the building. At the same time chemical analysis of the water systems is to be carried out. The findings from this exercise will be discussed in a separate report. For the purpose of this report we have noted long term replacement of the main chilled, heating and condense water systems but have not included a cost.

6.1.6 Foul Water Drainage

The foul water drainage is in excess of 50 years old. This will require a replacement throughout the building in year 1.

6.1.7 Chilled Water Plate Heat Exchanger

Due to the age of the plate heat exchangers, we have allowed to replace both in year one of the ten-year plan.

6.1.8 Hot Water Calorifiers

Due to their age and condition, the domestic hot water calorifiers will require replacing in year one. As with the chiller and boilers, the strategy for the domestic hot water generation is dependent upon the strategy for the building. Should the office floor plates be refurbished, then it is likely that local electric hot water heaters will be installed across the floors, and the 12th floor calorifiers will be removed. Furthermore, British Land's aspirations to be gas free prevent the installation of new central gas fired water heaters on the 12th floor. For the purpose of this report we have included for the replacement of the existing hot water calorifiers with a similar type, heated from the boilers.

As with the domestic hot water calorifiers, the eight non-storage calorifiers in the 12th floor plantroom should be replaced with plate heat exchangers early in the longer term scenario. This is due to their age, condition and type, with the plate heat exchangers requiring significantly less maintenance than the existing calorifiers.

6.1.9 Pumps, Motors and Valves

We have discussed separately elsewhere in this report, the short term strategy for pumps, motors/valves and plate heat exchangers. For the longer term strategy, the replacement of these system will be incorporated within replacement of the main core services, so individual costs are not shown.

The exception to this are the cold water booster sets in the basement, these will remain serviceable in the short term. However, based on the expected lifecycle for this type of equipment, the booster sets will require replacing towards the end of the ten year period.

6.1.10 Ductwork and Dampers

We have identified elsewhere that, in the short term, the ductwork and damper systems (fire dampers and volume control dampers) within the building require attention. Following this, we have made allowance for cleaning the main supply and extract ductwork and allowance for access doors to be cut to be carried out in year one of the ten year plan.

6.1.11 Fan Coil Units

Due to the replacement of the chillers as part of the long-term plan, we would need to replace the existing fan coil units as part of the overall heating and cooling plan.

6.1.12 Wet Riser

Based upon the final connections to the wet riser pumps it is our opinion that the pipework is carbon steel. We recommend, that random samples of pipework sections are removed from the system for testing in year one. This will allow for the detailed inspection of the pipework (internal surface condition and wall thickness). This will allow the determination of the remaining economic life of the wet riser.

6.1.13 Sprinkler

Due to the age of the system, we will need to fully drain down, flush, refill and pressure test the system. We will also need to carry out NDT for samples of the existing distribution pipework, and to remove and inspect a sample of sprinkler heads.

6.1.14 Storage Tanks

In the long-term, the cold-water storage tank will require flushing, refilling and chlorinating to remain compliant.

6.1.15 Building Management System (BMS)

We have recommended that an allowance is set aside for the replacement of an outstation which may fail in years one to three. It is our opinion that the BMS outstations will need to be replaced in the long term. This is due to the controllers in the outstations being no longer supported by the manufacturer. We also recommend regular software upgrades and general maintenance. We have made allowance in the cost plan for one software upgrade during the ten year period.

6.1.16 Motor Control Centres (MCC)

We have recommended that the MCCs installed in 1997 are replaced in years one. The remaining MCC panels installed in the first-floor plantrooms shall be in excess of twenty years old in 2021. We have therefore made allowance to replace the existing plantroom MCC panels within year one of the ten-year investment plan.

6.1.17 Main LV Distribution Panels

There are six low voltage sub distribution switchgear panels located in the basement electrical plantroom. These have been replaced in the last five years. In our opinion, we see no further investment required within the next twenty years, other than normal repairs and general maintenance.

6.1.18 Electrical Intake Room

Given that the redundant electrical switchgear has been removed in the first three years, it is assumed there is no further works required in this plantroom.

6.1.19 Standby Generator

The standby generator located in the basement plantroom was replaced in 2008. In our opinion, we see no further investment required within the next ten years, other than normal repairs and general maintenance.

6.1.20 Tenant's Distribution Boards and Busbar

We have made allowance to replace the rising bus bar and tenant's distribution boards serving floors 2 – 19 in the years one to three plan. In our opinion we see no further investment required within the next ten years, other than normal repairs and general maintenance.

6.1.21 Small Power

The small power in the office floor plates are in good condition albeit with some damaged floor boxes. With the ten-year plan, the floor boxes can be stripped out and returned to a cat A fitout to meet the requirements of any prospective new tenants. We have provided a budgetary cost to install cleaner sockets to the office floor plates.

6.1.22 Lighting

The lighting is predominantly the old CIBSE Lighting Design Guide category 2 type of fluorescent light fittings in the office areas, fitted into the suspended ceilings. For the purposes of this report we have assumed that the existing lighting would be replaced with energy efficient luminaires (LEDs) in year one of the ten year investment plan.

6.1.23 Landlord's Sub Distribution Boards

The landlord's sub distribution boards shall be in excess of twenty years old by 2021 and shall be at the end of their economical and serviceable life. In our opinion the landlord's distribution boards shall then need to be replaced throughout the building with new boards. We have assumed to replace these distribution boards as part of the long-term strategy for the building.

6.1.24 Chiller HV Electrical Power Supply

The chiller HV electrical switchgear shall be in excess of sixty years old by 2021 therefore the equipment shall be at the end of its economical and serviceable life and will need to be replaced in years one of the ten year investment plan.

6.1.25 Fire Alarm System

The fire alarm system was replaced in 2012 and therefore as part of the ten-year plan, the field devices and controllers will require replacement and a software upgrade to the fire alarm system in 2022. This is coupled with significant maintenance works in year one.

6.1.26 High Passenger Lifts

The high rise lifts have exceeded the expected economical and serviceable life by approximately 25 years. There is a high risk of component obsolescence. There is also a significant risk in terms of skills obsolescence. There are very few lifts with this type of equipment left in service within the UK and as a result there is an ever decreasing necessity to have skilled engineers trained on this type of equipment.

The lifts should be modernised to allow a reliable and improved performance for the building. This will eliminate the skill and parts obsolescence issues.

Depending on the strategy for the building there are two options available which are comprehensive modernisation or complete replacement with machine-room-less type lifts.

The cost effective approach will be to modernise the group of lifts and retain the existing lift car, counterweight and guides of each lift in the group. The alternative approach will be the full replacement of the lifts with machine-room-less types. However, given there are already machine rooms available and the cost would be increased we do not currently recommend this option.

6.1.27 Low Rise Passenger Lifts

The low rise lifts were installed at the same time using the same equipment as the high rise groups. Similar modernisation and stabilisation works have been completed and therefore the same description of lifecycle as described in the sub-section above applies.

The difference with the low rise when compared to the high rise is the machine room position. The machine room for the low rise is currently accessed in the centre core of a tenant occupied floor.

The position of the machine room may drive the requirement to install machine-room-less lifts in lieu of modernisation to avoid the tenant area having to be accessed. This will depend on the strategy for the building going forward.

6.1.28 Goods Lifts

The goods lifts were comprehensively modernised 10 years ago and are in good condition. The lifts should provide a further 10 years of reliable service dependent on a good quality of ongoing maintenance being provided and parts remaining available. We believe the risk of obsolescence is low.

However, the lift entrances either require drain gulley's to be installed across the threshold of each entrance or a bund ramp to be installed. This will reduce the risk of water entering the lift shaft during a fire incident.

6.1.29 WC Facilities

The male and female WC facilities are provided on each of the office floor plates, these are accessed form the demised tenant areas. The toilet facilities on each floor are designed to meet the requirements of an occupancy rate of one person per 10m^2. Should this occupancy level be exceeded, these facilities will not be sufficient, and alternative provision will need to be considered. It should be noted that access arrangement needs to carefully be considered if there is an intention to change the usage of the space.

The majority of the hot and cold-water services serving the toilets dates from approximately 1997. Therefore, we have made allowance to strip out and replace the hot and cold-water services serving both male and female toilets in year one of the ten-year plan.

6.2 Builders Works

We have excluded builder's works in association with the removal and disposal of the M&E services within plant rooms, floor plates and service risers. Given that perimeter fan coil units are removed, and heating and ventilation systems are subsequently installed in the ceiling voids, this will benefit in providing a small gain in net internal area (NIA) to the tenant's floor plates.

Our costs have excluded making good of the building fabric following the works for either the three-year or ten-year plan.

7 EPC

The Energy Performance Certificate (EPC) for the building as a whole was original undertaken in April 2009, this expired in April 2019. The original EPC rating was banded as 'E' scoring 101 rating.

Various other EPC have been uploaded by tenants onto the Landmark site the table below provides a sample of the more recently lodged EPC.

Area	EPC Rating	Score	Date Lodged
The Building	E	101	20 April 2009
Podium	C	62	4th July 2018
Floors 14 -19	E	119	11 Sept 2018
Floor 24	D	98	31 Aug 2018
Floor 32	E	120	31 Aug 2018
Floor 20	D	99	27 Aug 2019
Floor 14	D	99	31 Aug 2018
Floors 24-32	E	121	11 Sept 2018

As of the 1 April 2018, all rented property (both domestic and non-domestic) which is to have a new tenancy currently must have an EPC rating of at least "E". This requirement also applies to all renewal tenancies to the same tenant for the same property on or after 1 April 2018.

Given that the Energy Performance certification model (SBEM) is continuously changing and becoming more onerous for property owners it will only becoming harder to achieve the higher bands such as 'B'. It will be increasing important for tenant and landlords to achieve this requirement and will have a commercial impact on the letting of many properties.

Given that the last EPC was based on a detailed assessment, and that the criteria has become more onerous, we recommend a high quality EPC assessment is undertaken now to assess the current position. An allowance should also be made now for an element of cost-effective improvements to the building – following this initial assessment. This will allow British Land to immediately undertake the improvements, such that letting could be enabled as soon as possible following the current lease expiry.

8 ASBESTOS

On reviewing the Mapeley asbestos management report for Euston Tower dated 7th August 2018 it should be noted that the report has identified deleterious materials being present in many elements of the mechanical and electrical services installed in the building.

The primary areas that the report identified are as follows;

- Boilers
- Pipework gaskets
- Perimeter heating back and facer boards
- Wet riser duct
- Lift shafts

Given that a major refurbishment is carried out to the M & E service the addition cost for the safe removal of the deleterious material shall need to be allowed for as a separate exercise. We have excluded any cost associated with the safe removal and disposal from the budgetary costs provided in this report.

APPENDIX A - BUDGET COSTS

Ref	MEP	Floor Level	Main Element / Area / Service	Comments / Observations / Assumptions	Work Item / Recommendation	Base Cost (£)	Year 1	Year 2	Year 3	Years 1 - 3
1	MEP	Roof	Cooling Towers	Allow for the replacement of 1 fan motor.	Isolate a tower, remove the old motor, refit new and commission.	[redacted]				
2	MEP	Roof	Cooling Towers	Allow for the relining of 1 of the ponds.	Drain the tower, remove any damaged sections of the ponds, treat with suitable corrosion paint. Pant the ponds and refill and commission.	[redacted]				
3	MEP	35 Plantroom	Water Treatment	Allow for the replacement of the existing water treatment plant	Replace	[redacted]				
4	MEP	Level 34	Chillers	Allow for the remedial works to bring the York MAXE chiller into repair.	Replace the controls to the existing unit.	[redacted]				
5	MEP	Level 34	Chillers	Replace the York Millennium chiller.	Removal of the existing unit and the transportation of the new chillers up through the lift shaft and for the rebuild and commissioning of the system.	[redacted]				
6	MEP	Level 34	Chillers	Replace the York Millennium chiller.	Removal of the existing unit and the transportation of the new chillers up through the lift shaft and for the rebuild and commissioning of the system.	[redacted]				
7	MEP	Level 34	Chillers	Allowance for replacing 1 of the Carrier chillers on the 1st floor plantroom	Isolate, remove and install a new chiller on a like for like basis	[redacted]				
8	MEP	Level 34	Chillers	Allow for the removal of both the redundant chillers and their ancillary services.	Isolate and remove the existing chillers.	[redacted]				
9	MEP	Level 34	Boilers	Allowance for the remedial works to the non-operational, oil fired boiler.	Allow for the repairs and modification to the boiler controls.	[redacted]				
10	MEP	Level 34	Boilers	Allowance for the replacement of like for like oil fired boilers and their commissioning	Each boiler is 600kW. Allow for the draining down, replacement, commissioning of new oil fired boilers.	[redacted]				

Ref	MEP	Floor Level	Main Element / Area / Service	Comments / Observations / Assumptions	Work Item / Recommendation	Base Cost (£)	Year 1	Year 2	Year 3	Years 1 - 3
11	MEP	Level 34	Boilers	Allowance for the replacement of the existing gas boiler in the 1st floor plantroom.	Replace the existing boiler on a like for like basis.	[redacted]				
12	MEP	Throughout	Air Handing Units	Allowance for the complete overhaul of 11 AHUs.	Allow for the works associated with the AHUs.					
13	MEP	Throughout	Air Handing Units	Allowance for remedial works to the existing extract systems.	Provisional sum					
14	MEP	Throughout	Building Pipework Heating	TBA						
15	MEP	Throughout	Building Pipework Cooling	TBA						
16	MEP	Throughout	Foul water drainage	Allowance for the inspection of the existing drainage stacks and an allowance for remedial works.	Carry out a CCTV inspection.					
17	MEP	Throughout	Domestic Hot Water	Allowance for the remedial works to the eight existing DHW calorifiers.	Carry out repairs to the immersion heaters and the safety valve.					
18	MEP	Throughout	CHW Plate Heat Exchangers	Allowance for the detailed inspection of the existing CHW plate heat exchangers.	Remove the insulation and carry out a detailed inspection of the 2 PHEs					
19	MEP	Plantroom	Hot water Calorifiers	Allowance for the replacement of the existing DHW calorifiers.	Replace the calorifiers on the 20th and 12th floors.					
20	MEP	Plantroom	Gas fired water heaters	Allowance for the remedial works to the gas fired water heater	Repair the safety valve					
21	MEP	Plantroom	Pumps, Motor and Valves	Allowance for remedial works to be carried out on the existing pumps.	Provisional sum					
22	MEP	Throughout	Ductwork	Allowance for the cleaning of the main supply and extract ductwork.	Allow for cutting additional access doors and the like					
23	MEP	Throughout	Fire Dampers	Allowance for the detailed inspection and reporting on the existing fire dampers.	Inspection and reporting only					
24	MEP	Throughout	Fire Dampers	Allowance for possible remedial works to the fire dampers.	Provisional sum					

Ref	MEP	Floor Level	Main Element / Area / Service	Comments / Observations / Assumptions	Work Item / Recommendation	Base Cost (£)	Year 1	Year 2	Year 3	Years 1 - 3
25	MEP	Throughout	Heating	Survey and report on the poor heating to the 1st floor.	Inspection and reporting only	[redacted]				
26	MEP	Throughout	Fan Coil Units	Survey and reporting on the existing horizontal and vertical fan coil units in the floor plates.	Inspection and reporting only. Allow 50 FCUs per floor and 32 floors.					
27	MEP	Throughout	Fan Coil Units	Allowance for remedial works to the FCUs following the initial inspection.	Allow for £250 (average cost) for the remedial works to the FCUs.					
28	MEP	Throughout	Wet Riser	Allowance for testing and reporting on the condition of the wet risers.	Provisional sum					
29	MEP	Throughout	Sprinkler	Allowance for the draining and flushing of the sprinkler installation to the ground to 2nd floor.	Provisional sum					
30	MEP	Throughout	Sprinkler	Allowance for the removal of the sprinkler pipework and the NDT testing of the pipework.	Provisional sum					
31	MEP	Throughout	Sprinkler	Allowance for the inspection and replacement of the existing sprinkler heads	Provisional sum					
32	MEP	Throughout	Water Tanks	Allowance for the draining, cleaning and inspection of the existing cold water storage tanks.	Provisional sum					
33	MEP	Throughout	BMS	Allowance for remedial works to the existing outstations.	Provisional sum					
34	MEP	35 Fl Plantroom	MCP South West MCC	Replace MCCP	Replace					
35	MEP	35 Fl Plantroom	MCP Panel 1 West	Water leaking onto panel from roof above. Repair leaking roof	Repair					
36	MEP	345Fl Plantroom	MCP Panel 2 East	Water leaking onto panel from roof above. Repair leaking roof	Repair					
37	MEP	34 Fl Plantroom	Inverter 1							
38	MEP	34 Fl Plantroom	Inverter 2							
39	MEP	34 Fl Plantroom	Inverter 3							
40	MEP	12 Fl West Wing Plantroom	MCP	Replace MCC panel	Replace					

Ref	MEP	Floor Level	Main Element / Area / Service	Comments / Observations / Assumptions	Work Item / Recommendation	Base Cost (£)	Year 1	Year 2	Year 3	Years 1 - 3
41	MEP	12 Fl West Wing Plantroom	MCP North	Replace MCC panel	Replace					
42	MEP	12 Fl West Wing Plantroom	MCP South Wing Control	Replace MCC panel	Replace					
43	MEP	12 Fl West Wing Plantroom	MCP North Wing Control	Replace MCC panel	Replace					
44	MEP	12 Fl West Wing Plantroom	Inverter Panel P6/P7	Replace inverter	Replace					
45	MEP	12 Fl West Wing Plantroom	Inverter Panel P38/39	Replace inverter	Replace					
46	MEP	12 Fl West Wing Plantroom	Inverter Panel P20A/P20B	Replace inverter	Replace					
47	MEP	12 Fl West Wing Plantroom	Inverter Panel P40/1.2	Replace inverter	Replace					
48	MEP	12 Fl West Wing Plantroom	Inverter Panel P15/P16	Replace inverter	Replace					
49	MEP	1st Fl South West Plantroom	MCP							
50	MEP	Basement	Main LV Distribution							
51	MEP	Level 34	Main LV Distribution							
52	MEP	Basement	Electrical Intake Room	Several large isolator assumed to be tenants. Remove the redundant electrical switch gear	Remove					
53	MEP	Basement	Standby Generator	No works noted						
54	MEP	East Riser 2- 11	Electrical	Replace rising bus bar and tenants distribution boards	Replace					
55	MEP	East Riser 12- 19	Electrical							
56	MEP	East Riser 20-33	Electrical							
57	MEP	North Riser 2-11	Electrical	Replace rising bus bar and tenants distribution boards	Replace					
58	MEP	North Riser 12-19	Electrical							
59	MEP	North Riser 20-33	Electrical							
60	MEP	West Riser 2-11	Electrical	Replace rising bus bar and tenants distribution boards	Replace					
61	MEP	West Riser 12-19	Electrical							
62	MEP	West Riser 20-33	Electrical							
63	MEP	South Riser 2-11	Electrical	Replace rising bus bar and tenants distribution boards	Replace					
64	MEP	South Riser 12-19	Electrical							
65	MEP	South Riser 20-33	Electrical							
66	MEP	Throughout 2- 32	Small Power	Allowance to repair damaged floor boxes assume 5 per floor	Repair					
67	MEP	Throughout	Floorplate Lighting	Allowance for repairs of the existing lighting	Repair					
68	MEP	Throughout	Landlords Lighting	General lighting is over 20 years old allowance made for failures	Repair					
69	MEP	Throughout	Landlords Sub Distribution Boards							
70	MEP	Throughout	Emergency Lighting	Allowance for battery failures	Repair					
71	MEP	Level 34	Chiller HV Electrical Distribution							
72	MEP	Level 34	Chiller Power Factor Correction Units							
73	MEP	Throughout	Data							
74	MEP	Throughout	Fire Alarm System		Replace					
75	MEP	Throughout	High rise passenger lifts	Purchase critical spares						
76	MEP	Throughout	Low rise passenger lifts	Purchase critical spares						

Ref	MEP	Floor Level	Main Element / Area / Service	Comments / Observations / Assumptions	Work Item / Recommendation	Base Cost (£)	Year 1	Year 2	Year 3	Years 1 - 3
77	MEP	Throughout	Good lifts x 2	Install water management gutters		[redacted]				
78	MEP	Throughout	EPC	To carry out detailed survey						
79	MEP	Throughout	EPC	Provisional sum for remedial works						
					TOTAL					

Ref	MEP	Floor Level	Main Element / Area / Service	Comments / Observations / Assumptions	Work Item / Recommendation	Base Cost (£)	Year 1	Year 2	Year 10	Years 1 - 10
1	MEP	Roof	Cooling Towers	Allow for the replacement of 1 fan motor.	Isolate a tower, remove the old motor, refit new and commission.	[redacted]				
2	MEP	Roof	Cooling Towers	Allow for the relining of 1 of the ponds.	Drain the tower, remove any damaged sections of the ponds, treat with suitable corrosion paint. Pant the ponds and refill and commission.					
3	MEP	35 Plantroom	Water Treatment	Allow for the replacement of the existing water treatment plant	Replace					
4	MEP	Level 34	Chillers	Determine strategy for chilled and heating water equipment	Carry out feasibility study					
5	MEP	Level 34	Chillers	Allow for the remedial works to bring the York MAXE chiller into repair.	Replace the controls to the existing unit.					
6	MEP	Level 34	Chillers	Replace the York Millennium chiller.	Removal of the existing unit and the transportation of the new chillers up through the lift shaft and for the rebuild and commissioning of the system.					
7	MEP	Level 34	Chillers	Replace the York Millennium chiller.	Removal of the existing unit and the transportation of the new chillers up through the lift shaft and for the rebuild and commissioning of the system.					
8	MEP	Level 34	Chillers	Allow for the removal of both the redundant chillers and their ancillary services.	Isolate and remove the existing chillers.					
9	MEP	Level 34	Chillers	Allow for the removal of both the redundant chillers and their ancillary services.	Isolate and remove the existing chillers.					

Ref	MEP	Floor Level	Main Element / Area / Service	Comments / Observations / Assumptions	Work Item / Recommendation	Base Cost (£)	Year 1	Year 2	Year 10	Years 1 - 10
10	MEP	Level 34	Boilers	Allowance for the replacement of like for like oil fired boilers and their commissioning	Each boiler is 600kW. Allow for the draining down, replacement, commissioning of new oil fired boilers.	[redacted]				
11	MEP	Level 34	Boilers	Allowance for the replacement of the existing gas boiler in the 1st floor plantroom.	Replace the existing boiler on a like for like basis.					
12	MEP	Throughout	Air Handing Units	Allowance for the complete replacement of 11 AHUs.	Allow for replacing the AHUs.					
13	MEP	Throughout	Building Pipework He	TBA	TBA					
14	MEP	Throughout	Building Pipework Co	TBA	TBA					
15	MEP	Throughout	Foul water drainage	Allowance for the replacement of the foul water pipework	Replace foul water stacks					
16	MEP	Throughout	Domestic Hot Water	Allowance for the installation of plate heat exchangers	Install new heat exchanges					
17	MEP	Throughout	CHW Plate Heat Exch	Allowance for the replacement of the plate heat exchangers.	Remove and install 2 PHEs					
18	MEP		Hot water Calorifiers	Allowance for the replacement of the existing DHW calorifiers.	Replace the calorifiers on the 20th and 12th floors.					
19	MEP		Gas fired water heate	Allowance for the replacement of gas fired water heaters	Replace 8 non storage calorifiers with plate heat exchangers					
20	MEP		Pumps, valves and me	Replace cold water booster set	Provisional sum					
21	MEP		Pumps, valves and me	Make allowance for remedial repairs to valve.	Provisional sum					

Ref	MEP	Floor Level	Main Element / Area / Service	Comments / Observations / Assumptions	Work Item / Recommendation	Base Cost (£)	Year 1	Year 2	Year 10	Years 1 - 10
22	MEP	Throughout	Ductwork	Allowance for the cleaning of the main supply and extract ductwork.	Allow for cutting additional access doors and the like	[redacted]				
23	MEP	Throughout	Fire Dampers	Allowance for the detailed inspection and reporting on the existing fire dampers.	Inspection and reporting only					
24	MEP	Throughout	Fire Dampers	Allowance for possible remedial works to the fire dampers.	Provisional sum					
25	MEP	Throughout	Heating	Survey and report on the poor heating to the 1st floor.	Inspection and reporting only					
26	MEP	Throughout	Fan Coil Units	Allowance for the replacement of the existing FCU's throughout the building	Allow for £250 (average cost) for the remedial works to the FCUs.					
27	MEP	Throughout	Wet Riser	Allowance for testing and reporting on the condition of the wet risers.	Provisional sum					
28	MEP	Throughout	Sprinkler	Allowance for the draining and flushing of the sprinkler installation to the ground to 2nd floor.	Provisional sum					
29	MEP	Throughout	Sprinkler	Allowance for the removal of the sprinkler pipework and the NDT testing of the pipework.	Provisional sum					
30	MEP	Throughout	Sprinkler	Allowance for the inspection and replacement of the existing sprinkler heads	Provisional sum					
31	MEP	Throughout	Water Tanks	Allowance for the draining, cleaning and inspection of the existing cold water storage tanks.	Provisional sum					

Ref	MEP	Floor Level	Main Element / Area / Service	Comments / Observations / Assumptions	Work Item / Recommendation	Base Cost (£)	Year 1	Year 2	Year 10	Years 1 - 10
32	MEP	Throughout	BMS	Allowance for replacement of the BMS outstation and field devices and software upgrade	Provisional sum	[redacted]				
33	MEP	35 Fl Plantroom	MCP South West MC	Replace MCCP	Replace					
34	MEP	35 Fl Plantroom	MCP Panel 1 West	Water leaking onto panel from roof above. Repair leaking roof	Repair					
35	MEP	345Fl Plantroom	MCP Panel 2 East	Water leaking onto panel from roof above. Repair leaking roof	Repair					
36	MEP	34 Fl Plantroom	Inverter 1							
37	MEP	34 Fl Plantroom	Inverter 2							
38	MEP	34 Fl Plantroom	Inverter 3							
39	MEP	12 Fl West Wing Plantroom	MCP	Replace MCC panel	Replace					
40	MEP	12 Fl West Wing Plantroom	MCP North	Replace MCC panel	Replace					
41	MEP	12 Fl West Wing Plantroom	MCP South Wing Con	Replace MCC panel	Replace					
42	MEP	12 Fl West Wing Plantroom	MCP North Wing Con	Replace MCC panel	Replace					
43	MEP	12 Fl West Wing Plantroom	Inverter Panel P6/P7	Replace inverter	Replace					
44	MEP	12 Fl West Wing Plantroom	Inverter Panel P38/39	Replace inverter	Replace					
45	MEP	12 Fl West Wing Plantroom	Inverter Panel P20A/B	Replace inverter	Replace					
46	MEP	12 Fl West Wing Plantroom	Inverter Panel P4D/1.	Replace inverter	Replace					
47	MEP	12 Fl West Wing Plantroom	Inverter Panel P15/P1	Replace inverter	Replace					
48	MEP	1st Fl South West Plantroom	MCP							
49	MEP	Basement	Main LV Distribution							
50	MEP	Level 34	Main LV Distribution							
51	MEP	Basement	Electrical Intake Room	Several large isolator assumed to be tenants. Remove the redundant electrical switch gear	Remove					
52	MEP	Basement	Standby Generator	No works noted						
53	MEP	East Riser 2- 11	Electrical	Replace rising bus bar and tenants distribution boards	Replace					
54	MEP	East Riser 12- 19	Electrical	Replace rising bus bar and tenants distribution boards	Replace					
55	MEP	East Riser 20-33	Electrical							
56	MEP	North Riser 2-11	Electrical	Replace rising bus bar and tenants distribution boards	Replace					
57	MEP	North Riser 12-19	Electrical	Replace rising bus bar and tenants distribution boards	Replace					
58	MEP	North Riser 20-33	Electrical							
59	MEP	West Riser 2-11	Electrical	Replace rising bus bar and tenants distribution boards	Replace					
60	MEP	West Riser 12-19	Electrical	Replace rising bus bar and tenants distribution boards	Replace					
61	MEP	West Riser 20-33	Electrical							
62	MEP	South Riser 2-11	Electrical	Replace rising bus bar and tenants distribution boards	Replace					
63	MEP	South Riser 12-19	Electrical	Replace rising bus bar and tenants distribution boards	Replace					
64	MEP	South Riser 20-33	Electrical							
65	MEP	Throughout 2- 32	Small Power	Allowance to install cleaner socket to Cat A fit out.	Replace					
66	MEP	Throughout	Floorplate Lighting, landlords lighting and emergency lighting	Allowance for the replacement of the existing lighting with new LED	Replace					

Ref	MEP	Floor Level	Main Element / Area / Service	Comments / Observations / Assumptions	Work Item / Recommendation	Base Cost (£)	Year 1	Year 2	Year 10	Years 1 - 10
67	MEP	Throughout	Landlords Sub Distribution Boards and electrical services for M&E services	Replace the DB's and field wiring	Replace	[redacted]				
68	MEP	Level 34	Chiller HV Electrical Distribution	Replace the HV cable and associated gear	Replace					
69	MEP	Level 34	Chiller Power Factor Correction Units							
70	MEP	Throughout	Data							
71	MEP	Throughout	Fire Alarm System							
72	MEP	Throughout	High rise passenger lifts	Fully modernises the passenger lifts						
73	MEP	Throughout	Low rise passenger lifts	Fully modernises the passenger lifts						
74	MEP	Throughout	Good lifts							
75	MEP	Throughout	W C Hot and cold water services	Remove and replace hot and cold water service						
76	MEP	Throughout	Disabled alarms and refuge alarms	Install						
77	MEP	Throughout	EPC	Carry out detailed survey						
					TOTAL					

APPENDIX B - MEP CURRENT SERVICES DATA

INSTALLED ENGINEERING SERVICES

Introduction

The following sections provide a brief description of the M&E services installed in the building. They only identify the core items of plant installed, due to the changing nature of the building and the previous tenants that have occupied it. There are several tenants installed services which have been installed to serve their requirements. However, there are no detailed records recording what has been installed and what it serves. During our visual, non-intrusive survey we observed some items of plant that may have served specific tenant's requirements which have been switched off, rather than been removed.

General

Record Documentation and Inspections

The following descriptions in this section of the report are based upon our visual, non-intrusive inspections. No plant performance testing or validation works has taken place on the mechanical services. During our survey we were unable to obtain access to record drawings other than those installed in the plantrooms, or any design details relating to the core services.

Lifecycle

We have detailed in the following table the key items of plant installed. Based on our experience and subjected to normal operation and maintenance regimes being carried out, we have indicated a typical lifecycle for the plant. The following table is a general aid and within the body of our report we may have reduced an item of plants economic life due to its visual appearance or signs of wear and tear.

Item	Equipment	Economic life/years
1.0	Waste pipes, plastic	30
2.0	Waste pipes, ductile iron	40
3.0	Storage tanks, galvanised steel	15
4.0	Storage tanks, plastic/non-metallic	20
5.0	Heating pipework, unvented	25
6.0	Boilers, MTHW	20
7.0	Boilers, LTHW	20
8.0	Oil fired burners	15
9.0	Gas fired burners	15
10	Boiler flues, steel	30
11	Heat exchangers, shell and tube	25
12	Heat exchangers, plate	15
13	DHW storage calorifiers, copper	25
14	Expansion vessels, closed system with membrane	15
15	Pipework distribution, copper	45
16	Pipework distribution, stainless steel	35
17	Radiators, steel panel	20
18	Air cooled chillers	20
19	Water cooled chillers	20
20	Cooling towers, plastic coated metal	25
21	Pumpsets, MTHW, LTHW and CHW	20
22	Air handling units, internal	20
23	Air handling units, external	15
24	Fan coil units	20
25	Ductwork	20
26	BMS Controls	15
27	Wet riser and landing valves	20
28	Sprinklers, pipework and heads	30
29	Sprinkler pump sets	20

Item	Equipment	Economic life/years
1.	Building Management System	10
2.	Motor Control Centres (MCC)	20
3.	Inverters	15
4.	Electrical Distribution	25-30
5.	Standby Generator	30
6.	Tenants Distribution Boards	25-30
7.	Bus Bars	35
8.	Small Power	25
9.	Lighting	20
10.	Landlord Sub Distribution Boards	20
11.	Chiller HV Electrical Power Supply	35
12.	Power Factor Correction	20
13.	Data	10
14.	Fire Alarm	10
15.	Intruder Alarm	15
16.	CCTV	15
17.	Lifts	20

Cooling Towers

There are four open circuit cooling towers which serve the four main chillers in the 34th floor plantroom. The cooling towers are manufactured by Balmoral, their AQ22549 range and they were installed in 1993. In 2005/6 the cooling towers were extensively refurbished. The cooling tower matrix packs have recently undergone a full replacement and during our survey we did not observe any leaks from the units. Due to the age of the cooling towers and taking into consideration their refurbishment in 2005/6.

Depending upon the long term strategy for the building's future heating and cooling provision will have an impact on the remaining economic life of the cooling towers i.e. if all the chillers were to be replaced it would by sensible to replace the cooling towers at the same time. This would ensure the maximum reliability of the cooling provision to the building than compared to replacing the cooling and retaining the cooling towers.

Chillers

General

The tower is served by four water cooled chillers and these units are in the 34th floor plantroom. These chillers serve the cooling requirements of the offices in the main tower block. There are a further two chillers which serve the cooling requirements for first floor area. These are in the chiller plantroom on the first floor. In addition to these main chillers there are two other chillers, located on the 12th floor plantroom. These two chillers serve the cooling requirements for the comms rooms on the 2nd to 12th floors. It is our understanding that the computer rooms have been removed. The following table details the current chillers provision and operational status:

Item	Location	Manufacturer	Model	Type	Refrigerant	Year of manufacture	Status
1.0	34th floor plantroom	Systemair	E166-18	Water cooled screw	R134a	2018	On
2.0	34th floor plantroom	York	YMC²	Water cooled centrifugal	R134a	2012	On
3.0	34th floor plantroom	York	MAXE	Water cooled centrifugal	R134a	2007	Off
4.0	34th floor plantroom	York	Millennium	Water cooled screw	R134a	1997	Off
5.0	12th floor plantroom	Carrier	RA 30 series	Air cooled reciprocating	R407c	2000	On
6.0	12th floor plantroom	Carrier	RA 30 series	Air cooled reciprocating	R407c	2000	Off
7.0	1st floor plantroom	Carrier	GV 30 series	Air cooled reciprocating	R407c	1999	On
8.0	1st floor plantroom	Carrier	GV 30 series	Air cooled reciprocating	R407c	1999	On

Typically, all the chillers, above, provide chilled water (CHW) at 6°C on the flow and 12°C on the return.

34th Floor Plantroom

During the writing of this report we have been unable to establish the reason why the York MAXE chiller has been isolated. However, we noted that there appears to be an issue with its controls as the control panel was open and PCB boards removed. If the York MAXE chiller is beyond economic repair, then this unit will require replacement.

Based upon the above table, it is our opinion that the oldest two chillers will require replacement due to their age and the availability of economic spare replacement parts in year one. The two remaining chillers will operate during years one to three (i.e. the York YMC² 2012 and the Systemair 2018).

The replacement of these chillers will involve the dismantling of the chillers and the transportation of the compressor, the condenser and evaporator sections up through the lift shafts. This will involve disruption to any tenants which require the use of the high rise lifts to access their floors. Typically, this disruption will be for three to four weeks whilst the chiller sections are moved through the lift shafts. Once the sections have been transported to the plantroom, the chillers will have to be rebuilt by the manufacturer and tested prior to their installation to the existing system.

1st Floor Plantroom

The two Carrier chillers in this plantroom are air cooled units. The heat rejection from the chillers are ducted to the external louvre of the façade of the 1st floor. The chillers are 19 to 20 years old and they have reached the end of their economic life. Due to their age, there are obsolescence issues with spare parts for their controls.

12th Floor Plantroom

On the 12th floor plantroom there are two Carrier chillers. The chillers have remote air cooled condensers which are located on the roof of the building. The chillers serve the comms rooms installed on the 2nd to 12th floors. During our survey we were advised that one of the units had failed. It is our opinion that when the tenant vacates these floors the comms rooms will be removed.

Local Cooling Units

There are several local cooling units installed throughout the building. However, for the purpose of this report we have assumed that these are tenant installed equipment and therefore we have excluded the local cooling units from our report.

Boilers

MTHW Boilers

The oil fired boilers are located in the boiler room on the 34th floor. The boilers are manufactured by Hoval and are their SR Plus 600 Heatpack range and were manufactured in 1999. The boilers are served by oil fired burners and the burners are manufactured by either Bentone (three units) or Nuway (five units). The boilers main source of heating for the following services:

- The main MTHW heater batteries on the air handling units on the 35th, 34th and 12th floor plantrooms.
- The DHW calorifiers which are on the 12th and 25th floor plantrooms.
- The vertical and horizontal, four pipe, fan coil units in the office area.

- The steel panel radiators in the common parts.
- All non-storage calorifiers.

The boilers are served by a day tank which is in a tank room, located on the 35th floor. The boilers operate on 35 sec fuel oil. During our survey there were no oil or water leaks in the boiler room. There is a pressurisation unit, located in the plantroom which serves the MTHW heating installation.

The boilers are double stacked, and they are served by a common stainless steel flue arrangement. The boiler room is naturally ventilated by external louvres, mounted on the external façade of the boiler room.

There are limited spares available from the manufacturer i.e. rope seals and gaskets.

LTHW Boiler

The first floor plantroom has been provided with a LTHW gas fired boiler. The boiler is manufactured by Hamworthy, their Wessex modular boiler range. The boiler serves the heating to the first floor. We were unable to identify the age of the boiler, but it is our opinion that the boiler is over 19 years old. The heating system to the 1st floor is served by a pressurisation unit, expansion vessel, an end suction pumps all which date from circa 2000.

The boiler is served by a stainless steel flue which terminates externally.

There is a gas meter located in a small cupboard in the plantroom.

Non-Storage Calorifiers

There are eight non-storage calorifiers, in the 12th floor plantroom which provide LTHW to the FCUs, staircase radiators, ground floor heating and the heater batteries in the 1st floor AHUs. The calorifiers date from the 2000 fit out. We do not anticipate any remedial works to the non-storage calorifiers in years one to three.

Ventilation Systems

General

The main supply and extract air handling units (AHUs) are in the 35th floor, 12th floor and 1st floor plantrooms. Generally, the ventilation systems are configured as two systems i.e. a north/east zone and a south/west zone. These AHUs serve the 23rd to 34th floors with each unit serving two wings. These AHUs operate with 100% fresh air. However, the AHUs have the facility of the installation of a run around coils arrangement between it and the extract from the floor plates.

The AHUs on the 12th floor serve the 2nd to 11th and 13th to 22nd floors. There are eight AHUs; four serve the 2nd to the 11th floors, one for each wing. The remaining four AHUs serve the 13th to 22nd floors. These AHUs have been provided with run around coil arrangements.

The AHUs consist of a filtration section, heating and cooling sections and a steam humidifier section.

The 1st floor is served from the first floor ventilation plantrooms.

There are separate AHUs, in the 35th floor plantrooms, which serve the toilets on the 13th to 34th floors and these have an independent toilet extract system. The 12th to 2nd floor toilets are served by a dedicated AHU which is located in the 12th floor plantroom.

Air Handling Units

During our survey we were unable to establish the age of the AHUs. However, it is our opinion they date from the original install of the building. The AHUs operate on 100% fresh air. The general condition of the AHU units is fair, and it is our opinion that they will continue to operate for a further one to three years subject to them receiving a major overhaul. However, we were unable to isolate the AHUs and carry out an internal inspection of the units.

The AHUs which serve the remaining floors down to the 2nd floor are on the 12th floor. These AHUs have been provided with run round coils.

Extract Systems

The extract fans serving floor 23rd to 34th floor are on the 35th floor and they are original to the building. The extract fans which serve the remaining floors are on the 12th floor. The various extract original to the building. There are dedicated extract systems which serve the common areas and the toilets on each floor plate and independent systems which serve the office area, and these are located on either the 34th or 12th floor plantrooms

Building Pipework

In general, most of the pipework is original. Heavy weight carbon steel pipework has been used on the heating and cooling installations with copper pipework being used on the hot and cold water services. There are pipework risers in in each wing of the building and these risers contain the vertical pipework to the various MEP services. From the risers the heating and cooling pipework is contained within the ceiling voids or in the service voids around the external perimeter of the floor plates. No major leaks were observed on the pipework distribution during our survey. During our survey we were unable to review any records on the water treatment or sampling of the water systems.

Calorifiers

DHW Calorifiers

The domestic hot water calorifiers (DHW) are in the 25th floor, three calorifiers, and the 12th floor plantroom, four calorifiers. The primary heating source to the calorifiers is from the MTHW system and they are provided with supplementary electrical heaters. The calorifiers are horizontal units and they date from the 2000 fit out of the building. During our survey we observed water staining and pooling water local to the 12th floor calorifiers which appears to be coming from the safety valve discharge pipe and that some of the immersion heaters have been disconnected. During our survey we were advised that there have been no issues with the legionella sampling on the DHW.

Gas Fired Water Heater

In the 1st floor plantroom there is a gas fired water heater which provides domestic hot water (DHW) to the kitchen area. It is our opinion that the heater has been replaced in the past 10 years.

Plate Heat Exchangers

There are two, CHW, PHEs installed in the 12th floor plantroom. The units were fully insulated, and we were unable to visually examine the units. The units were installed as part of the 2000 fit out.

Pumps

35th Floor Plantroom

Typically, the heating and cooling pumps are in the 35th and 12th floor plantrooms and they are a combination of long and close coupled units, dependent upon their age. During our survey we noted that some of the pump motors have been changed in past.

Originally the MTHW pumps were fitted with mechanical cooling to their bearings. However, these systems have all been decommissioned albeit they are still in-situ. We have excluded for the re-instatement of the cooling systems from our cost tables.

34th Floor Plantroom

The CHW and condenser water pumps are in the chiller plantroom. These pumps have been replaced in the past five years with in-line, single headed, mechanical seal, pumps. [redacted]

Booster Pumps

The main cold water booster pumps are in the basement, cold water tank room. The booster pumps appear to have been replaced in the past five years and it is our opinion that the booster sets will continue to operate during years one to three.

Valves

The valves serving the water distribution services are original to the building and have exceeded their normal economic life. However, from our inspection, no major issues were observed on the valves. However, we were unable to open or close the valves as the water distribution systems were in operation.

On the MTHW systems, the valves are configured in a double valve arrangement. However, as part of any long term strategy with the heating and cooling systems, the use of MTHW systems may be removed.

Generally, the valves are gate valves but there are instances when later pipework modifications have been carried out, the use of butterfly valves has been employed on the later installed systems.

Ductwork

The supply and extract ductwork systems are in a fair condition, and it is our opinion that these systems will continue to operate for a considerable period.

Dampers

Fire Dampers

Fire dampers have been installed throughout the building where the ventilation system breaches the buildings fire barriers. During our survey we were unable to examine any fire or their service records. It is our experience that fire dampers are not regularly tested in accordance with BS 9999:2017 code of practice for fire safety in the design, management and use of buildings.

Volume Control Dampers

Volume control dampers are installed in the supply and extract ductwork systems. These dampers are original to the building. No internal access was available to these dampers.

Floor Plates

General

During our survey we were unable to determine if there were any issues with the current heating and cooling provision to the tenant areas in the tower block. However, it is our understanding that there are some underheating issues with the perimeter offices on the 1st floor. Currently the 1st floor is predominately meeting rooms and we recommend that the issues with the heating is addressed in year one.

Fan Coil Units

The heating and cooling to the tenant areas is using four pipe fan coil units (FCUs). A mixture of ceiling mounted, and wall mounted units have been employed throughout the floors. During the survey we were unable to identify the age of the FCUs. However, it is our opinion that the ceiling void mounted units were installed as part of the 2000 refit of the building with the wall mounted units being original to the building. We recommend that the FCUs are fully overhauled and cleaned in year one.

Wet Riser

There are two wet risers that serve the building. The wet risers are in the east and west protected lobbies. In general, the wet riser consists of a water storage tank in the basement, an electrically driven pump and a separate diesel driven pump and these pumps are in the same plantroom as the water storage tank. No pressure or water flow rate tests were carried out on the risers. However, it is our understanding that the current FM provider service and test the systems in accordance with the current regulations.

Sprinklers

There is a cold water main supplied sprinkler installation that serves the ground, 1st and 2nd floor office areas. The installation consists of main distribution pipework, range pipework and sprinkler heads. Most of the pipework is concealed in ceiling voids and therefore there was limited access to the sprinkler installation. It is our opinion that the sprinkler installation dates from the 2000 fit out of the building.

Storage Tanks

Oil Storage

The MTHW boilers are oil fired and the main oil storage is in the basement of the building. The oil storage is original to the building. However, the main oil pumps in the basement have recently been replaced in the past five years. There is a further daily, oil storage tank located on the 35th floor and again this is original to the building. This tank then serves the boilers which are on the floor below. Both these tanks are of a single skin construction. The overall condition of the oil storage and distribution is fair. We do not anticipate any major issues with this system during years one to three.

Cold Water Storage

The main water storage tanks are located on the 35th floor plantroom and in the basement water tank room. Typically, the tanks are GRP section units and during our survey we did not observe any leaks from the tanks. It is our opinion that the water tanks date from around the year 2000 fit out and there were probably sized for a 24 hour water storage capacity. It is now normal practice to size water tanks on a maximum storage capacity of 6 to 8 hours of usage.

During our survey we were unable to review the water risk assessment or any water sample records.

Building Management System (BMS)

The building management system (BMS) dates from the 2000 fit out of the M&E services. The original BMS is a Saulter system. In general, the system consists of local outstations contained within the motor control centres (MCCs) and these outstations contain all the software and controllers to control the M&E services served by the MCC. All the outstations are linked using area network cables. The networked outstations allow their controls to be viewed by a remote computer which has the supervisor software. The supervisor software allows the various control routines to be adjusted remotely. The supervisor also allows for the remote monitoring of alarms and plant failure. The outstations controllers are no longer support by the manufacturer.

The supervisor uses a Niagara Framework as supplied and manufactured by Tridium. The supervisor has been installed in the past five years. The system supports the older network protocols as used by the Saulter controllers.

For the long term, we anticipate that all the outstations will require replacement on a phased basis. We recommend that a BACNET protocol system is installed as this provided the most flexibility with third party control systems. The current supervisor would be retained and adapted to work with the new outstations when they are installed.

Electrical Services

Electrical Distribution

The building is served by a number of 11,000(V) three-phase and neutral (TPN) supplies, which enter the property from the sub-basement area. These are divided into landlord's and tenants' 11,000(V) supplies feeding transformers on the 34th floor to serve tenant plant. The 415(V), 400(A) TPN supplies to common parts, plant on the 1st, 12th , 33rd and 34th floors and other ancillary areas are routed via dedicated switch rooms to the different service risers throughout the property.

The tenants' supply risers are located in each wing, via a propriety type of busbar distribution system serving at every level a compartmented, single-phase distribution board. These are located within the fire escape stairwells, and serve small power to sockets, lighting and the comfort conditioning fan coil units. Additional distribution boards are located within the floor plates and serve additional small power works, i.e. the Sauter controls for the comfort conditioning system located on the floor plates, comms rooms supplies etc.

Main LV Distribution Panels

The main LV distribution panels are located in a dedicated electrical switchroom in the sub- basement of the building. The LV distribution panels consist of six individual sectional panels identified LV-1 to LV-6 serving the retail units, landlord's services and tenant's electrical services. With the LV essential power boards being fitted with automatic changeover switchgear.

Electrical Intake Room

Located in a separate electrical plantroom are several LV switch panels, these appear to have been installed by a tenant some years ago and appear to be redundant.

Standby Generator

The property is served by a dedicated standby diesel powered generator, this is located in the sub-basement of the building. The generator dates from 2008 and is manufactured by Perkins Ltd and rated at 800 (kVA). The standby generator set has been installed retrospectively and has been installed to provide essential power to serve the fireman's lifts in the event of power failure. Any future scheme for the building will have to consider retaining the generator set, this will need to based on the recommendation of a future Fire Risk Assessment.

Tenant's Distribution Boards and Busbar

The busbar distribution system is fed from the basement switchgear room and is supplied from several 400 (A), three phase isolators; the busbar systems are separated into four distinct systems per wing, based on floor levels, i.e. floors 2 to 11, 13 to 19 and 20 to 34.

Generally, the distribution boards and associated busbar distribution system serving floors 2 to 11 dates from the original construction of the building in the 1970s.

The distribution boards serving floors 12 to 19 date from approximately 2001, with the associated busbar distribution system still being original to the construction of the building. With the distribution boards and associated busbar distributions system serving floors 20 to 34 having been replaced within the last 10 years. The bus bar is manufactured by Barduct, with the distribution boards being manufactured by Square D from their Load Centre range of products.

Small Power

Small power distribution on the floor plates is via a propriety type of 1990s busbar distribution type within an intercell type shallow false floor serving floor boxes throughout the floor plates. This system carries single-phase 13 (A) double-switched socket outlets, together with voice and data points. The compartmented distribution boards have typically two compartments dedicated to serve small power for each particular floor wing.

Lighting

The general office lighting on the office floorplates is generally comprised of modular fluorescent luminaires laid in the suspended ceiling grid.

The plantrooms, staircases and general back of house area are illuminated with a mixture of surface mounted baton florescent light fittings and bulkheads. In general, these are in are in poor condition with many fittings damaged or not functioning.

Emergency lighting is provided by a combination of self-contained bulkhead luminaires distributed throughout the back of house areas, floor plates, and recessed luminaires fitted with emergency battery conversion packs. There is sufficient provision of luminaires in most areas; the operation of the system was not verified at the time of visit.

The directional exit signage throughout the back of house areas and floor plates comprises of a mixture of pictogram styles, including those with 'Exit' wording that have now been superseded by European standards. These are in fair condition although their operation was not verified at the time of visit.

We understand that a programme of testing and inspection of the emergency lighting system is in existence in accordance with BS 5266-1: Emergency Lighting, Code of Practice for the Emergency Lighting of Premises.

Landlord Sub Distribution Boards

The majority of the Landlord's sub distribution boards are feed by SWA emanating from the main LV distribution panels located in the basement. The majority of sub distribution boards are manufactured by Square D from their Load Master range, they are generally 200 amp TP& N fitted with MCBs and are in good condition.

Chiller HV Electrical Power Supply

The four chillers located in the 33rd floor plantroom is electrically fed via a dedicated high voltage power supply located in a substation on the same floor as the chillers. The two HV transformer and associated chiller LV switchgear all dates from the original construction of the building in the 1970s.

In addition to the chiller transformers and associated switchgear, two power factor correction units have been installed. These are manufactured by PFC Engineering and date from approximately 2014. They are both in good condition with no defects noted during the site inspection.

Data

The existing data cabling which serves each floor and each wing of the tower is routed via a dedicated service riser, which is generally within the fire escape stairwell of each wing and is distributed throughout the floor plate via the local comms rooms and floor boxes.

Fire Alarm System

The property is provided with general smoke detection throughout the floor plates together with a limited number of the services risers. The automatic smoke detection system is supplemented with manual call points at all of the final exist points at each floor level into all stairwells. In addition, the fire alarm installation is provided with numerous sounders and voice annunciation that will activate when a fire is detected. The system operates as phased evacuation was originally designed to meet the requirements BS5839 Part1: 2002 for life protection system category L1 system.

Vertical Transportation

We have separated the lift provision at Euston Tower into three distinct groups, the high rise group, low rise group and the goods lifts.

The high rise is a group of five lifts serving floors ground, 20-34. The motor room is located on level 36 and is accessed via level 36 plant room

The low rise is a group of five lifts serving floors ground, 1 to 19, The motor room located over 2 floors on levels 21 and 22 within tenanted floors.

The two goods lifts are situated in the fire escape stairwells, one within the east stair well and one within the west stair well. Both lifts serve floors basement, ground, 1 to 34.

High Rise Lifts

The group of five lifts within the high rise group are designated A through to E and are passenger lifts. The lifts travel from ground floor to the 20th floor without stopping, this section of the lift shaft is known as the express zone. Escape doors are fitted periodically within the express zone.

Each lift has a rated load of 23 persons or 1590kg and rated speed of 5 metres per second. The lifts operate as a fully collective group.

The lifts were originally installed when the building was originally built in 1970. A significant modernisation was undertaken in 1990 and further stabilisation works undertaken in 2017. Much of the equipment is the original design, including the guides, lift cars, counterweights, machines, divertors compensation and buffers.

The controllers were replaced in 1990 along with all car and landing signalisation. The generators were removed but the dc motors were retained. The stabilisation works in 2017 allowed for a full overhaul of the lift machines, replacement door operators and significant health and safety upgrades, along with the provision of critical spares.

The landing doors have had some modification and improvements over their lifetime, including replacement rollers, lock components and air cords.

Low Rise Lifts

The group of five lifts within the low rise group are designated as A through to E and are passenger lifts. Each lift has a rated load of 19 persons or 1425kg and a rated speed of 3.5 metres per second. The lifts operate as a fully collective group. The lifts were originally installed when the building was originally built in 1970. A significant modernisation was undertaken in 1990 and a further stabilisation in 2017. Much of the equipment is the original design, including the guides, lift cars, counterweights, machines, divertors, compensation and buffers.

The controllers were replaced in 1990 along with all car and landing signalisation. The generators were removed but the dc motors were retained. The stabilisation works in 2017 allowed for a full overhaul of the lift machines, replacement door operators and significant health and safety upgrades, along with the provision of critical spares.

The landing doors have had some modification and improvements over their lifetime, including replacement rollers, lock components and air cords.

Goods Lifts

The two goods lifts are designated the east and west goods lifts. Each lift was installed during the building construction in 1970 and since that time have undergone a comprehensive modernisation in 2010. The equipment installed is the same for each lift.

During the modernisation only the car and counterweight guides were retained, all other equipment was replaced. The lifts have a capacity of 20 persons or 1360kg and serve basement, ground, 1-34, the machine rooms are each located on level 35. Each lift has a rated speed of 2.5 m/s.

The lifts are installed with 'Kollmorgan' manufactured microprocessor control systems incorporating variable voltage variable frequency drives. The drive system is regenerative type. The lifting machine is a gearless type manufactured by 'Thyssen' Lifts. The car and landing door were manufactured by 'Meiller' and are centre opening type. The car door operator is a variable voltage, variable frequency type.

APPENDIX C - SVM CLAUSES

SVM ASSOCIATES

LIMITATIONS TO SURVEY

The surveys were undertaken on a visual basis. This does not allow an in-depth assessment of condition and further assessments may reveal defects that would affect the operation or life cycle of the building and equipment.

- SVM did not inspect parts of the building which are covered, unexposed or inaccessible excepting sample areas of suspended ceiling tiles and raised floor tiles where it is reasonable to do so and therefore no advice will be given as to, nor responsibility accepted by SVM for the condition of such areas. The exterior of the building was inspected from ground level only unless access was available to a higher level. Below ground drainage was not inspected as part of this survey, unless otherwise stated.

- The survey was limited to a surface examination of accessible parts of the building and the report describes the form and present condition of the services, drawing attention to visible defects in design and installation and where appropriate, recommendations have been given by SVM upon the need for repair. Should it appear from the survey that any opening up works or further investigation is desirable, SVM has advised accordingly and if so instructed and the necessary consent obtained, make a further examination for which a supplementary fee will be charged.

- SVM has not commented upon minor defects associated with normal wear and tear of the services or defects except where such matters have a bearing upon the general condition of the property.

- Unless SVM are specifically instructed and the building owner's written consent was obtained, SVM did not move any heavy furniture or disturb fittings, remove articles from cupboards or like areas, raise any floor coverings or remove any floorboards. If in SVM's opinion further investigations are necessary, they will advise accordingly as noted.

- SVM have not considered the premises in relation to apparent contravention's of the Building Regulations and will only report in broad terms on any shortcomings noted in this respect.

- No formal enquiries have been made to the local authority to obtain historical information, existing user rights, proposed use etc. legal interests, fire certificate, effluent agreements, easements and wayleaves. SVM have relied upon the client's solicitors to undertake these normal enquiries and searches.

- Where the property is leasehold and the demised premises form part of a larger building or estate, SVM have made a limited inspection of accessible common parts of the building or estate, for the purpose of assessing their general condition.

- Unless otherwise instructed, testing of components within the services for taking of samples of materials for analysis to establish their make-up and consideration as to whether they may prove prejudicial to the use or value of the building has not been undertaken.

- SVM were not required to determine whether asbestos, calcium chloride, high alumina cement, woodwool slabs (used as permanent shuttering) or other deleterious materials are used within the premises. Advice regarding condition has been given on the assumption that such materials are not present. However, where SVM believe deleterious materials are present they will advise of their suspicions to the client, so that a specialist can be appointed and appropriate action can be undertaken.

- SVM's report is confidential to the party whom it is addressed and it is intended for the use of that party only. However, the client may assign its sole rights and benefits once only with the written agreement of SVM, which will not unreasonably be withheld.

- SVM are entitled to rely upon all information given to them and consider it to be accurate.

Or

No site documentation was available concerning the services, and the condition of equipment was based upon non-intrusive observation of the systems. As no tests or measurements of equipment performance was made our comments are indicative only.

- SVM's inspection specifically excludes an analysis and review of environmental considerations as they relate to the property, site and surrounding areas.

- The economic working life quoted for the plant, equipment and building fabric is based on professional judgement, visual assessment of the plant conditions and published data. Operation of plant beyond its economic working life is possible, however the risk of failure is increased leading to higher operating costs and the possibility of catastrophic failure presenting business risk. If there is poor maintenance or unusual environmental conditions then this can reduce the economic working life of items.

ASBESTOS

- Where SVM was not advised of the presence of asbestos containing material (ACM) by the client, either in the form of a written statement or an asbestos register, SVM assumed that ACM's may be present. This restricted the areas accessed by SVM during the survey i.e. inspection covers, ceiling tiles etc in an effort to avoid the disturbance of possible ACMs.

- Where SVM was advised of the presence of ACM by the client, either in the form of a written statement or an asbestos register, SVM took appropriate measures to avoid disturbing the ACM, should SVM disturb an ACM in an area not previously identified by the client, SVM will not accept any liability for any contamination subsequently caused.

Liability not to Exceed amount of Insurance

Further and notwithstanding anything to the contrary contained in this agreement and without prejudice to any provision in this agreement whereby liability is excluded or limited to a lesser amount, the liability of SVM Associates under or in connection with this agreement whether in contract or in tort, in negligence, for breach of statutory duty or otherwise for any claim shall not exceed the amount, if any, recoverable by SVM Associates by way of indemnity against the claim in question under professional indemnity insurance taken out by SVM Associates and in force at the time of the claim or (if earlier) circumstances that may give rise to the claim is or are reported to the insurers in question. This limitation shall not apply if no such amount is recoverable due to SVM Associates having been in breach of his obligations to maintain professional indemnity insurance under this agreement or the terms of any insurance maintained in accordance therewith or having failed to report any such claims or circumstances to the insurers in question timeously.

Limitation of Liability

Further and notwithstanding anything to the contrary contained in this agreement and without prejudice to any provision in this agreement whereby liability is excluded or limited to a lesser amount, any liability under or in connection with this agreement, whether in contract or in tort, in negligence, for breach of statutory duty or otherwise, for any claim for loss or damage wholly, partly, directly or indirectly arising out of or resulting from or associated in any way with asbestos or any product or waste that contains asbestos (including without limitation the costs of testing for, monitoring, abatement, mitigation, removal, remediation or disposal of any asbestos or product or waste that contains asbestos) shall not exceed the amount, if any, recoverable by SVM Associates by way of indemnity against the claim in question under professional indemnity insurance taken out by SVM Associates and in force at the time the claim or (if earlier) circumstances that may give rise to the claim is or are reported to the insurers in question. This limitation shall not apply if no such amount is recoverable due to SVM Associates having been in breach of his obligations to maintain professional indemnity insurance under this agreement or the terms of any insurance maintained in accordance therewith it having failed to report the claim or such circumstances to the insurers in question timeously.

Indemnity from the Client in relation to Asbestos Claims

The client will indemnify SVM Associates against liability for any claim for injury, death, loss or damage wholly, partly, directly or indirectly arising out of or resulting from or associated in any way with asbestos or any product or waste that contains asbestos (including without limitation the costs of testing for, monitoring, abatement, mitigation, removal, remediation or disposal of any asbestos or product or waste that contains asbestos) in excess of the amount, if any, recoverable by SVM Associates by way of indemnity against the claim in question under professional indemnity insurance taken out by SVM Associates and in force at the time that the claim or (if earlier) circumstances that may give rise to a claim is or are reported to the insurers in question, or un the event that no such amount is recoverable due to SVM Associates having been in breach of his obligations to maintain professional indemnity insurance under this agreement or of the terms of any insurance maintained in accordance therewith or having failed to report the claim or such circumstances to the insurers in question timeously, the client will indemnify SVM Associates against any such liability in excess of the amount which would have been so recoverable but for such breach or failure.

Lift Dilapidation Report

Euston tower delap report B8910

Euston Tower

August 2021

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Report Reference: I:\07\B8910\Dilapidation report 21Aug.docx

Revision	Date	Scope of Revision	Prepared by	Approved by	Issued On
	11/08/21	Issue	PS	ED	13/08/21
a					
b					
c					

If the document is marked "draft" it is deemed to be uncontrolled and is issued for comment and further development only.

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1 INTRODUCTION

SVM Associates were instructed by Malcom Webb to inspect and comment on the overall condition of the 12 lifts at Euston tower and carry out a dilapidation report. As the lifts are going to enter an extended period of Builders Beneficial Use, we will offer recommendations as to their use during this period and works that we recommend be undertaken prior to them being handed over to the builder.

A series of photographs have been taken and will be issued to the client showing the current general condition, these cover the car interiors, the landing doors, pits, and car tops, along with the motor room. They are filed under the individual lifts, additionally for the high- and low-rise lifts there is a file covering common areas.

Within this report there is a table for each lift, detailing any defects or service items that we recommend are addressed. Within this report there is a section covering critical spares that were purchased for the main passenger lifts, this includes a full list of parts available, however the area in which they were stored has been disturbed and we recommend a full inventory is carried out as there appears to be several omissions.

Surveys were carried out by Peter Sherrin on the 9th, 10th and 11th of August 2021.

2 HIGH RISE

2.1 Lift Schedules

Rated Load:	23 persons/1590kg
Rated Speed:	5 m/s
Floors Served:	G, 20 - 35
Duty:	Passenger
Maker:	Otis
Controller Type:	411 Otis
Drive Type:	DC invertor
Firefighting/evacuation:	No

2.2 Routines

Maintenance visits per annum:	12 visits per annum
Maintenance visits completed:	May and June missed
Adherence to PPM regime:	No

Lift Specific Issues High rise	Lift A	Lift B	Lift C	Lift D	Lift E	Comments	Signature and Date
Lift Machine Room							
Noisy selector tape, repair				▯			
Lift Car interior							
Car return is loose and catching on car doors, rectify					▯		
Car emergency light to be checked and confirmed in log card	▯	▯	▯	▯	▯		
Worn car door shoes, replace			▯	▯	▯		
Hall and Lobby	Floors						
Inoperative landing call acceptance lights	▯	▯	▯	▯	▯	Down 22,29 Up Ground	
Lift Car Top							
Selector tape fixing damaged, repair		▯					
Rope gatherer tether missing, replace		▯	▯	▯	▯		
Rope Gatherer missing, replace	▯						
Lift Shaft	Floors						
Kicking rollers adjustment required to landing doors		29	18,19	27,28	22,23, 26,30		
Adjust door speed and air-cords to stop doors slamming	▯	▯	▯	▯	▯		
Vertima units locked out, repair		▯			▯		
Shaft screening missing at front of shaft level 18 – replace		▯	▯				
Lift Pit							

Lift Specific Issues High rise	Lift A	Lift B	Lift C	Lift D	Lift E	Comments	Signature and Date
Lights not working (pit), incorrectly wired, not to each set of shaft lights, repair.	▯	▯			▯		
Escutcheon missing on landing doors, replace		G		G	G		
Counterweight screen requires extending	▯	▯	▯	▯	▯		
Guard missing off selector tape pulley, replace	▯						
Fit debris guard to weighted wheel	▯	▯	▯	▯	▯		
Shaft screen missing lower pit, replace	▯	▯					
Counterweight screen damaged (as it was caught on counterweight), repair					▯		
Lower pit light not working, repair	▯	▯		▯			
Poorly wired pit light has been removed, replace					▯		
No two-way switching on shaft lights, repair	▯						
Outstanding Statutory Inspection Items							
Not issued							

3 LOW RISE

3.1 Lift Schedules

Rated Load:	19 Persons/1425kg
Rated Speed:	3.5m/s
Floors Served:	G - 19
Duty:	Passenger
Maker:	Otis
Controller Type:	411 Otis
Drive Type:	DC
Firefighting/evacuation:	No

3.2 Routines

Maintenance visits per annum:	12 visits per annum
Maintenance visits completed:	May and June missed
Adherence to PPM regime:	No

Lift Specific Issues	Lift A	Lift B	Lift C	Lift D	Lift E	Comments	Signature and Date
Lift Machine Room							
Confirm greasing dates for machines. Recorded in log card	▯	▯	▯	▯	▯		
Fit chain across machine hatch access	▯						
Controller fan inoperative, repair				2	2		
No access to brake release due to selector tape run and machine guarding		▯	▯				
Windcrest batteries out of date, test and replace if necessary. Record test/replacement date in log card	▯	▯	▯	▯	▯		
Lift Car interior							
Landing door to car door offset causing landing doors to slam, rectify	▯	▯	▯	▯	▯		
Worn car door shoes, replace	▯	▯	▯	▯	▯		
Hall and Lobby	Floors						
Inoperative call acceptance lights, repair	▯	▯	▯	▯	▯	Down 10,14,18	
Missing/worn/loose door shoes		G	G	G	G		
Lift Car Top							
Noisy divertor/selector tape, investigate and undertake any required remedial works			▯				
Worn tape guides, replace	▯	▯	▯	▯	▯		
Damaged selector tape fixing, rectify				▯			
Vertima at the top of the shaft is out of adjustment, rectify			▯	▯	▯		

Lift Specific Issues	Lift A	Lift B	Lift C	Lift D	Lift E	Comments	Signature and Date
Lift Shaft	Floors						
Adjust landing door kicking roller	1		1				
Loose door shoe, rectify				14			
Debris guard loose on counterweight, secure					▯		
Rope jumps are loose on counterweight, rectify					▯		
Rope rubbing on the counterweight guard when lift at ground floor, adjust		B					
Loose lock nuts on compensation, tighten			▯				
Forced door gap stops lift, rectify		7					
Shaft lights inoperative, repair			▯				
Lift Pit							
Paint pit upstands and tripping hazards	▯	▯	▯	▯	▯		
Counterweight screen too low, adjust		▯					
Pit lights inoperative, incorrectly wired. Repair		▯	▯		▯		
Debris guard missing on weighted wheel, replace					▯		
Weighted wheel guard removed, replace			▯				
Outstanding Statutory Inspection Items							
None issued							

4 GOODS LIFTS

4.1 Lift Schedules

Rated Load:	20 person/1360kg
Rated Speed:	2.5m/s
Floors Served:	B, G, - 34
Duty:	Goods/Pass
Maker:	Otis
Controller Type:	Kollmorgen Microprocessor
Drive Type:	Gearless
Firefighting/evacuation:	Yes

4.2 Routines

Maintenance visits per annum:	12 visits per annum
Maintenance visits completed:	May and June missed
Adherence to PPM regime:	No

Lift Specific Issues	East	West	Comments	Signature and Date
Lift Machine Room				
Hand-winding unit not operating correctly (loses position), rectify	▯			
Controller fan not working, repair	▯			
Remove redundant UPS units	▯	▯		
Motor room divertor bearing over greased seal possibly damaged, investigate	▯			
Water leak from motor room ceiling, Salisbury to investigate		▯		
Lift Car interior				
Fixing missing from handrail, replace	▯			
Emergency lights not working	▯	▯		
Car lights becoming detached from ceiling, rectify		▯		
Car preference switch broken	▯			
Hall and Lobby	Floors			
Damaged door panels, rectify	3, 4, 34, B	17, 18, 22, 24, 28		
Braille plate missing, reinstate		1		
Basement aircord damaged, replace		▯		
Lift Car Top				
Main hoisting ropes are unevenly tensioned, re-tension ropes	▯	▯		
Door panels rusting on door shoe fixing, clean and treat	1	1,3		
Note: Unable to maintain car top divertors, due to fixed guarding		▯		
Fixing missing from divertor guard, reinstate	▯			

Lift Specific Issues	East	West	Comments	Signature and Date
Lift Shaft	Floors			
Encoder tape bracket poorly fitted, rectify	▯			
Worn car guide roller (top left-hand side), replace		▯		
Counterweight divertor noisy, investigate		▯		
Facias poorly fixed, noisy in travel	▯			
Lock cover missing, reinstate		B		
Basement closer inoperative, repair	▯			
Lift Pit				
Pit ladder damaged, repair	▯			
Lower counterweight screen missing, reinstate	▯			
Note: Trailing flex used as compensation		▯		
Shorten governor rope	▯	▯		
Pit begrimed, clean	▯	▯		
Outstanding Statutory Inspection Items				
None issued				

5 SITE SPARES

Provision was made for the supply of critical spares that were to be held on site and managed by the lift contractor, the full list of spares and the number that was available is listed below, the spares however have been accessed by third parties and it is unclear if all are still available and what their condition is. It is recommended that an inventory is undertaken by the contractor, any omissions replaced, and any additional items required sourced.

Description of Required Inventory	Part No	Number
Ring Car Board ll	GHA21270A30	1
RS4 remote stations (x 2)	GAA26800NV100	2
RSEB Remote Station Extender boards (x 2)	B9693AE1	2
DISS front door control board	C9693MB2-B	1
ADISS rear door control board (used to interface load weighing system)	ABA26800KK4	1
LWD board (interface for LVDT and ADISS)	ABA26800KKY	1
LVDT load weighing differential transformer unit (mounted under the lift car)	AAA26800LM1/B	1
MCSS board	ABA26800ABA002	1
MCSS I/O board	ACA26800ABB001	1
DBSS drive and brake sub-system control board	LA46S02691-0041	1
12SCR thyristor control firing board	LA46S2690-0023	1
Gate firing board (low rise board is different to the high rise, one of each required)	LA46S02686-2020 (low rise)	1
	LA46S02686-2030 (high rise)	1
Relay interface board interfacing the external section of the drive	LA46S728-0041	1
Switch over module	GEA26800AL10	1
Complete Drive	LA46S02965-0021	1
DBSS control board	46SO2691-0040	1
Controller mounted relays. One of each type except for 1M and 2M. 1M and 2M main contactors including auxiliary contact block (x 2)	199DBX-3	1
	3RH1362-2BC40	1
	LC1D18F7	1
	LADN11 AUX	1
	3RH2911-1GA31 AUX	1
	3RH2911-1GA22	1
	1M 2M main contactors	1
	GAA177KC1	2

Description of Required Inventory	Part No	Number
1M and 2M main contactors armature plate (x 2)	Armature plate	2
All types of drive and controller fuses	Various	2
Machine encoder (x 1)	A663D1	1
Machine encoder coupling (x 1)	388-9301	1
Smart Primary Position Transducer complete assembly	ABA21430AAA005	1
Tape head assembly	ACA25500AAC001(selector box)	1
One length to accommodate a high rise and one length to accommodate a low-rise lift	ABA22439AAC001 (head)	1
	Low rise tape	1
	High rise tape	1
Landing Door beak assembly complete (L09940A) (x 2)	B6940C1	2
Landing Door Lock assembly complete (L09940A) (x 2)	6940A	2
Landing Door (slave door) lock and bridging assembly	AZ14-1 KD	2
Landing Door Shoe assembly (x 4)	REF 20942	4
Landing Door Header Track Rollers (x 10)	REF20239	10
Landing Door Header Track up-thrust Rollers (x 10)	FO2215Z466	10
Air-cord pulleys (x 4)	Not present	4
Air-cord. 50m Drum	Not present	50m
Car Door lock and bridging assembly (x 2)	AZ14-1 KD	2
Car Door (slave door) lock and bridging assembly (x 2)	AZ14-1 KD	2
Car Door Shoe assembly (x 4)	FOB316LBG1	4
Car Door Header Track Rollers (x 10)	FO470AA1	10
Car Door Header Track up-thrust Roller (x 10)	RL0762JK1-5153	10
Air-cord pulleys (x 4)	FO2215Z466	4
Landing and car buttons – Four of each type	Not present	4
Landing indicator/direction arrow	7069AF14	4
car indicators/direction arrow unit. Two of each variant	9693H1	2

6 RECOMMENDATIONS FOR LIFTS ENTERING BBU

It is understood that the lifts are to be handed over to the Builders for an extended period whilst the building is a construction site. Prior to these works it is recommended that several tasks are undertaken to ensure safe, reliable service during this period.

1. There is a likelihood that during this period the site telephone lines will be interrupted, we recommend that GSM telephone lines are installed to ensure there is no interruption in the connection of the auto-diallers.
2. Ensure a LOLER inspection is carried out on all lifts and a schedule introduced to ensure these are carried out at 6-month intervals.
3. Line out the lift cars to protect the finishes, including a draw bridge to protect the bottom tracks that is of a design to prevent the doors closing whilst deployed.
4. Re-calibrate the car-load weighers to consider the additional weight of the car protection.
5. Place lifts on priority service and assign a lift driver to always operate the lift.

7 DELAPIDATION

All 12 lifts were inspected, and a record of the general condition was noted. The photographs that were taken will be issued alongside this report.

Particular attention was paid to car interiors, the landing doors, car tops and pits, along with the machine spaces recording damage, cleanliness, and overall condition, allowing a comparison to be made once the lifts are retuned to the building owner.

8 CONCLUSION

The main passenger lifts at Euston tower were originally installed in 1969 and retain their original motors along with the general structure, including guides, sling, car, counterweight, and landing doors. The controllers were replaced along with most switching and signalisation in 1990, followed by stabilisation work in 2017, covering door operators, health and safety items and service items.

Generally, the lifts are in a good serviceable condition, although the equipment does not embrace the latest technology it is of good design and of robust construction. With a strong maintenance regime, careful management and with the availability of the critical spares the lifts should deliver reliable service during the BBU period.

The two goods lifts were replaced in 2000 in their entirety, these lifts are of a modern design and although there is no critical spare availability most components are still available with reasonably short lead times. It would be advisable to have service items available such as air-cords, rollers, and door shoes to limit potential down times should there be a failure but as with the passenger lifts reasonable reliability should be expected assuming the recommendations above are considered.

UKAS INSPECTION
7892

William Martin Compliance
MARLOWE Critical Services

ASBESTOS REINSPECTION REPORT

Site: RPE Euston Tower
Address: Regents Place Estate, London, NW1 3HF
Client: British land
Survey Date: 18 July 2022 to 19 July 2022
Surveyor: Andrew Johnson
Issue Number: 1

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Section 1 - Executive Summary

William Martin Compliance were instructed to carry out an Asbestos Reinspection at Euston Tower, Regents Place Estate, Regents Place, London, NW1 3HF.

The purpose of an Asbestos Reinspection is to locate, as far as reasonably practicable, all previously identified ACMs in the relevant parts of the building and assess their condition. New material assessments have therefore been carried out for every accessible ACM.

This report has been prepared for British land, who have been identified as having control over the management and maintenance of the premises and are therefore regarded as the dutyholders.

It must be ensured that this report is made available to all staff, tradesmen and contractors that require access to the building, and that appropriate method statements and risk assessments are prepared if any works are required. It must also be realised that if any work goes beyond the scope of the original survey, a more intrusive survey may be required.

William Martin Compliance are accredited by UKAS to undertake Management, Refurbishment, Demolition & Reinspection Surveys in domestic, commercial and industrial properties.

This Reinspection report is based on the findings within the following survey reports. William Martin Compliance have been instructed to update these reports to ensure all previously identified ACMs which remain in situ are in a safe condition:

Survey Company	Type of Survey	Date of Survey	Report Reference
William Martin Compliance	Refurbishment Survey	June 2021	FRSF967
William Martin Compliance	Refurbishment Survey	June 2021	FRSF971

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The summary tables below have been collated to give a brief overview of findings for this site and are for reference purposes only. It must be ensured that **this report is read in its entirety.**

1.1 – Asbestos Findings Summary

The following number of ACMs remain in situ at this site:

Total ACMs	High Risk ACMs	Medium Risk ACMS	Low Risk ACMs	Very Low Risk ACMs	Removed ACMs
58	0	19	9	30	18

1.2 – Recommended Actions Summary

The following summary table has been collated to give a brief overview of the ACMs which require **remedial actions**. Refer to the Asbestos Register and Asbestos Sample Records for further information regarding these ACMs:

Location	ACM	Description	Risk Category	Recommended Action
1st to 8th Floors, East Lift Lobby Riser	Insulating Board	Insulating board debris throughout riser	Medium	Remove
9th to 16th Floors, East Lift Lobby Riser	Insulating Board	Insulating board debris throughout riser	Medium	Remove
17th to 24th Floors, East Lift Lobby Riser	Insulating Board	Insulating board debris throughout riser	Medium	Remove
25th to 33rd Floors, East Lift Lobby Riser	Insulating Board	Insulating board debris throughout riser	Medium	Remove
1st to 8th Floors, West Lift Lobby Riser	Insulating Board	Insulating board debris throughout riser	Medium	Remove
9th to 16th Floors, West Lift Lobby Riser	Insulating Board	Insulating board debris throughout riser	Medium	Remove
17th to 24th Floors, West Lift Lobby Riser	Insulating Board	Insulating board debris throughout riser	Medium	Remove
25th to 33rd Floors, West Lift Lobby Riser	Insulating Board	Insulating board debris throughout riser	Medium	Remove
2nd to 8th Floors, South Lobby Riser	Insulating Board	Insulating board debris throughout riser	Medium	Remove
9th to 16th Floors, South Lobby Riser	Insulating Board	Insulating board debris throughout riser	Medium	Remove
17th to 24th Floors, South Lobby Riser	Insulating Board	Insulating board debris throughout riser	Medium	Remove
25th to 33rd Floors, South Lobby Riser	Insulating Board	Insulating board debris throughout riser	Medium	Remove
2nd to 8th Floors, North Lobby Riser	Insulating Board	Insulating board debris throughout riser	Medium	Remove
9th to 16th Floors, North Lobby Riser	Insulating Board	Insulating board debris throughout riser	Medium	Remove
17th to 24th Floors, North Lobby Riser	Insulating Board	Insulating board debris throughout riser	Medium	Remove
25th to 33rd Floors, North Lobby Riser	Insulating Board	Insulating board debris throughout riser	Medium	Remove
Ground Floor, R.16 Riser	Insulating Board	Insulating board debris to floor	Medium	Remove
34th Floor, R.02 Riser Adjacent South Stairs	Insulating Board	Insulating board debris to floor	Medium	Remove
26th Floor, East Lift Lobby Riser	Cement Product	Cement debris on floor	Very Low	Remove

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1.3 - Non-Accessed ACMs

The table below details lists specific ACMs which could not be accessed during this Reinspection. It has therefore been presumed that these ACMs are still present and in the same condition as previously reported until it can be proved otherwise. Arrangements should be made for these ACMs to be inspected as soon as reasonably practicable:

ACM	Location	Reason for No Access / Comments
F971/VR505	Euston Tower, Ground Floor, 36.06 UPS Room	This area was locked, and keys were not available at the time of the survey.
F971/S002	Euston Tower, Ground Floor, 36.09 Comms Room	This area was locked, and keys were not available at the time of the survey.
F971/S003	Euston Tower, Ground Floor, 36.09 Comms Room	This area was locked, and keys were not available at the time of the survey.
F971/VR517	Euston Tower, Ground Floor, 36.13 Battery Room	This area was locked, and keys were not available at the time of the survey.
AS F971/S003 F971/VR519	Euston Tower, Ground Floor, 36.14 Gas Cupboard	This area was locked, and keys were not available at the time of the survey.
F971/S043	Euston Tower, Ground Floor, G.12 Store Room	This area was locked, and keys were not available at the time of the survey.
F971/S042	Euston Tower, Ground Floor, R.18 Riser	This area was locked, and keys were not available at the time of the survey.
F971/S041	Euston Tower, Ground Floor, R.16 Riser	This area was locked, and keys were not available at the time of the survey.

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Section 2 - Survey Details

Site Address:
Euston Tower
Regents Place Estate
Regents Place
London
NW1 3HF

Survey Date:
18/07/2022 to 19/07/2022

Surveyor:
Andrew Johnson

Report Prepared For: British land

Report Prepared By: William Martin Compliance, 1 The Courtyard, Harris Business Park, Stoke Prior, B60 4DJ

Report Authorised By: Andrew Johnson - Asbestos Consultant

Report Issued By: Mark Harrison - Technical Manager

Report Issue Date: 2nd September 2022

Report Issue History: Issue No. 1 - Reinspection report issued in full

2.1 – Scope of Reinspection

Agreed Scope of Survey

The purpose of a Reinspection is to locate, as far as reasonably practicable, all previously identified ACMs in the relevant parts of the building and assess their condition.

This Reinspection was based on the findings contained within the previous survey report, as detailed in Section 1. No other areas were surveyed or inspected.

Refer to the original survey report for the original scope of survey.

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Section 3 - Asbestos Register

RPE Euston Tower

Location	Sample No.	ACM	Description	Amount	Condition	Access	Type	Method	Risk Category	Action
Euston Tower, RF.01, Main Roof	**F971/S005**	Insulating board	East wet riser soffit panel	1 m2	Some Minor Damage	Difficult	Amosite	Previously Sampled	Medium	Manage
Euston Tower, 35th Floor, 35.08 workshop	**AS F971/S019 F971/VR512**	Cement Product	Window Sills	16 lin m	Some Minor Damage	Easy	Chrysotile	Previously Sampled	Very Low	Manage
Euston Tower, 35th Floor, 35.09 Engineers Office	**AS F971/S019 F971/VR513**	Cement Product	Window Sills	7 lin m	Some Minor Damage	Easy	Chrysotile	Previously Sampled	Very Low	Manage
Euston Tower, 35th Floor, 35.10 Kitchen	**AS F971/S019 F971/VR514**	Cement Product	Window Sills	3 lin m	Some Minor Damage	Easy	Chrysotile	Previously Sampled	Very Low	Manage
Euston Tower, 35th Floor, 35.11 High Rise Lift Motor Room	**F971/VR515**	Friction Material	Brake Linings to Lift Motors	5 no	Some Minor Damage	Difficult	Chrysotile	Previously Sampled	Very Low	Manage
Euston Tower, 35th Floor, 35.12 Lobby	**F971/S023**	Cement Product	Durasteel Boxing	3 m^2	Some Minor Damage	Medium	Chrysotile	Previously Sampled	Very Low	Manage
Euston Tower, 35th Floor, 35.13 West Goods Lift Motor Room	**F971/S023 F971/VR516**	Cement Product	Durasteel Boxing	1 m^2	Some Minor Damage	Medium	Chrysotile	Previously Sampled	Very Low	Manage
Euston Tower, 35th Floor, 35.04 Control Room	**F971/S019**	Cement Product	Window Sills	NQ	Some Minor Damage	Medium	Chrysotile	Previously Sampled	Very Low	Manage
Euston Tower, R.03, 35th Floor, Electrical Riser	**G033/VR501**	Woven Material	Within Electric Box	1 no	Some Minor Damage	Difficult	Chrysotile	Previously Sampled	Low	Manage
Euston Tower, 36th Floor, 36.06 UPS Room	**F971/VR505**	Woven Material	Within Electric Box	1 no	Some Minor Damage	Difficult	Chrysotile	Previously Sampled	Low	Manage
Euston Tower, 36th Floor, 36.09 Comms Room	**F971/S002**	Insulating Board	Door Lining	1 no	Some Minor Damage	Medium	Amosite	Previously Sampled	Low	Manage
Euston Tower, 36th Floor, 36.13 Battery Room	**F971/VR517**	Woven Material	Within Electric Boxes	2 no	Some Minor Damage	Difficult	Chrysotile	Previously Sampled	Low	Manage
Euston Tower, 36th Floor, 36.14 Gas Cupboard	**AS F971/S003 F971/VR519**	Cement Product	Flue Pipe's	2 Visible lin m	Some Minor Damage	Difficult	Chrysotile	Previously Sampled	Very Low	Manage

Location	Sample No.	ACM	Description	Amount	Condition	Access	Type	Method	Risk Category	Action
Euston Tower, 24th Floor, 24.19 - Plant Room	**F969/VR511**	Woven Material	Within Electric Boxes	1 no	Some Minor Damage	Difficult	Chrysotile	Previously Sampled	Low	Manage
Euston Tower, floors 2-33, Ladies Toilets	**AS F969/S004 F969/VR502**	Mastic	Mastic to Ductwork throughout ladies' toilets	Throughout	Some Minor Damage	Difficult	Chrysotile	Previously Sampled	Very Low	Manage
Euston Tower, 17th Floor, 7.17 Ladies Toilet	**F969/S004**	Mastic	Mastic to Ductwork	Throughout	Some Minor Damage	Difficult	Chrysotile	Previously Sampled	Very Low	Manage
Euston Tower, 26th Floor, R.01 East Lift Lobby Riser	**F970/S009**	Cement Product	Cement Debris on 26th Floor	1 m²	Some Minor Damage	Medium	Chrysotile	Previously Sampled	Very Low	Remove
Euston Tower, 1st to 8th Floors, East Lift Lobby Riser	**G044/VR505**	Insulating Board	Insulating board debris throughout Riser	Throughout Riser	High Damage/Debris	Easy	Amosite	Previously Sampled	Medium	Remove
Euston Tower, 9th to 16th Floors, East Lift Lobby Riser	**F968/S022**	Insulating Board	Insulating board debris throughout Riser	Throughout Riser	High Damage/Debris	Easy	Amosite	Previously Sampled	Medium	Remove
Euston Tower, 17th to 24th Floors, East Lift Lobby Riser	**F969/S012**	Insulating Board	Insulating board debris throughout Riser	Throughout Riser	High Damage/Debris	Easy	Amosite	Previously Sampled	Medium	Remove
Euston Tower, 25th to 33rd Floors, East Lift Lobby Riser	**G044/VR503**	Insulating Board	Insulating board debris throughout Riser	Throughout Riser	High Damage/Debris	Easy	Amosite	Previously Sampled	Medium	Remove
Euston Tower, 1st to 8th Floors, West Lift Lobby Riser	**G044/VR507**	Insulating Board	Insulating board debris throughout Riser	Throughout Riser	High Damage/Debris	Easy	Amosite	Previously Sampled	Medium	Remove
Euston Tower, 9th to 16th Floors, West Lift Lobby Riser	**F968/S023**	Insulating Board	Insulating board debris throughout Riser	Throughout Riser	High Damage/Debris	Easy	Amosite	Previously Sampled	Medium	Remove
Euston Tower, 17th to 24th Floors, West Lift Lobby Riser	**F968/S010**	Insulating Board	Insulating board debris throughout Riser	Throughout Riser	High Damage/Debris	Easy	Amosite	Previously Sampled	Medium	Remove
Euston Tower, 25th to 33rd Floors, West Lift Lobby Riser	**G044/VR501**	Insulating Board	Insulating board debris throughout Riser	Throughout Riser	High Damage/Debris	Easy	Amosite	Previously Sampled	Medium	Remove
Euston Tower, 2nd to 8th Floors, South Lobby Riser	**G044/VR508**	Insulating Board	Insulating board debris throughout Riser	Throughout Riser	High Damage/Debris	Easy	Amosite	Previously Sampled	Medium	Remove
Euston Tower, 9th to 16th Floors, South Lobby Riser	**G044/S025**	Insulating Board	Insulating board debris throughout Riser	Throughout Riser	High Damage/Debris	Easy	Amosite	Previously Sampled	Medium	Remove

Location	Sample No.	ACM	Description	Amount	Condition	Access	Type	Method	Risk Category	Action
Euston Tower, 17th to 24th Floors, South Lobby Riser	**G044/S011**	Insulating Board	Insulating board debris throughout Riser	Throughout Riser	High Damage/Debris	Easy	Amosite	Previously Sampled	**Medium**	Remove
Euston Tower, 25th to 33rd Floors, South Lobby Riser	**G044/VR502**	Insulating Board	Insulating board debris throughout Riser	Throughout Riser	High Damage/Debris	Easy	Amosite	Previously Sampled	**Medium**	Remove
Euston Tower, 2nd to 8th Floors, North Lobby Riser	**G044/VR506**	Insulating Board	Insulating board debris throughout Riser	Throughout Riser	High Damage/Debris	Easy	Amosite	Previously Sampled	**Medium**	Remove
Euston Tower, 9th to 16th Floors, North Lobby Riser	**G044/S024**	Insulating Board	Insulating board debris throughout Riser	Throughout Riser	High Damage/Debris	Easy	Amosite	Previously Sampled	**Medium**	Remove
Euston Tower, 17th to 24th Floors, North Lobby Riser	**G044/S013**	Insulating Board	Insulating board debris throughout Riser	Throughout Riser	High Damage/Debris	Easy	Amosite	Previously Sampled	**Medium**	Remove
Euston Tower, 25th to 33rd Floors, North Lobby Riser	**G044/VR504**	Insulating Board	Insulating board debris throughout Riser	Throughout Riser	High Damage/Debris	Easy	Amosite	Previously Sampled	**Medium**	Remove
Euston Tower, Basement, B.02 Corridor	**AS F971/S037 F971/VR527**	Cement Product	Durasteel Door	1 no	Some Minor Damage	Easy	Chrysotile	Previously Sampled	**Very Low**	Manage
Euston Tower, Basement, B.04 Electric Intake	**F971/VR529**	Woven Material	Within Electric Boxes	1 no	Some Minor Damage	Difficult	Chrysotile	Previously Sampled	**Low**	Manage
Euston Tower, Basement, B.04 Electric Intake	**AS F971/S042/ F971/VR528**	Putty	Putty to Emergency Lighting Unit to Soffit	2 no	Some Minor Damage	Difficult	Chrysotile	Previously Sampled	**Very Low**	Manage
Euston Tower, Basement, B.05 Main Switch Room	**F971/VR531**	Woven Material	Within Electric Boxes	4 no	Some Minor Damage	Medium	Chrysotile	Previously Sampled	**Low**	Manage
Euston Tower, Basement, B.05 Main Switch Room	**F971/VR530**	Thermoplastic	Bakelite Covers	4 no	Some Minor Damage	Medium	Chrysotile	Previously Sampled	**Very Low**	Manage
Euston Tower, Basement, B.06 Store Room	**F971/VR532**	Bituminous Product	Damp Proof Course to Below Lightwell	10 lin m	Some Minor Damage	Difficult	Chrysotile	Previously Sampled	**Very Low**	Manage
Euston Tower, Basement, B.06 Store Room	**F971/VR537**	Putty	Putty to Emergency Lighting Unit to Soffit	1 no	Some Minor Damage	Difficult	Chrysotile	Previously Sampled	**Very Low**	Manage
Euston Tower, Basement, B.13 Pump Room	**AS F971/S037 F971/VR533**	Cement Product	Durasteel Fire Door	2 no	Some Minor Damage	Easy	Chrysotile	Previously Sampled	**Very Low**	Manage
Euston Tower, Basement, B.13 Pump Room	**F971/VR542**	Woven Material	Within Electric Boxes	4 no	Some Minor Damage	Difficult	Chrysotile	Previously Sampled	**Low**	Manage
Euston Tower, Basement, B.13 Pump Room	**AS F971/S042 F971/VR534**	Putty	Putty to Emergency Lighting Units to Soffit	4 no	Some Minor Damage	Difficult	Chrysotile	Previously Sampled	**Very Low**	Manage

Location	Sample No.	ACM	Description	Amount	Condition	Access	Type	Method	Risk Category	Action
Euston Tower, Basement, B.13 Pump Room	**F971/S046**	Gaskets (Compressed)	Within Pipework Flanges	50 no	Some Minor Damage	Difficult	Chrysotile	Previously Sampled	Very Low	Manage
Euston Tower, Basement, B.14 Oil Store	**AS F971/S037 F971/VR538**	Cement Product	Durasteel Fire Door	1 no	Some Minor Damage	Easy	Chrysotile	Previously Sampled	Very Low	Manage
Euston Tower, Basement, B.14 Oil Store	**AS F971/S046 F971/VR539**	Gaskets (Compressed)	Within Pipework Flanges	10 no	Some Minor Damage	Difficult	Chrysotile	Previously Sampled	Very Low	Manage
Euston Tower, Basement, B.14 Oil Store	**AS F971/S042 F971/VR540**	Putty	Putty to Emergency Lighting Units to Soffit	4 no	Some Minor Damage	Difficult	Chrysotile	Previously Sampled	Very Low	Manage
Euston Tower, Basement, B.18 Fuel Pump Room	**F971/S048**	Gaskets (Compressed)	Within Pipework Flanges	50 no	Some Minor Damage	Difficult	Chrysotile	Previously Sampled	Very Low	Manage
Euston Tower, Basement, B.18 Fuel Pump Room	**F971/VR535**	Woven Material	Within Electric Boxes	7 no	Some Minor Damage	Difficult	Chrysotile	Previously Sampled	Low	Manage
Euston Tower, Basement, B.18 Fuel Pump Room	**AS F971/S042 F971/VR536**	Putty	Putty to Emergency Lighting Units to Soffit	4 no	Some Minor Damage	Difficult	Chrysotile	Previously Sampled	Very Low	Manage
Euston Tower, Basement, B.20 Store Room	**F971/S049**	Gaskets (Compressed)	Within Pipework Flanges	6 no	Some Minor Damage	Difficult	Chrysotile	Previously Sampled	Very Low	Manage
Euston Tower, Ground Floor, G.12 Store Room	**F971/S043**	Gaskets (Compressed)	Gaskets to Bolted Flange	1 Visible	Some Minor Damage	Difficult	Chrysotile	Previously Sampled	Very Low	Manage
Euston Tower, Ground Floor, R.18 Riser	**F971/S042**	Putty	Putty to Emergency Lighting Units to Soffit	1 no	Some Minor Damage	Difficult	Chrysotile	Previously Sampled	Very Low	Manage
Euston Tower, Ground Floor, R.16 Riser	**F971/S041**	Insulating Board	Insulating board debris on floor	1 m²	High Damage/Debris	Easy	Amosite	Previously Sampled	Medium	Remove
Euston Tower, 34th Floor, R.02 Riser adjacent south stairs	**F971/S027**	Insulating Board	Insulating board debris on floor	1 m²	High Damage/Debris	Easy	Amosite	Previously Sampled	Medium	Remove
Euston Tower, External, RF.02 - Roof	**AS F971/S003 F971/VR509**	Cement Product	Flues & Cowls	Various throughout	Some Minor Damage	Medium	Chrysotile	Previously Sampled	Very Low	Manage
Euston Tower, External, RF.01 - Roof	**F971/S004**	Cement Product	Promenade Floor Tiles to Roof	300 m²	Some Minor Damage	Medium	Chrysotile	Previously Sampled	Very Low	Manage
Euston Tower, External, RF.01 - Roof	**F971/S008**	Cement Product	Promenade Floor Tiles to Roof	300 m²	Some Minor Damage	Medium	Chrysotile	Previously Sampled	Very Low	Manage

3.1 - Removed ACMs

Since the previous inspection, the following ACMs have been removed by an asbestos contractor. These ACMs have therefore been removed from the Asbestos Register and reinspection schedule.

Location	Sample No.	Description	Amount	Condition	Access	Type	Method	Risk Category	Action
Euston Tower, 35th Floor Riser R.01	F971/S021	Composite sample of loose gaskets	n/a	n/a	n/a	n/a	n/a	n/a	NONE - ACM REMOVED
Euston Tower, 35.08 - Workshop	F971/VR511	Within Fuse Cartridge's	n/a	n/a	n/a	n/a	n/a	n/a	NONE - ACM REMOVED
Euston Tower, 35.06 - Fan Chamber	F971/S020	Gaskets within bolted flanges	n/a	n/a	n/a	n/a	n/a	n/a	NONE - ACM REMOVED
Euston Tower, 35.03 - Cooling Towers	F971/S024	Vent recess surround	n/a	n/a	n/a	n/a	n/a	n/a	NONE - ACM REMOVED
Euston Tower, 35.01 - ABH Plant Room	F971/S015	Jointing compound to metal panels	n/a	n/a	n/a	n/a	n/a	n/a	NONE - ACM REMOVED
Euston Tower, 34.24 - HV transformer chamber	F971/S044	Internal Door lining	n/a	n/a	n/a	n/a	n/a	n/a	NONE - ACM REMOVED
Euston Tower, 34.24 - HV transformer chamber	F971/VR524	Within Switch Gear	n/a	n/a	n/a	n/a	n/a	n/a	NONE - ACM REMOVED
Euston Tower, 34.22 - chiller room and chemical storage	As F971/S034 F971/VR523	Gaskets within bolted flange	n/a	n/a	n/a	n/a	n/a	n/a	NONE - ACM REMOVED
Euston Tower, 34.22 - chiller room and chemical storage	F971/S034	Gaskets within bolted flange	n/a	n/a	n/a	n/a	n/a	n/a	NONE - ACM REMOVED
Euston Tower, 34.22 - chiller room and chemical storage	F971/S033	Textile gaiter within Duct flange	n/a	n/a	n/a	n/a	n/a	n/a	NONE - ACM REMOVED
Euston Tower, 34.18 - Plant Room	As F971/S037 F971/VR520	Durasteel Door	n/a	n/a	n/a	n/a	n/a	n/a	NONE - ACM REMOVED
Euston Tower, 34.16 - Boiler Room	F971/S029	Textile caulking within chute plates	n/a	n/a	n/a	n/a	n/a	n/a	NONE - ACM REMOVED
Euston Tower, 34.05 - Entrance Lobby to plant room	F971/S037	Durasteel door	n/a	n/a	n/a	n/a	n/a	n/a	NONE - ACM REMOVED
Euston Tower, 12th Floor, 12.07 - plant room	F968/S019	Gaskets to Pipework Flanges	n/a	n/a	n/a	n/a	n/a	n/a	NONE - ACM REMOVED

Euston Tower, 14th Floor, 14.04 - Gents Toilets	F968/S012	Toilet Cistern within ceiling void	n/a	n/a	n/a	n/a	n/a	n/a	NONE - ACM REMOVED
Euston Tower, 16th Floor, 16.10 - Gents Toilets	As F968/S012 F968/VR517	Toilet Cistern within ceiling void	n/a	n/a	n/a	n/a	n/a	n/a	NONE - ACM REMOVED
Euston Tower, 18th Floor, 18.04 - Gents Toilets	F969/S007	Toilet Cistern within ceiling void	n/a	n/a	n/a	n/a	n/a	n/a	NONE - ACM REMOVED
Euston Tower, 35th Floor, 35.14 - Oil Tank Room	F971/VR518	Durasteel Door	n/a	n/a	n/a	n/a	n/a	n/a	NONE - ACM REMOVED

Section 4 – Reinspection Limitations

Only previously identified ACMs were inspected during this visit.

Every effort has been made to locate and inspect all ACMs previously identified, so far as was reasonably practical to do so. Methods used to carry out the reinspection were agreed with the client prior to any works being commenced.

- Refer to the original survey report for the original survey limitations.
- Any ACMs which could not be inspected are listed in Section 1.3.

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Section 5 – Asbestos Material Assessments

This section details all confirmed asbestos, referenced asbestos and presumed asbestos items which were remain at this site.

WMC Sample Numbering System

S = Sampled. Where a material has been sampled and the result is confirmed by way of laboratory identification. Eg "**S001".**

P = Presumed. Where no sample can be taken of a suspected ACM, the letter '**P**' signifies that the surveyor has presumed the material to contain asbestos. Eg **"P001".**

SP = Strongly Presumed. Where no physical sample can be taken of a suspected ACM, the letters '**SP**' signify that the surveyor has strongly presumed the material to contain asbestos. Eg **"SP001".**

X = A referenced sample. A material may not always be sampled when it is visually similar to that of a material previously sampled during the survey. In this case, the number which follows the letter '**X**' represents the number of the sample to which the material is visually similar. Eg "**X001".**

Note: The above only applies where WMC have carried out the original survey. Where the original/previous inspection was carried out by a third-party, their numbering system has been retained.

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Sample Number:	**F971/S005**			
Building:	Euston Tower	**Floor:**	Main roof	
Room Name/Number:	RF.01	**Material/Amount:**	Insulating Board	1 m2
Sample Description:	East wet riser soffit panel			

Material Assessment

Product Type:	Insulating Board	**Total Risk Score:**	**7**
Condition:	Some Minor Damage	**Risk Category:**	**Medium**
Surface Treatment:	Unsealed		
Asbestos Types:	Amosite	**Action:**	Manage
Comments:	Periodic inspections should be carried out in accordance with Regulation 4 of the Control of Asbestos Regulations 2012. Do not disturb this ACM. Ensure all employees, contractors & tenants who may come into contact with this ACM are made aware.		

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Sample Number:	**AS F971/S019 F971/VR512**			
Building:	Euston Tower	**Floor:**	35th Floor	
Room Name/Number:	35.08 workshop	**Material/Amount:**	Cement Product	16 lin m
Sample Description:	Window Sills			

Material Assessment

Product Type:	Cement Product	**Total Risk Score:**	**4**
Condition:	Some Minor Damage	**Risk Category:**	**Very Low**
Surface Treatment:	Sealed		
Asbestos Types:	Chrysotile	**Action:**	Manage
Comments:	Periodic inspections should be carried out in accordance with Regulation 4 of the Control of Asbestos Regulations 2012. Do not disturb this ACM. Ensure all employees, contractors & tenants who may come into contact with this ACM are made aware.		

William Martin Compliance
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Sample Number:	**AS F971/S019 F971/VR513**			
Building:	Euston Tower	**Floor:**	35th Floor	
Room Name/Number:	35.09 Engineers Office	**Material/Amount:**	Cement Product	7 lin m
Sample Description:	Window Sills			

Material Assessment

Product Type:	Cement Product	**Total Risk Score:**	**4**
Condition:	Some Minor Damage	**Risk Category:**	**Very Low**
Surface Treatment:	Sealed		
Asbestos Types:	Chrysotile	**Action:**	Manage
Comments:	Periodic inspections should be carried out in accordance with Regulation 4 of the Control of Asbestos Regulations 2012. Do not disturb this ACM. Ensure all employees, contractors & tenants who may come into contact with this ACM are made aware.		

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Sample Number:	**AS F971/S019 F971/VR514**			
Building:	Euston Tower	**Floor:**	35th Floor	
Room Name/Number:	35.10 Kitchen	**Material/Amount:**	Cement Product	3 lin m
Sample Description:	Window Sills			

Material Assessment

Product Type:	Cement Product	**Total Risk Score:**	**4**
Condition:	Some Minor Damage	**Risk Category:**	**Very Low**
Surface Treatment:	Sealed		
Asbestos Types:	Chrysotile	**Action:**	Manage
Comments:	Periodic inspections should be carried out in accordance with Regulation 4 of the Control of Asbestos Regulations 2012. Do not disturb this ACM. Ensure all employees, contractors & tenants who may come into contact with this ACM are made aware.		

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Sample Number:	**F971/VR513**			
Building:	Euston Tower	**Floor:**	35th Floor	
Room Name/Number:	35.11 High Rise Lift Motor Room	**Material/Amount:**	Friction Material	5 no
Sample Description:	Brake Linings to Lift Motors			

Material Assessment

Product Type:	Friction Material	**Total Risk Score:**	**4**
Condition:	Some Minor Damage	**Risk Category:**	**Very Low**
Surface Treatment:	Sealed		
Asbestos Types:	Chrysotile	**Action:**	Manage
Comments:	Periodic inspections should be carried out in accordance with Regulation 4 of the Control of Asbestos Regulations 2012. Do not disturb this ACM. Ensure all employees, contractors & tenants who may come into contact with this ACM are made aware.		

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Sample Number:	**F971/S023**			
Building:	Euston Tower	**Floor:**	35th Floor	
Room Name/Number:	35.12 Lobby	**Material/Amount:**	Cement Product	3 m²
Sample Description:	Durasteel Boxing			

Material Assessment

Product Type:	Cement Product	**Total Risk Score:**	**4**
Condition:	Some Minor Damage	**Risk Category:**	**Very Low**
Surface Treatment:	Sealed		
Asbestos Types:	Chrysotile	**Action:**	Manage
Comments:	Periodic inspections should be carried out in accordance with Regulation 4 of the Control of Asbestos Regulations 2012. Do not disturb this ACM. Ensure all employees, contractors & tenants who may come into contact with this ACM are made aware.		

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Sample Number:	**F971/S023 F971/VR516**			
Building:	Euston Tower	**Floor:**	35th Floor	
Room Name/Number:	35.13 West Goods Lift Motor Room	**Material/Amount:**	Cement Product	1 m²
Sample Description:	Durasteel Boxing			

Material Assessment

Product Type:	Cement Product	**Total Risk Score:**	**4**
Condition:	Some Minor Damage	**Risk Category:**	**Very Low**
Surface Treatment:	Sealed		
Asbestos Types:	Chrysotile	**Action:**	Manage
Comments:	Periodic inspections should be carried out in accordance with Regulation 4 of the Control of Asbestos Regulations 2012. Do not disturb this ACM. Ensure all employees, contractors & tenants who may come into contact with this ACM are made aware.		

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Sample Number:	**F971/S019**			
Building:	Euston Tower	**Floor:**	35th Floor	
Room Name/Number:	35.04 Control Room	**Material/Amount:**	Cement Product	NQ
Sample Description:	Window Sills			

Material Assessment

Product Type:	Cement Product	**Total Risk Score:**	**4**
Condition:	Some Minor Damage	**Risk Category:**	**Very Low**
Surface Treatment:	Sealed		
Asbestos Types:	Chrysotile	**Action:**	Manage
Comments:	Periodic inspections should be carried out in accordance with Regulation 4 of the Control of Asbestos Regulations 2012. Do not disturb this ACM. Ensure all employees, contractors & tenants who may come into contact with this ACM are made aware.		

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Sample Number:	**G033/VR501**			
Building:	Euston Tower	**Floor:**	35th Floor	
Room Name/Number:	R.03 Electrical Riser	**Material/Amount:**	Woven Material	1 no
Sample Description:	Within Electric Box			
No Photo Available				
Material Assessment				
Product Type:	Woven Material	**Total Risk Score:**	**5**	
Condition:	Some Minor Damage	**Risk Category:**	**Low**	
Surface Treatment:	Sealed			
Asbestos Types:	Chrysotile	**Action:**	Manage	
Comments:	Periodic inspections should be carried out in accordance with Regulation 4 of the Control of Asbestos Regulations 2012. Do not disturb this ACM. Ensure all employees, contractors & tenants who may come into contact with this ACM are made aware.			

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Sample Number:	**F971/VR505**			
Building:	Euston Tower	**Floor:**	36th Floor	
Room Name/Number:	36.06 UPS Room	**Material/Amount:**	Woven Material	1 no
Sample Description:	Within Electric Box			

Material Assessment

Product Type:	Woven Material	**Total Risk Score:**	**5**
Condition:	Some Minor Damage	**Risk Category:**	**Low**
Surface Treatment:	Sealed		
Asbestos Types:	Chrysotile	**Action:**	Manage
Comments:	As confirmed with the client/representative, this area was locked, and keys were not available at the time of the survey.		

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Sample Number:	**F971/S002**			
Building:	Euston Tower	**Floor:**	36th Floor	
Room Name/Number:	36.09 Comms Room	**Material/Amount:**	Insulating Board	1 no
Sample Description:	Door Lining			

Material Assessment

Product Type:	Insulating Board	**Total Risk Score:**	**6**
Condition:	Some Minor Damage	**Risk Category:**	**Low**
Surface Treatment:	Sealed		
Asbestos Types:	Amosite	**Action:**	Manage
Comments:	As confirmed with the client/representative, this area was locked, and keys were not available at the time of the survey.		

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Sample Number:	**F971/VR517**			
Building:	Euston Tower	**Floor:**	36th Floor	
Room Name/Number:	36.13 Battery Room	**Material/Amount:**	Woven Material	2 no
Sample Description:	Within Electric Boxes			

Material Assessment

Product Type:	Woven Material	**Total Risk Score:**	**5**
Condition:	Some Minor Damage	**Risk Category:**	**Low**
Surface Treatment:	Sealed		
Asbestos Types:	Chrysotile	**Action:**	Manage
Comments:	As confirmed with the client/representative, this area was locked, and keys were not available at the time of the survey.		

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Sample Number:	**AS F971/S003 F971/VR519**			
Building:	Euston Tower	**Floor:**	36th Floor	
Room Name/Number:	36.14 Gas Cupboard	**Material/Amount:**	Cement Product	2 Visible lin m
Sample Description:	Flue Pipe's			

Material Assessment

Product Type:	Cement Product	**Total Risk Score:**	**4**
Condition:	Some Minor Damage	**Risk Category:**	**Very Low**
Surface Treatment:	Sealed		
Asbestos Types:	Chrysotile	**Action:**	Manage
Comments:	As confirmed with the client/representative, this area was locked, and keys were not available at the time of the survey.		

William Martin Compliance
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Sample Number:	**F969/VR511**			
Building:	Euston Tower	**Floor:**	24th Floor	
Room Name/Number:	24.19 - Plant Room	**Material/Amount:**	Woven Material	1 no
Sample Description:	Within Electric Boxes			

Material Assessment

Product Type:	Woven Material	**Total Risk Score:**	**5**
Condition:	Some Minor Damage	**Risk Category:**	**Low**
Surface Treatment:	Sealed		
Asbestos Types:	Chrysotile	**Action:**	Manage
Comments:	Periodic inspections should be carried out in accordance with Regulation 4 of the Control of Asbestos Regulations 2012. Do not disturb this ACM. Ensure all employees, contractors & tenants who may come into contact with this ACM are made aware.		

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Sample Number:	**AS F969/S004 F969/VR502**			
Building:	Euston Tower	**Floor:**	Floors 2-33	
Room Name/Number:	Ladies Toilets	**Material/Amount:**	Mastic	Throughout
Sample Description:	Mastic to ductwork throughout ladies' toilets on floors 2-33			

Material Assessment

Product Type:	Mastic	**Total Risk Score:**	**3**
Condition:	Some Minor Damage	**Risk Category:**	**Very Low**
Surface Treatment:	Composite/Self Sealed		
Asbestos Types:	Chrysotile	**Action:**	Manage
Comments:	Periodic inspections should be carried out in accordance with Regulation 4 of the Control of Asbestos Regulations 2012. Do not disturb this ACM. Ensure all employees, contractors & tenants who may come into contact with this ACM are made aware.		

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Sample Number:	**F969/S004**			
Building:	Euston Tower	**Floor:**	17th Floor	
Room Name/Number:	17.17 Ladies Toilet	**Material/Amount:**	Mastic	Throughout
Sample Description:	Mastic to Ductwork			

Material Assessment

Product Type:	Mastic	**Total Risk Score:**	**3**
Condition:	Some Minor Damage	**Risk Category:**	**Very Low**
Surface Treatment:	Composite/Self Sealed		
Asbestos Types:	Chrysotile	**Action:**	Manage
Comments:	Periodic inspections should be carried out in accordance with Regulation 4 of the Control of Asbestos Regulations 2012. Do not disturb this ACM. Ensure all employees, contractors & tenants who may come into contact with this ACM are made aware.		

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Sample Number:	**F970/S009**			
Building:	Euston Tower	**Floor:**	26th Floor	
Room Name/Number:	R.01 East Lift Lobby Riser	**Material/Amount:**	Cement Product	1 m²
Sample Description:	Cement debris on floor			

Material Assessment

Product Type:	Cement Product	**Total Risk Score:**	**4**
Condition:	Some Minor Damage	**Risk Category:**	**Very Low**
Surface Treatment:	Sealed		
Asbestos Types:	Chrysotile	**Action:**	Remove
Comments:	Remove this ACM using a licensed asbestos contractor. Until then, do not disturb. Ensure all employees, contractors & tenants who may come into contact with this ACM are made aware.		

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Sample Number:	**F969/S012**			
Building:	Euston Tower	**Floor:**	17th to 24th Floors	
Room Name/Number:	East Lift Lobby Riser	**Material/Amount:**	Insulating Board	Throughout Riser
Sample Description:	Insulating board debris throughout riser			

Material Assessment

Product Type:	Insulating Board	**Total Risk Score:**	**8**
Condition:	High Damage/Debris	**Risk Category:**	**Medium**
Surface Treatment:	Sealed		
Asbestos Types:	Amosite	**Action:**	Remove
Comments:	Remove this ACM using a licensed asbestos contractor. Until then, do not disturb. Ensure all employees, contractors & tenants who may come into contact with this ACM are made aware.		

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Sample Number:	**F969/S010**			
Building:	Euston Tower	**Floor:**	17th to 24th Floors	
Room Name/Number:	West Lift Lobby Riser	**Material/Amount:**	Insulating Board	Throughout Riser
Sample Description:	Insulating board debris throughout riser			

Material Assessment

Product Type:	Insulating Board	**Total Risk Score:**	**8**
Condition:	High Damage/Debris	**Risk Category:**	**Medium**
Surface Treatment:	Sealed		
Asbestos Types:	Amosite	**Action:**	Remove
Comments:	Remove this ACM using a licensed asbestos contractor. Until then, do not disturb. Ensure all employees, contractors & tenants who may come into contact with this ACM are made aware.		

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Sample Number:	**F968/S023**			
Building:	Euston Tower	**Floor:**	9th to 16th Floors	
Room Name/Number:	West Lift Lobby Riser	**Material/Amount:**	Insulating Board	Throughout Riser
Sample Description:	Insulating board debris throughout riser			

Material Assessment

Product Type:	Insulating Board	**Total Risk Score:**	**8**
Condition:	High Damage/Debris	**Risk Category:**	**Medium**
Surface Treatment:	Sealed		
Asbestos Types:	Amosite	**Action:**	Remove
Comments:	Remove this ACM using a licensed asbestos contractor. Until then, do not disturb. Ensure all employees, contractors & tenants who may come into contact with this ACM are made aware.		

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Sample Number:	**F969/S011**			
Building:	Euston Tower	**Floor:**	17th to 24th Floors	
Room Name/Number:	South Lobby Riser	**Material/Amount:**	Insulating Board	Throughout Riser
Sample Description:	Insulating board debris throughout riser			

Material Assessment

Product Type:	Insulating Board	**Total Risk Score:**	**8**
Condition:	High Damage/Debris	**Risk Category:**	**Medium**
Surface Treatment:	Sealed		
Asbestos Types:	Amosite	**Action:**	Remove
Comments:	Remove this ACM using a licensed asbestos contractor. Until then, do not disturb. Ensure all employees, contractors & tenants who may come into contact with this ACM are made aware.		

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Sample Number:				
Building:	Euston Tower	**Floor:**	9th to 16th Floors	
Room Name/Number:	South Lobby Riser	**Material/Amount:**	Insulating Board	Throughout Riser
Sample Description:	Insulating board debris throughout riser			

Material Assessment

Product Type:	Insulating Board	**Total Risk Score:**	**8**
Condition:	High Damage/Debris	**Risk Category:**	**Medium**
Surface Treatment:	Sealed		
Asbestos Types:	Amosite	**Action:**	Remove
Comments:	Remove this ACM using a licensed asbestos contractor. Until then, do not disturb. Ensure all employees, contractors & tenants who may come into contact with this ACM are made aware.		

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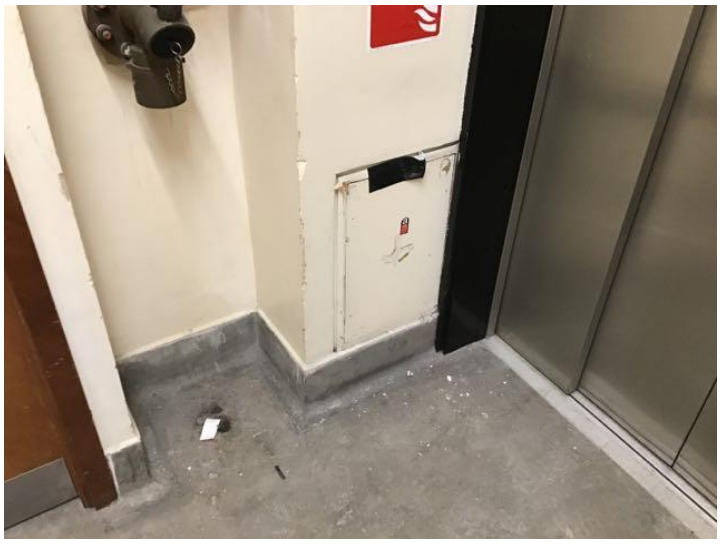
Sample Number:	**F968/S022**			
Building:	Euston Tower	**Floor:**	9th to 16th Floors	
Room Name/Number:	East Lift Lobby Riser	**Material/Amount:**	Insulating Board	Throughout Riser
Sample Description:	Insulating board debris throughout riser			



Material Assessment

Product Type:	Insulating Board	**Total Risk Score:**	**8**
Condition:	High Damage/Debris	**Risk Category:**	**Medium**
Surface Treatment:	Sealed		
Asbestos Types:	Amosite	**Action:**	Remove
Comments:	Remove this ACM using a licensed asbestos contractor. Until then, do not disturb. Ensure all employees, contractors & tenants who may come into contact with this ACM are made aware.		

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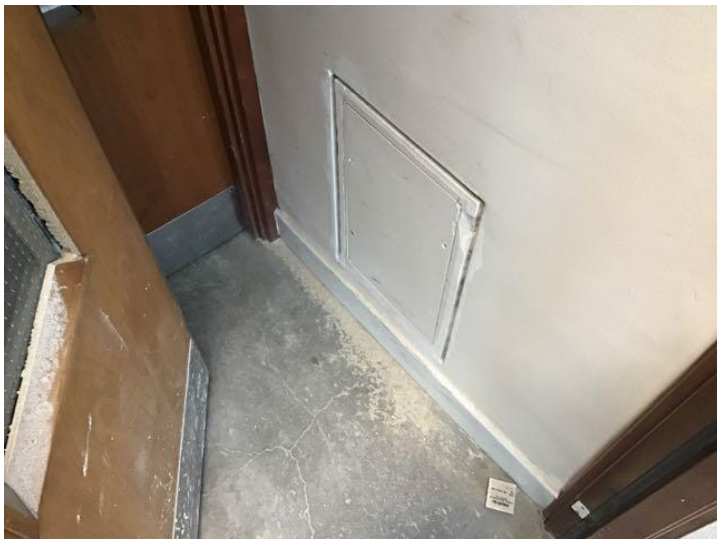
Sample Number:	**F969/S013**			
Building:	Euston Tower	**Floor:**	17th to 24th Floors	
Room Name/Number:	North Lobby Riser	**Material/Amount:**	Insulating Board	Throughout Riser
Sample Description:	Insulating board debris throughout riser			



Material Assessment

Product Type:	Insulating Board	**Total Risk Score:**	**8**
Condition:	High Damage/Debris	**Risk Category:**	**Medium**
Surface Treatment:	Sealed		
Asbestos Types:	Amosite	**Action:**	Remove
Comments:	Remove this ACM using a licensed asbestos contractor. Until then, do not disturb. Ensure all employees, contractors & tenants who may come into contact with this ACM are made aware.		

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Sample Number:	**F968/S024**			
Building:	Euston Tower	**Floor:**	9th to 16th Floors	
Room Name/Number:	North Lobby Riser	**Material/Amount:**	Insulating Board	Throughout Riser
Sample Description:	Insulating board debris throughout riser			

Material Assessment

Product Type:	Insulating Board	**Total Risk Score:**	**8**
Condition:	High Damage/Debris	**Risk Category:**	**Medium**
Surface Treatment:	Sealed		
Asbestos Types:	Amosite	**Action:**	Remove
Comments:	Remove this ACM using a licensed asbestos contractor. Until then, do not disturb. Ensure all employees, contractors & tenants who may come into contact with this ACM are made aware.		

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Sample Number:	**G044/VR507**			
Building:	Euston Tower	**Floor:**	1st to 8th Floors	
Room Name/Number:	West Lift Lobby Riser	**Material/Amount:**	Insulating Board	Throughout Riser
Sample Description:	Insulating board debris throughout riser			

Material Assessment

Product Type:	Insulating Board	**Total Risk Score:**	**8**
Condition:	High Damage/Debris	**Risk Category:**	**Medium**
Surface Treatment:	Sealed		
Asbestos Types:	Amosite	**Action:**	Remove
Comments:	Remove this ACM using a licensed asbestos contractor. Until then, do not disturb. Ensure all employees, contractors & tenants who may come into contact with this ACM are made aware.		

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Sample Number:	**G044/VR501**			
Building:	Euston Tower	**Floor:**	25th to 33rd Floors	
Room Name/Number:	West Lift Lobby Riser	**Material/Amount:**	Insulating Board	Throughout Riser
Sample Description:	Insulating board debris throughout riser			

Material Assessment

Product Type:	Insulating Board	**Total Risk Score:**	**8**
Condition:	High Damage/Debris	**Risk Category:**	**Medium**
Surface Treatment:	Sealed		
Asbestos Types:	Amosite	**Action:**	Remove
Comments:	Remove this ACM using a licensed asbestos contractor. Until then, do not disturb. Ensure all employees, contractors & tenants who may come into contact with this ACM are made aware.		

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Sample Number:	**G044/VR502**			
Building:	Euston Tower	**Floor:**	25th to 33rd Floors	
Room Name/Number:	South Lobby Riser	**Material/Amount:**	Insulating Board	Throughout Riser
Sample Description:	Insulating board debris throughout riser			

Material Assessment

Product Type:	Insulating Board	**Total Risk Score:**	**8**
Condition:	High Damage/Debris	**Risk Category:**	**Medium**
Surface Treatment:	Sealed		
Asbestos Types:	Amosite	**Action:**	Remove
Comments:	Remove this ACM using a licensed asbestos contractor. Until then, do not disturb. Ensure all employees, contractors & tenants who may come into contact with this ACM are made aware.		

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Sample Number:	**G044/VR508**			
Building:	Euston Tower	**Floor:**	2nd to 8th Floors	
Room Name/Number:	South Lobby Riser	**Material/Amount:**	Insulating Board	Throughout Riser
Sample Description:	Insulating board debris throughout riser			

Material Assessment

Product Type:	Insulating Board	**Total Risk Score:**	**8**
Condition:	High Damage/Debris	**Risk Category:**	**Medium**
Surface Treatment:	Sealed		
Asbestos Types:	Amosite	**Action:**	Remove
Comments:	Remove this ACM using a licensed asbestos contractor. Until then, do not disturb. Ensure all employees, contractors & tenants who may come into contact with this ACM are made aware.		

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Sample Number:	**G044/VR503**			
Building:	Euston Tower	**Floor:**	25th to 33rd Floors	
Room Name/Number:	East Lift Lobby Riser	**Material/Amount:**	Insulating Board	Throughout Riser
Sample Description:	Insulating board debris throughout riser			

Material Assessment

Product Type:	Insulating Board	**Total Risk Score:**	**8**
Condition:	High Damage/Debris	**Risk Category:**	**Medium**
Surface Treatment:	Sealed		
Asbestos Types:	Amosite	**Action:**	Remove
Comments:	Remove this ACM using a licensed asbestos contractor. Until then, do not disturb. Ensure all employees, contractors & tenants who may come into contact with this ACM are made aware.		

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Sample Number:	**G044/VR505**			
Building:	Euston Tower	**Floor:**	1st to 8th Floors	
Room Name/Number:	East Lift Lobby Riser	**Material/Amount:**	Insulating Board	Throughout Riser
Sample Description:	Insulating board debris throughout riser			

Material Assessment

Product Type:	Insulating Board	**Total Risk Score:**	**8**
Condition:	High Damage/Debris	**Risk Category:**	**Medium**
Surface Treatment:	Sealed		
Asbestos Types:	Amosite	**Action:**	Remove
Comments:	Remove this ACM using a licensed asbestos contractor. Until then, do not disturb. Ensure all employees, contractors & tenants who may come into contact with this ACM are made aware.		

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Sample Number:	**G044/VR504**			
Building:	Euston Tower	**Floor:**	25th to 33rd Floors	
Room Name/Number:	North Lobby Riser	**Material/Amount:**	Insulating Board	Throughout Riser
Sample Description:	Insulating board debris throughout riser			

Material Assessment

Product Type:	Insulating Board	**Total Risk Score:**	**8**
Condition:	High Damage/Debris	**Risk Category:**	**Medium**
Surface Treatment:	Sealed		
Asbestos Types:	Amosite	**Action:**	Remove
Comments:	Remove this ACM using a licensed asbestos contractor. Until then, do not disturb. Ensure all employees, contractors & tenants who may come into contact with this ACM are made aware.		

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Sample Number:	**G044/VR506**			
Building:	Euston Tower	**Floor:**	2nd to 8th Floors	
Room Name/Number:	North Lobby Riser	**Material/Amount:**	Insulating Board	Throughout Riser
Sample Description:	Insulating board debris throughout riser			

Material Assessment

Product Type:	Insulating Board	**Total Risk Score:**	**8**
Condition:	High Damage/Debris	**Risk Category:**	**Medium**
Surface Treatment:	Sealed		
Asbestos Types:	Amosite	**Action:**	Remove
Comments:	Remove this ACM using a licensed asbestos contractor. Until then, do not disturb. Ensure all employees, contractors & tenants who may come into contact with this ACM are made aware.		

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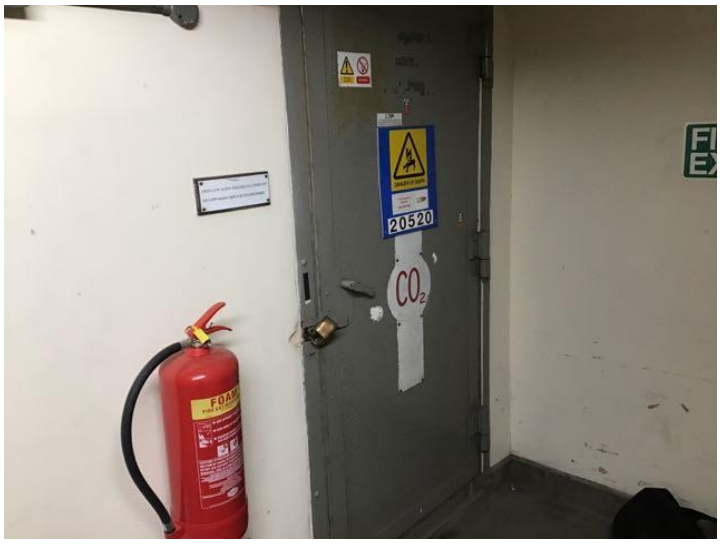
Sample Number:	**AS F971/S037 F971/VR527**			
Building:	Euston Tower	**Floor:**	Basement	
Room Name/Number:	B.02 Corridor	**Material/Amount:**	Cement Product	1 no
Sample Description:	Durasteel Door			



Material Assessment

Product Type:	Cement Product	**Total Risk Score:**	**4**
Condition:	Some Minor Damage	**Risk Category:**	**Very Low**
Surface Treatment:	Sealed		
Asbestos Types:	Chrysotile	**Action:**	Manage
Comments:	Periodic inspections should be carried out in accordance with Regulation 4 of the Control of Asbestos Regulations 2012. Do not disturb this ACM. Ensure all employees, contractors & tenants who may come into contact with this ACM are made aware.		

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Sample Number:	**F971/VR529**			
Building:	Euston Tower	**Floor:**	Basement	
Room Name/Number:	B.04 Electric Intake	**Material/Amount:**	Woven Material	1 no
Sample Description:	Within Electric Boxes			

Material Assessment

Product Type:	Woven Material	**Total Risk Score:**	**5**
Condition:	Some Minor Damage	**Risk Category:**	**Low**
Surface Treatment:	Sealed		
Asbestos Types:	Chrysotile	**Action:**	Manage
Comments:	Periodic inspections should be carried out in accordance with Regulation 4 of the Control of Asbestos Regulations 2012. Do not disturb this ACM. Ensure all employees, contractors & tenants who may come into contact with this ACM are made aware.		

William Martin Compliance
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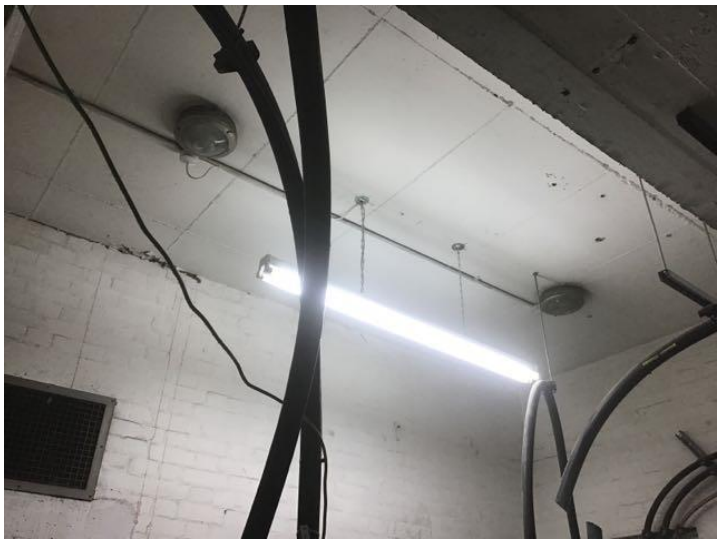
Sample Number:	**AS F971/S042/ F971/VR528**			
Building:	Euston Tower	**Floor:**	Basement	
Room Name/Number:	B.04 Electric Intake	**Material/Amount:**	Putty	2 no
Sample Description:	Putty to Emergency Lighting Unit to Soffit			



Material Assessment

Product Type:	Putty	**Total Risk Score:**	**3**
Condition:	Some Minor Damage	**Risk Category:**	**Very Low**
Surface Treatment:	Composite/Self Sealed		
Asbestos Types:	Chrysotile	**Action:**	Manage
Comments:	Periodic inspections should be carried out in accordance with Regulation 4 of the Control of Asbestos Regulations 2012. Do not disturb this ACM. Ensure all employees, contractors & tenants who may come into contact with this ACM are made aware.		

William Martin Compliance
Reg. Office: 85 Gresham Street, London, EC2V 7NQ
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Sample Number:	**F971/VR531**			
Building:	Euston Tower	**Floor:**	Basement	
Room Name/Number:	B.05 Main Switch Room	**Material/Amount:**	Woven Material	4 no
Sample Description:	Within Electric Boxes			

Material Assessment

Product Type:	Woven Material	**Total Risk Score:**	**5**
Condition:	Some Minor Damage	**Risk Category:**	**Low**
Surface Treatment:	Sealed		
Asbestos Types:	Chrysotile	**Action:**	Manage
Comments:	Periodic inspections should be carried out in accordance with Regulation 4 of the Control of Asbestos Regulations 2012. Do not disturb this ACM. Ensure all employees, contractors & tenants who may come into contact with this ACM are made aware.		

William Martin Compliance
Reg. Office: 85 Gresham Street, London, EC2V 7NQ
W: wmcompliance.co.uk | **T:** 020 3819 8829

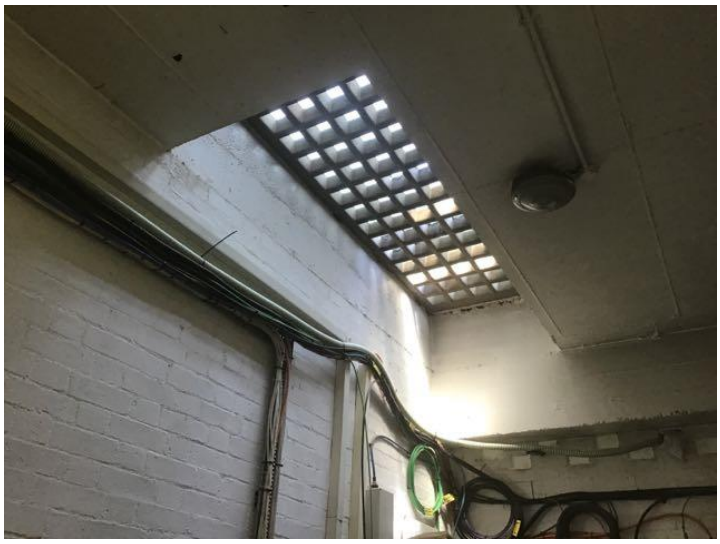
Sample Number:	**F971/VR530**			
Building:	Euston Tower	**Floor:**	Basement	
Room Name/Number:	B.05 Main Switch Room	**Material/Amount:**	Thermoplastic	4 no
Sample Description:	Bakelite Covers			

Material Assessment

Product Type:	Thermoplastic	**Total Risk Score:**	**3**
Condition:	Some Minor Damage	**Risk Category:**	**Very Low**
Surface Treatment:	Composite/Self Sealed		
Asbestos Types:	Chrysotile	**Action:**	Manage
Comments:	Periodic inspections should be carried out in accordance with Regulation 4 of the Control of Asbestos Regulations 2012. Do not disturb this ACM. Ensure all employees, contractors & tenants who may come into contact with this ACM are made aware.		

William Martin Compliance
Reg. Office: 85 Gresham Street, London, EC2V 7NQ
W: wmcompliance.co.uk | **T:** 020 3819 8829

Sample Number:	**F971/VR532**			
Building:	Euston Tower	**Floor:**	Basement	
Room Name/Number:	B.06 Store Room	**Material/Amount:**	Bituminous Product	10 lin m
Sample Description:	Damp Proof Course to Below Lightwell			



Material Assessment

Product Type:	Bituminous Product	**Total Risk Score:**	**3**
Condition:	Some Minor Damage	**Risk Category:**	**Very Low**
Surface Treatment:	Composite/Self Sealed		
Asbestos Types:	Chrysotile	**Action:**	Manage
Comments:	Periodic inspections should be carried out in accordance with Regulation 4 of the Control of Asbestos Regulations 2012. Do not disturb this ACM. Ensure all employees, contractors & tenants who may come into contact with this ACM are made aware.		

William Martin Compliance
Reg. Office: 85 Gresham Street, London, EC2V 7NQ
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Sample Number:	**F971/VR537**			
Building:	Euston Tower	**Floor:**	Basement	
Room Name/Number:	B.06 Store Room	**Material/Amount:**	Putty	1 no
Sample Description:	Putty to Emergency Lighting Unit to Soffit			

Material Assessment

Product Type:	Putty	**Total Risk Score:**	**3**
Condition:	Some Minor Damage	**Risk Category:**	**Very Low**
Surface Treatment:	Composite/Self Sealed		
Asbestos Types:	Chrysotile	**Action:**	Manage
Comments:	Periodic inspections should be carried out in accordance with Regulation 4 of the Control of Asbestos Regulations 2012. Do not disturb this ACM. Ensure all employees, contractors & tenants who may come into contact with this ACM are made aware.		

William Martin Compliance
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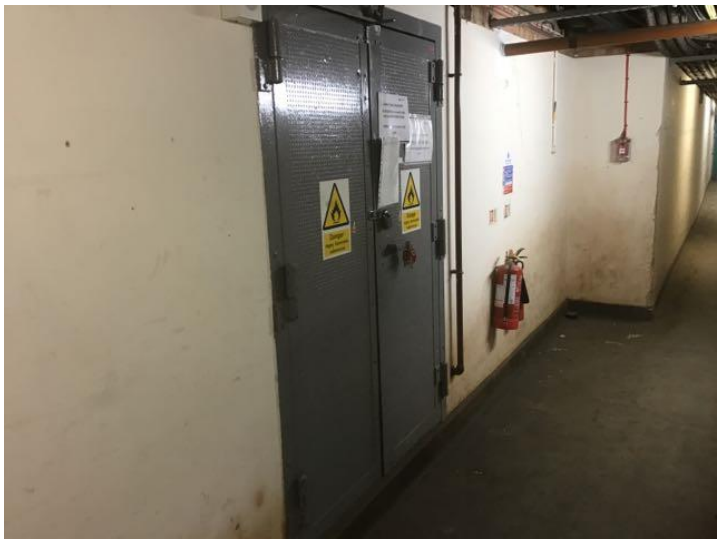
Sample Number:	**AS F971/S037 F971/VR533**			
Building:	Euston Tower	**Floor:**	Basement	
Room Name/Number:	B.13 Pump Room	**Material/Amount:**	Cement Product	2 no
Sample Description:	Durasteel Fire Door			



Material Assessment

Product Type:	Cement Product	**Total Risk Score:**	**4**
Condition:	Some Minor Damage	**Risk Category:**	**Very Low**
Surface Treatment:	Sealed		
Asbestos Types:	Chrysotile	**Action:**	Manage
Comments:	Periodic inspections should be carried out in accordance with Regulation 4 of the Control of Asbestos Regulations 2012. Do not disturb this ACM. Ensure all employees, contractors & tenants who may come into contact with this ACM are made aware.		

William Martin Compliance
Reg. Office: 85 Gresham Street, London, EC2V 7NQ
W: wmcompliance.co.uk | **T:** 020 3819 8829

Sample Number:	**F971/VR542**			
Building:	Euston Tower	**Floor:**	Basement	
Room Name/Number:	B.13 Pump Room	**Material/Amount:**	Woven Material	4 no
Sample Description:	Within Electric Boxes			

Material Assessment

Product Type:	Woven Material	**Total Risk Score:**	**5**
Condition:	Some Minor Damage	**Risk Category:**	**Low**
Surface Treatment:	Sealed		
Asbestos Types:	Chrysotile	**Action:**	Manage
Comments:	Periodic inspections should be carried out in accordance with Regulation 4 of the Control of Asbestos Regulations 2012. Do not disturb this ACM. Ensure all employees, contractors & tenants who may come into contact with this ACM are made aware.		

William Martin Compliance
Reg. Office: 85 Gresham Street, London, EC2V 7NQ
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Sample Number:	**AS F971/S042 F971/VR534**			
Building:	Euston Tower	**Floor:**	Basement	
Room Name/Number:	B.13 Pump Room	**Material/Amount:**	Putty	4 no
Sample Description:	Putty to Emergency Lighting Units to Soffit			

Material Assessment

Product Type:	Putty	**Total Risk Score:**	**3**
Condition:	Some Minor Damage	**Risk Category:**	**Very Low**
Surface Treatment:	Composite/Self Sealed		
Asbestos Types:	Chrysotile	**Action:**	Manage
Comments:	Periodic inspections should be carried out in accordance with Regulation 4 of the Control of Asbestos Regulations 2012. Do not disturb this ACM. Ensure all employees, contractors & tenants who may come into contact with this ACM are made aware.		

William Martin Compliance
Reg. Office: 85 Gresham Street, London, EC2V 7NQ
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Sample Number:	**F971/S046**			
Building:	Euston Tower	**Floor:**	Basement	
Room Name/Number:	B.13 Pump Room	**Material/Amount:**	Gaskets (Compressed)	50 no
Sample Description:	Within Pipework Flanges			

Material Assessment

Product Type:	Gaskets (Compressed)	**Total Risk Score:**	**4**
Condition:	Some Minor Damage	**Risk Category:**	**Very Low**
Surface Treatment:	Composite/Self Sealed		
Asbestos Types:	Chrysotile	**Action:**	Manage
Comments:	Periodic inspections should be carried out in accordance with Regulation 4 of the Control of Asbestos Regulations 2012. Do not disturb this ACM. Ensure all employees, contractors & tenants who may come into contact with this ACM are made aware.		

William Martin Compliance
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Sample Number:	**AS F971/S037 F971/VR538**			
Building:	Euston Tower	**Floor:**	Basement	
Room Name/Number:	B.14 Oil Store	**Material/Amount:**	Cement Product	1 no
Sample Description:	Durasteel Fire Door			

Material Assessment

Product Type:	Cement Product	**Total Risk Score:**	**4**
Condition:	Some Minor Damage	**Risk Category:**	**Very Low**
Surface Treatment:	Sealed		
Asbestos Types:	Chrysotile	**Action:**	Manage
Comments:	Periodic inspections should be carried out in accordance with Regulation 4 of the Control of Asbestos Regulations 2012. Do not disturb this ACM. Ensure all employees, contractors & tenants who may come into contact with this ACM are made aware.		

William Martin Compliance
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Sample Number:	**AS F971/S046 F971/VR539**			
Building:	Euston Tower	**Floor:**	Basement	
Room Name/Number:	B.14 Oil Store	**Material/Amount:**	Gaskets (Compressed)	10 no
Sample Description:	Within Pipework Flanges			

Material Assessment

Product Type:	Gaskets (Compressed)	**Total Risk Score:**	**4**
Condition:	Some Minor Damage	**Risk Category:**	**Very Low**
Surface Treatment:	Composite/Self Sealed		
Asbestos Types:	Chrysotile	**Action:**	Manage
Comments:	Periodic inspections should be carried out in accordance with Regulation 4 of the Control of Asbestos Regulations 2012. Do not disturb this ACM. Ensure all employees, contractors & tenants who may come into contact with this ACM are made aware.		

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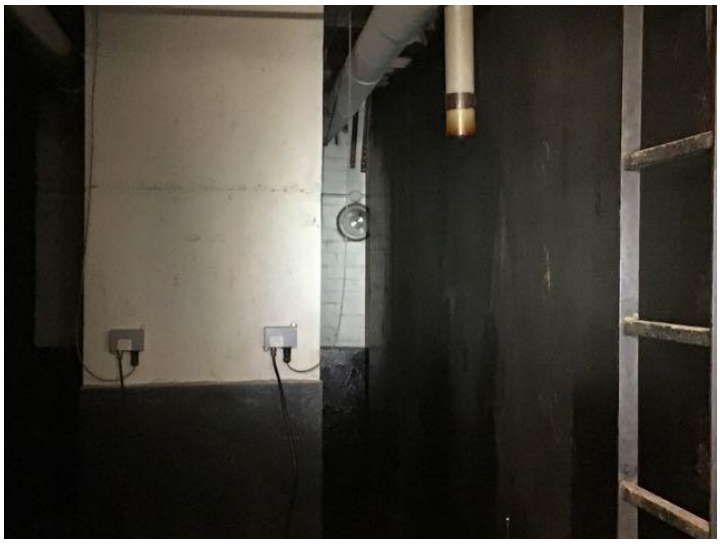
Sample Number:	**AS F971/S042 F971/VR540**			
Building:	Euston Tower	**Floor:**	Basement	
Room Name/Number:	B.14 Oil Store	**Material/Amount:**	Putty	4 no
Sample Description:	Putty to Emergency Lighting Units to Soffit			



Material Assessment

Product Type:	Putty	**Total Risk Score:**	**3**
Condition:	Some Minor Damage	**Risk Category:**	**Very Low**
Surface Treatment:	Composite/Self Sealed		
Asbestos Types:	Chrysotile	**Action:**	Manage
Comments:	Periodic inspections should be carried out in accordance with Regulation 4 of the Control of Asbestos Regulations 2012. Do not disturb this ACM. Ensure all employees, contractors & tenants who may come into contact with this ACM are made aware.		

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Sample Number:	**F971/S048**			
Building:	Euston Tower	**Floor:**	Basement	
Room Name/Number:	B.18 Fuel Pump Room	**Material/Amount:**	Gaskets (Compressed)	50 no
Sample Description:	Within Pipework Flanges			

Material Assessment

Product Type:	Gaskets (Compressed)	**Total Risk Score:**	**4**
Condition:	Some Minor Damage	**Risk Category:**	**Very Low**
Surface Treatment:	Composite/Self Sealed		
Asbestos Types:	Chrysotile	**Action:**	Manage
Comments:	Periodic inspections should be carried out in accordance with Regulation 4 of the Control of Asbestos Regulations 2012. Do not disturb this ACM. Ensure all employees, contractors & tenants who may come into contact with this ACM are made aware.		

William Martin Compliance
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Sample Number:	**F971/VR535**			
Building:	Euston Tower	**Floor:**	Basement	
Room Name/Number:	B.18 Fuel Pump Room	**Material/Amount:**	Woven Material	7 no
Sample Description:	Within Electric Boxes			

Material Assessment

Product Type:	Woven Material	**Total Risk Score:**	**5**
Condition:	Some Minor Damage	**Risk Category:**	**Low**
Surface Treatment:	Sealed		
Asbestos Types:	Chrysotile	**Action:**	Manage
Comments:	Periodic inspections should be carried out in accordance with Regulation 4 of the Control of Asbestos Regulations 2012. Do not disturb this ACM. Ensure all employees, contractors & tenants who may come into contact with this ACM are made aware.		

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Sample Number:	**AS F971/S042 F971/VR536**			
Building:	Euston Tower	**Floor:**	Basement	
Room Name/Number:	B.18 Fuel Pump Room	**Material/Amount:**	Putty	4 no
Sample Description:	Putty to Emergency Lighting Units to Soffit			

Material Assessment

Product Type:	Putty	**Total Risk Score:**	**3**
Condition:	Some Minor Damage	**Risk Category:**	**Very Low**
Surface Treatment:	Composite/Self Sealed		
Asbestos Types:	Chrysotile	**Action:**	Manage
Comments:	Periodic inspections should be carried out in accordance with Regulation 4 of the Control of Asbestos Regulations 2012. Do not disturb this ACM. Ensure all employees, contractors & tenants who may come into contact with this ACM are made aware.		

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Sample Number:	**F971/S049**			
Building:	Euston Tower	**Floor:**	Basement	
Room Name/Number:	B.20 Store Room	**Material/Amount:**	Gaskets (Compressed)	6 no
Sample Description:	Within Pipework Flanges			

Material Assessment

Product Type:	Gaskets (Compressed)	**Total Risk Score:**	**4**
Condition:	Some Minor Damage	**Risk Category:**	**Very Low**
Surface Treatment:	Composite/Self Sealed		
Asbestos Types:	Chrysotile	**Action:**	Manage
Comments:	Periodic inspections should be carried out in accordance with Regulation 4 of the Control of Asbestos Regulations 2012. Do not disturb this ACM. Ensure all employees, contractors & tenants who may come into contact with this ACM are made aware.		

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Sample Number:	**F971/S043**			
Building:	Euston Tower	**Floor:**	Ground Floor	
Room Name/Number:	G.12 Store Room	**Material/Amount:**	Gaskets (Compressed)	1 Visible
Sample Description:	Gaskets to Bolted Flange			

Material Assessment

Product Type:	Gaskets (Compressed)	**Total Risk Score:**	**4**
Condition:	Some Minor Damage	**Risk Category:**	**Very Low**
Surface Treatment:	Composite/Self Sealed		
Asbestos Types:	Chrysotile	**Action:**	Manage
Comments:	As confirmed with the client/representative, this area was locked, and keys were not available at the time of the survey.		

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Sample Number:	**F971/S042**			
Building:	Euston Tower	**Floor:**	Ground Floor	
Room Name/Number:	R.18 Riser	**Material/Amount:**	Putty	1 no
Sample Description:	Putty to Emergency Lighting Units to Soffit			

Material Assessment

Product Type:	Putty	**Total Risk Score:**	**3**
Condition:	Some Minor Damage	**Risk Category:**	**Very Low**
Surface Treatment:	Composite/Self Sealed		
Asbestos Types:	Chrysotile	**Action:**	Manage
Comments:	As confirmed with the client/representative, this area was locked, and keys were not available at the time of the survey.		

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Sample Number:	**F971/S041**			
Building:	Euston Tower	**Floor:**	Ground Floor	
Room Name/Number:	R.16 Riser	**Material/Amount:**	Insulating Board	1 m²
Sample Description:	Insulating board debris to floor			

Material Assessment

Product Type:	Insulating Board	**Total Risk Score:**	**9**
Condition:	High Damage/Debris	**Risk Category:**	**Medium**
Surface Treatment:	Unsealed AIB/Sealed Lagging		
Asbestos Types:	Amosite	**Action:**	Remove
Comments:	As confirmed with the client/representative, this area was locked, and keys were not available at the time of the survey. Remove this ACM using a licensed asbestos contractor. Until then, do not disturb. Ensure all employees, contractors & tenants who may come into contact with this ACM are made aware.		

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Sample Number:	**F971/S027**			
Building:	Euston Tower	**Floor:**	34th Floor	
Room Name/Number:	R.02 Riser adjacent south stairs	**Material/Amount:**	Throughout	1 m2
Sample Description:	Insulating board debris to floor			

Material Assessment

Product Type:		**Total Risk Score:**	**7**
Condition:	High Damage/Debris	**Risk Category:**	**Medium**
Surface Treatment:	Unsealed AIB/Sealed Lagging		
Asbestos Types:	Amosite	**Action:**	Remove
Comments:	Remove this ACM using a licensed asbestos contractor. Until then, do not disturb. Ensure all employees, contractors & tenants who may come into contact with this ACM are made aware.		

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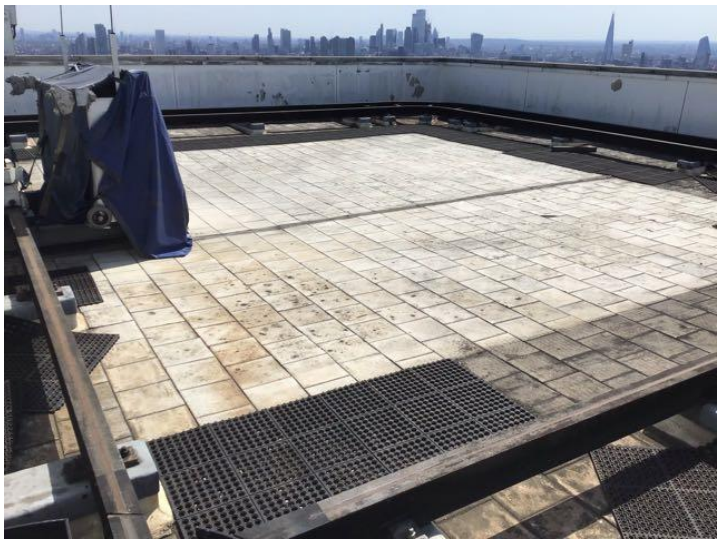
Sample Number:	**AS F971/S003 F971/VR509**			
Building:	Euston Tower	**Floor:**	External	
Room Name/Number:	RF.02 - Roof	**Material/Amount:**	Cement Product	Various throughout Roof Area
Sample Description:	Flues & Cowls			

Material Assessment

Product Type:	Cement Product	**Total Risk Score:**	**4**
Condition:	Some Minor Damage	**Risk Category:**	**Very Low**
Surface Treatment:	Sealed		
Asbestos Types:	Chrysotile	**Action:**	Manage
Comments:	Periodic inspections should be carried out in accordance with Regulation 4 of the Control of Asbestos Regulations 2012. Do not disturb this ACM. Ensure all employees, contractors & tenants who may come into contact with this ACM are made aware.		

William Martin Compliance
Reg. Office: 85 Gresham Street, London, EC2V 7NQ
W: wmcompliance.co.uk | **T:** 020 3819 8829

Sample Number:	**F971/S004**			
Building:	Euston Tower	**Floor:**	External	
Room Name/Number:	RF.01 - Roof	**Material/Amount:**	Cement Product	300 m²
Sample Description:	Promenade Floor Tiles to Roof			



Material Assessment

Product Type:	Cement Product	**Total Risk Score:**	**4**
Condition:	Some Minor Damage	**Risk Category:**	**Very Low**
Surface Treatment:	Sealed		
Asbestos Types:	Chrysotile	**Action:**	Manage
Comments:	Periodic inspections should be carried out in accordance with Regulation 4 of the Control of Asbestos Regulations 2012. Do not disturb this ACM. Ensure all employees, contractors & tenants who may come into contact with this ACM are made aware.		

William Martin Compliance
Reg. Office: 85 Gresham Street, London, EC2V 7NQ
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Sample Number:	**F971/S008**			
Building:	Euston Tower	**Floor:**	External	
Room Name/Number:	RF.01 - Roof	**Material/Amount:**	Cement Product	300 m²
Sample Description:	Promenade Floor Tiles to Roof			

Material Assessment

Product Type:	Cement Product	**Total Risk Score:**	**4**
Condition:	Some Minor Damage	**Risk Category:**	**Very Low**
Surface Treatment:	Sealed		
Asbestos Types:	Chrysotile	**Action:**	Manage
Comments:	Only present in vegetation material settled on the surface of the tiles. Periodic inspections should be carried out in accordance with Regulation 4 of the Control of Asbestos Regulations 2012. Do not disturb this ACM. Ensure all employees, contractors & tenants who may come into contact with this ACM are made aware.		

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5.1 - Recommended Actions

Unless otherwise stated, all recommended actions should be carried out within the following timescales:

Manage = The ACM can be left in situ and managed accordingly. Periodic inspections should be carried out in accordance with Regulation 4 of the control of Asbestos Regulations 2012.

Label = It is recommended that the ACM is labelled using prescribed Asbestos warning labels. The ACM can then be left in situ and managed accordingly. Periodic inspections should be carried out in accordance with Regulation 4 of the control of Asbestos Regulations 2012.

Encapsulate = The ACM should be encapsulated using a suitably trained asbestos contractor. The ACM can then be left in situ and managed accordingly. Periodic inspections should be carried out in accordance with Regulation 4 of the control of Asbestos Regulations 2012.

Remove = The ACM should be removed using a suitably trained asbestos contractor. Request and save copies of all removal documentation, such as RAMS, Waste Consignment Notes and Air Monitoring Certificates (where applicable).

Restrict Access = Access to the ACM should be prevented until the appropriate remedial works have been completed. This is typically recommended when an ACM is posing a significant risk. Any further recommendations on how to restrict access and what to do next should be followed.

5.2 - Timescales

High Risk ACMs = Recommended actions to be carried out **Immediately.**

Medium Risk ACMs = Recommended actions to be carried out within **3 Months**.

Low Risk ACMs = Recommended actions to be carried out within **6 Months**.

Very Low Risk ACMs = Recommended actions to be carried out within **12 Months.**

William Martin Compliance
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W: wmcompliance.co.uk | **T:** 020 3819 8829

Section 6 – Non-Asbestos Sample Register

RPE Euston Tower

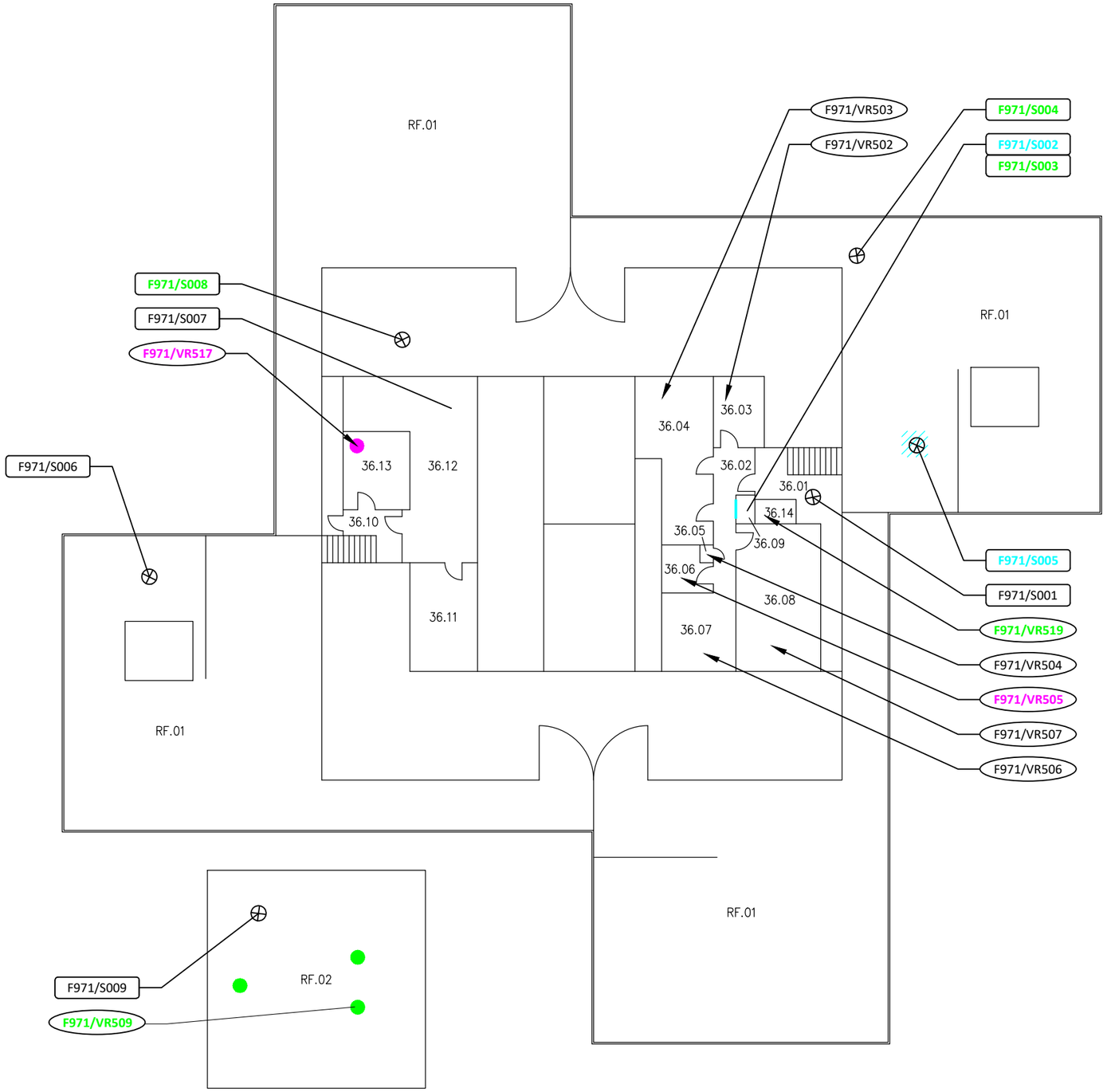
There were no additional non-asbestos samples taken during this Reinspection.

Section 7 – Floor Plans

See overleaf.

The floor plans supplied with this survey report are not to scale and should be used for approximate location details only.

William Martin Compliance
Reg. Office: 85 Gresham Street, London, EC2V 7NQ
W: wmcompliance.co.uk | **T:** 020 3819 8829



LEGEND

- NO ACCESS
- SPRAY COATING, TEXTURED COATING, INSULATION, ROPE/CLOTH USED AS INSULATION
- ASBESTOS INSULATING BOARD
- CEMENT PRODUCTS
- BITUMINOUS PRODUCTS, VINYL PRODUCTS, REINFORCED PLASTICS, BONDED PRODUCTS, ROPE, GASKETS etc.
- EXTENT OF DEMOLITION/REFURBISHMENT SURVEY
- OUTSIDE SCOPE OF SURVEY
- F971/VRXXX — VISUAL REF. AND LOCATION
- F971/SXXX — SAMPLE No. AND LOCATION

CLIENT:
BRITISH LAND

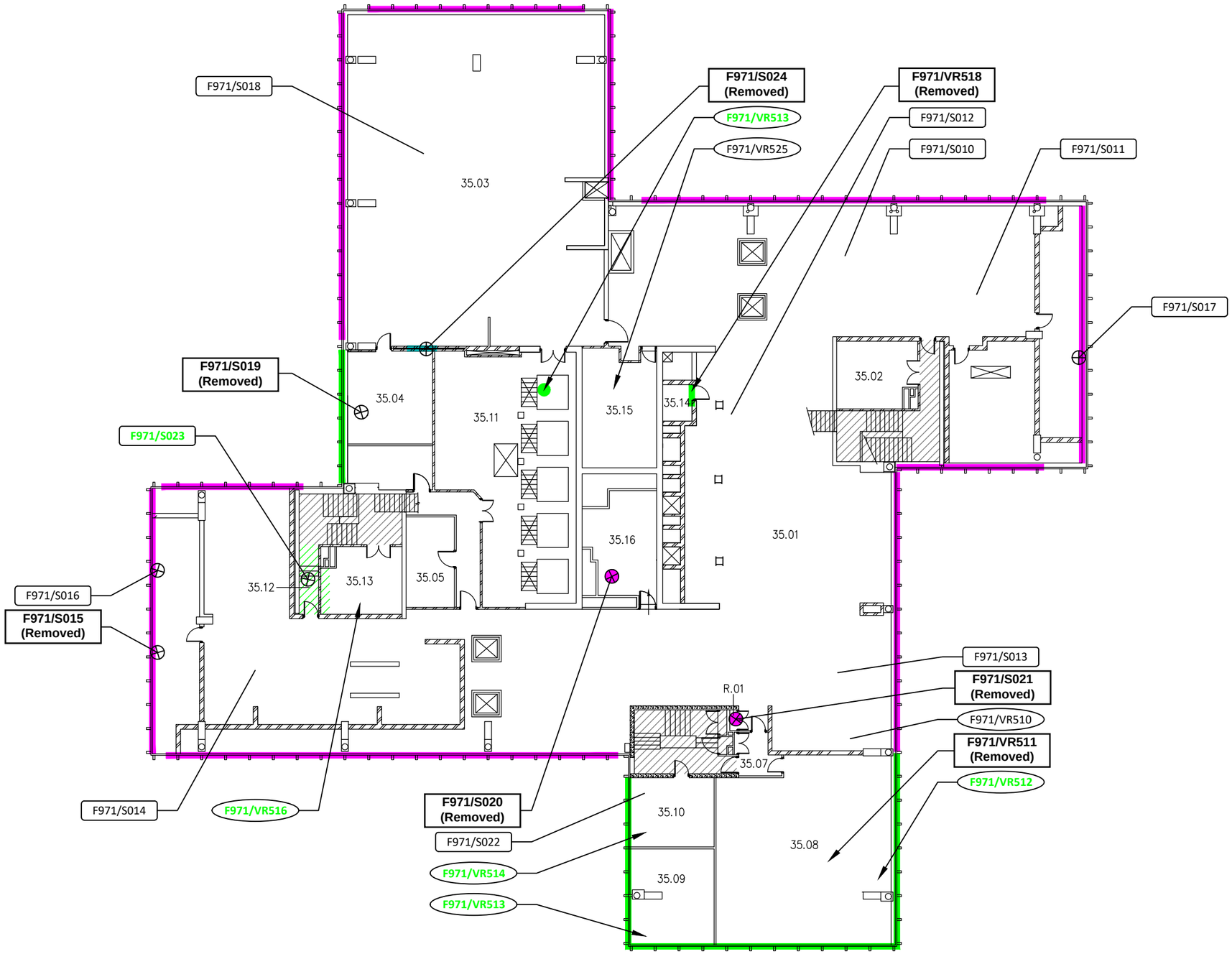
SITE:
EUSTON TOWER, EUSTON ROAD, REGENTS PLACE, LONDON, NW1 3DP

TITLE:
36TH FLOOR & ROOF LEVEL ASBESTOS SURVEY

rev	description	date

PROJECT #	FRSF971
SHEET #	05
DATE:	05.07.21

William Martin Compliance
MARLOWE Critical Services



LEGEND

- NO ACCESS
- SPRAY COATING, TEXTURED COATING, INSULATION, ROPE/CLOTH USED AS INSULATION
- ASBESTOS INSULATING BOARD
- CEMENT PRODUCTS
- BITUMINOUS PRODUCTS, VINYL PRODUCTS, REINFORCED PLASTICS, BONDED PRODUCTS, ROPE, GASKETS etc.
- EXTENT OF DEMOLITION/REFURBISHMENT SURVEY
- OUTSIDE SCOPE OF SURVEY
- F971/VRXXX — VISUAL REF. AND LOCATION
- F971/SXXX — SAMPLE No. AND LOCATION

CLIENT:
BRITISH LAND

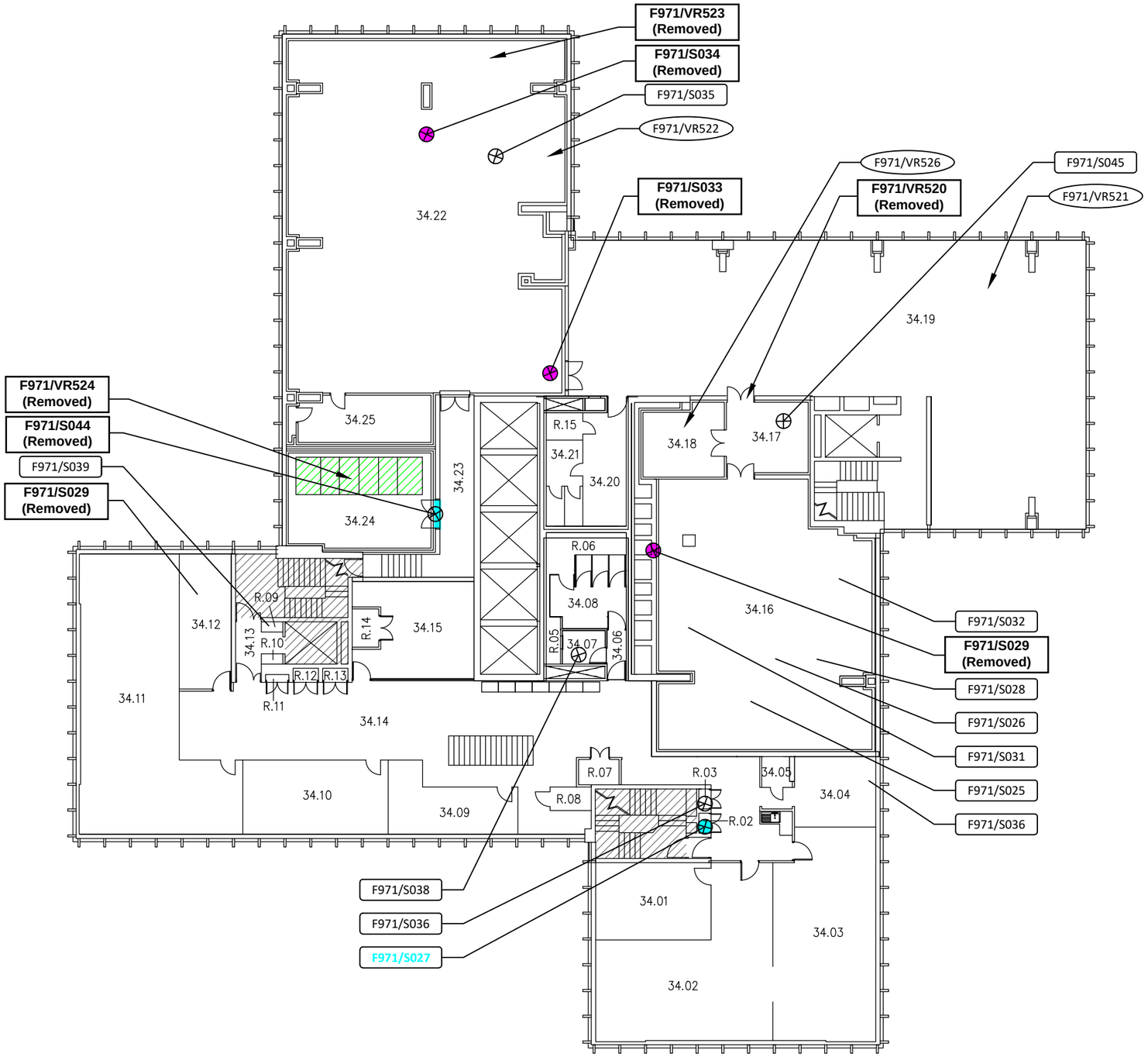
SITE:
EUSTON TOWER, EUSTON ROAD, REGENTS PLACE, LONDON, NW1 3DP

TITLE:
35TH FLOOR
ASBESTOS SURVEY

rev	description	date

PROJECT #	FRSF971
SHEET #	04
DATE:	05.07.21

William Martin Compliance
MARLOWE Critical Services



LEGEND

- NO ACCESS
- SPRAY COATING, TEXTURED COATING, INSULATION, ROPE/CLOTH USED AS INSULATION
- ASBESTOS INSULATING BOARD
- CEMENT PRODUCTS
- BITUMINOUS PRODUCTS, VINYL PRODUCTS, REINFORCED PLASTICS, BONDED PRODUCTS, ROPE, GASKETS etc.
- EXTENT OF DEMOLITION/REFURBISHMENT SURVEY
- OUTSIDE SCOPE OF SURVEY
- F971/VRXXX — VISUAL REF. AND LOCATION
- F971/SXXX — SAMPLE No. AND LOCATION

CLIENT:
BRITISH LAND

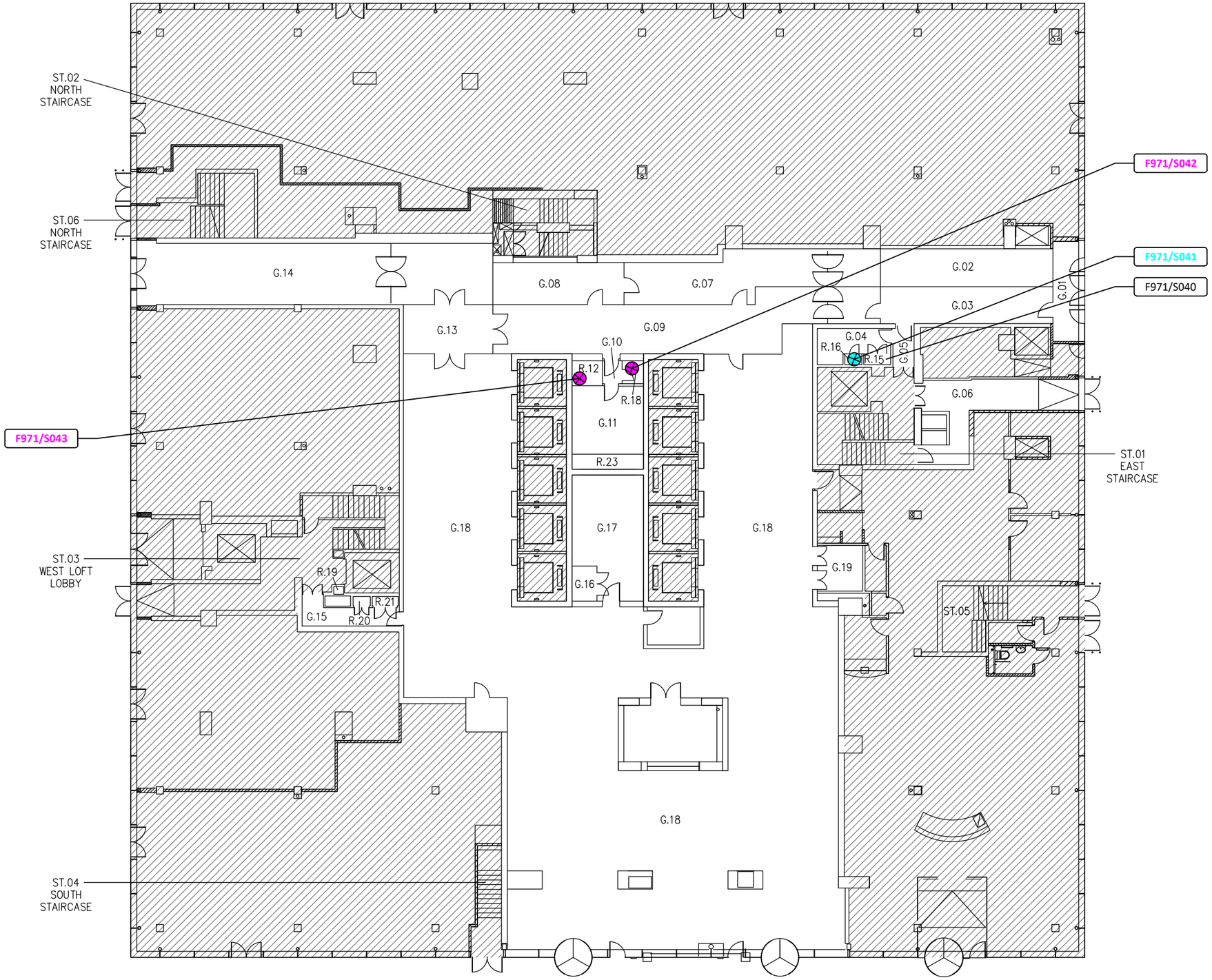
SITE:
EUSTON TOWER, EUSTON ROAD, REGENTS PLACE, LONDON, NW1 3DP

TITLE:
34TH FLOOR
ASBESTOS SURVEY

rev	description	date

PROJECT #	FRSF971
SHEET #	03
DATE:	05.07.21

William Martin Compliance
MARLOWE Critical Services



LEGEND

- NO ACCESS
- SPRAY COATING, TEXTURED COATING, INSULATION, ROPE/CLOTH USED AS INSULATION
- ASBESTOS INSULATING BOARD
- CEMENT PRODUCTS
- BITUMINOUS PRODUCTS, VINYL PRODUCTS, REINFORCED PLASTICS, BONDED PRODUCTS, ROPE, GASKETS etc.
- EXTENT OF DEMOLITION/REFURBISHMENT SURVEY
- OUTSIDE SCOPE OF SURVEY
- F971/VRXXX — VISUAL REF. AND LOCATION
- F971/SXXX — SAMPLE No. AND LOCATION

CLIENT:
BRITISH LAND

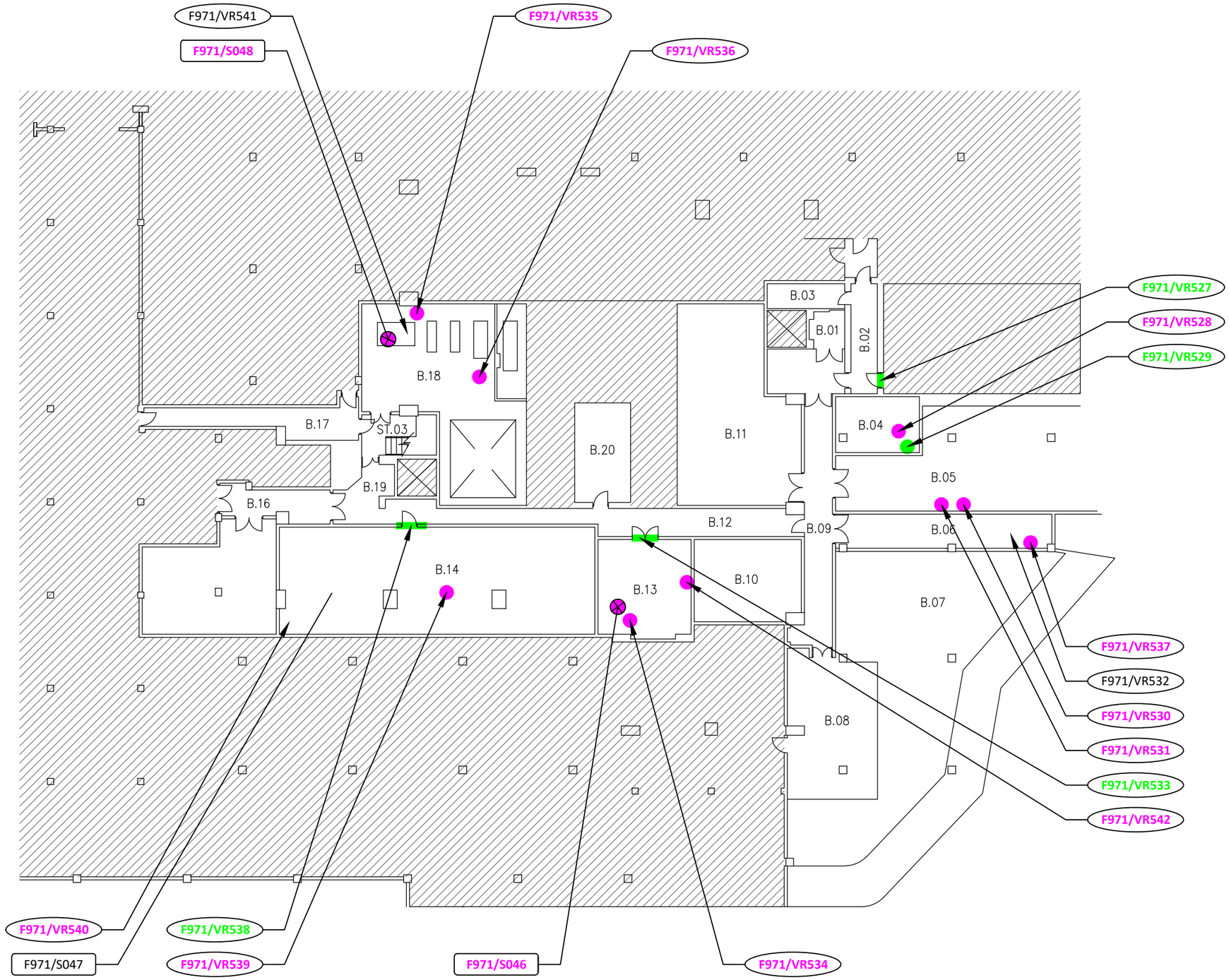
SITE:
EUSTON TOWER, EUSTON ROAD,
REGENTS PLACE, LONDON, NW1 3DP

TITLE:
GROUND FLOOR
ASBESTOS SURVEY

rev	description	date

PROJECT #	FRSF971
SHEET #	02
DATE:	05.07.21

William Martin Compliance
MARLOWE Critical Services



LEGEND

- NO ACCESS
- SPRAY COATING, TEXTURED COATING, INSULATION, ROPE/CLOTH USED AS INSULATION
- ASBESTOS INSULATING BOARD
- CEMENT PRODUCTS
- BITUMINOUS PRODUCTS, VINYL PRODUCTS, REINFORCED PLASTICS, BONDED PRODUCTS, ROPE, GASKETS etc.
- EXTENT OF DEMOLITION/REFURBISHMENT SURVEY
- OUTSIDE SCOPE OF SURVEY
- F971/VRXXX — VISUAL REF. AND LOCATION
- F971/SXXX — SAMPLE No. AND LOCATION

CLIENT:
BRITISH LAND

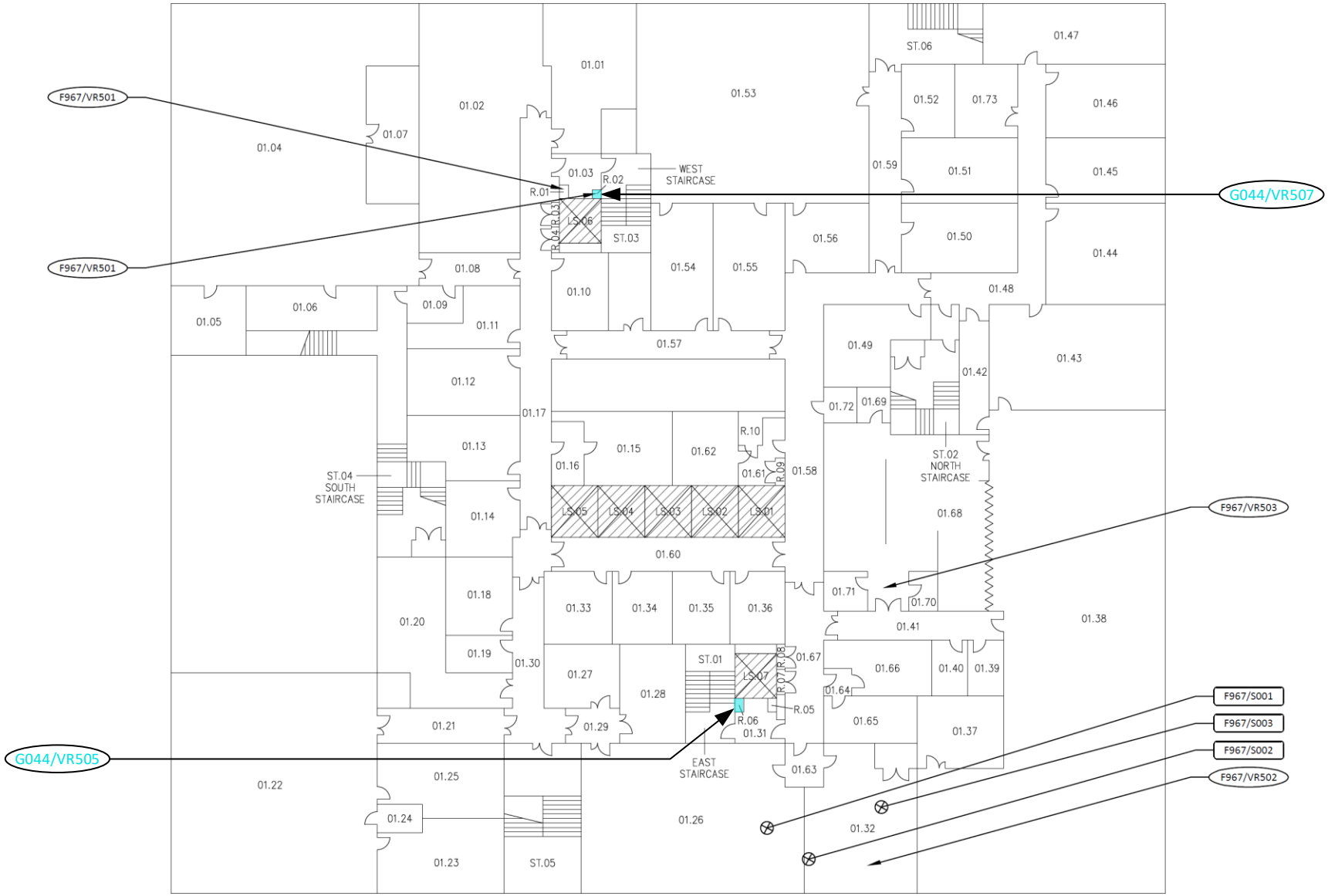
SITE:
EUSTON TOWER, EUSTON ROAD, REGENTS PLACE, LONDON, NW1 3DP

TITLE:
BASEMENT LEVEL ASBESTOS SURVEY

rev	description	date

PROJECT #	FRSF971
SHEET #	01
DATE:	05.07.21

William Martin Compliance
MARLOWE Critical Services



LEGEND

- NO ACCESS
- SPRAY COATING, TEXTURED COATING, INSULATION, ROPE/CLOTH USED AS INSULATION
- ASBESTOS INSULATING BOARD
- CEMENT PRODUCTS
- BITUMINOUS PRODUCTS, VINYL PRODUCTS, REINFORCED PLASTICS, BONDED PRODUCTS, ROPE, GASKETS etc.
- EXTENT OF DEMOLITION/REFURBISHMENT SURVEY
- OUTSIDE SCOPE OF SURVEY
- F967/VRXXX — VISUAL REF. AND LOCATION
- F967/SXXX — SAMPLE No. AND LOCATION

CLIENT:
BRITISH LAND

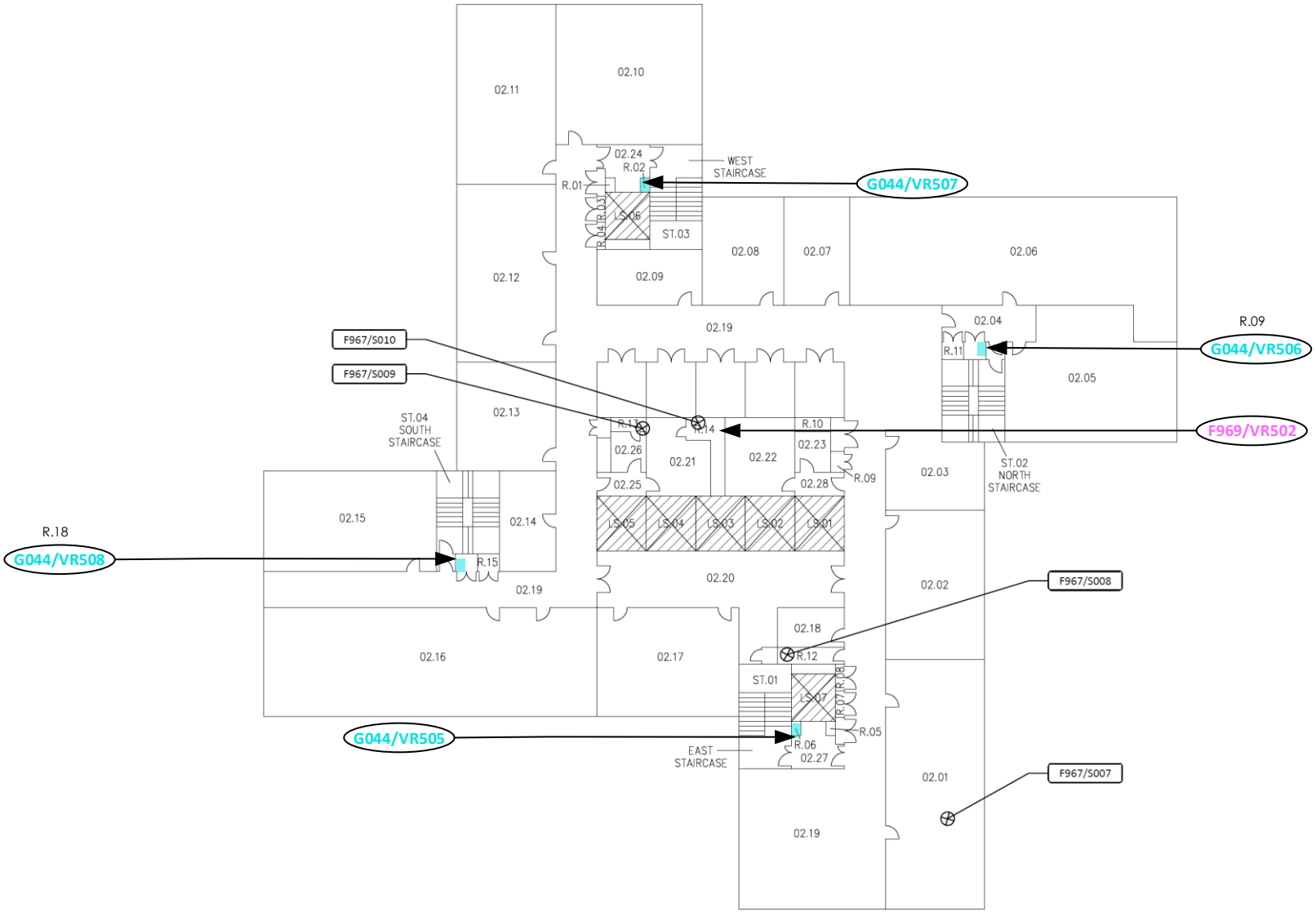
SITE:
EUSTON TOWER, EUSTON ROAD, REGENTS PLACE, NW1 3DP

TITLE:
FIRST FLOOR ASBESTOS SURVEY

rev	description	date

PROJECT #	FRSF967
SHEET #	01
DATE:	11.05.21

William Martin Compliance
MARLOWE Critical Services



LEGEND

- NO ACCESS
- SPRAY COATING, TEXTURED COATING, INSULATION, ROPE/CLOTH USED AS INSULATION
- ASBESTOS INSULATING BOARD
- CEMENT PRODUCTS
- BITUMINOUS PRODUCTS, VINYL PRODUCTS, REINFORCED PLASTICS, BONDED PRODUCTS, ROPE, GASKETS etc.
- EXTENT OF DEMOLITION/REFURBISHMENT SURVEY
- OUTSIDE SCOPE OF SURVEY
- F967/VRXXX — VISUAL REF. AND LOCATION
- F967/SXXX — SAMPLE No. AND LOCATION

CLIENT:
BRITISH LAND

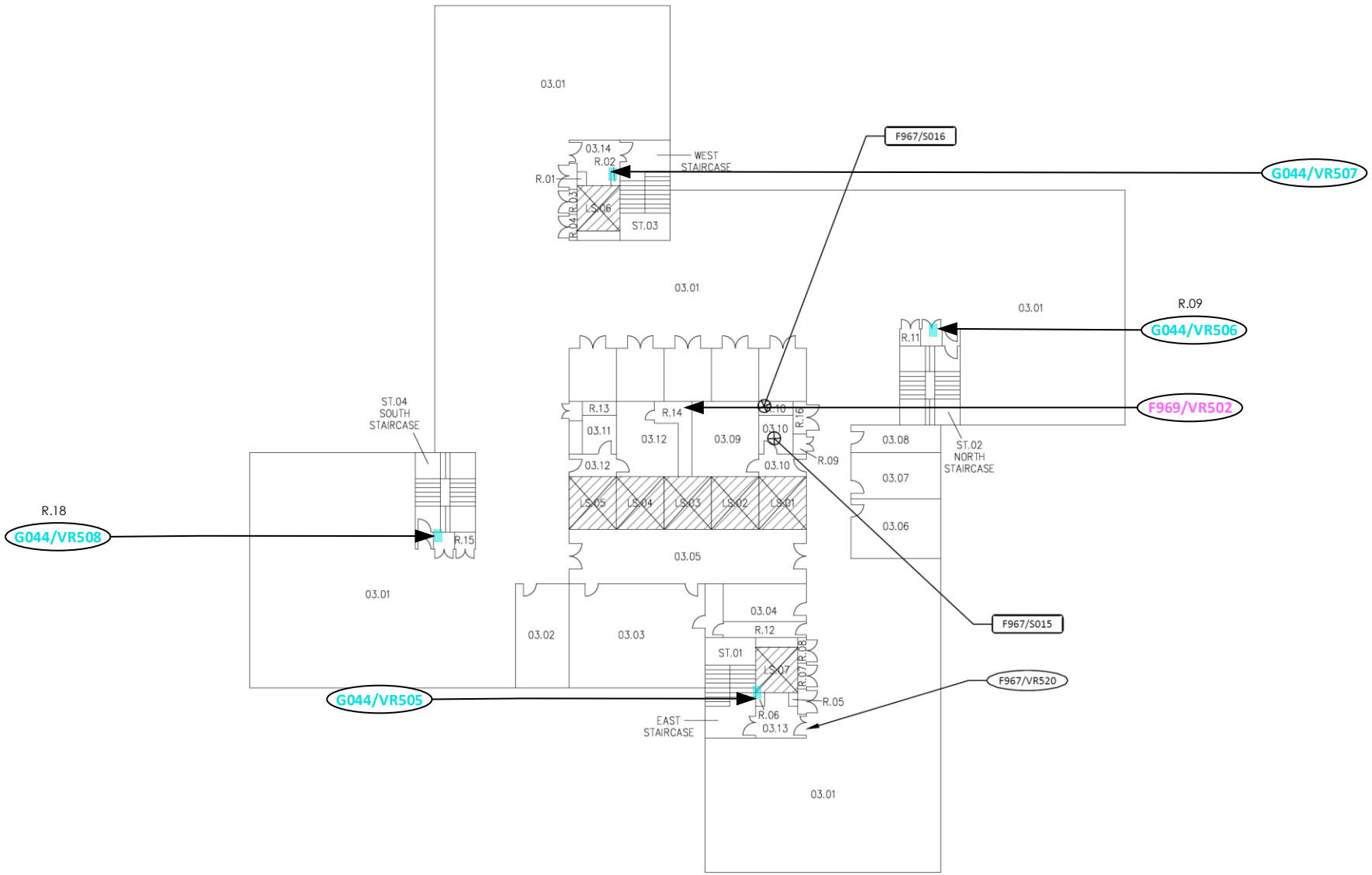
SITE:
EUSTON TOWER, EUSTON ROAD, REGENTS PLACE, NW1 3DP

TITLE:
SECOND FLOOR ASBESTOS SURVEY

rev	description	date

PROJECT #	FRSF967
SHEET #	02
DATE:	11.05.21

William Martin Compliance
MARLOWE Critical Services



LEGEND

- NO ACCESS
- SPRAY COATING, TEXTURED COATING, INSULATION, ROPE/CLOTH USED AS INSULATION
- ASBESTOS INSULATING BOARD
- CEMENT PRODUCTS
- BITUMINOUS PRODUCTS, VINYL PRODUCTS, REINFORCED PLASTICS, BONDED PRODUCTS, ROPE, GASKETS etc.
- EXTENT OF DEMOLITION/REFURBISHMENT SURVEY
- OUTSIDE SCOPE OF SURVEY
- F967/VRXXX — VISUAL REF. AND LOCATION
- F967/SXXX — SAMPLE No. AND LOCATION

CLIENT:
BRITISH LAND

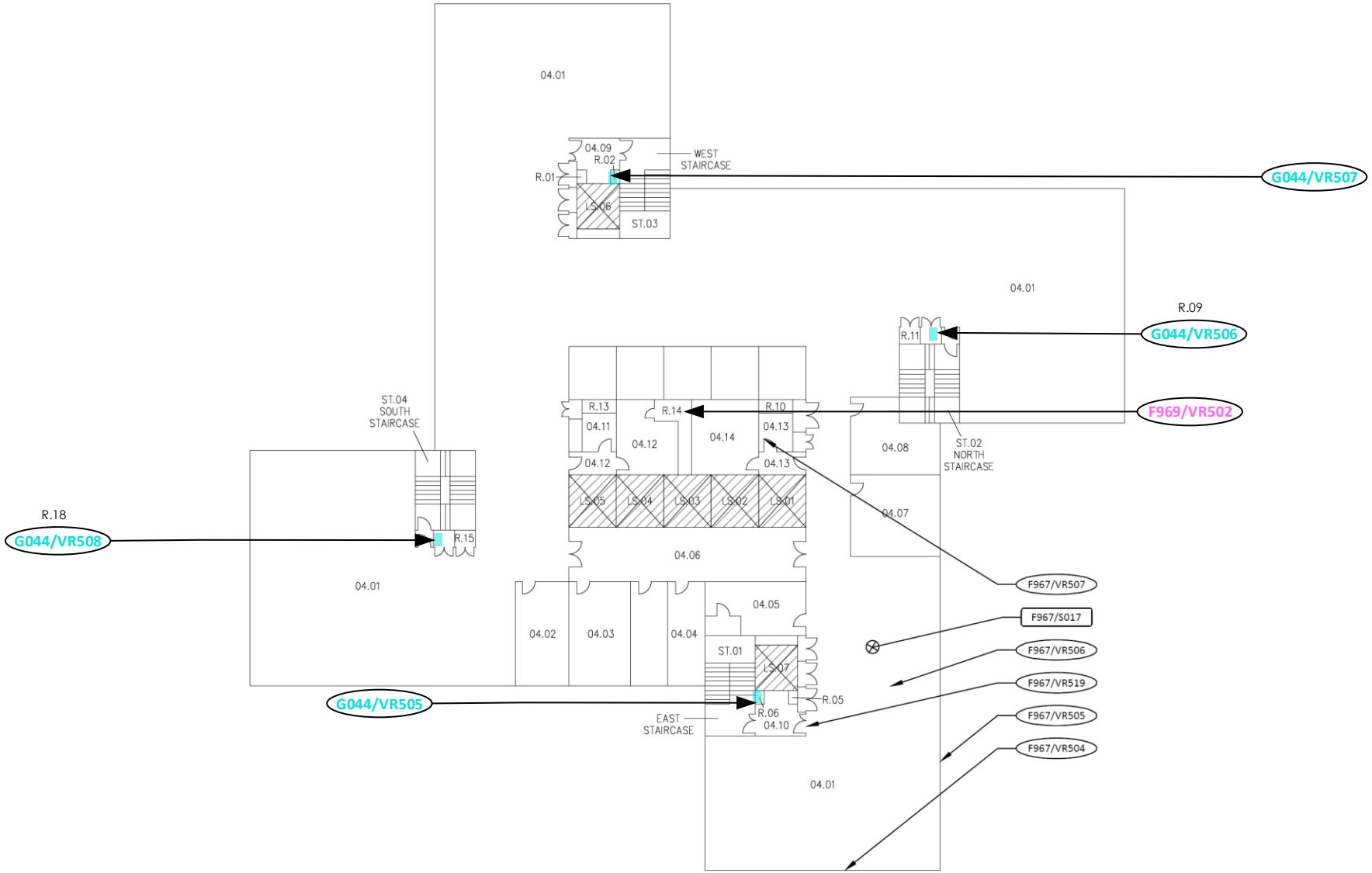
SITE:
EUSTON TOWER, EUSTON ROAD, REGENTS PLACE, NW1 3DP

TITLE:
THIRD FLOOR ASBESTOS SURVEY

rev	description	date

PROJECT #	FRSF967
SHEET #	03
DATE:	11.05.21

William Martin Compliance
MARLOWE Critical Services



LEGEND

- NO ACCESS
- SPRAY COATING, TEXTURED COATING, INSULATION, ROPE/CLOTH USED AS INSULATION
- ASBESTOS INSULATING BOARD
- CEMENT PRODUCTS
- BITUMINOUS PRODUCTS, VINYL PRODUCTS, REINFORCED PLASTICS, BONDED PRODUCTS, ROPE, GASKETS etc.
- EXTENT OF DEMOLITION/REFURBISHMENT SURVEY
- OUTSIDE SCOPE OF SURVEY
- F967/VRXXX — VISUAL REF. AND LOCATION
- F967/SXXX — SAMPLE No. AND LOCATION

CLIENT:
BRITISH LAND

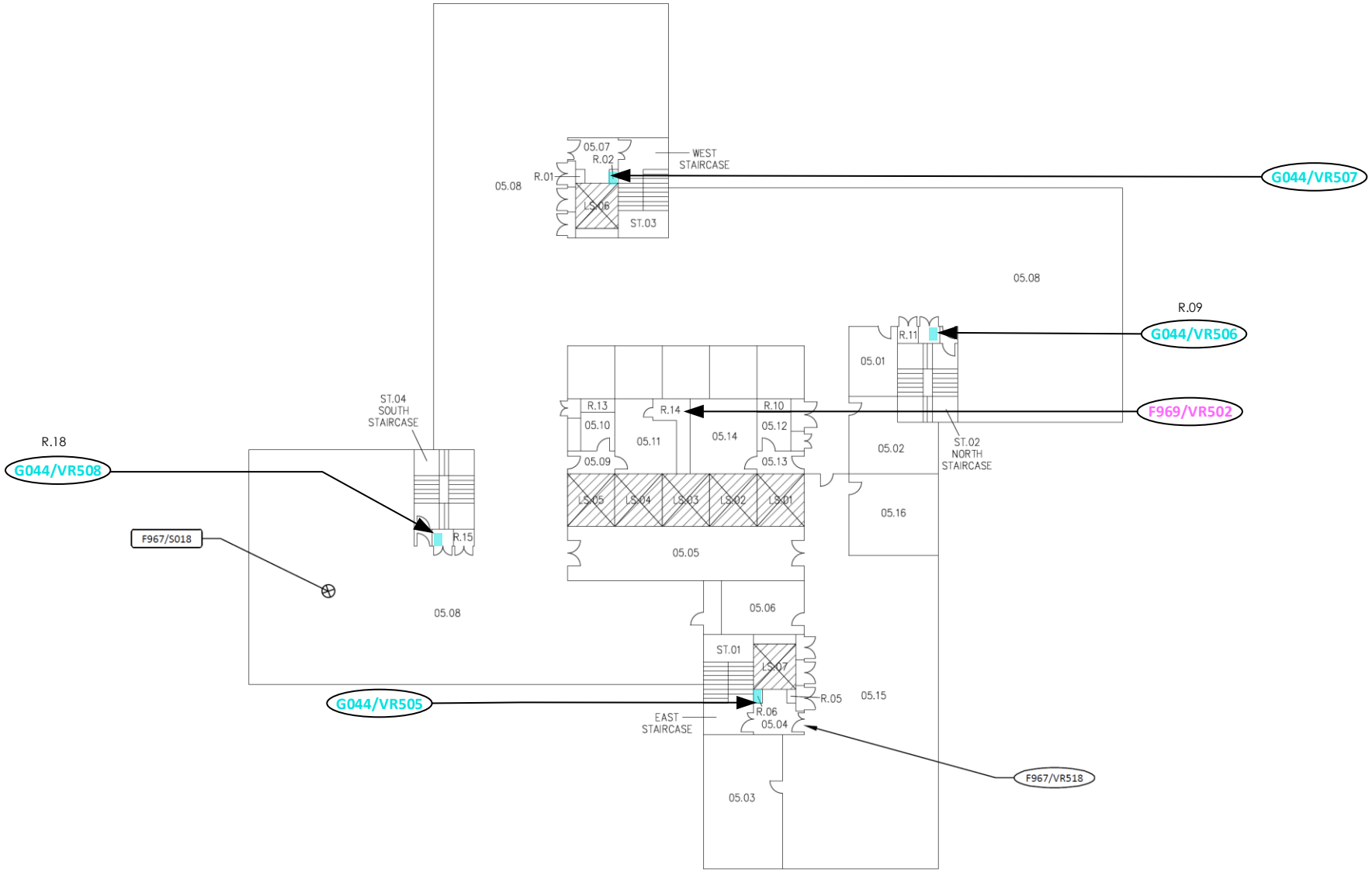
SITE:
EUSTON TOWER, EUSTON ROAD, REGENTS PLACE, NW1 3DP

TITLE:
FOURTH FLOOR ASBESTOS SURVEY

rev	description	date

PROJECT #	FRSF967
SHEET #	04
DATE:	11.05.21

William Martin Compliance
MARLOWE Critical Services



LEGEND

- NO ACCESS
- SPRAY COATING, TEXTURED COATING, INSULATION, ROPE/CLOTH USED AS INSULATION
- ASBESTOS INSULATING BOARD
- CEMENT PRODUCTS
- BITUMINOUS PRODUCTS, VINYL PRODUCTS, REINFORCED PLASTICS, BONDED PRODUCTS, ROPE, GASKETS etc.
- EXTENT OF DEMOLITION/REFURBISHMENT SURVEY
- OUTSIDE SCOPE OF SURVEY
- F967/VRXXX — VISUAL REF. AND LOCATION
- F967/SXXX — SAMPLE No. AND LOCATION

CLIENT:
BRITISH LAND

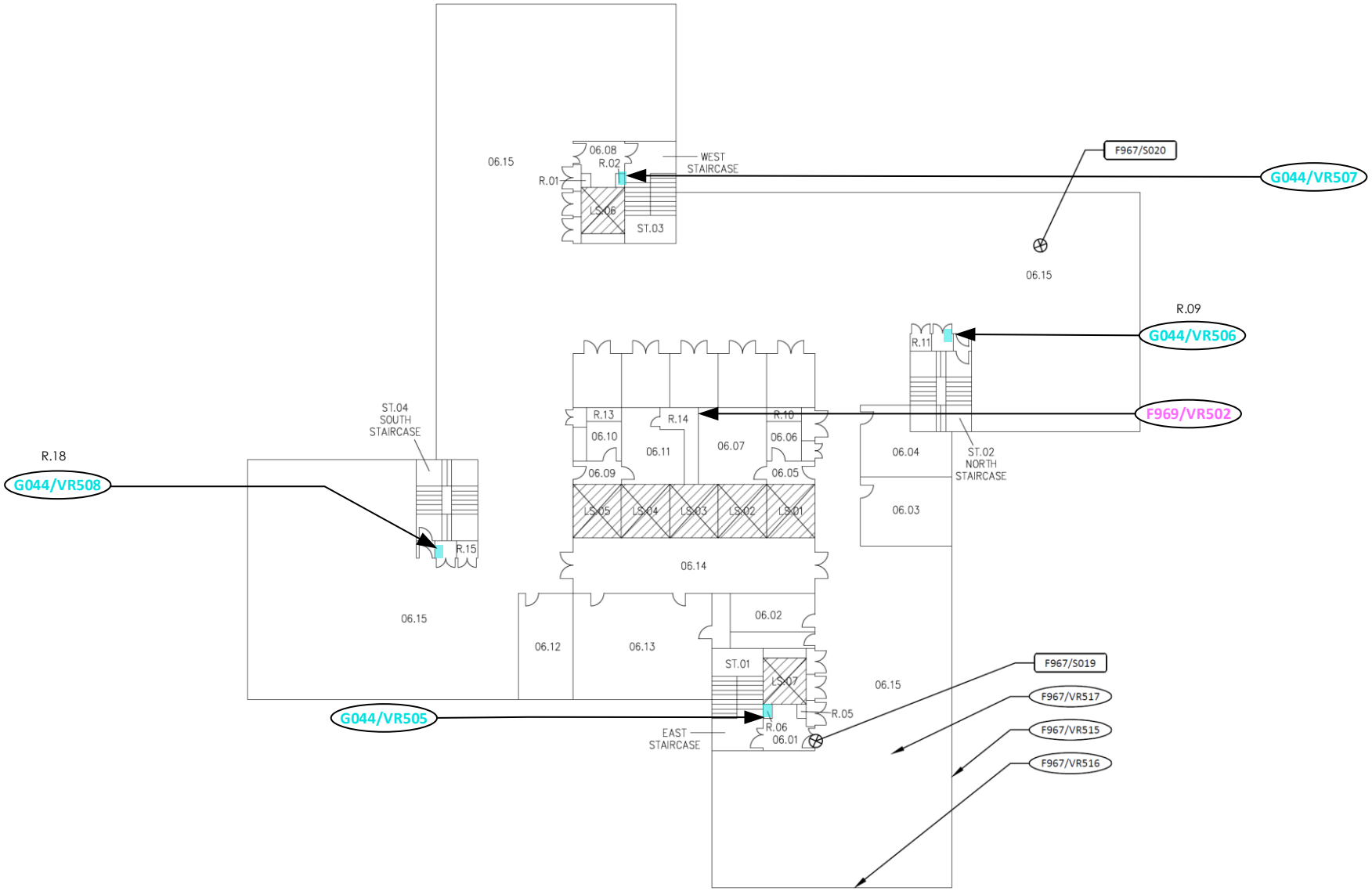
SITE:
EUSTON TOWER, EUSTON ROAD, REGENTS PLACE, NW1 3DP

TITLE:
FIFTH FLOOR
ASBESTOS SURVEY

rev	description	date

PROJECT #	FRSF967
SHEET #	05
DATE:	11.05.21

William Martin Compliance
MARLOWE Critical Services



LEGEND

- NO ACCESS
- SPRAY COATING, TEXTURED COATING, INSULATION, ROPE/CLOTH USED AS INSULATION
- ASBESTOS INSULATING BOARD
- CEMENT PRODUCTS
- BITUMINOUS PRODUCTS, VINYL PRODUCTS, REINFORCED PLASTICS, BONDED PRODUCTS, ROPE, GASKETS etc.
- EXTENT OF DEMOLITION/REFURBISHMENT SURVEY
- OUTSIDE SCOPE OF SURVEY
- F967/VRXXX — VISUAL REF. AND LOCATION
- F967/SXXX — SAMPLE No. AND LOCATION

CLIENT:
BRITISH LAND

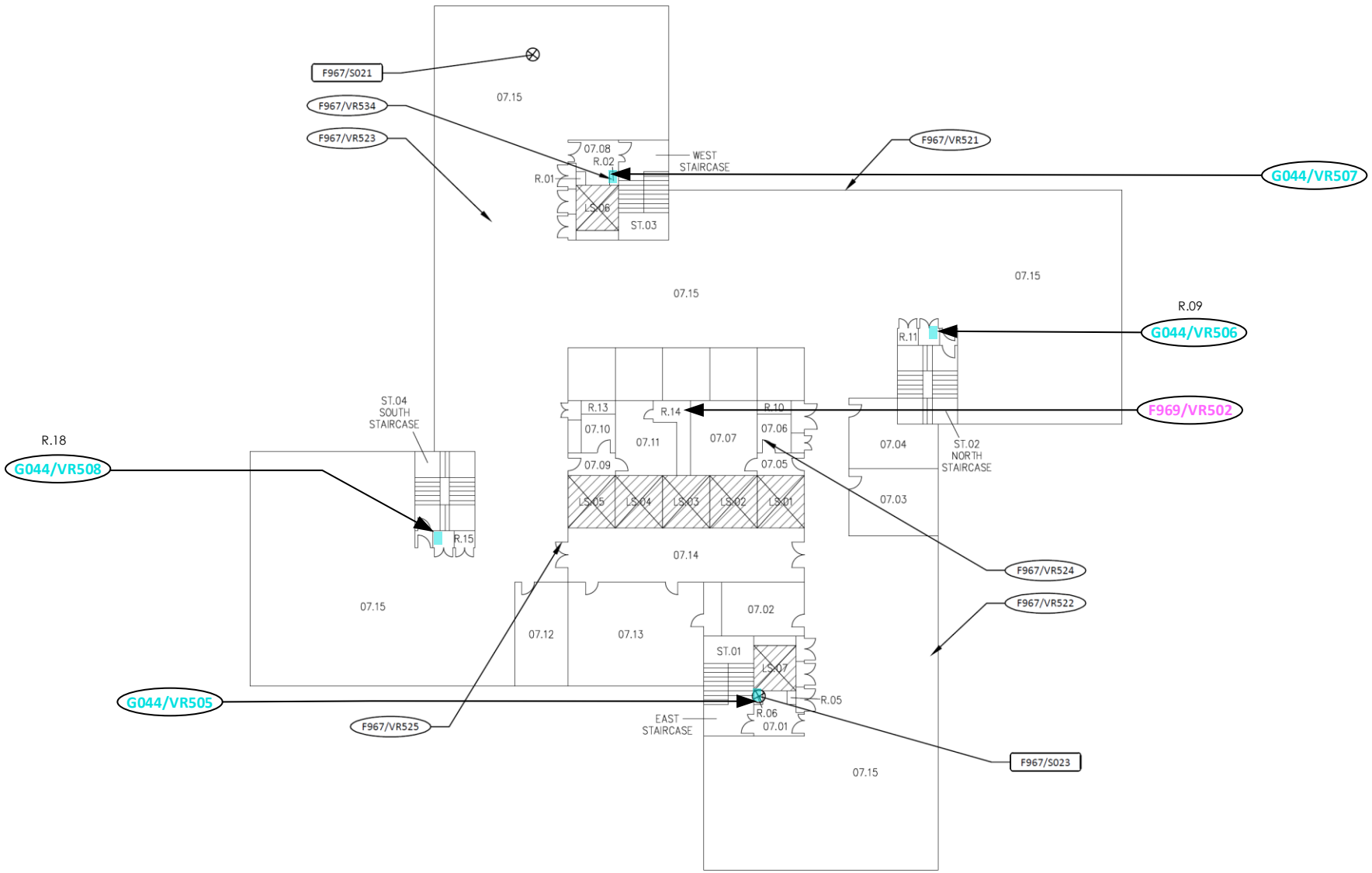
SITE:
EUSTON TOWER, EUSTON ROAD, REGENTS PLACE, NW1 3DP

TITLE:
SIXTH FLOOR
ASBESTOS SURVEY

rev	description	date

PROJECT #	FRSF967
SHEET #	06
DATE:	11.05.21

William Martin Compliance
MARLOWE Critical Services



LEGEND

- NO ACCESS
- SPRAY COATING, TEXTURED COATING, INSULATION, ROPE/CLOTH USED AS INSULATION
- ASBESTOS INSULATING BOARD
- CEMENT PRODUCTS
- BITUMINOUS PRODUCTS, VINYL PRODUCTS, REINFORCED PLASTICS, BONDED PRODUCTS, ROPE, GASKETS etc.
- EXTENT OF DEMOLITION/REFURBISHMENT SURVEY
- OUTSIDE SCOPE OF SURVEY
- F967/VRXXX — VISUAL REF. AND LOCATION
- F967/SXXX — SAMPLE No. AND LOCATION

CLIENT:
BRITISH LAND

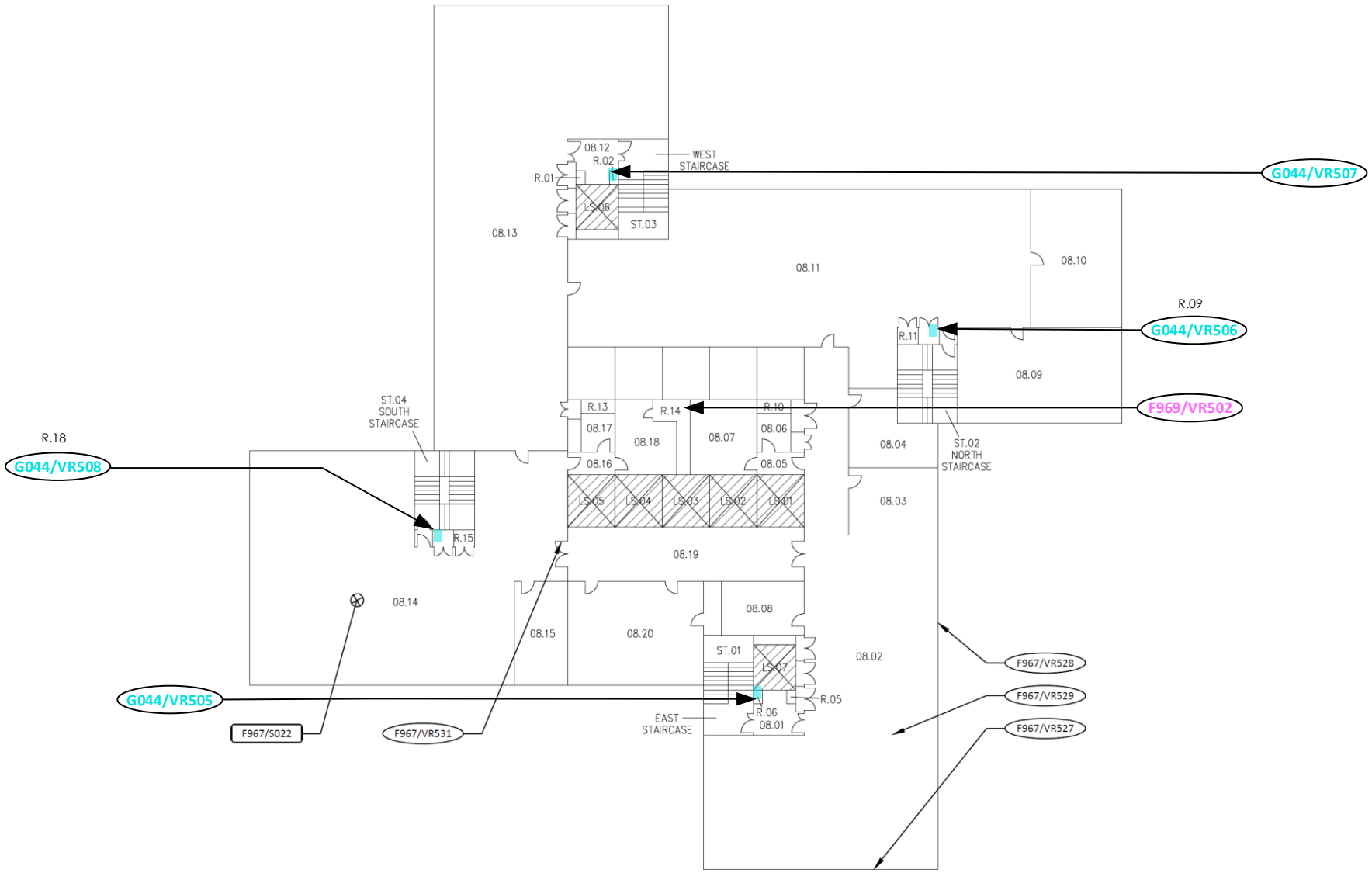
SITE:
EUSTON TOWER, EUSTON ROAD, REGENTS PLACE, NW1 3DP

TITLE:
SEVENTH FLOOR ASBESTOS SURVEY

rev	description	date

PROJECT #	FRSF967
SHEET #	07
DATE:	11.05.21

William Martin Compliance
MARLOWE Critical Services



LEGEND

- NO ACCESS
- SPRAY COATING, TEXTURED COATING, INSULATION, ROPE/CLOTH USED AS INSULATION
- ASBESTOS INSULATING BOARD
- CEMENT PRODUCTS
- BITUMINOUS PRODUCTS, VINYL PRODUCTS, REINFORCED PLASTICS, BONDED PRODUCTS, ROPE, GASKETS etc.
- EXTENT OF DEMOLITION/REFURBISHMENT SURVEY
- OUTSIDE SCOPE OF SURVEY
- F967/VRXXX — VISUAL REF. AND LOCATION
- F967/SXXX — SAMPLE No. AND LOCATION

CLIENT:
BRITISH LAND

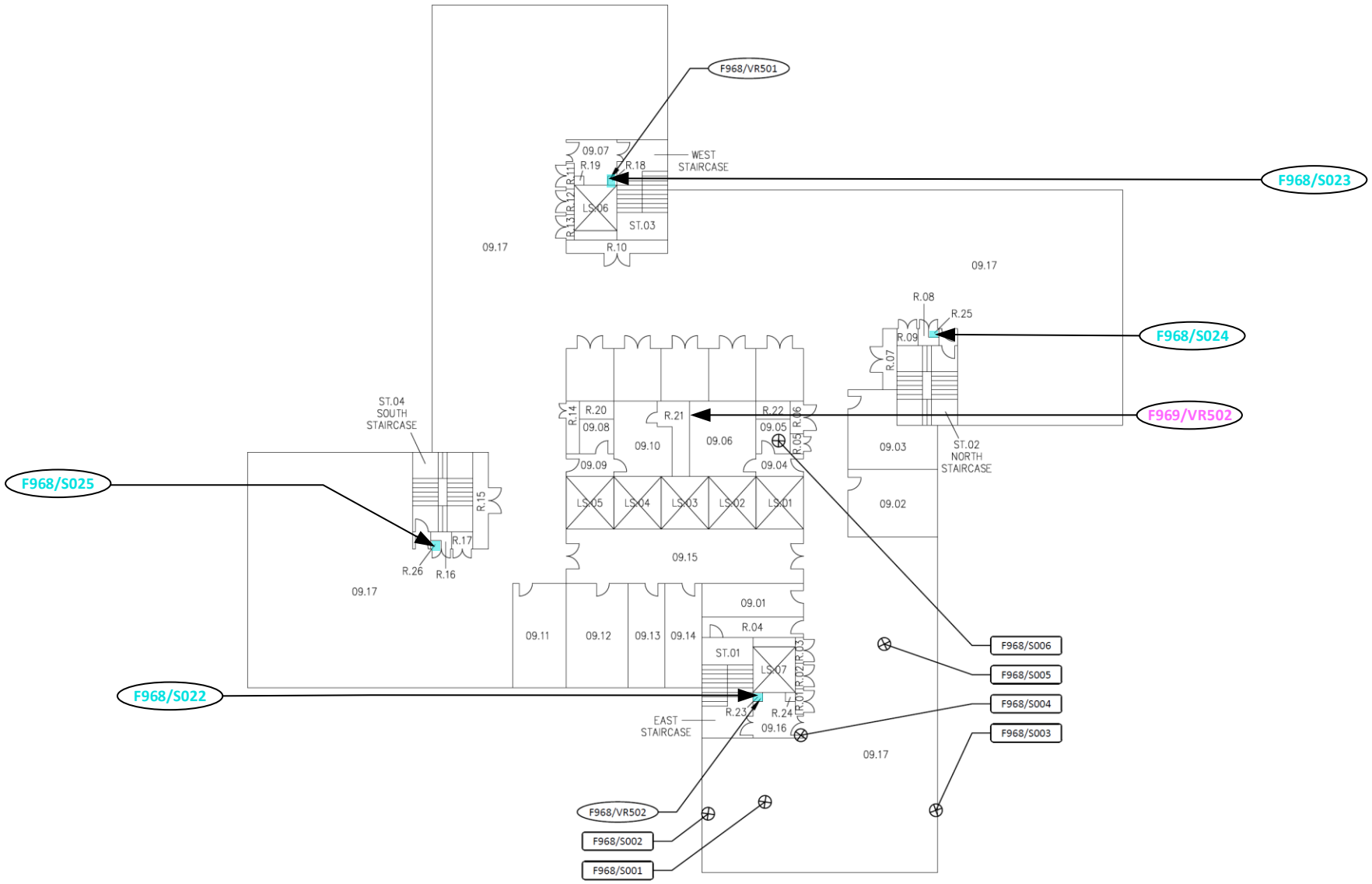
SITE:
EUSTON TOWER, EUSTON ROAD, REGENTS PLACE, NW1 3DP

TITLE:
EIGHTH FLOOR
ASBESTOS SURVEY

rev	description	date

PROJECT #	FRSF967
SHEET #	08
DATE:	11.05.21

William Martin Compliance
MARLOWE Critical Services



LEGEND

- NO ACCESS
- SPRAY COATING, TEXTURED COATING, INSULATION, ROPE/CLOTH USED AS INSULATION
- ASBESTOS INSULATING BOARD
- CEMENT PRODUCTS
- BITUMINOUS PRODUCTS, VINYL PRODUCTS, REINFORCED PLASTICS, BONDED PRODUCTS, ROPE, GASKETS etc.
- EXTENT OF DEMOLITION/REFURBISHMENT SURVEY
- OUTSIDE SCOPE OF SURVEY
- F968/VRXXX — VISUAL REF. AND LOCATION
- F968/SXXX — SAMPLE No. AND LOCATION

CLIENT:
BRITISH LAND

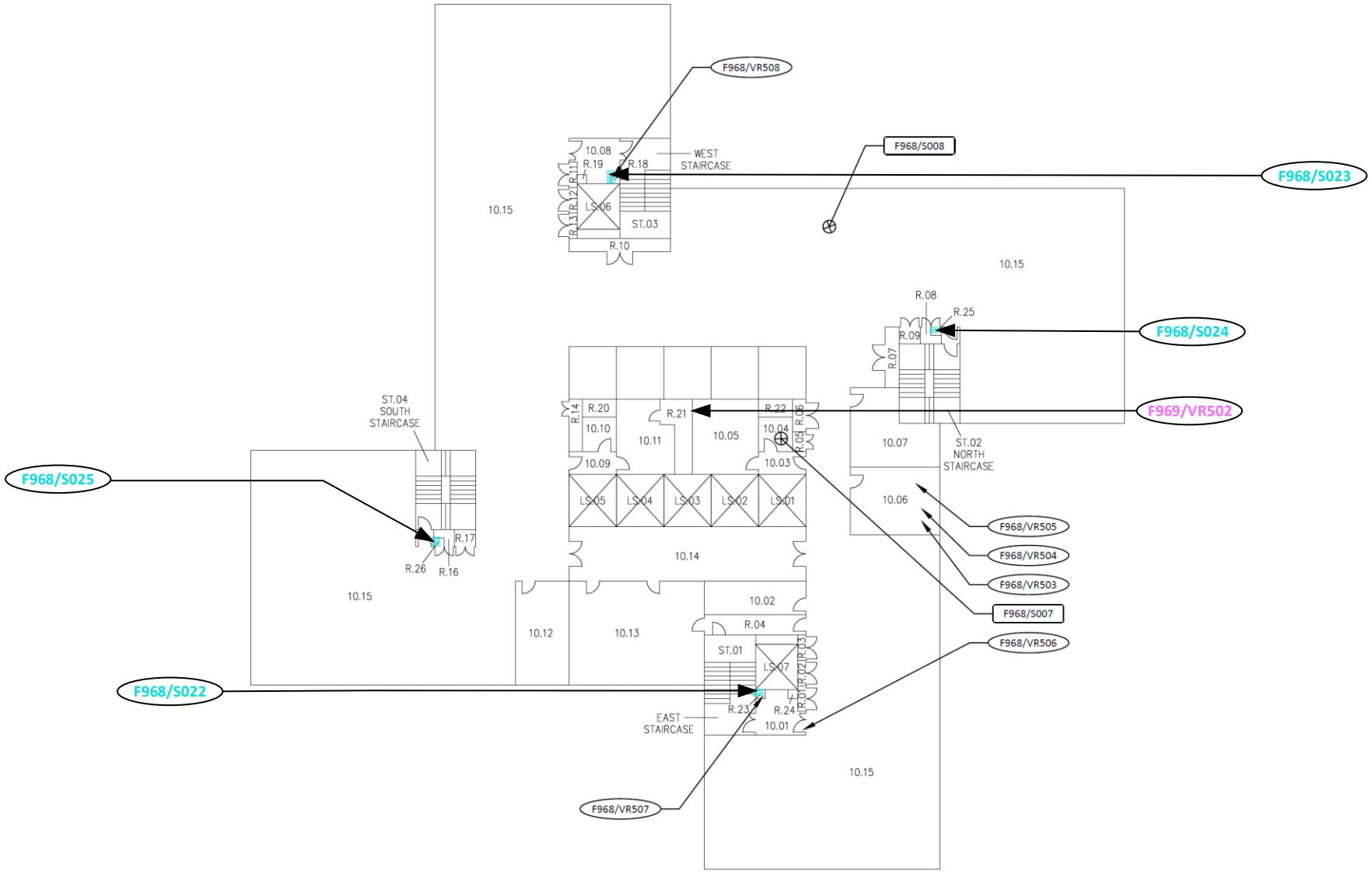
SITE:
EUSTON TOWER, EUSTON ROAD, REGENTS PLACE, NW1 3DP

TITLE:
NINTH FLOOR
ASBESTOS SURVEY

rev	description	date

PROJECT #	FRSF968
SHEET #	01
DATE:	11.05.21

William Martin Compliance
MARLOWE Critical Services



LEGEND

- NO ACCESS
- SPRAY COATING, TEXTURED COATING, INSULATION, ROPE/CLOTH USED AS INSULATION
- ASBESTOS INSULATING BOARD
- CEMENT PRODUCTS
- BITUMINOUS PRODUCTS, VINYL PRODUCTS, REINFORCED PLASTICS, BONDED PRODUCTS, ROPE, GASKETS etc.
- EXTENT OF DEMOLITION/REFURBISHMENT SURVEY
- OUTSIDE SCOPE OF SURVEY
- F968/VRXXX — VISUAL REF. AND LOCATION
- F968/SXXX — SAMPLE No. AND LOCATION

CLIENT:
BRITISH LAND

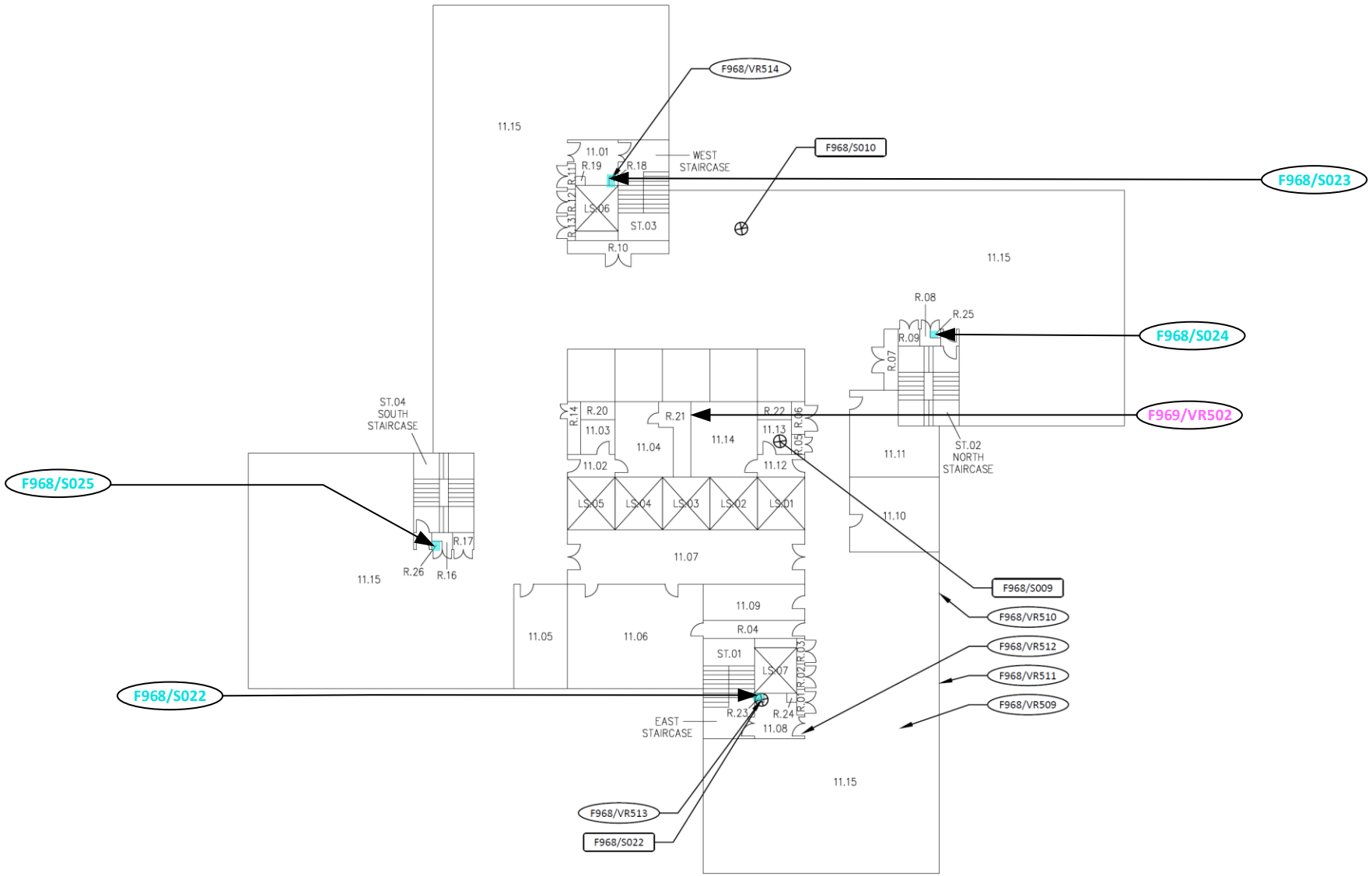
SITE:
EUSTON TOWER, EUSTON ROAD, REGENTS PLACE, NW1 3DP

TITLE:
TENTH FLOOR
ASBESTOS SURVEY

rev	description	date

PROJECT #	FRSF968
SHEET #	02
DATE:	11.05.21

William Martin Compliance
MARLOWE Critical Services



LEGEND

- NO ACCESS
- SPRAY COATING, TEXTURED COATING, INSULATION, ROPE/CLOTH USED AS INSULATION
- ASBESTOS INSULATING BOARD
- CEMENT PRODUCTS
- BITUMINOUS PRODUCTS, VINYL PRODUCTS, REINFORCED PLASTICS, BONDED PRODUCTS, ROPE, GASKETS etc.
- EXTENT OF DEMOLITION/REFURBISHMENT SURVEY
- OUTSIDE SCOPE OF SURVEY
- F968/VRXXX — VISUAL REF. AND LOCATION
- F968/SXXX — SAMPLE No. AND LOCATION

CLIENT:
BRITISH LAND

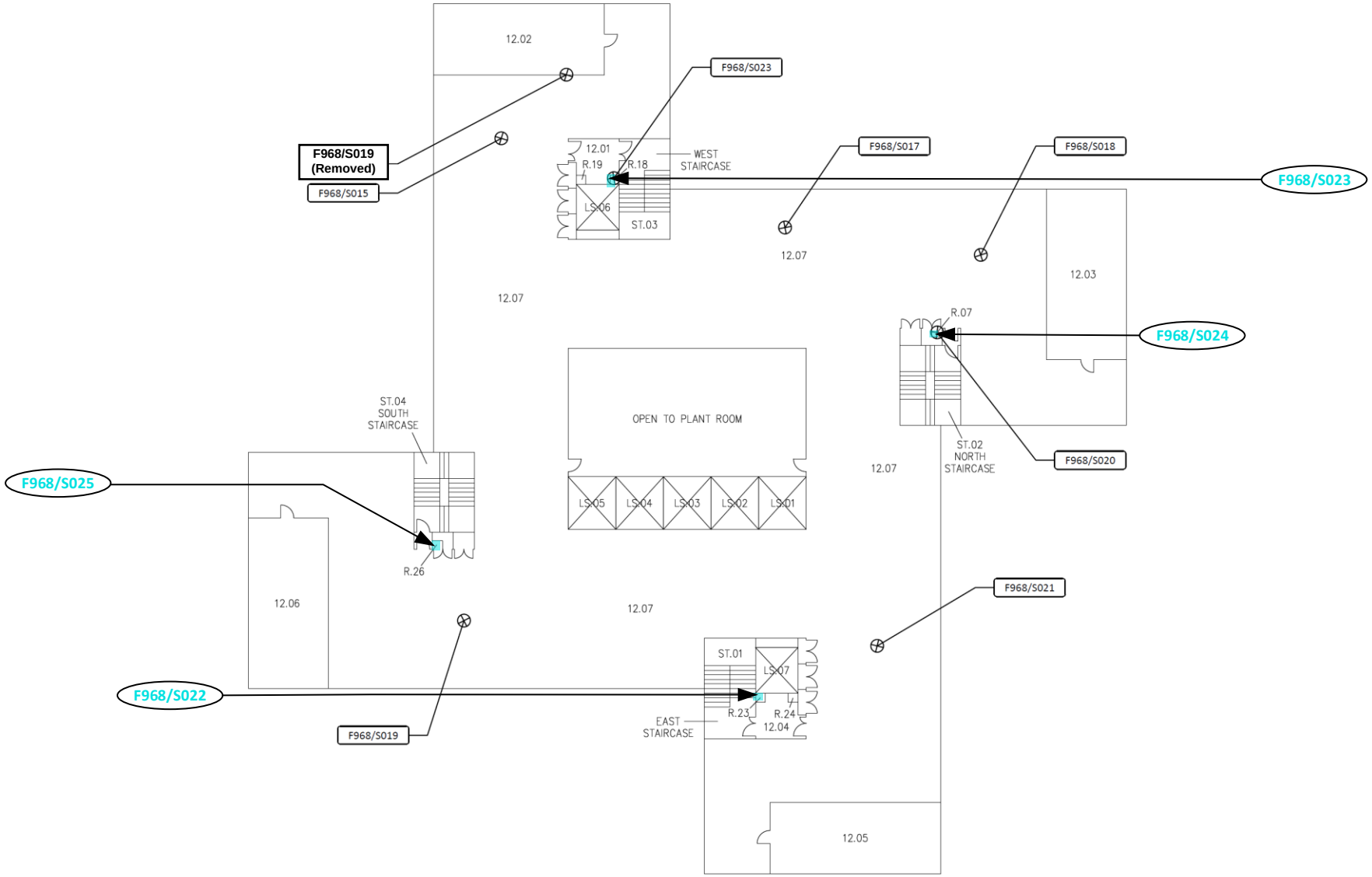
SITE:
EUSTON TOWER, EUSTON ROAD, REGENTS PLACE, NW1 3DP

TITLE:
ELEVENTH FLOOR ASBESTOS SURVEY

rev	description	date

PROJECT #	FRSF968
SHEET #	03
DATE:	11.05.21

William Martin Compliance
MARLOWE Critical Services



LEGEND

- NO ACCESS
- SPRAY COATING, TEXTURED COATING, INSULATION, ROPE/CLOTH USED AS INSULATION
- ASBESTOS INSULATING BOARD
- CEMENT PRODUCTS
- BITUMINOUS PRODUCTS, VINYL PRODUCTS, REINFORCED PLASTICS, BONDED PRODUCTS, ROPE, GASKETS etc.
- EXTENT OF DEMOLITION/REFURBISHMENT SURVEY
- OUTSIDE SCOPE OF SURVEY
- F968/VRXXX — VISUAL REF. AND LOCATION
- F968/SXXX — SAMPLE No. AND LOCATION

CLIENT:
BRITISH LAND

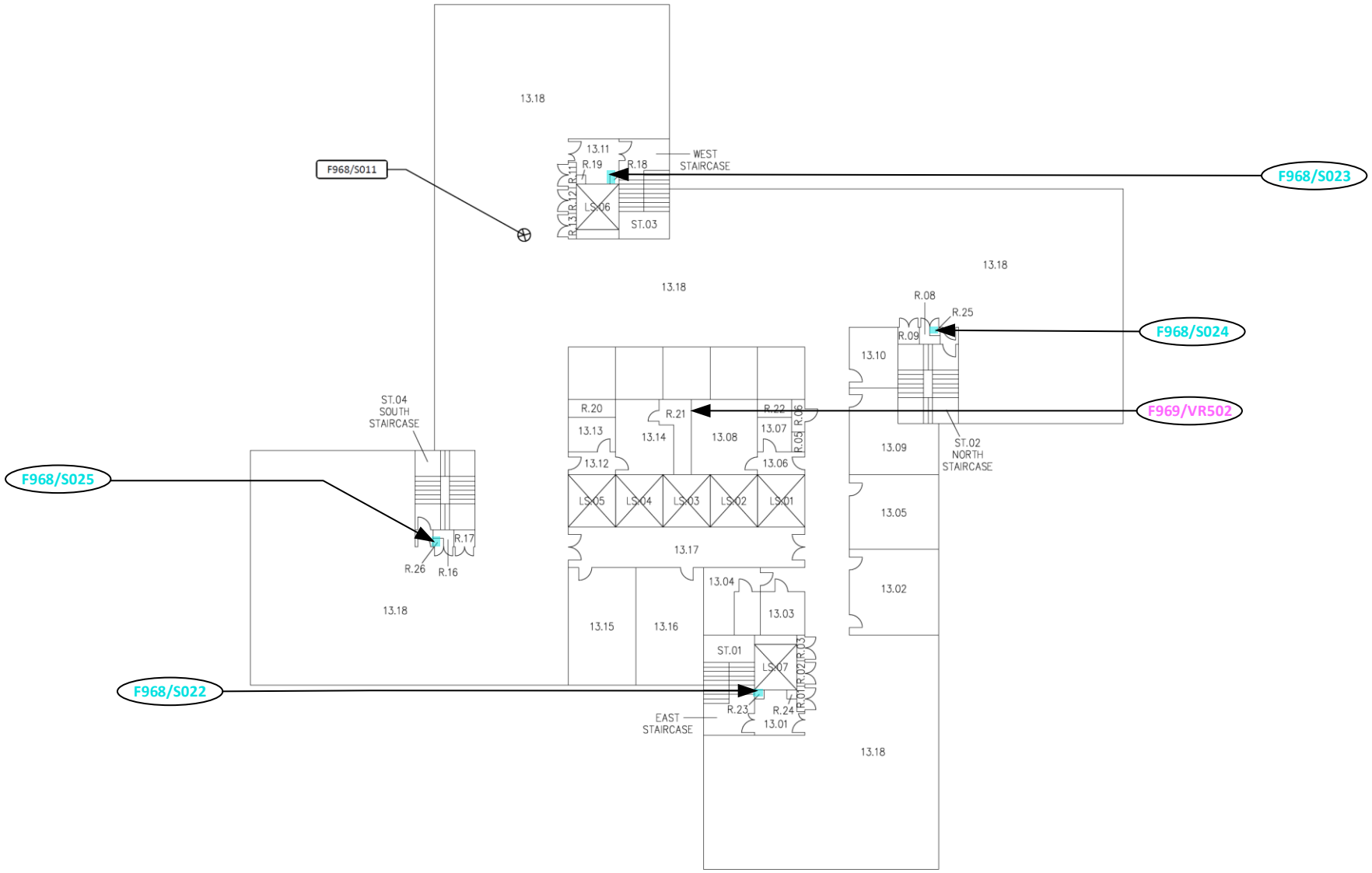
SITE:
EUSTON TOWER, EUSTON ROAD, REGENTS PLACE, NW1 3DP

TITLE:
TWELFTH FLOOR ASBESTOS SURVEY

rev	description	date

PROJECT #	FRSF968
SHEET #	04
DATE:	11.05.21

William Martin Compliance
MARLOWE Critical Services



LEGEND

- NO ACCESS
- SPRAY COATING, TEXTURED COATING, INSULATION, ROPE/CLOTH USED AS INSULATION
- ASBESTOS INSULATING BOARD
- CEMENT PRODUCTS
- BITUMINOUS PRODUCTS, VINYL PRODUCTS, REINFORCED PLASTICS, BONDED PRODUCTS, ROPE, GASKETS etc.
- EXTENT OF DEMOLITION/REFURBISHMENT SURVEY
- OUTSIDE SCOPE OF SURVEY
- F968/VRXXX — VISUAL REF. AND LOCATION
- F968/SXXX — SAMPLE No. AND LOCATION

CLIENT:
BRITISH LAND

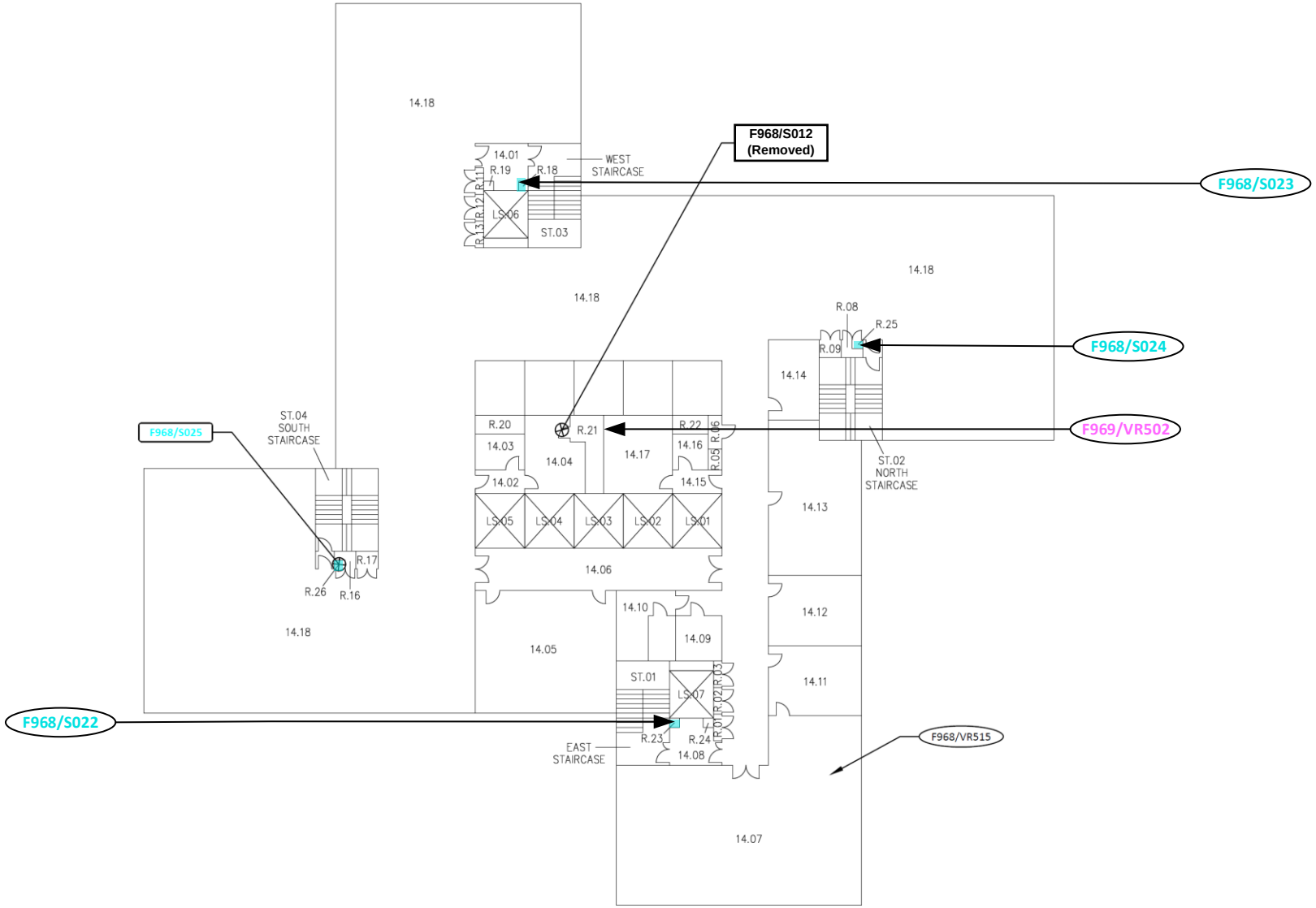
SITE:
EUSTON TOWER, EUSTON ROAD, REGENTS PLACE, NW1 3DP

TITLE:
THIRTEENTH FLOOR ASBESTOS SURVEY

rev	description	date

PROJECT #	FRSF968
SHEET #	05
DATE:	11.05.21

William Martin Compliance
MARLOWE Critical Services



LEGEND

- NO ACCESS
- SPRAY COATING, TEXTURED COATING, INSULATION, ROPE/CLOTH USED AS INSULATION
- ASBESTOS INSULATING BOARD
- CEMENT PRODUCTS
- BITUMINOUS PRODUCTS, VINYL PRODUCTS, REINFORCED PLASTICS, BONDED PRODUCTS, ROPE, GASKETS etc.
- EXTENT OF DEMOLITION/REFURBISHMENT SURVEY
- OUTSIDE SCOPE OF SURVEY
- F968/VRXXX — VISUAL REF. AND LOCATION
- F968/SXXX — SAMPLE No. AND LOCATION

CLIENT:
BRITISH LAND

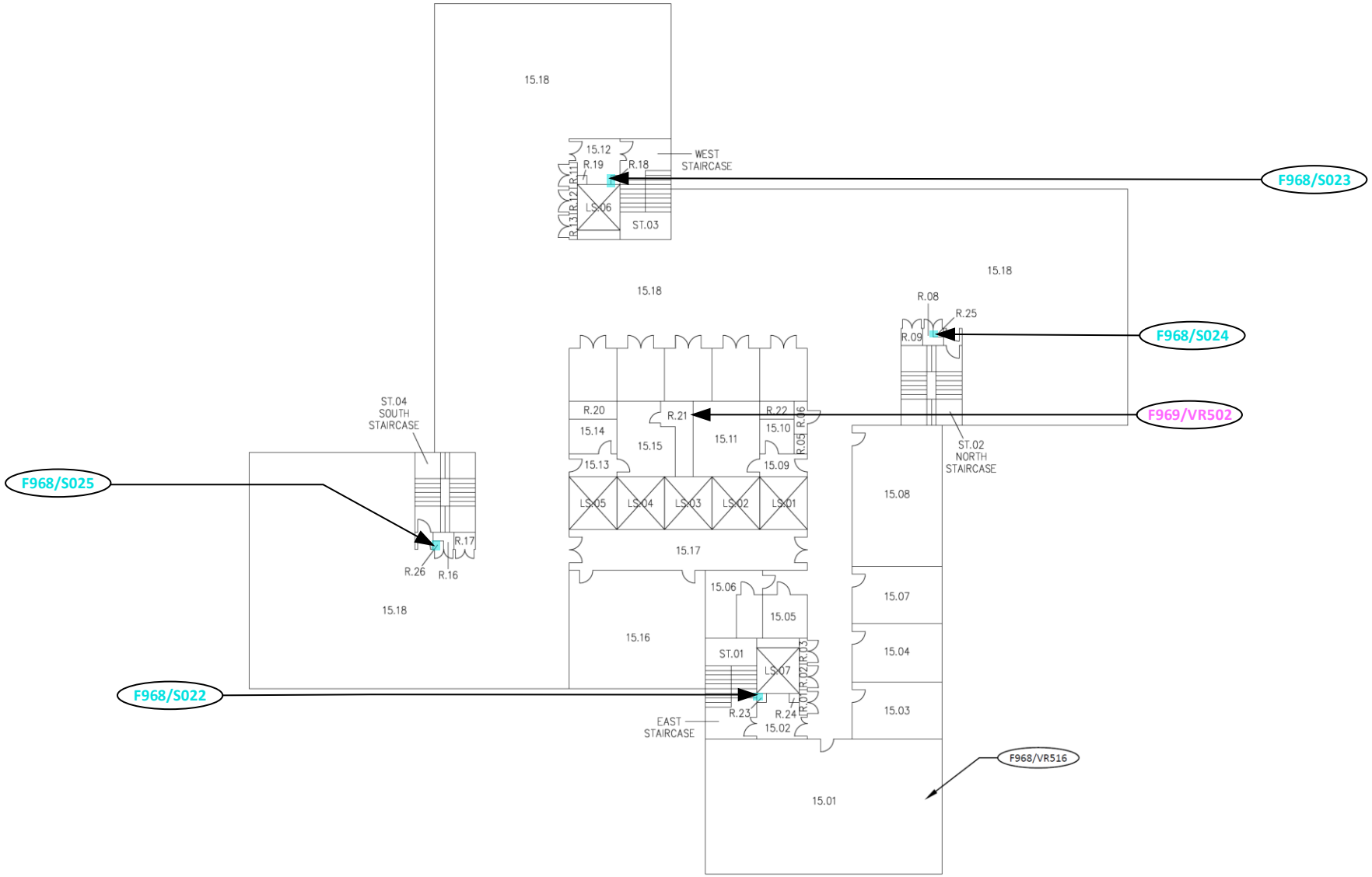
SITE:
EUSTON TOWER, EUSTON ROAD, REGENTS PLACE, NW1 3DP

TITLE:
FOURTEENTH FLOOR ASBESTOS SURVEY

rev	description	date

PROJECT #	FRSF968
SHEET #	06
DATE:	11.05.21

William Martin Compliance
MARLOWE Critical Services



LEGEND

- NO ACCESS
- SPRAY COATING, TEXTURED COATING, INSULATION, ROPE/CLOTH USED AS INSULATION
- ASBESTOS INSULATING BOARD
- CEMENT PRODUCTS
- BITUMINOUS PRODUCTS, VINYL PRODUCTS, REINFORCED PLASTICS, BONDED PRODUCTS, ROPE, GASKETS etc.
- EXTENT OF DEMOLITION/REFURBISHMENT SURVEY
- OUTSIDE SCOPE OF SURVEY
- F968/VRXXX — VISUAL REF. AND LOCATION
- F968/SXXX — SAMPLE No. AND LOCATION

CLIENT:
BRITISH LAND

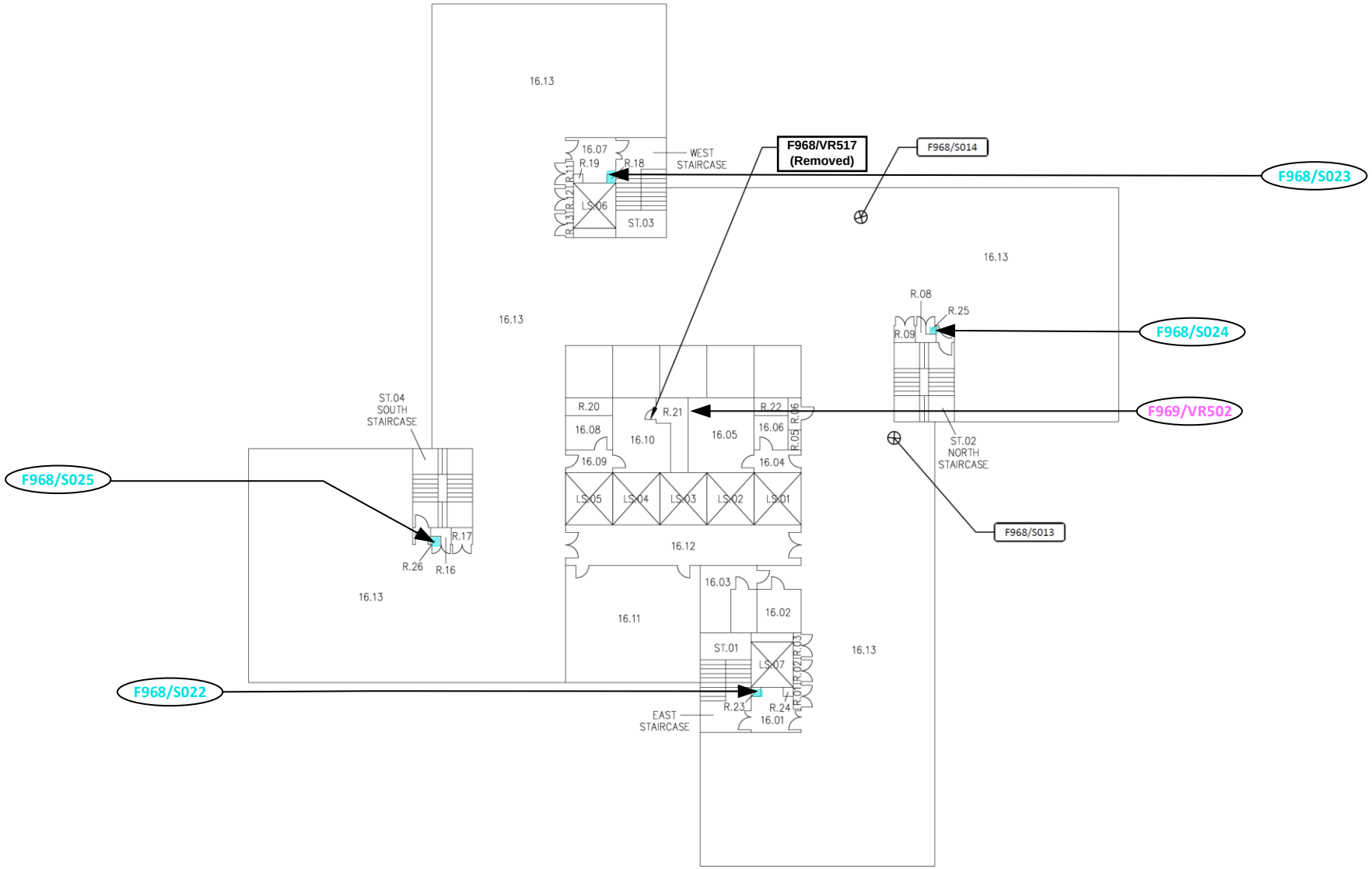
SITE:
EUSTON TOWER, EUSTON ROAD, REGENTS PLACE, NW1 3DP

TITLE:
FIFTEENTH FLOOR ASBESTOS SURVEY

rev	description	date

PROJECT #	FRSF968
SHEET #	07
DATE:	11.05.21

William Martin Compliance
MARLOWE Critical Services



LEGEND

- NO ACCESS
- SPRAY COATING, TEXTURED COATING, INSULATION, ROPE/CLOTH USED AS INSULATION
- ASBESTOS INSULATING BOARD
- CEMENT PRODUCTS
- BITUMINOUS PRODUCTS, VINYL PRODUCTS, REINFORCED PLASTICS, BONDED PRODUCTS, ROPE, GASKETS etc.
- EXTENT OF DEMOLITION/REFURBISHMENT SURVEY
- OUTSIDE SCOPE OF SURVEY
- F968/VRXXX — VISUAL REF. AND LOCATION
- F968/SXXX — SAMPLE No. AND LOCATION

CLIENT:
BRITISH LAND

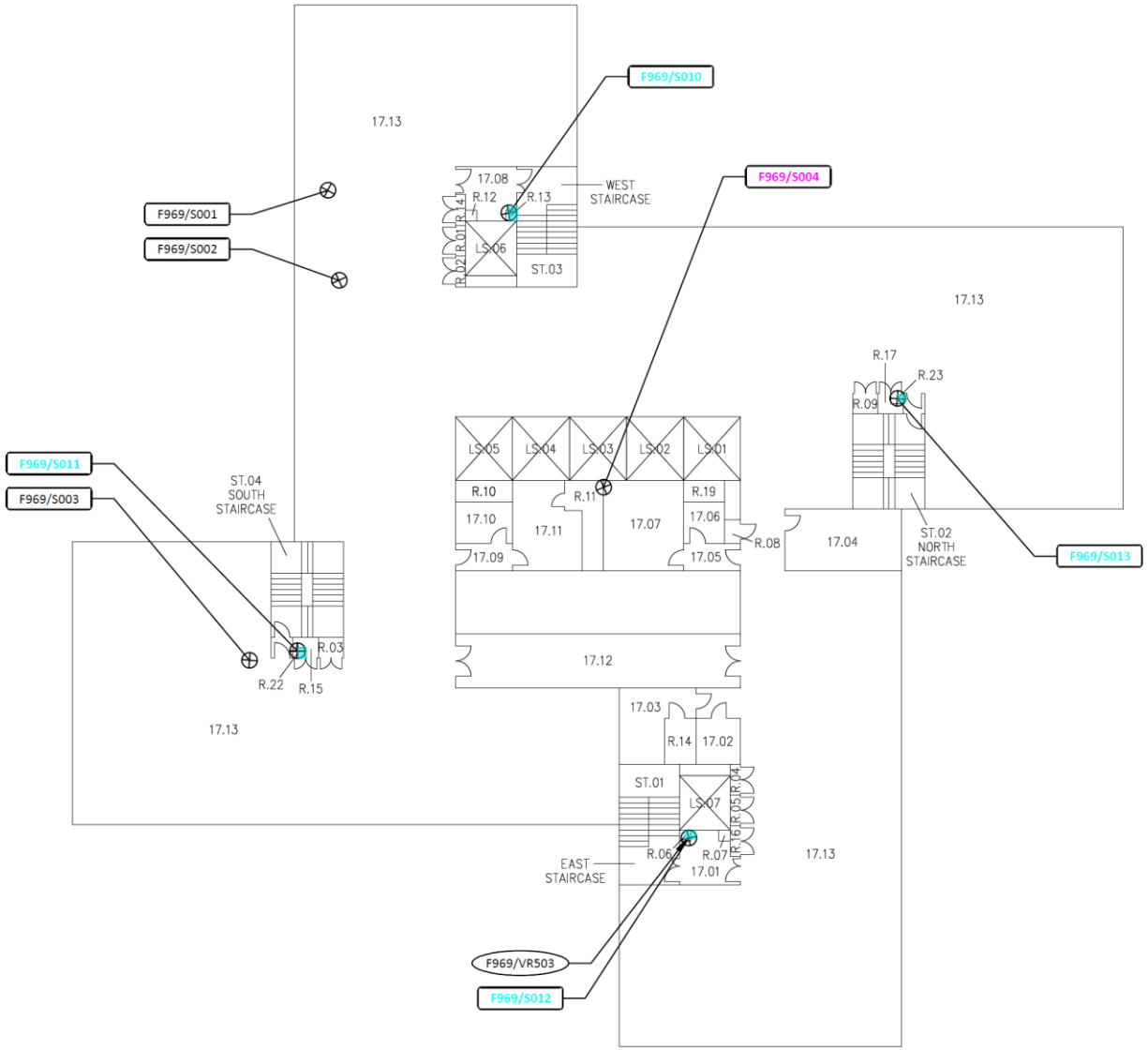
SITE:
EUSTON TOWER, EUSTON ROAD, REGENTS PLACE, NW1 3DP

TITLE:
SIXTEENTH FLOOR ASBESTOS SURVEY

rev	description	date

PROJECT #	FRSF968
SHEET #	08
DATE:	11.05.21

William Martin Compliance
MARLOWE Critical Services



LEGEND

- NO ACCESS
- SPRAY COATING, TEXTURED COATING, INSULATION, ROPE/CLOTH USED AS INSULATION
- ASBESTOS INSULATING BOARD
- CEMENT PRODUCTS
- BITUMINOUS PRODUCTS, VINYL PRODUCTS, REINFORCED PLASTICS, BONDED PRODUCTS, ROPE, GASKETS etc.
- EXTENT OF DEMOLITION/REFURBISHMENT SURVEY
- OUTSIDE SCOPE OF SURVEY
- F969/VRXXX — VISUAL REF. AND LOCATION
- F969/SXXX — SAMPLE No. AND LOCATION

CLIENT:
BRITISH LAND

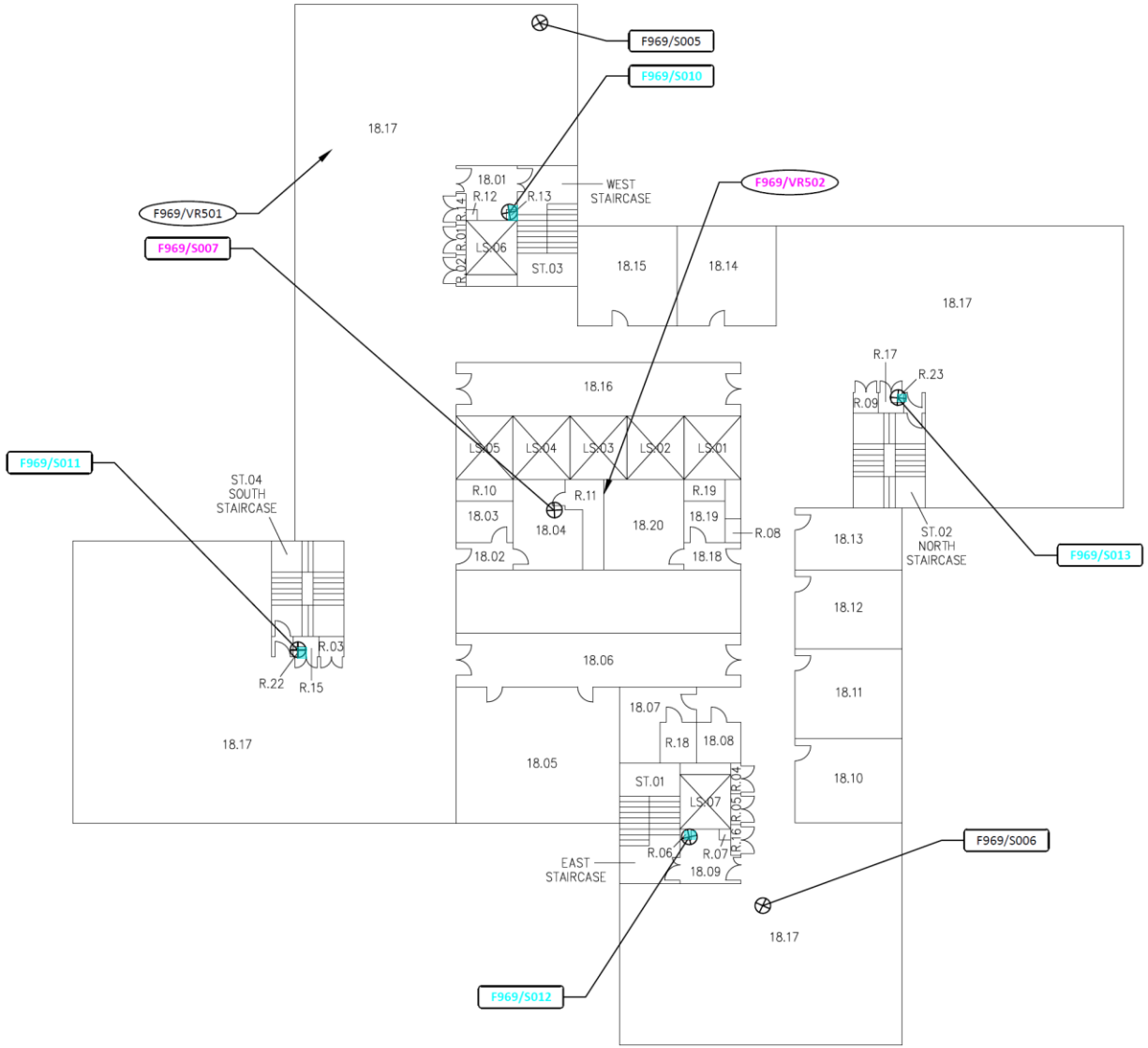
SITE:
EUSTON TOWER, EUSTON ROAD, REGENTS PLACE, NW1 3DP

TITLE:
SEVENTEENTH FLOOR ASBESTOS SURVEY

rev	description	date

PROJECT #	FRSF969
SHEET #	01
DATE:	23.05.21

William Martin Compliance
MARLOWE Critical Services



LEGEND

- NO ACCESS
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- ASBESTOS INSULATING BOARD
- CEMENT PRODUCTS
- BITUMINOUS PRODUCTS, VINYL PRODUCTS, REINFORCED PLASTICS, BONDED PRODUCTS, ROPE, GASKETS etc.
- EXTENT OF DEMOLITION/REFURBISHMENT SURVEY
- OUTSIDE SCOPE OF SURVEY
- F969/VRXXX — VISUAL REF. AND LOCATION
- F969/SXXX — SAMPLE No. AND LOCATION

CLIENT:
BRITISH LAND

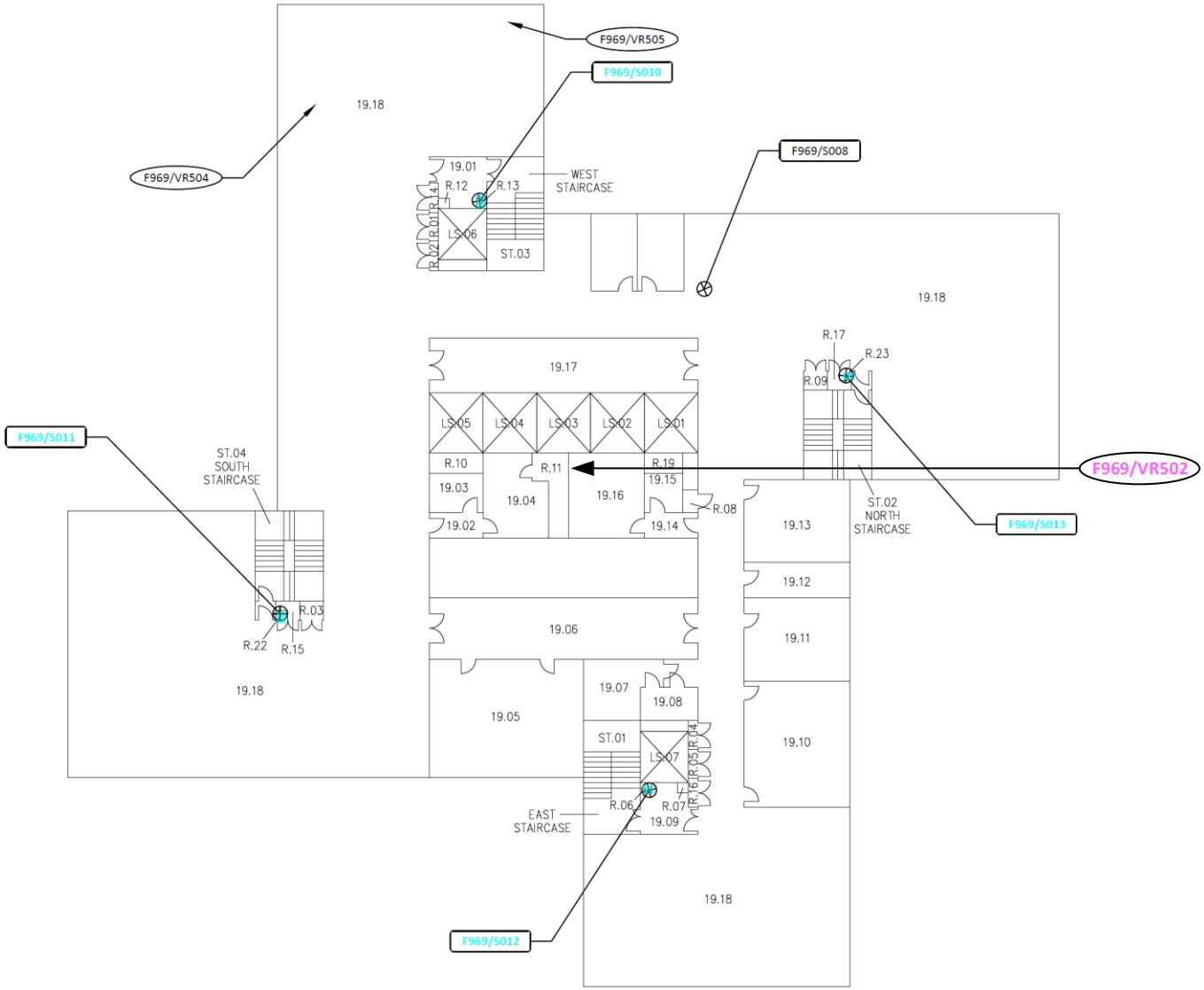
SITE:
EUSTON TOWER, EUSTON ROAD, REGENTS PLACE, NW1 3DP

TITLE:
EIGHTEENTH FLOOR ASBESTOS SURVEY

rev	description	date

PROJECT #	FRSF969
SHEET #	02
DATE:	23.05.21

William Martin Compliance
MARLOWE Critical Services



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- CEMENT PRODUCTS
- BITUMINOUS PRODUCTS, VINYL PRODUCTS, REINFORCED PLASTICS, BONDED PRODUCTS, ROPE, GASKETS etc.
- EXTENT OF DEMOLITION/REFURBISHMENT SURVEY
- OUTSIDE SCOPE OF SURVEY
- F969/VRXXX — VISUAL REF. AND LOCATION
- F969/SXXX — SAMPLE No. AND LOCATION

CLIENT:
BRITISH LAND

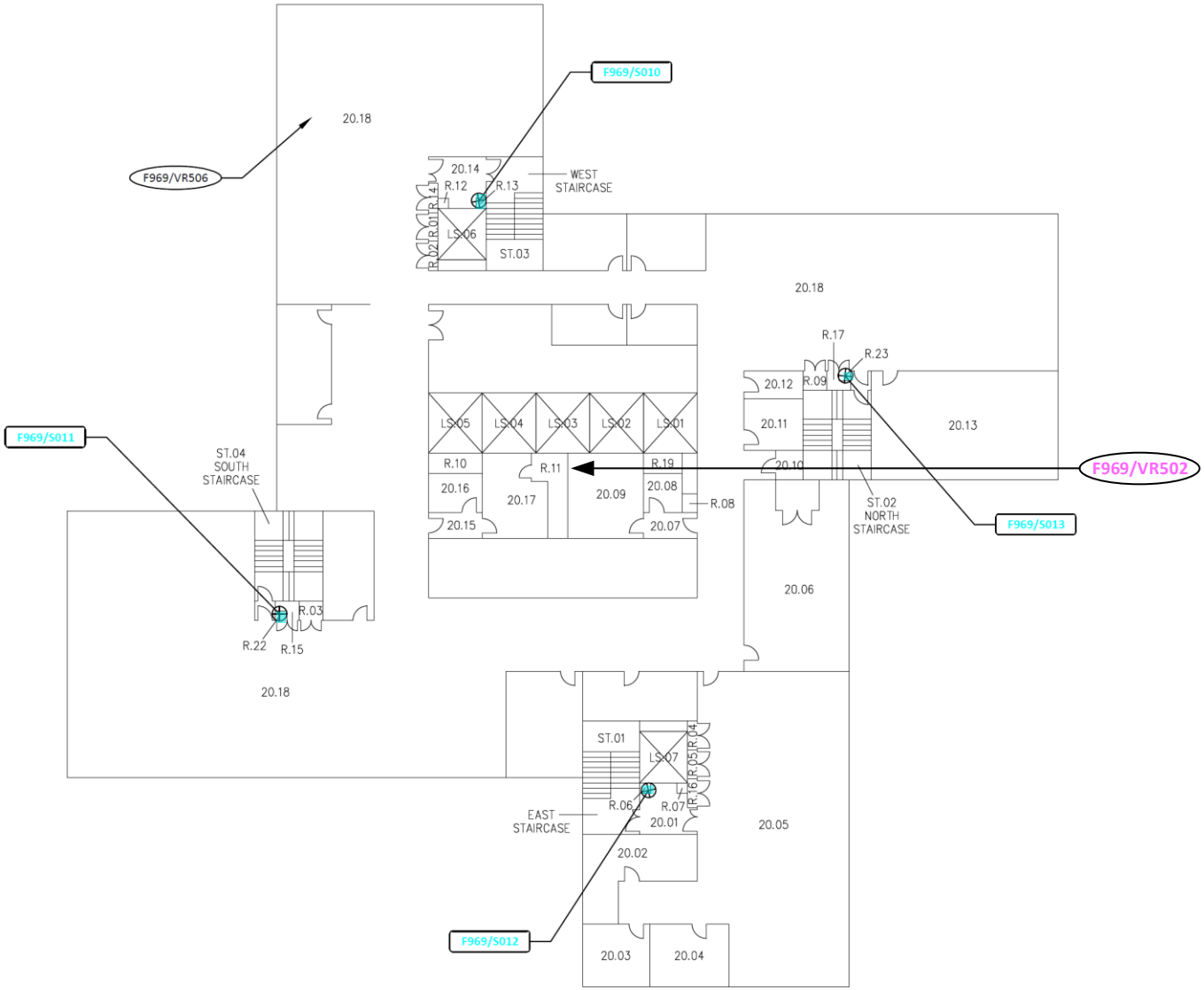
SITE:
EUSTON TOWER, EUSTON ROAD, REGENTS PLACE, NW1 3DP

TITLE:
NINETEENTH FLOOR ASBESTOS SURVEY

rev	description	date

PROJECT #	FRSF969
SHEET #	03
DATE:	23.05.21

William Martin Compliance
MARLOWE Critical Services



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- CEMENT PRODUCTS
- BITUMINOUS PRODUCTS, VINYL PRODUCTS, REINFORCED PLASTICS, BONDED PRODUCTS, ROPE, GASKETS etc.
- EXTENT OF DEMOLITION/REFURBISHMENT SURVEY
- OUTSIDE SCOPE OF SURVEY
- F969/VRXXX — VISUAL REF. AND LOCATION
- F969/SXXX — SAMPLE No. AND LOCATION

CLIENT:
BRITISH LAND

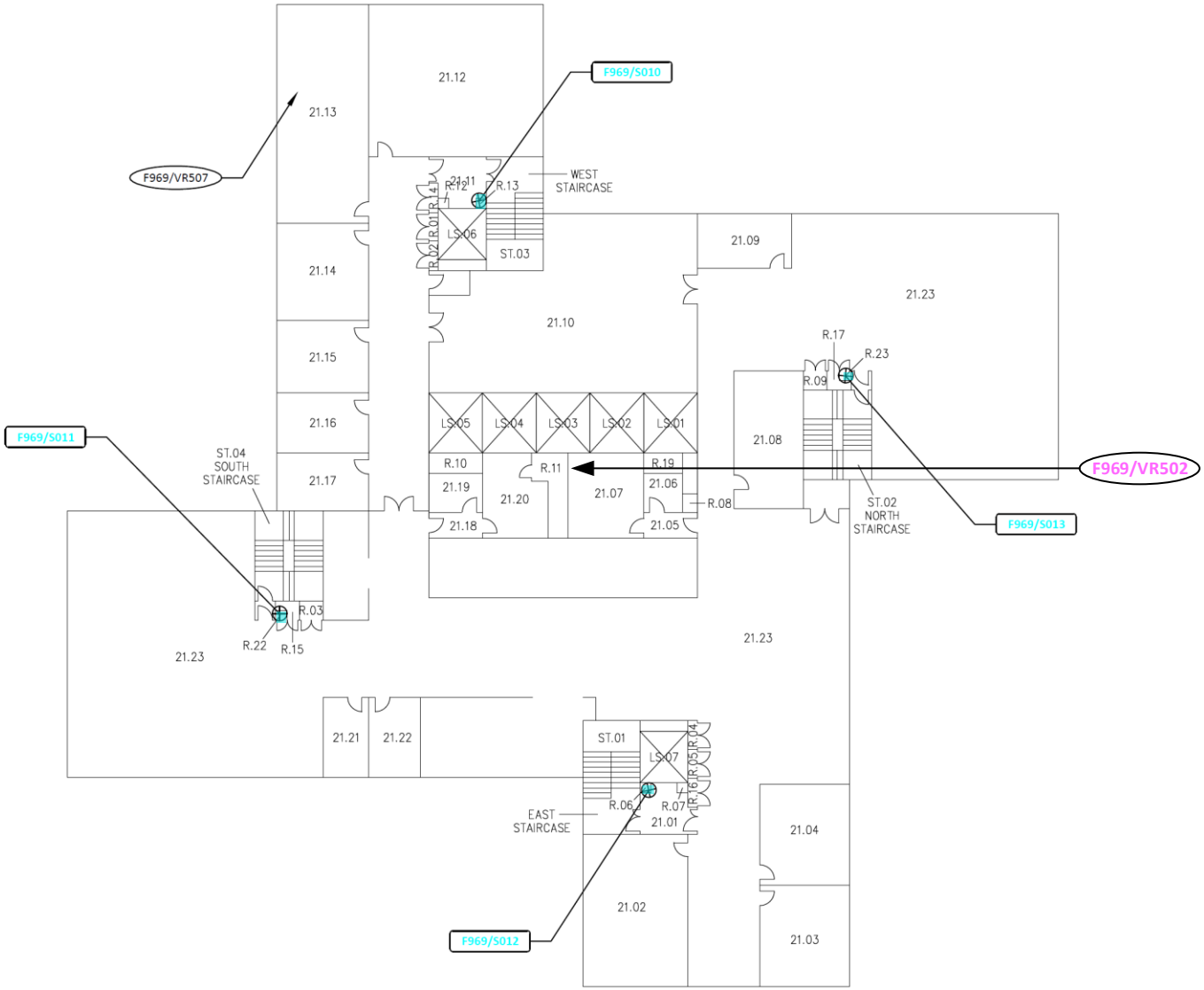
SITE:
EUSTON TOWER, EUSTON ROAD, REGENTS PLACE, NW1 3DP

TITLE:
TWENTIETH FLOOR ASBESTOS SURVEY

rev	description	date

PROJECT #	FRSF969
SHEET #	04
DATE:	23.05.21

William Martin Compliance
MARLOWE Critical Services



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- CEMENT PRODUCTS
- BITUMINOUS PRODUCTS, VINYL PRODUCTS, REINFORCED PLASTICS, BONDED PRODUCTS, ROPE, GASKETS etc.
- EXTENT OF DEMOLITION/REFURBISHMENT SURVEY
- OUTSIDE SCOPE OF SURVEY
- F969/VRXXX — VISUAL REF. AND LOCATION
- F969/SXXX — SAMPLE No. AND LOCATION

CLIENT:
BRITISH LAND

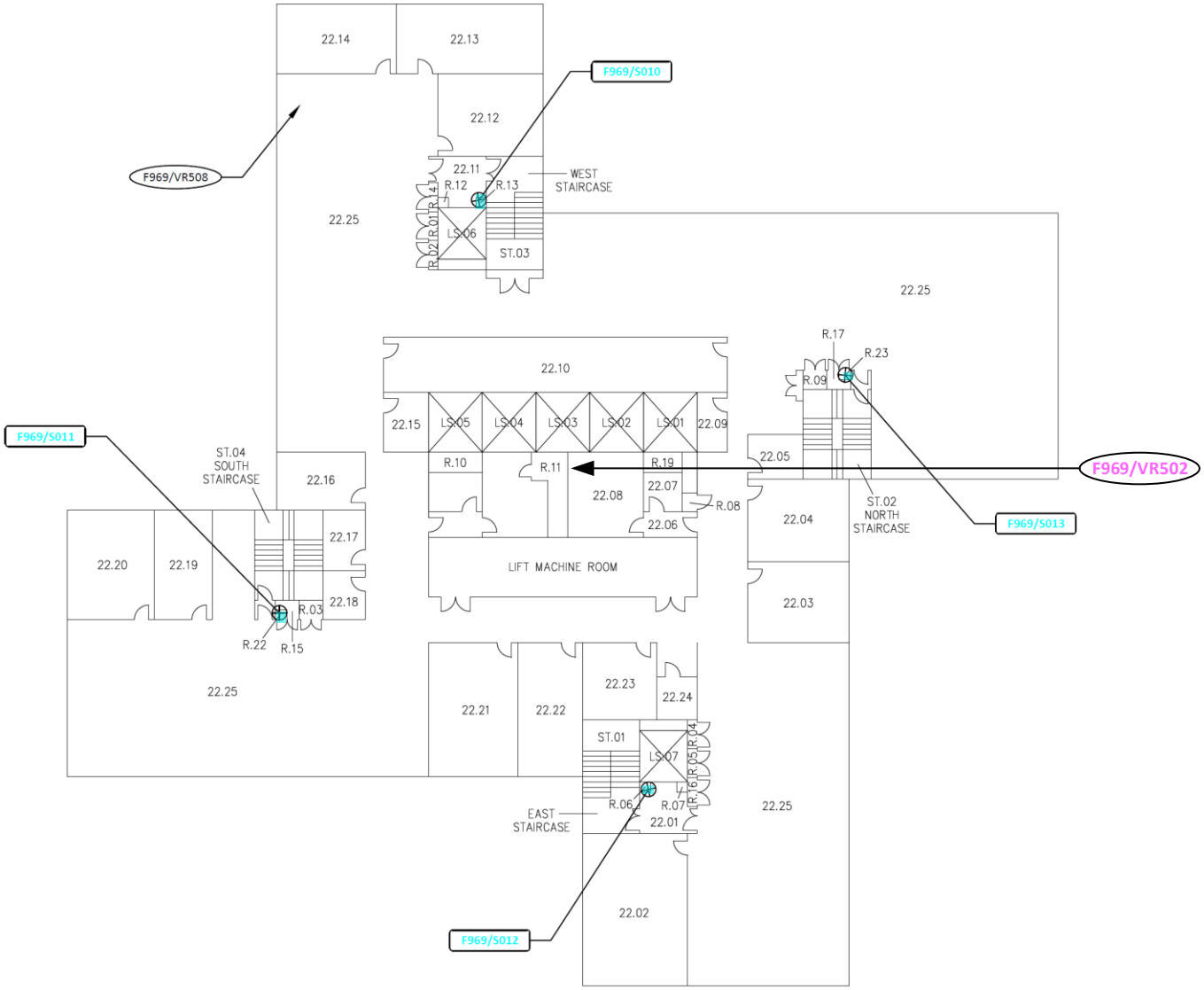
SITE:
EUSTON TOWER, EUSTON ROAD, REGENTS PLACE, NW1 3DP

TITLE:
TWENTY FIRST FLOOR ASBESTOS SURVEY

rev	description	date

PROJECT #	FRSF969
SHEET #	05
DATE:	23.05.21

William Martin Compliance
MARLOWE Critical Services



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- CEMENT PRODUCTS
- BITUMINOUS PRODUCTS, VINYL PRODUCTS, REINFORCED PLASTICS, BONDED PRODUCTS, ROPE, GASKETS etc.
- EXTENT OF DEMOLITION/REFURBISHMENT SURVEY
- OUTSIDE SCOPE OF SURVEY
- F969/VRXXX — VISUAL REF. AND LOCATION
- F969/SXXX — SAMPLE No. AND LOCATION

CLIENT:
BRITISH LAND

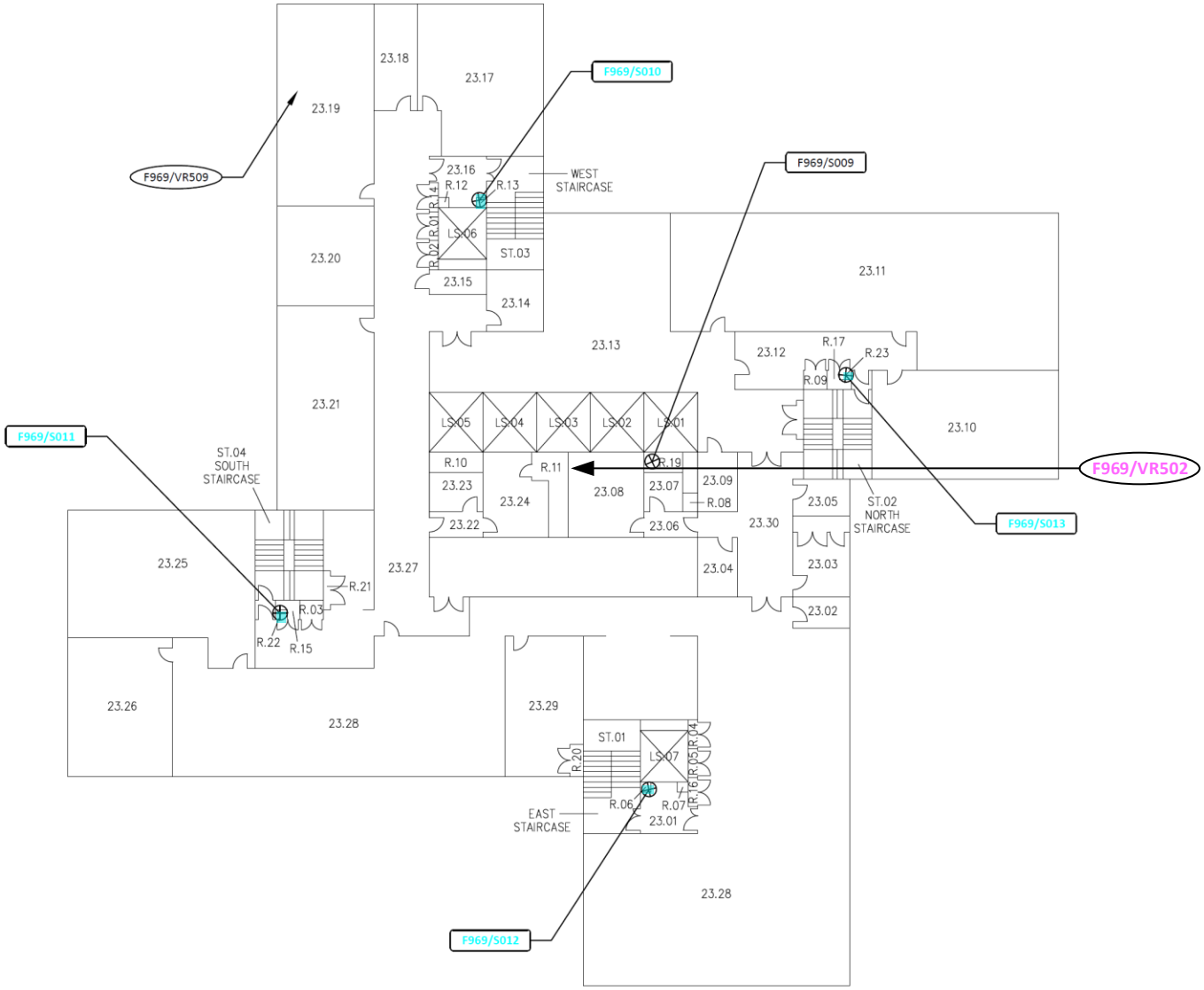
SITE:
EUSTON TOWER, EUSTON ROAD, REGENTS PLACE, NW1 3DP

TITLE:
TWENTY SECOND FLOOR ASBESTOS SURVEY

rev	description	date

PROJECT #	FRSF969
SHEET #	06
DATE:	23.05.21

William Martin Compliance
MARLOWE Critical Services



LEGEND

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- CEMENT PRODUCTS
- BITUMINOUS PRODUCTS, VINYL PRODUCTS, REINFORCED PLASTICS, BONDED PRODUCTS, ROPE, GASKETS etc.
- EXTENT OF DEMOLITION/REFURBISHMENT SURVEY
- OUTSIDE SCOPE OF SURVEY
- F969/VRXXX — VISUAL REF. AND LOCATION
- F969/SXXX — SAMPLE No. AND LOCATION

CLIENT:
BRITISH LAND

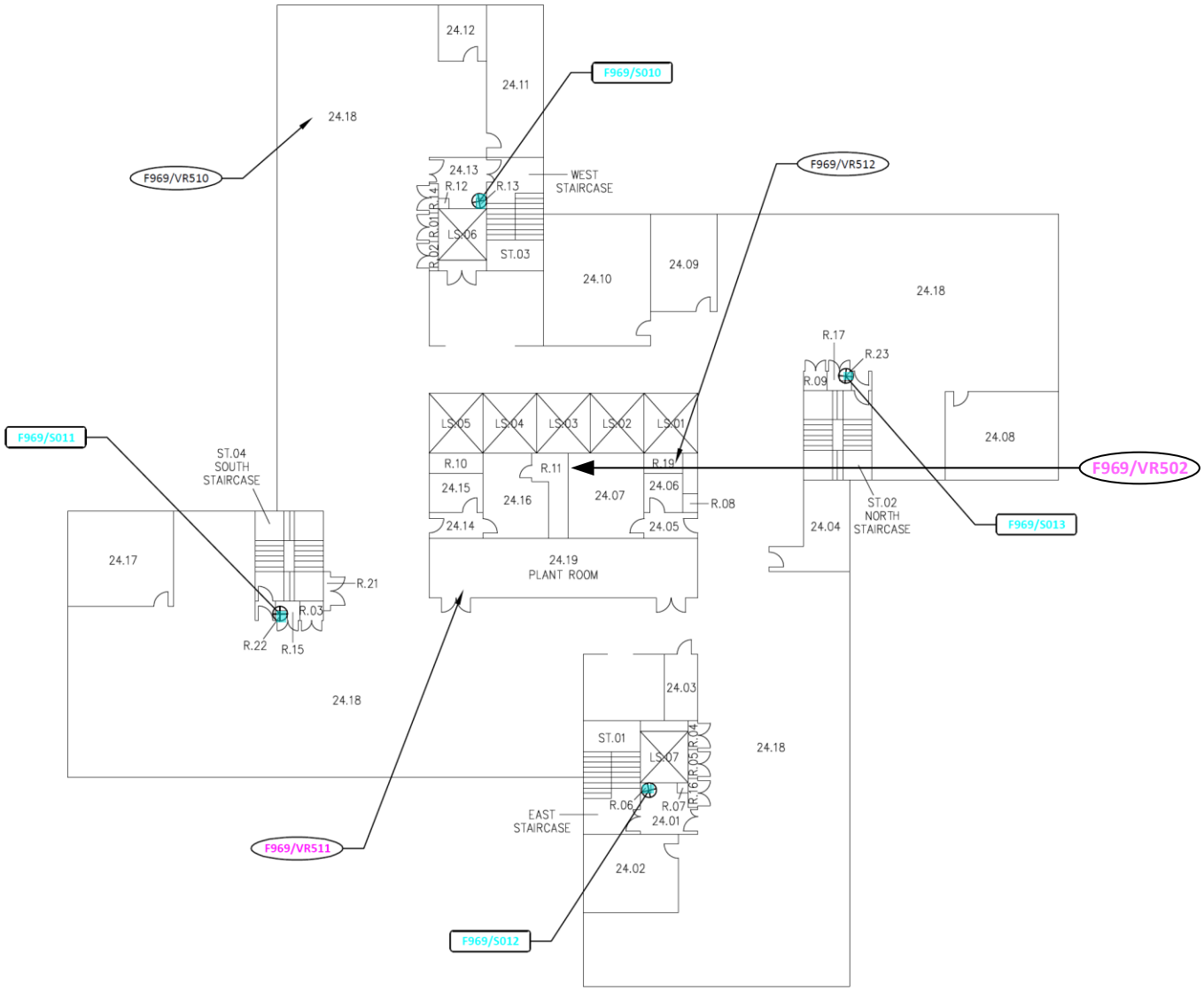
SITE:
EUSTON TOWER, EUSTON ROAD, REGENTS PLACE, NW1 3DP

TITLE:
TWENTY THIRD FLOOR ASBESTOS SURVEY

rev	description	date

PROJECT #	FRSF969
SHEET #	07
DATE:	23.05.21

William Martin Compliance
MARLOWE Critical Services



LEGEND

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- CEMENT PRODUCTS
- BITUMINOUS PRODUCTS, VINYL PRODUCTS, REINFORCED PLASTICS, BONDED PRODUCTS, ROPE, GASKETS etc.
- EXTENT OF DEMOLITION/REFURBISHMENT SURVEY
- OUTSIDE SCOPE OF SURVEY
- F969/VRXXX — VISUAL REF. AND LOCATION
- F969/SXXX — SAMPLE No. AND LOCATION

CLIENT:
BRITISH LAND

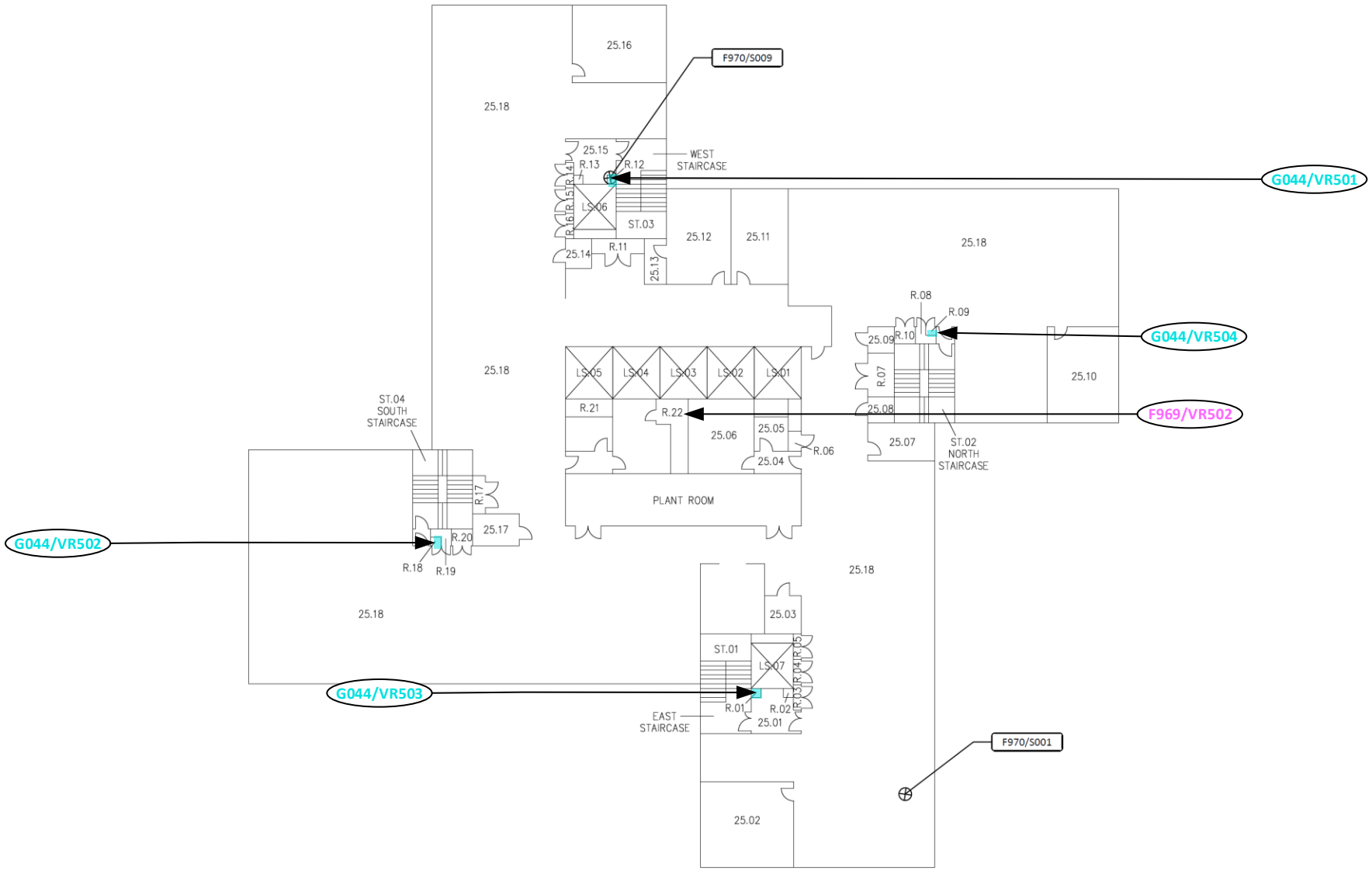
SITE:
EUSTON TOWER, EUSTON ROAD, REGENTS PLACE, NW1 3DP

TITLE:
TWENTY FOURTH FLOOR ASBESTOS SURVEY

rev	description	date

PROJECT #	FRSF969
SHEET #	08
DATE:	23.05.21

William Martin Compliance
MARLOWE Critical Services



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- OUTSIDE SCOPE OF SURVEY
- F970/VRXXX — VISUAL REF. AND LOCATION
- F970/SXXX — SAMPLE No. AND LOCATION

CLIENT:
BRITISH LAND

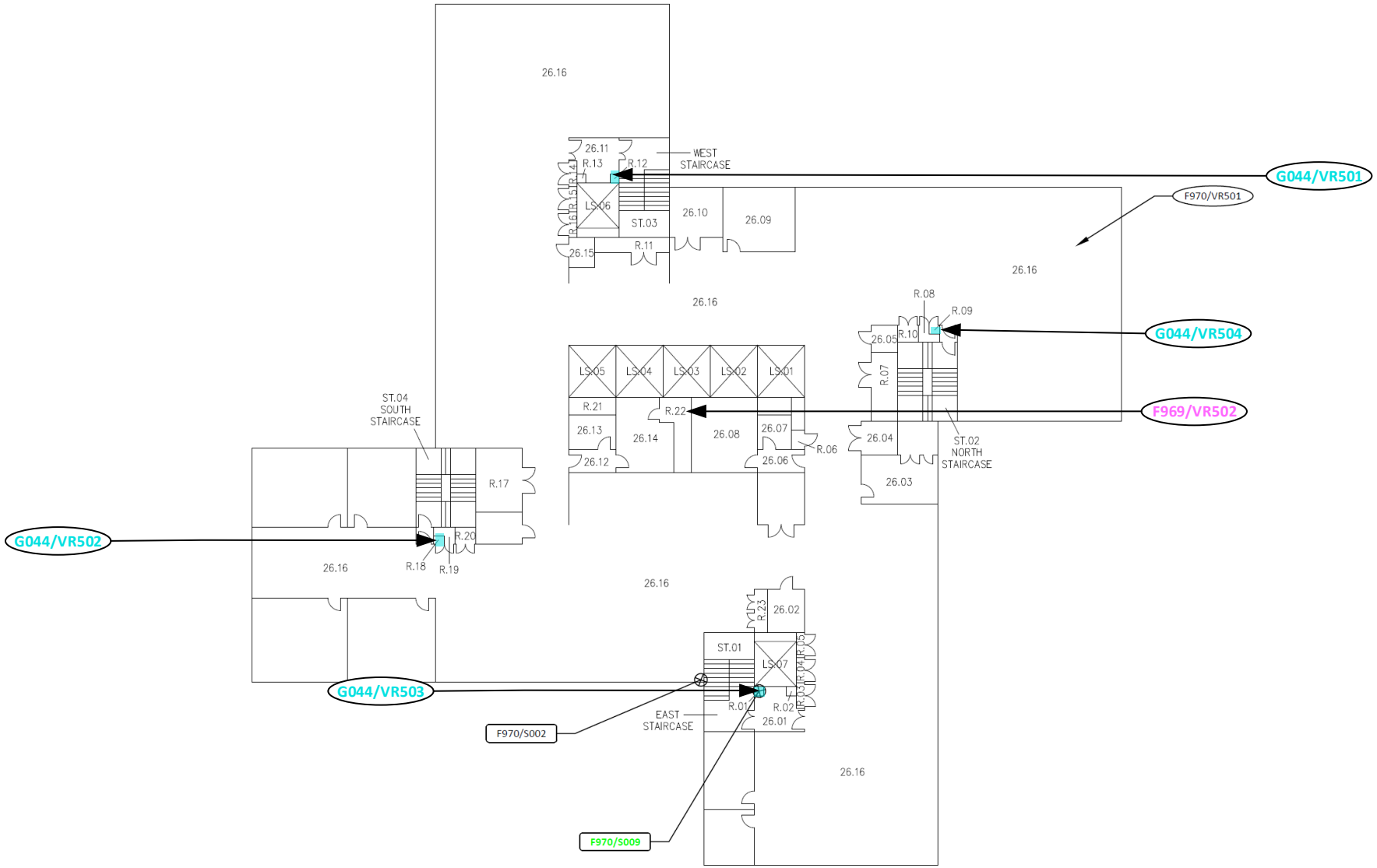
SITE:
EUSTON TOWER, EUSTON ROAD, REGENTS PLACE, NW1 3DP

TITLE:
25TH FLOOR
ASBESTOS SURVEY

rev	description	date

PROJECT #	FRSF970
SHEET #	01
DATE:	24.06.21

William Martin Compliance
MARLOWE Critical Services



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- CEMENT PRODUCTS
- BITUMINOUS PRODUCTS, VINYL PRODUCTS, REINFORCED PLASTICS, BONDED PRODUCTS, ROPE, GASKETS etc.
- EXTENT OF DEMOLITION/REFURBISHMENT SURVEY
- OUTSIDE SCOPE OF SURVEY
- F970/VRXXX — VISUAL REF. AND LOCATION
- F970/SXXX — SAMPLE No. AND LOCATION

CLIENT:
BRITISH LAND

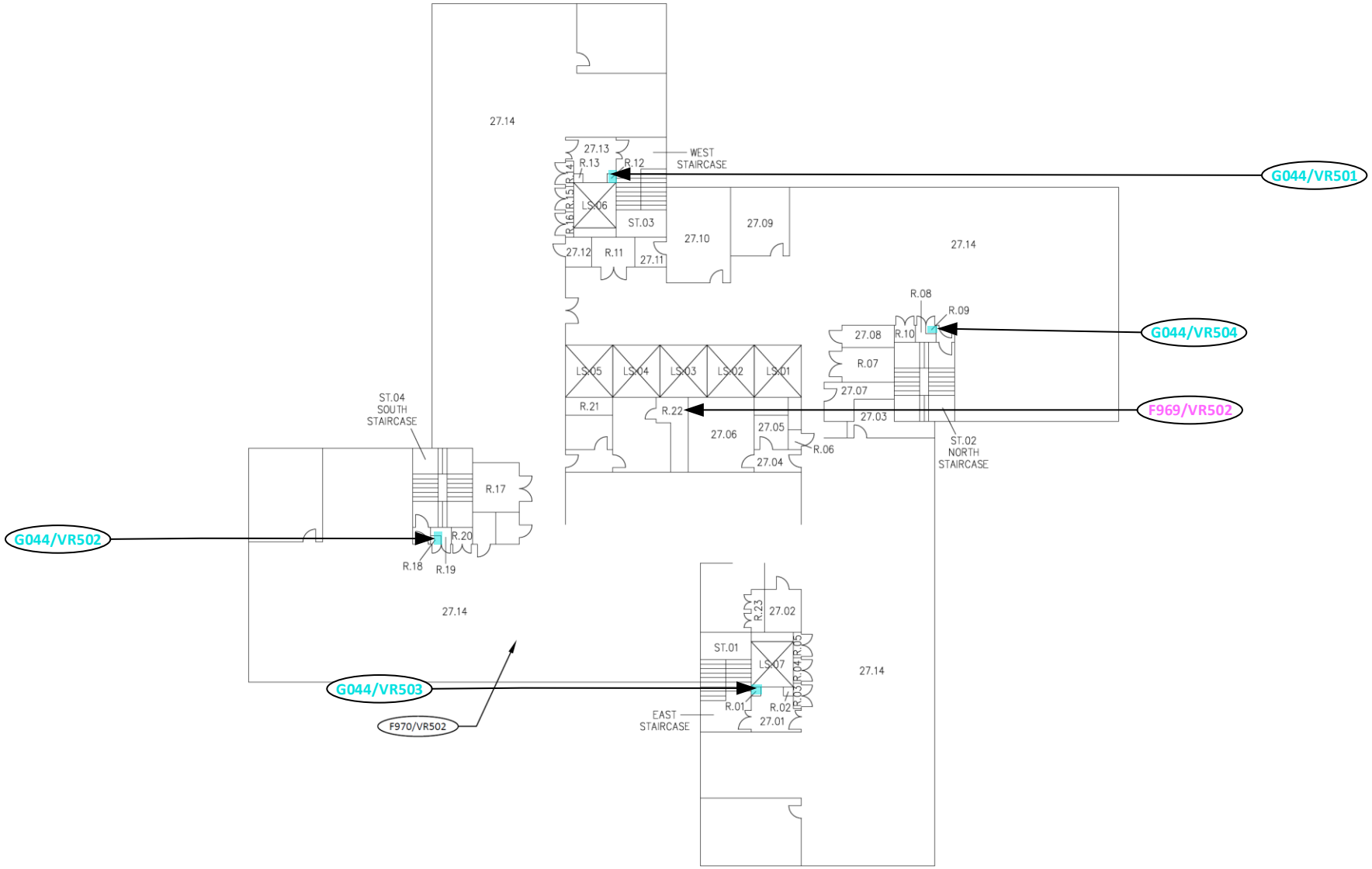
SITE:
EUSTON TOWER, EUSTON ROAD, REGENTS PLACE, NW1 3DP

TITLE:
26TH FLOOR
ASBESTOS SURVEY

rev	description	date

PROJECT #	FRSF970
SHEET #	02
DATE:	24.06.21

William Martin Compliance
MARLOWE Critical Services



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- CEMENT PRODUCTS
- BITUMINOUS PRODUCTS, VINYL PRODUCTS, REINFORCED PLASTICS, BONDED PRODUCTS, ROPE, GASKETS etc.
- EXTENT OF DEMOLITION/REFURBISHMENT SURVEY
- OUTSIDE SCOPE OF SURVEY
- F970/VRXXX — VISUAL REF. AND LOCATION
- F970/SXXX — SAMPLE No. AND LOCATION

CLIENT:
BRITISH LAND

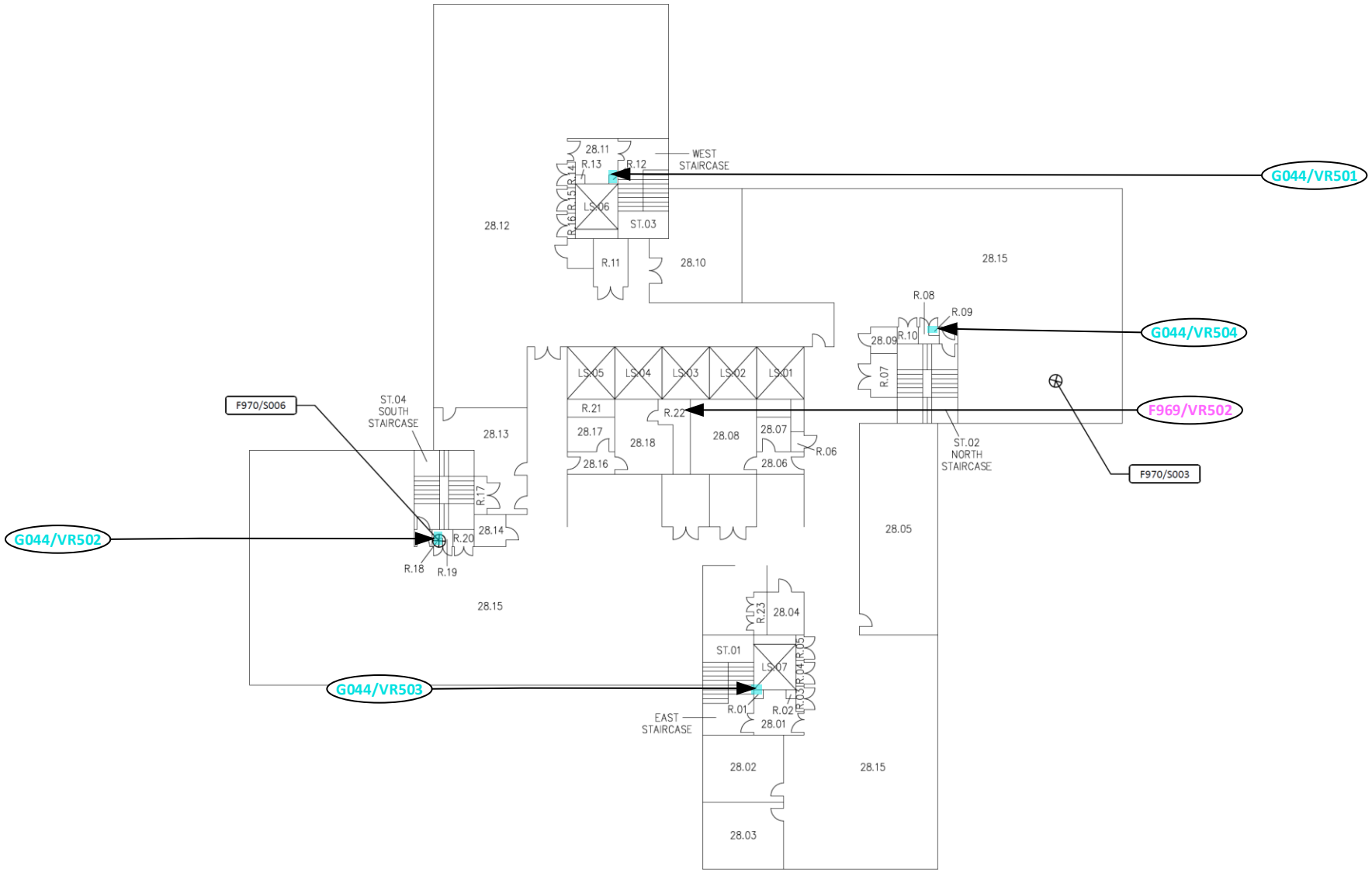
SITE:
EUSTON TOWER, EUSTON ROAD, REGENTS PLACE, NW1 3DP

TITLE:
27TH FLOOR
ASBESTOS SURVEY

rev	description	date

PROJECT #	FRSF970
SHEET #	03
DATE:	24.06.21

William Martin Compliance
MARLOWE Critical Services



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- BITUMINOUS PRODUCTS, VINYL PRODUCTS, REINFORCED PLASTICS, BONDED PRODUCTS, ROPE, GASKETS etc.
- EXTENT OF DEMOLITION/REFURBISHMENT SURVEY
- OUTSIDE SCOPE OF SURVEY
- F970/VRXXX — VISUAL REF. AND LOCATION
- F970/SXXX — SAMPLE No. AND LOCATION

CLIENT:
BRITISH LAND

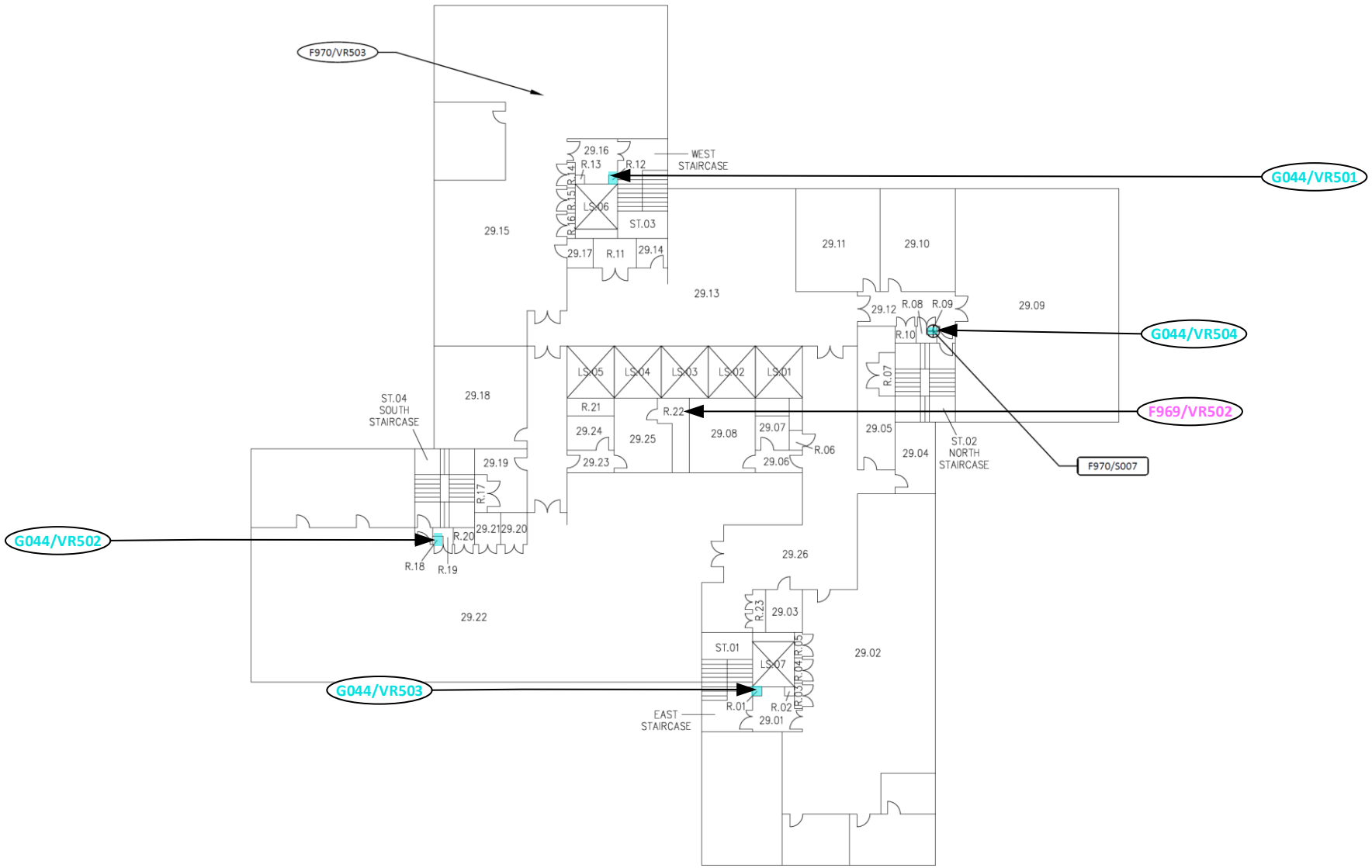
SITE:
EUSTON TOWER, EUSTON ROAD, REGENTS PLACE, NW1 3DP

TITLE:
28TH FLOOR
ASBESTOS SURVEY

rev	description	date

PROJECT #	FRSF970
SHEET #	04
DATE:	24.06.21

William Martin Compliance
MARLOWE Critical Services



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- BITUMINOUS PRODUCTS, VINYL PRODUCTS, REINFORCED PLASTICS, BONDED PRODUCTS, ROPE, GASKETS etc.
- EXTENT OF DEMOLITION/REFURBISHMENT SURVEY
- OUTSIDE SCOPE OF SURVEY
- F970/VRXXX — VISUAL REF. AND LOCATION
- F970/SXXX — SAMPLE No. AND LOCATION

CLIENT:
BRITISH LAND

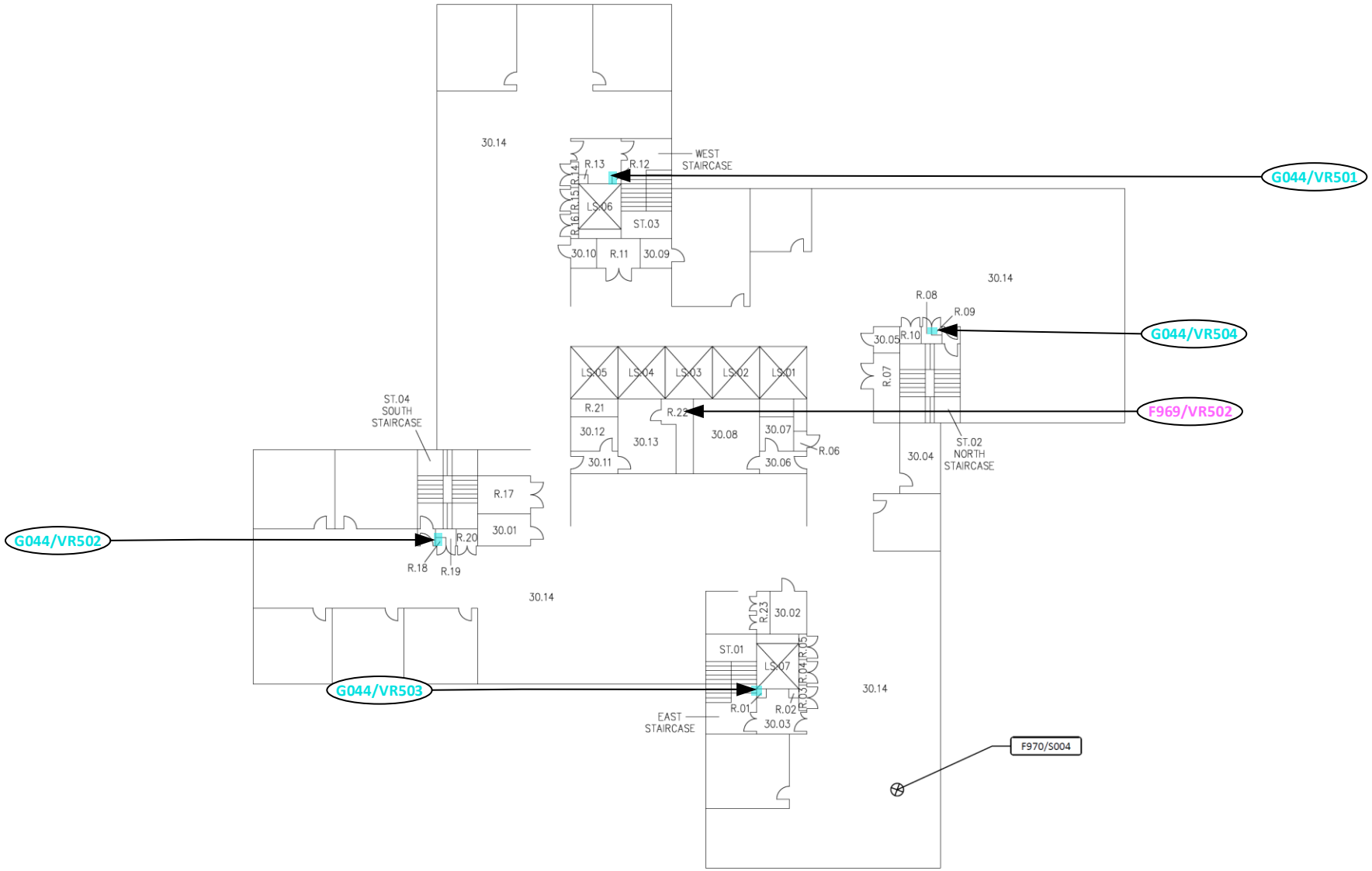
SITE:
EUSTON TOWER, EUSTON ROAD, REGENTS PLACE, NW1 3DP

TITLE:
29TH FLOOR
ASBESTOS SURVEY

rev	description	date

PROJECT #	FRSF970
SHEET #	05
DATE:	24.06.21

William Martin Compliance
MARLOWE Critical Services



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- BITUMINOUS PRODUCTS, VINYL PRODUCTS, REINFORCED PLASTICS, BONDED PRODUCTS, ROPE, GASKETS etc.
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- OUTSIDE SCOPE OF SURVEY
- F970/VRXXX — VISUAL REF. AND LOCATION
- F970/SXXX — SAMPLE No. AND LOCATION

CLIENT:
BRITISH LAND

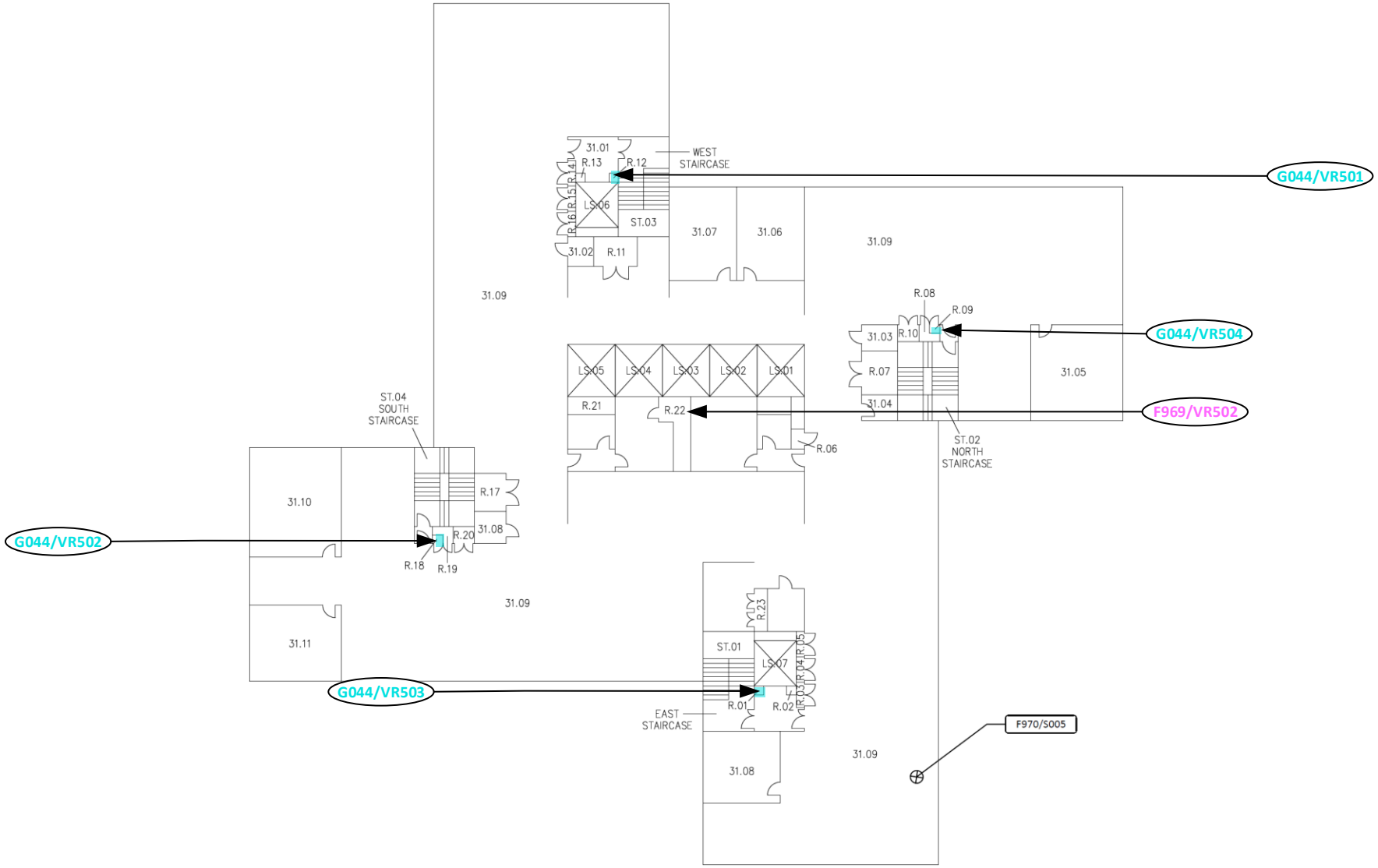
SITE:
EUSTON TOWER, EUSTON ROAD, REGENTS PLACE, NW1 3DP

TITLE:
30TH FLOOR
ASBESTOS SURVEY

rev	description	date

PROJECT #	FRSF970
SHEET #	06
DATE:	24.06.21

William Martin Compliance
MARLOWE Critical Services



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- BITUMINOUS PRODUCTS, VINYL PRODUCTS, REINFORCED PLASTICS, BONDED PRODUCTS, ROPE, GASKETS etc.
- EXTENT OF DEMOLITION/REFURBISHMENT SURVEY
- OUTSIDE SCOPE OF SURVEY
- F970/VRXXX — VISUAL REF. AND LOCATION
- F970/SXXX — SAMPLE No. AND LOCATION

rev	description	date

CLIENT: BRITISH LAND

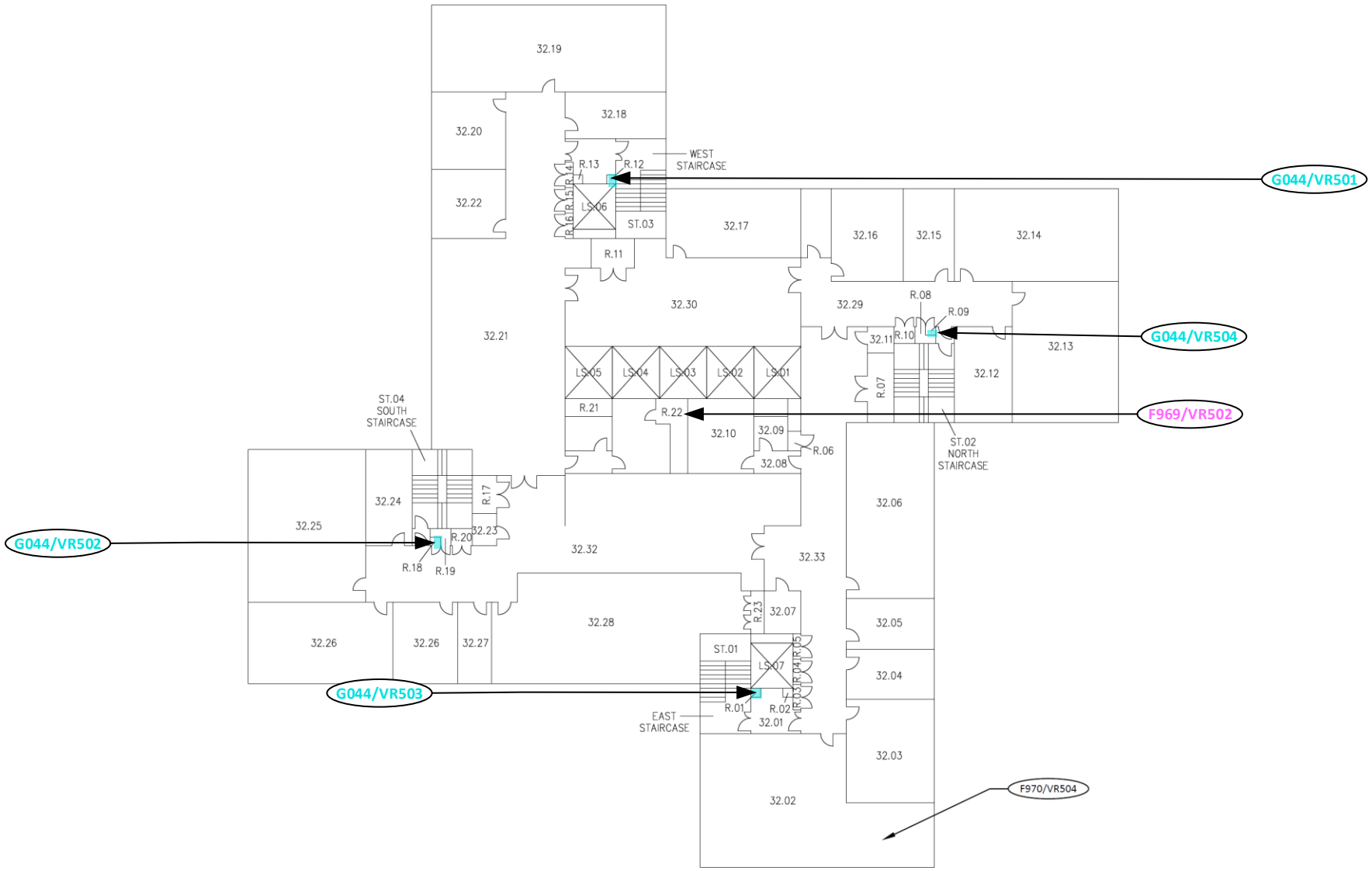
SITE: EUSTON TOWER, EUSTON ROAD, REGENTS PLACE, NW1 3DP

TITLE: 31ST FLOOR ASBESTOS SURVEY

PROJECT #	FRSF970
SHEET #	07
DATE:	24.06.21

William Martin Compliance

MARLOWE Critical Services



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- BITUMINOUS PRODUCTS, VINYL PRODUCTS, REINFORCED PLASTICS, BONDED PRODUCTS, ROPE, GASKETS etc.
- EXTENT OF DEMOLITION/REFURBISHMENT SURVEY
- OUTSIDE SCOPE OF SURVEY
- F970/VRXXX — VISUAL REF. AND LOCATION
- F970/SXXX — SAMPLE No. AND LOCATION

CLIENT:
BRITISH LAND

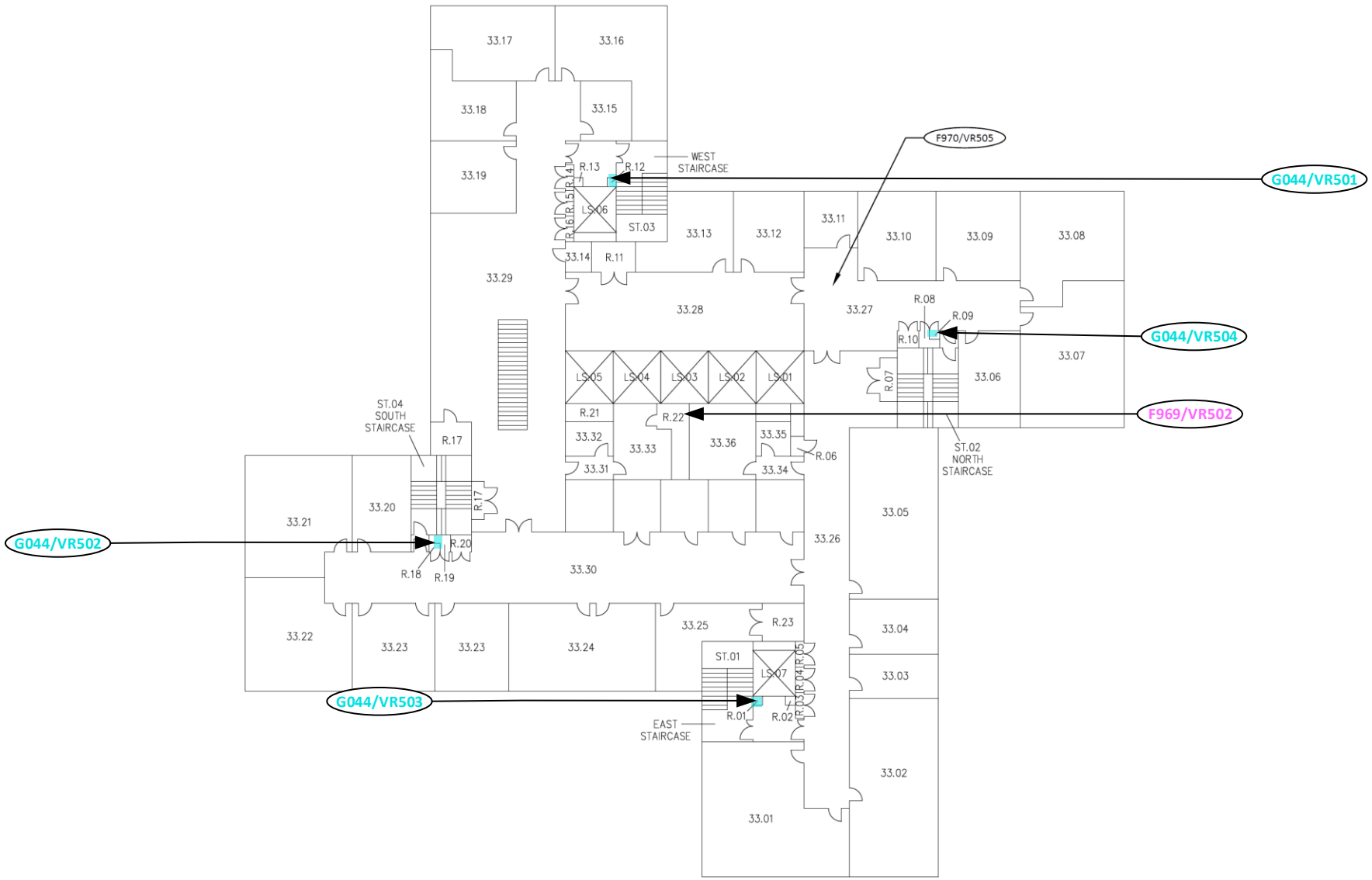
SITE:
EUSTON TOWER, EUSTON ROAD, REGENTS PLACE, NW1 3DP

TITLE:
32ND FLOOR
ASBESTOS SURVEY

rev	description	date

PROJECT #	FRSF970
SHEET #	08
DATE:	24.06.21

William Martin Compliance
MARLOWE Critical Services



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- EXTENT OF DEMOLITION/REFURBISHMENT SURVEY
- OUTSIDE SCOPE OF SURVEY
- F970/VRXXX — VISUAL REF. AND LOCATION
- F970/SXXX — SAMPLE No. AND LOCATION

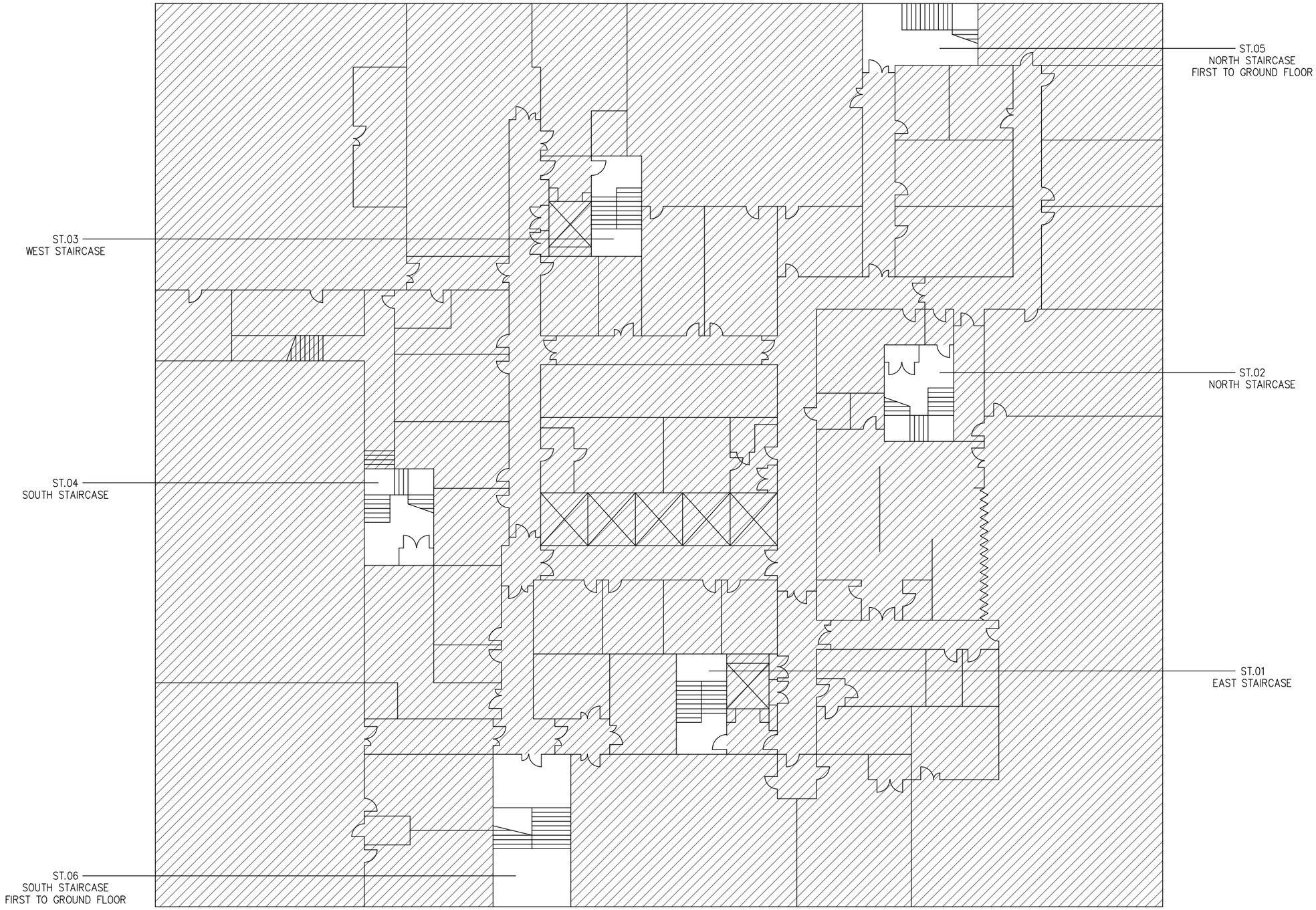
CLIENT:	SITE:	TITLE:
BRITISH LAND	EUSTON TOWER, EUSTON ROAD, REGENTS PLACE, NW1 3DP	33RD FLOOR ASBESTOS SURVEY

rev	description	date

PROJECT #	FRSF970
SHEET #	09
DATE:	24.06.21

William Martin Compliance

MARLOWE Critical Services



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- CEMENT PRODUCTS
- BITUMINOUS PRODUCTS, VINYL PRODUCTS, REINFORCED PLASTICS, BONDED PRODUCTS, ROPE, GASKETS etc.
- EXTENT OF DEMOLITION/REFURBISHMENT SURVEY
- OUTSIDE SCOPE OF SURVEY
- G033/VRXXX — VISUAL REF. AND LOCATION
- G033/SXXX — SAMPLE No. AND LOCATION

CLIENT:
BRITISH LAND

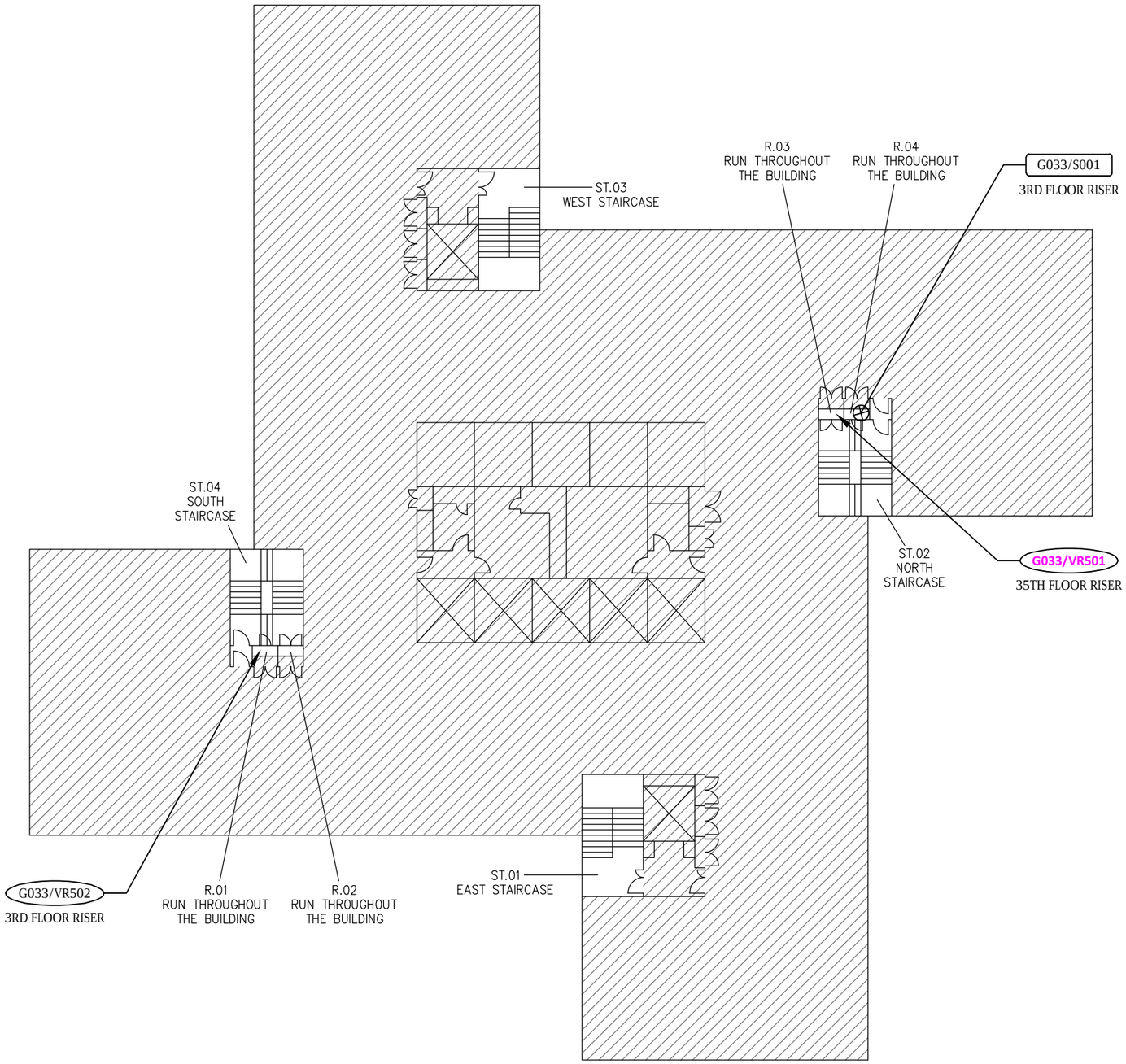
SITE:
EUSTON TOWER, EUSTON ROAD, REGENTS PLACE, NW1 3DP

TITLE:
GROUND - 36TH FLOORS
STAIR CORES & RISERS WITHIN STAIRS
ASBESTOS SURVEY

rev	description	date

PROJECT #	FRSG033
SHEET #	01
DATE:	24.06.21

William Martin Compliance
MARLOWE Critical Services



LEGEND

- NO ACCESS
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- ASBESTOS INSULATING BOARD
- CEMENT PRODUCTS
- BITUMINOUS PRODUCTS, VINYL PRODUCTS, REINFORCED PLASTICS, BONDED PRODUCTS, ROPE, GASKETS etc.
- EXTENT OF DEMOLITION/REFURBISHMENT SURVEY
- OUTSIDE SCOPE OF SURVEY
- G033/VRXXX — VISUAL REF. AND LOCATION
- G033/SXXX — SAMPLE No. AND LOCATION

CLIENT:
BRITISH LAND

rev	description	date

SITE:
EUSTON TOWER, EUSTON ROAD,
REGENTS PLACE, NW1 3DP

TITLE:
GROUND - 36TH FLOORS
STAIR CORES & RISERS WITHIN STAIRS
ASBESTOS SURVEY

PROJECT #	FRSG033
SHEET #	02
DATE:	24.06.21

William Martin Compliance
MARLOWE Critical Services

Section 8 – Certificates of Analysis

No samples were taken during this Reinspection.

Section 9

APPENDICIES

Appendix A - Methodology

Reinspection Objectives

The objective of this Reinspection was to;

- Locate and reinspect previously identified asbestos containing materials within the building. This will not involve destructive investigation.
- Produce a report for the client that is simple to understand and clearly shows the location and type of all presumed and identified ACMs.
- Highlight ACMs that could not be inspected by the surveyor; these are listed in Section 1.3. Arrangements should be made for these ACMs to be inspected as soon as reasonably practicable.
- To assign a risk level for all ACMs identified or presumed by using a simple algorithm as explained in HSG264. (Refer to Appendix B for more detail.)
- Where instructed by the client, collect samples of suspect materials for analysis. The results of which will be shown in Section 9 of this report. It is normal practice for surveyors to “Presume”, “Strongly Presume” or “Cross Reference”. These sample numbers will begin with either “P”, “SP” or “X” respectively.
- To provide recommendations for action that should be taken for any ACM found, taking into account algorithm score and the type of material. These recommendations can be found within the asbestos register in Section 3 and asbestos sample records in Section 5.

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Methodology

The general procedure is as follows:

- Client provides existing survey report/register
- Locate all existing and suspected ACMs using the register description, photographs and/or drawings
- Carry out new Material Assessments for each ACM
- When instructed to do so, carry out new Priority Assessment scoring

The existing survey report/register will ideally be a WMC report. However, on occasion, the client may provide a third-party report. In this case, the validity of the report will be assessed according to who carried out the survey, when it was carried out, if there is a defined scope, etc.

Prior to the Reinspection commencing, any weaknesses with the report will be brought to the attention of the client. If any weaknesses become apparent during the site work, these will also be reported to the client, who will be advised if a new Management Survey is required.

Each ACM reinspected will:

- Be inspected and verified as the original product type
- Have its description reviewed to ensure this is clear and unambiguous
- Have MA scores updated
- If requested, have PA scores updated
- Have the quantity confirmed
- Be photographed
- Have the location recorded on the drawing
- If the site has a labelling policy then labels will be checked
- Any sign of damage or deterioration will be noted and appropriate recommendation made

The surveyor shall work around the building in a logical manner and cause minimum disruption to occupants.

Any additional site records will be gathered using the Material Assessment. The existing report/register may also be used to make notes; the front page will be annotated with the Reinspection survey job number, the date, the surveyor's name and signature.

The Reinspection process may be similar to that of a Management Survey by way of access requirements to locate the ACM. This may have involved some minor intrusive work and making good and so not all ACM will be readily visible even after consulting the register description. The following areas may need to be checked in order to locate the ACM; under carpets, inside boxing, in floor voids, in ceiling voids, inside lofts/roofs, lagging residues in plant areas etc.

The original Management Survey may also have involved specialist access equipment for heights, or engineers for isolation of equipment, safety kit for confined spaces or other trades as such as a licensed contractor. All of these factors will be considered during the planning stages so the Reinspection survey can safely locate and inspect all ACM.

The building layout and use may have changed since the original survey, or areas may have been refurbished. This will also be considered as part of the survey planning.

Some ACMs may have been subject to remedial work since the original survey such as removal, encapsulation or physical protection, or debris may have been removed. This means surveyors may need to seek out hidden ACM within voids or behind boxing and the extent of the intrusion will vary between premises and will depend on what is reasonably practicable of each property.

At the conclusion of the survey, it is important that all ACMs have been accounted for, even if the comment is "missing" or "presumed removed" so that an updated report can be issued which assists the client with their "duty to manage" actions.

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Asbestos Quantities

This survey report should not be used for costing the removal of ACMs alone. While asbestos quantities are reported as accurately as possible, they are estimations only and should not be considered exact. Where asbestos removal is required, the asbestos removal contractor(s) should create a detailed plan of work and confirm any amounts and measurements independently. William Martin Compliance accept no responsibility for errors made in this respect.

Limitations, Exclusion and General Caveats

Every effort has been made to locate and inspect all asbestos materials previously identified so far as was reasonably practical to do so. Methods used to carry out the reinspection were agreed with the client prior to any works being commenced.

Techniques adopted by our trained and experienced surveyors involved the combined approach of visual examination (and bulk sampling where necessary). It is, however, possible that additional ACM may be discovered.

This could be due to various reasons:

- Materials may be hidden or obscured by other items or cover finishes i.e. over-boarding or items which are present behind existing ACM. Where this is the case then its detection will be impaired.

- Asbestos may well be hidden as part of the building structure and not visible until the structure is dismantled at a later date.

- Debris from previous asbestos removal projects may well be present in some areas; unless specifically required during the contract review stage ad hoc dust sampling does not form part of this survey, however, all reasonably practicable methods will have been taken to identify visible asbestos debris.

- It must be pointed out that asbestos removal techniques have improved steadily over the years since its introduction. Most notably would be the Control of Asbestos Regulations 2012 or subsequent regulations laying down certain enforceable guidelines. Asbestos removal prior to this regulation would not be to today's standard and therefore, debris may be present below new coverings.

- Access for the survey may be restricted for many reasons beyond our control such as height, inconvenience to others, immovable obstacles or confined space. Where electrical equipment is present and determined to be in the way of the surveyor, no access will be attempted until proof of its safe state is given. William Martin Compliance has a duty to our surveyors under the Health and Safety at Work Act 1974 and to others.

- Textured Coatings such as “Artex” may contain a trace quantity of asbestos. Due to this low asbestos content, applications of this product may be non-homogenous and may elicit both positive and negative samples. Where both positive and negative samples are obtained we recommend the client should presume that the textured coating contains asbestos throughout even though a non-detected result has been obtained, particularly where pattern (decorative style) and density are similar.

- Where a Reinspection is carried out under the guidance of the owner of the property, or his representative, then this will be as per their instructions and guidance at that time.

- For the reasons mentioned above, William Martin Compliance cannot accept any liability for loss, injury, damage or penalty issues due to errors or omissions within this report.

- This report is produced solely for the benefit of the instructing party and must be made available to all tradesmen and contractors that will have access to the building for any reason, so that they can take appropriate recommendations and/or actions to protect themselves.

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Appendix B - Material Risk Assessment Algorithm

An important part of the management of asbestos is the assessment for the potential of fibre release of each identified ACM. HSG264 describes a material assessment algorithm divided into four parameters with the scores for each then added together to give a final score:

- Product type (or debris from product)
- Extent of damage or deterioration
- The type of surface treatment (if any)
- The type of asbestos fibres found in the ACM

The total risk score from the Material Assessment determines the potential fibre release as follows:

Material Risk Score	Potential to release asbestos fibres
10 or more	**HIGH** potential to release fibres
7-9	**MEDIUM** potential to release fibres
5-6	**LOW** potential to release fibres
4 or less	**VERY LOW** potential to release fibres
Non-asbestos materials have no potential to release asbestos fibres.	

The HSG264 Material Risk Assessment Algorithm is shown overleaf.

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HSG264 Material Risk Assessment Algorithm

Sample Variable	Score	Examples of Scores
Product type (or debris from product).	1	Asbestos-reinforced composites (plastics, resins, mastics, roofing felts, vinyl floor tiles, semi-rigid paints or decorative finishes, asbestos cement etc).
	2	AIB, millboards, other low-density insulation boards, asbestos textiles, gaskets, ropes and woven textiles, asbestos paper and felt.
	3	Thermal insulation (e.g. pipe and boiler lagging), sprayed asbestos, loose asbestos, asbestos mattresses and packing.
Condition	0	Good condition: no visible damage.
	1	Low damage: a few scratches or surface marks, broken edges on boards, tiles etc.
	2	Medium damage: significant breakage of materials or several small areas where material has been damaged revealing loose asbestos fibres.
	3	High damage or delamination of materials, sprays and thermal insulation. Visible asbestos debris.
The type of surface treatment (if any).	0	Composite materials containing asbestos: reinforced plastics, resins, vinyl tiles.
	1	Enclosed sprays and lagging, AIB (with exposed face painted or encapsulated) asbestos cement sheets etc.
	2	Unsealed AIB, or encapsulated lagging and sprays.
	3	Unsealed lagging and sprays.
The type of asbestos fibres found in the ACM.	1	Chrysotile.
	2	Amphibole asbestos excluding Crocidolite.
	3	Crocidolite.

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Appendix C - Legal Requirements

Regulation 4 (The Duty to Manage) of The Control of Asbestos Regulations 2012, places an obligation on the dutyholder to;

- take reasonable steps to find ACM and check their condition
- make a written record of the location and condition and keep it up to date
- assess the risk of exposure
- prepare a plan to manage that risk

The Material Assessment which has been carried out as part of this survey identifies the materials that will most readily release airborne fibres if disturbed.

Furthermore, in order to comply fully with Regulation 4 and manage the asbestos risks effectively the dutyholder should develop an Asbestos Management Plan which addresses the following points;

- Keep and maintain an up to date record of the location, condition, maintenance and removal of all ACMs
- Repair, seal or remove asbestos if there is a risk of exposure
- Maintain asbestos in a good state of repair and regularly monitor the condition
- Inform anyone likely to disturb asbestos of its location and condition
- Have arrangements in place so that work which disturbs asbestos complies with CAR 2012
- Review the plan at regular intervals and update if circumstances change

William Martin Compliance are able to assist with developing the above documents should this be required.

The dutyholder must ensure that when any works are planned for this building that the contractor must be made fully aware of the content of this report, and informed that the building is of an age where additional ACMs may be encountered, which should be taken into account when preparing risk assessments and method statements for their work.

Any building work which goes beyond the scope of the original survey may require a more intrusive survey, such as a Refurbishment or Demolition Survey. These types of survey are used to locate and describe, as far as reasonably practicable, all ACM in the area where the refurbishment work will take place, or in the whole building if demolition is planned. A refurbishment or demolition survey may also be required in other circumstances, e.g. when more intrusive maintenance and repair work will be carried out or for plant removal, replacement or dismantling.

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Appendix D - Glossary of Terms

ACM	Asbestos Containing Material
CAR	The Control of Asbestos Regulations 2012
Amosite	'Brown' Asbestos
Chrysotile	'White' Asbestos
Crocidolite	'Blue' Asbestos
MMMF	Man Made Mineral Fibre
NAD	No Asbestos Detected
NNLW	Notifiable Non-Licensed Work
S	Sampled Material
X	Referenced Sample
P	Presumed
SP	Strongly Presumed
PPE	Personal Protective Equipment
RPE	Respiratory Protective Equipment
WMC	William Martin Compliance

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ASBESTOS IDENTIFICATION TEST REPORT

Analytical Report Number : J077816

Number of samples: : 7

Sample submitted by : William Martin Compliance Limited

Client reference : Q-81144 - Euston Tower, Regents Place Estate, NW1 3HF

Sample received on : 23rd November 2022

Samples analysed on : 24th November 2022

Analysed by: : Ben Pillay

Authorised By:

:

Ben Pillay
(Bulk Analyst)
For & on behalf of Vintec Laboratories Ltd.

Report Issue Number:	Report issued on	Notes/Comments:
1	24 November 2022	Original report

The analysis of samples submitted for asbestos identification is undertaken using polarised light microscopy in conjunction with dispersion staining techniques in accordance with our documented in house procedure P053 and HSG248. Asbestos is defined in the Control of Asbestos Regulations 2012 as any of the following naturally occurring fibrous silicate minerals : Crocidolite, Amosite, Chrysotile, Actinolite, Anthophyllite and Tremolite. Most commonly found are the following: CROCIDOLITE (Blue Asbestos), AMOSITE (Brown Asbestos) and CHRYSOTILE (White Asbestos). Those contemplating any form of work involving asbestos should refer to the Approved Code of Practice published by the Health & Safety Executive. Vintec stores samples for six months following date of reporting unless instructed otherwise. Certificates of analysis are retained on file for six years.Vintec offers no guarantee of the accuracy of reported sample locations as supplied with sample by clients. Sampling conducted by clients falls outside the scope of our bulk sampling accreditation. Where samples are not taken by Vintec surveyors, the sample descriptions and details remain the responsibility of the client. The results apply to the sample as received. Where samples are taken by Vintec surveyors and included in a survey report, the version number on the test report is as per main survery report.

In certain types of sample where very small quantities of asbestos may be present we advise on the possibility of unidentified and unreported asbestos being present in trace quantity, however small. We advise this principally in relation to textured paint samples, sometimes referred to by the trade name 'artex', thermoplastic floor tiles or linoleum, and bitumen based samples including roofing felts, acoustic pads etc. This uncertainty arises from the fact that analysis is normally based on the treatment and examination of a small proportion of the supplied sample, which leaves open the possibility that small traces may remain unreported. Where only one or two fibres or fibre bundles have been identified within a sample, this will be reported as 'trace asbestos identified'.

The above results relate only to the items submitted for testing. This report should not be reproduced except in full, without the written approval of the laboratory. Any opinions and interpretations indicated are outside the scope of UKAS accreditation.

Analytical Report Number : J077816
Client : William Martin Compliance Limited
Client Reference : Q-81144 - Euston Tower, Regents Place Estate
Report Issue Number : 1

Vintec Reference	Client Reference	Sample Description	Asbestos Content	Comments
BS097171	S001	32nd Floor Open Plan Area (Adjacent South Staircase) - Fibreboard to ceiling	No Asbestos Detected	
BS097172	S002	32nd Floor Open Plan Area (Adjacent South Staircase) - Textured Coating to Concrete Ceiling Slab	No Asbestos Detected	
BS097173	S003	32nd Floor Open Plan Area (Adjacent South Staircase) - Textured Coating to Concrete Ceiling Slab	No Asbestos Detected	
BS097174	S004	32nd Floor Open Plan Area (Adjacent North Staircase) - Textured Coating to Concrete Ceiling Slab	No Asbestos Detected	
BS097175	S005	16th Floor Open Plan Area (Adjacent North Staircase) - Mastic Residue To Concrete Ceiling Slab	No Asbestos Detected	
BS097176	S006	16th Floor Open Plan Area (Adjacent South Staircase) -Textured Coating To Concrete Ceiling Slab	No Asbestos Detected	
BS097177	S007	7th Floor Open Plan Area - Sprayed Coating To Concrete Ceiling Slab	No Asbestos Detected	

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Dilapidation Report

Site: **Euston Tower**
Address: **Regents Place, Euston Road, London**
Date: **02/11/2021**
Engineer(s): **Sam Noakes, Ben Spink**

Introduction

We have been asked to carry out investigation works into the current state of the system and rectify faults where possible. The System is a 10 panel Gent Sentri/SMS network in a 38-storey building which is being stripped back to shell & core with no occupied areas except for the retail units on the ground floor –all of which have their own systems.

System particulars

Manufacturer	**Gent By Honneywell**
Protocol	**SMS/Sentri**
Design Category	**Unknown**
Floors	**Basement, Ground, L1-35 & Roof**
Number of Nodes	**9 panels + 1 Network Node**
Number of Loops (in use)	**34**
Number of Devices	**2040**
Number of Faults On Arrival	**617**
Cable Type	**MICC 2L1.5 (90%), FP200 Gold 2c+e 1.5 (10%)**
Device Age	**Circa 10 Years**

System layout

Upon interrogation of the device list extracted from the fire alarm panels, it is evident that each floor is on its own loop with very few exceptions. As the system has evidently been converted froman old 4 wire conventional system, the stair cores are all on their own individual loops across nodes8&9. All PA/VA outputs are also on their own loops fed by node 2.

The layout of the fire alarm's infrastructure differs throughout the building. O&M information foundin the engineering office on level 35 suggests that there was a refurbishment project c.2002 on levels21 upwards. On these floors there is a junction box per floor for fire alarm loops and PA/VA A&B circuits in the south core comms riser, it is at this point that we can easily disconnect the field wiring to each floor whilst leaving the core areas unaffected leaving a connection point available should the intention be to re-fit those floors after the strip out is complete at a later date.

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On all tenant floors from 1-20, the cabling appears to come in and out of the old short circuit isolator enclosures left over from the pre-existing conventional fire alarm system indicating that the cabling has been re-used and would therefore be from the 1995 refurbishment in the best case but could possibly be older than that. Again, as with the upper floors, it will be possible to isolate the field wiring and leave the core areas unaffected.

On each floor there is a central toilet core with fire detection and voice alarm devices installed, we have been asked to keep these live but to do so would entail rewiring them on most floors as the cables have been damaged going in/out of the toilet area. Coupled with the fact that the intention is for the building to remain unoccupied or be refurbished completely.

Summary of faults

The vast majority of the faults are missing devices and short circuits which appear to have been caused by old pyro cabling failing. The system has been heavily modified through the years leaving the system unstable and virtually impossible for cable monitoring, due to the amount of junction boxes and radial circuits.

The number of faults has been greatly reduced by running the loops up to the problem devices as radials and disregarding the faulty devices and cabling in between. Repair of the MICC circuits would not be possible due to the age and level of disruption that the cables have already endured thus far, these would need to be identified leg by leg and replaced in FP or circuits replaced entirely. This would also leave potential for issues in the future.

In summary the faults are mainly caused by disruption to the current state of the existing cabling. In my opinion the cabling through out site is beyond repair.

The system is derived from an old conventional system and has been adapted through out the years to create an addressable system, inclusive of loop isolators which are designed to cut the circuits when any form of short circuit is presented onto the loop.

Please see below for photos of the current state of the fire system through out.

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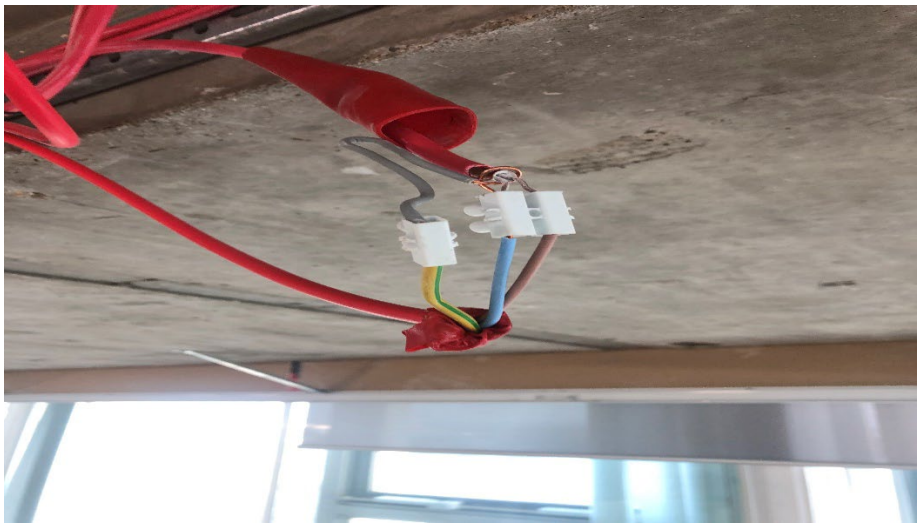
Damaged pyro causing short circuit on level 32



Pyro joint causing short circuit due to earth link touching both pairs

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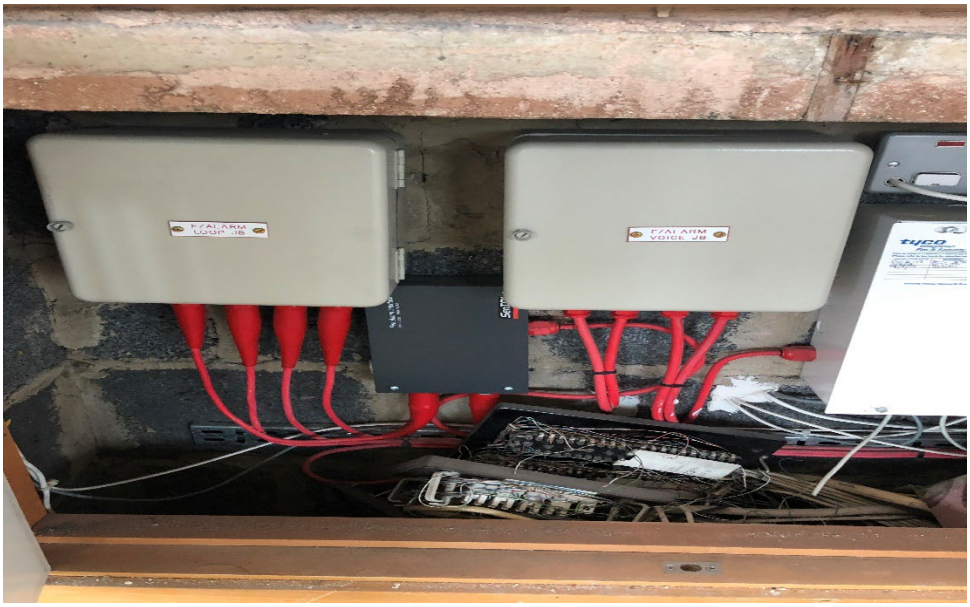

Joint boxes for both VA/FA located in risers from levels 21 – 34, loops could be strip back to these risers.

Multiple joint boxes and old zone isolators across all floors.

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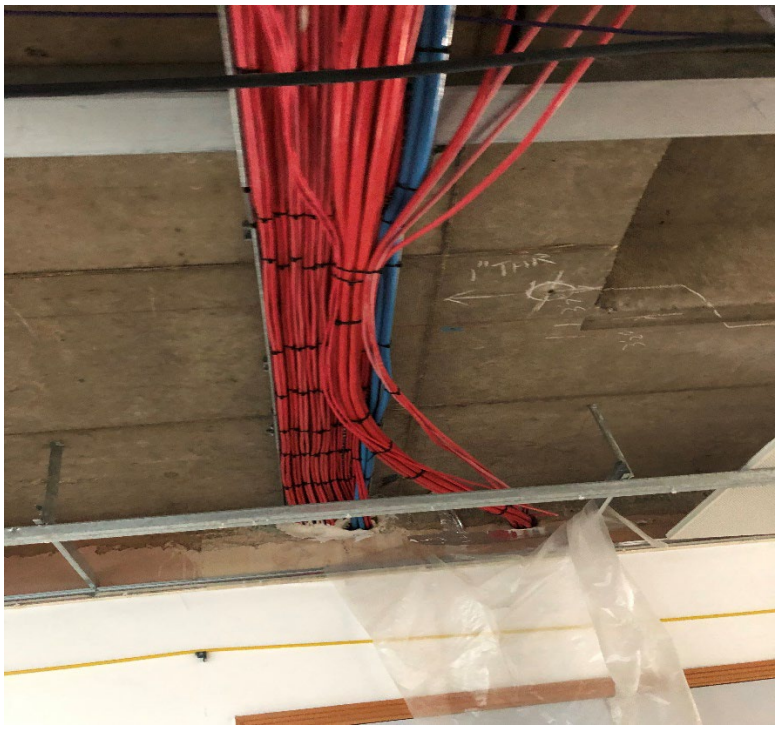
Pyro cable damaged causing short circuit on loop, Level 28



Level 24 multiple cables running through the floor to old VA rack now being used as a joint box

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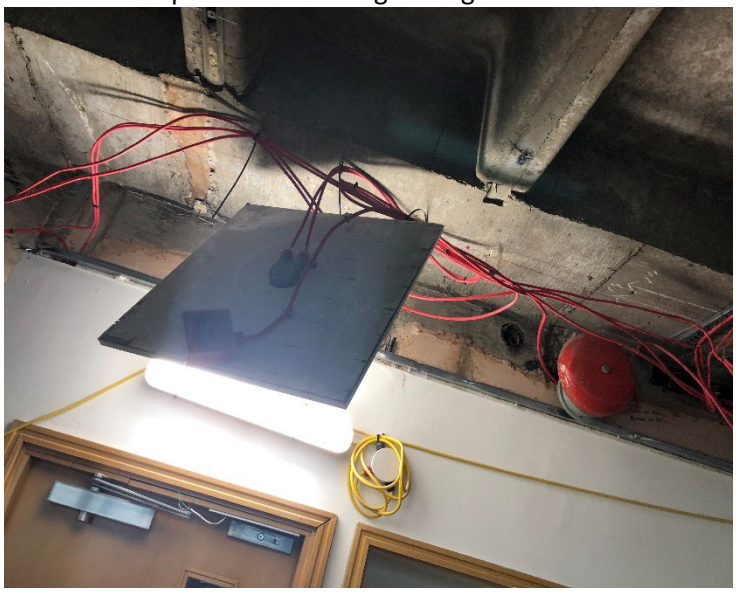
Level 24 multiple cables running through the floor to old VA rack now being used as a joint box



Old Cabling / mcp from previous system.

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Level 3 – Old FA system panel used as JB to feed loops for new gent system / panel in adj riser.

Old Cabling / Smoke from previous system.

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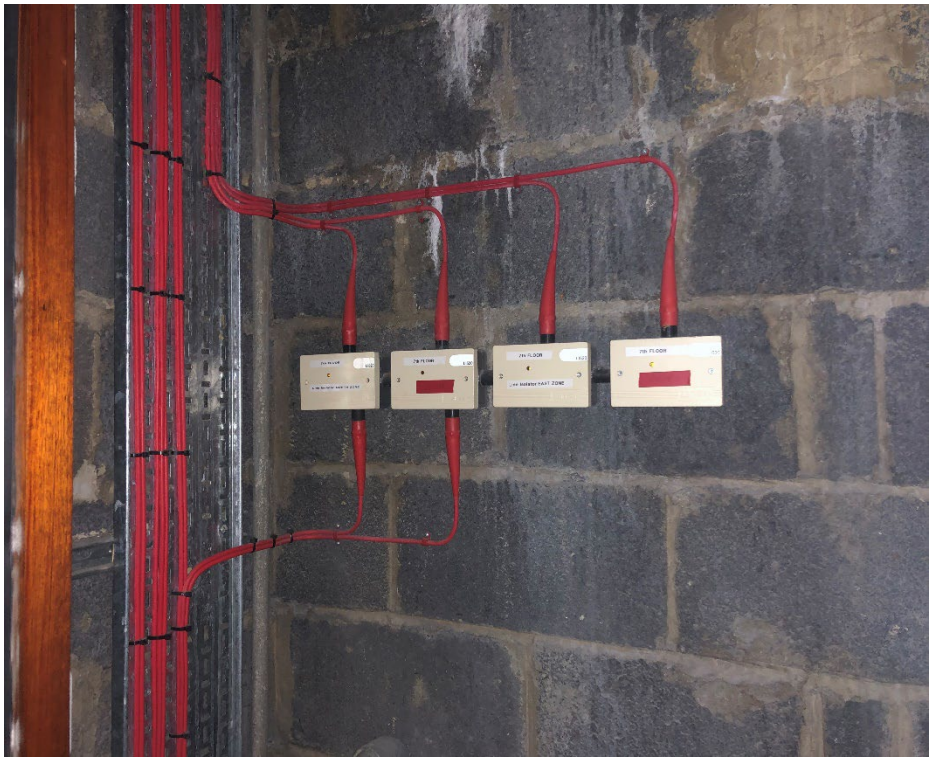

Isolators from old risers installed on most floors as using as feed wring for the loops on each floor.

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Proposal

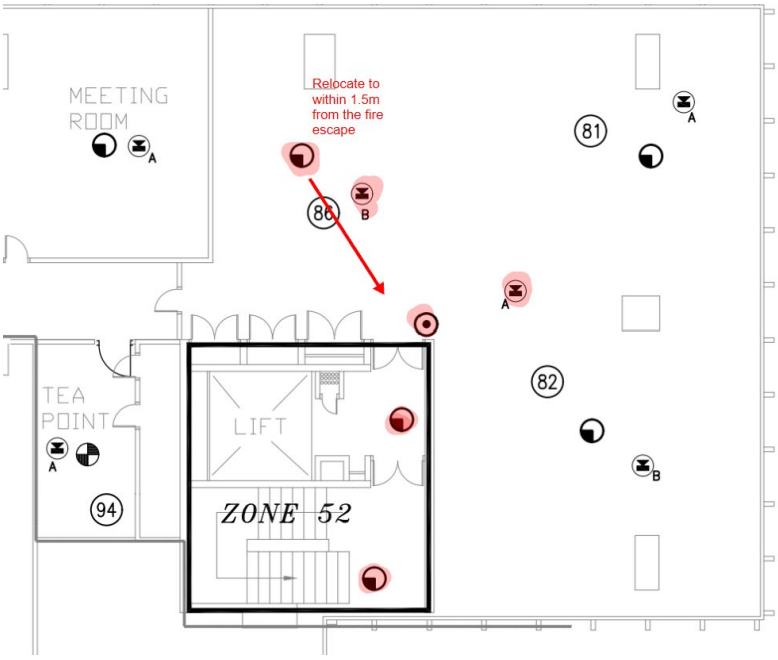
Due to the cabling throughout being beyond repair it leaves us with one option moving forward, to leave the building with a stable and compliant system.

- **Shell and Core**

  We propose a strip out of all existing fire alarm and PA/VA systems back to the south core comms riser (as per levels 21 upwards). Once all cabling has been stripped back to the core, we then re cable using FP200 gold a minimal system consisting of devices leading to fire exits, covering of risers and flue like structures.

  We will be able to re utilize detection and PAVA speakers throughout, although there may be the possibility of faulty devices in which we may have to swap for new, as per quote.

  Below shows a screen shot from the mark up indicating the proposal, red highlighted devices will be re cabled and equipment re used. All other equipment not highlighted will be stripped out.



Date:	23 November 2022
Prepared For:	Adam Ozinsky (GXN)
CC:	Gavin Williams (G&T)
Prepared By:	Kenneth Zammit (TT)
Project Name:	Euston Tower
Project Number:	Y22049.00
Memo Subject:	Feasibility of retention of the existing facade

Table 1: Referenced Documents

Ref	Date	Document Title	Designer/Author
[1]	Oct 2018	Euston Tower Inspection	Vertex Access
[2]	22 April 2022	1312_220426_PreApp02_FeasibilityStudy_FacadePages	3XN

Thornton Tomasetti have reviewed the Euston Tower Inspection report [1] as well as the Pre-App Feasibility Study [2] and are in agreement with the general conclusions made in these reports. We have also conducted a site visit on the 04/10/22 to assess the condition of the existing glazing.

We observe that the façade is single glazed, with an internal secondary window system to improve thermal performance. We understand that the aluminium system used externally is not thermally broken and that the external seals are in a poor state of repair.

It is our opinion that the existing façade cannot achieve the level performance required by current building regulations and standards. Even if the single glazing would be replaced by thin double glazing of vacuum insulated glazing, this would introduce a condensation risk that would not be acceptable. It is unlikely that the existing building fabric could be re-sealed to achieve the level of air-tightness required to control the thermal performance or occupant comfort required in the refurbished state for any of the building uses currently being considered.

Some of the materials used in the existing façade would not be considered suitable under current good practice and regulations, such as the extensive use of monolithic toughened glass and timber.

It is therefore our opinion that the façade system is nearing the end of its design life and due to the condition and design, it cannot be realistically upgraded.

Yours sincerely,
Kenneth Zammit

reusefully

Report From:

Katherine Adams and Gilli Hobbs
Circular Economy and Waste Specialists
Reusefully Ltd

Report Prepared For:

GXN

Pre-demolition audit of Euston Tower

24th August 2022

Executive Summary

The pre- demolition audit was undertaken on the 6th of January 2022 and 10th February 2022 by Katherine Adams and Gilli Hobbs of Reusefully Ltd. A visual survey of the building, combined with analysis of the plans provided, was used to calculate the Key Demolition Products (KDP). The audit has investigated the key materials which are likely to rise from the full demolition to aid with the decision making for the proposed development at RIBA Stage 1. The embodied carbon of these materials has also been estimated. The quantities are as follows:

Materials	**Tonnes**	**Volume (m^3)**
Concrete	36,981	15,548
Steel	1,942	250
Brick	389	229
Glass	378	151
Aluminium	305	140
PVC	120	48
Gypsum	105	137
Softwood	34	69
Ceramic	16	7
Chipboard	12	17
Fibreboard	7	10
Aggregate	6	4
Insulation	4	89
Vinyl	1	1
Grand total	**40,303**	**16,701**

Concrete is by far the most prominent material, estimated to be 36,981 tonnes from a full demolition (92% of all demolition arisings. This does not include waste that has already been generated as part of the strip out process, which is estimated to be 1,848 tonnes (as provided by the demolition contractor). The embodied carbon of the materials present within the building is estimated to be 10,937 tonnes of CO_2e.

Parameters and points of interest have been provided for key products to assist with reuse in this development and externally and to assist with BREEAM requirements. A presentation has also been issued which has the key parameters for products and images (titled *ET Pre-Dem Results 20.4.22*).

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1. The Requirement

GXN have engaged Reusefully Ltd to carry out a pre-demolition audit of Euston Tower in London. The aim of the audit is:

- To provide an understanding of the types and amounts of products and materials arising during the demolition.
- Provide key parameters for products and elements to identify opportunities for reuse.
- To optimise the management of products and materials from the demolition and provide recommendations to the design team and demolition contractor in line with the waste hierarchy i.e. maximise reuse and recycling and minimise waste to landfill
- To provide details of the embodied carbon of the materials resulting from demolition
- To provide technical advice on the reuse of products and recycling of material on site
- To provide data to help with populating the Resource Management Plan and in support of the BREEAM assessment and the Greater London Authority Circular Economy Statement
- To advise on targets for reuse and recycling for products and materials arising during the demolition

2. Site details

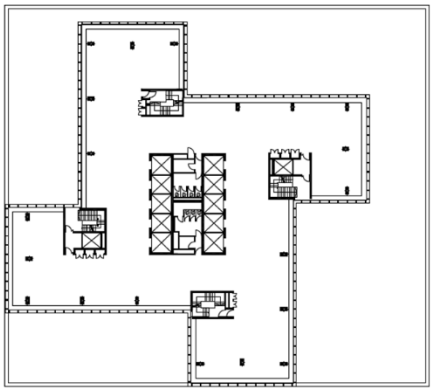
Euston Tower is located on Euston Road in the London Borough of Camden. It was built in 1970 and has been mainly used for offices. It has a storey height of 36 floors; the overall height of the building is 124 metres. There is a wraparound building on the ground and 1st floor which is used for retail/café space (on the ground floor) and offices (on the 1st floor). At the time of the visit, strip out works had occurred on most of the floors, with some plant equipment still being removed. The floor plate is the same for each floor of the tower with 4 core areas of stairs, a central core of bathrooms and lifts (one set to Floor 19 and the other set to Floor 35). There are a number of floors which have plant equipment (Floors 1, 12, 24, 34 and 25). The building comprises the following:

- Glass façade with aluminium mullions and aluminium sheet cladding on the tower
- Secondary glazing throughout the Tower (except Floor 36)
- Glass façade with louvres on the ground and first floor
- A double height glass atrium
- Reinforced concrete floors and columns – beam, ribbed and standard sections
- A mix of precast concrete, concrete block, brick and stud walling.
- A steel deck poured with concrete used for the lower floor building

The floor plate of the Tower is shown below(taken from Euston Tower Design Scheme Presentation 11.1.22).

Demolition

Existing



3. The Pre-Demolition Audit

The pre-demolition audit was undertaken on the 6th of January and the 10th of February 2022, consisting of a non-invasive visual survey of the buildings. Certain areas were inaccessible, such as the ground floor units and not all floors were visited. Hence, construction details and materials have been inferred based on typical practice. Survey notes and photographs were taken, and plans of the buildings were supplied (though not detailed floor layouts). Also provided was access to Matterport files, demolition and orginal architectural and engineers drawings. There is also a BIM model of the core areas and some floors.

On the basis of information gathered and provided, an analysis of materials arising from a full demolition has been undertaken, with results reported in both weight and volume. The weight has been calculated using standard density figures for the materials identified. Embodied carbon figures have also been used (See Appendix A for source and assumptions).

A presentation has also been issued which has the key parameters for products and images (titled '*ET Pre-Dem Results 20.4.22*).

The following assumptions have been applied:

<u>Demolition</u>

- Removal of the entire building down to floor slab

Please note, a number of areas have not been included in this audit, due to lack of access/information – however the amount of materials is thought to be relatively insignificant compared to the amount of materials already identified. This includes the internal areas of the commercial and retail units, the fixtures and fittings on the ground floor and first floor (which have

not as yet been removed), any waste electronic and electrical equipment including lifts and plant equipment. As the basement is communal with other buildings, this has been excluded. Any equipment on the roof has not been included.

4. Demolition Results

Overall, there is an estimated 40,303 tonnes (16,701m^3) arising from the demolition. Concrete is the largest KDP (36,891 tonnes) followed by Steel (1942 tonnes), Brick (389 tonnes), Glass (378 tonnes), Aluminium (305 tonnes), PVC (120 tonnes), Gypsum (105 tonnes) and Softwood (34 tonnes) as shown in Figure 1 and 2 and Table 1. In volume, the largest KDP is Concrete (15,547m^3), followed by Steel (250m^3), Brick (229m^3), Glass (151m^3), Aluminium (150m^3), Gypsum (137m^3) and Insulation (89m^3). Each of these KDPs is described later in the report detailing their arising, likely management options and next steps (where applicable) to support reuse and/or higher value recycling.

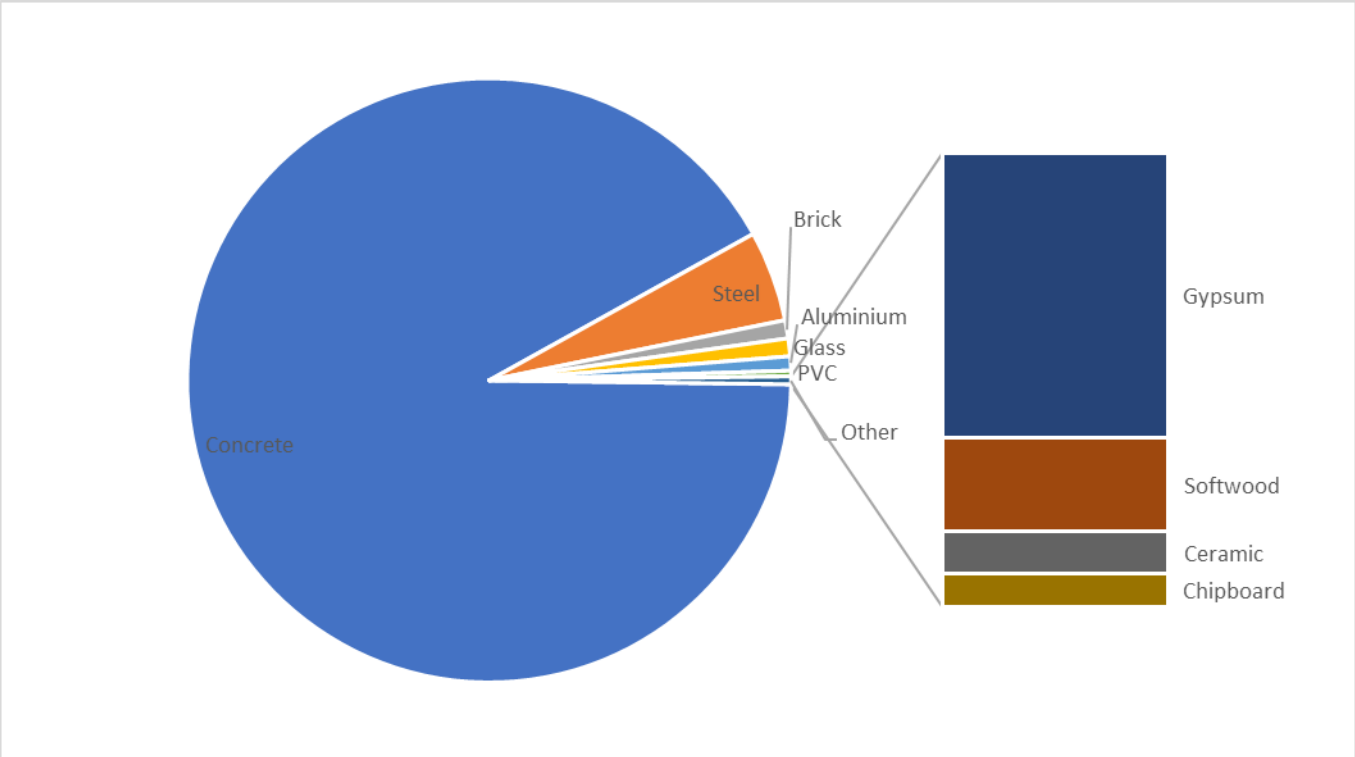


Figure 1: Demolition Results - KDPs by weight (tonnes)

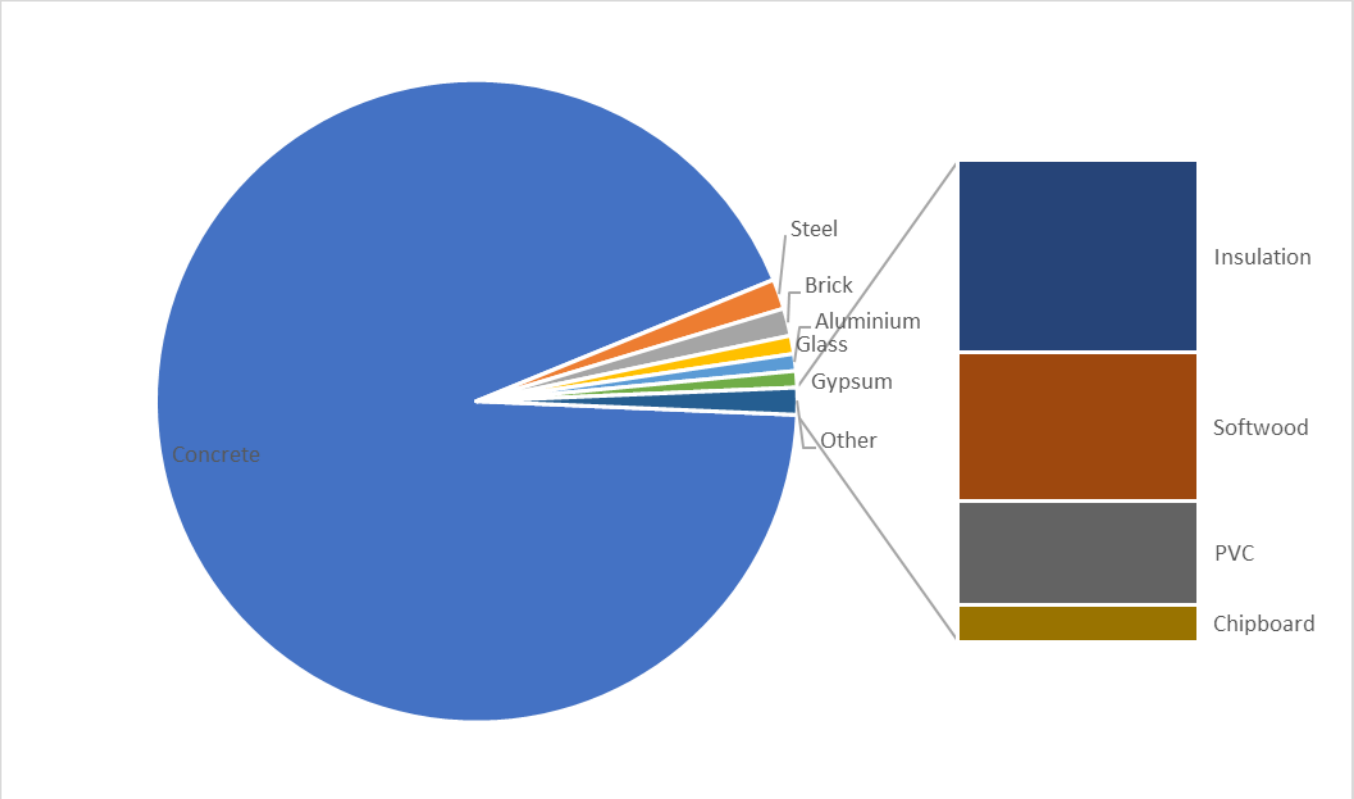


Figure 2: Demolition Results - KDPs by volume (m^3)

Table 1 provides the weight (tonnes), volume (m^3) and European Waste Codes for each KDP.

	Weight (tonnes)	Volume (m^3)	EWC
Concrete	36,981.12	15,547.81	17 01 01
Steel	1942.39	249.78	17 04 05
Brick	388.50	228.53	17 01 01
Glass	378.37	151.35	17 02 02
Aluminium	305.13	140.49	17 04 05
PVC	120.30	48.12	17 02 03
Gypsum	105.38	137.14	17 08 02
Softwood	34.31	68.63	17 02 01
Ceramic	15.84	6.60	17 01 03
Chipboard	12.22	17.46	17 02 01
Fibreboard	7.18	10.26	17 02 01
Aggregate	6.48	4.00	17 01 01
Insulation	4.47	89.36	17 06 04
Vinyl	1.34	0.99	17 02 03
Grand total	**40303.05**	**16700.52**	

Table 1: Demolition Results - KDPs by tonnage and volume (m^3)

Strip out results

Information has been provided by the contractor, JF Hunt, on the amount and type of waste that has been produced from the strip out process to December 2021. This has been logged on to BRE's SmartWaste system. As of the 21st of December 2021, 1,848 tonnes of waste had been produced and of that 100% diverted from landfill. Of this, metals were the greatest, at 740 tonnes (40%); followed by mixed waste at 527 tonnes (29%), plasterboard/gypsum at 222 tonnes (12%), timber at 193 tonnes (10%) and carpet at 70 tonnes (4%). There are smaller amounts (less than 30 tonnes each) of inert waste, floor coverings, tiles and ceramics and concrete. There was also 1.4 tonnes of hazardous materials (oils, refrigerants and asbestos). Due to way the data has been collected it is difficult to infer what materials are in the mixed waste category. The results can be seen in Table 2 and Figure 3. Note, these figures are likely to have increased as more plant has been taken out since these figures were provided.

	Weight (tonnes)	**EWC**
Metals	739.49	17 04 07
Mixed construction and/or demolition waste	526.52	17 09 04
Plasterboard / Gypsum	222.2	17 08 02
Timber	192.86	17 02 01
Carpets	69.5	20 01 11
Inert	30	17 01 07
Floor coverings (soft)	26.92	20 01 11
Tiles and Ceramics	23.82	17 01 03
Concrete	15	17 01 01
Oils	1	13 01 13*
Refrigerants	0.371	14 06 01*
Construction materials containing asbestos	0.03	167 06 05*
Grand Total	**1847.71**	

Table 2: Strip Out Results – Waste by tonnage

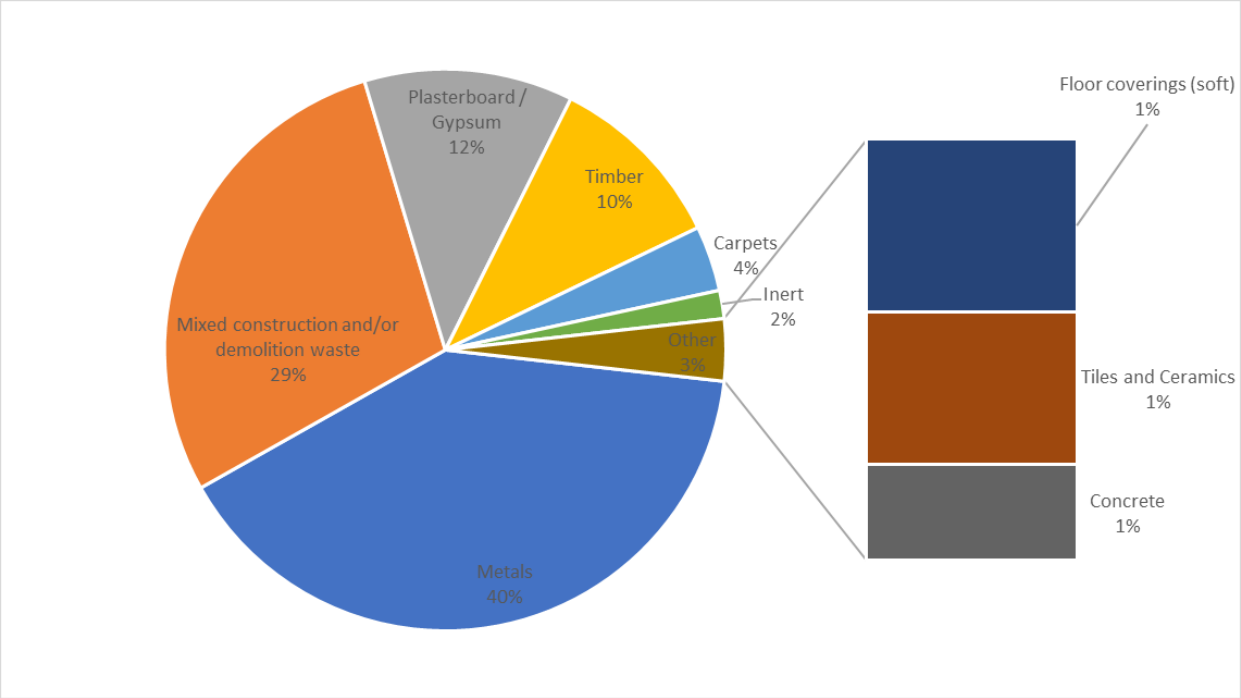


Figure 3: Strip Out Waste Results – waste by tonnage

The destination of the waste materials has also been recorded. This shows overall that 4% of materials was reused (all of the carpet at 60.5 tonnes); 41% of the materials were sent for direct recycling (largely the metals) and 37% for recovery (further reprocessing) which accounted for the plasterboard and gypsum. The majority of the timber was sent for energy recovery as well as the mixed construction and demolition waste at 39% (these figures seem high, so there could be some inaccuracy in their reporting). Table 3 and Figure 4 provide more information.

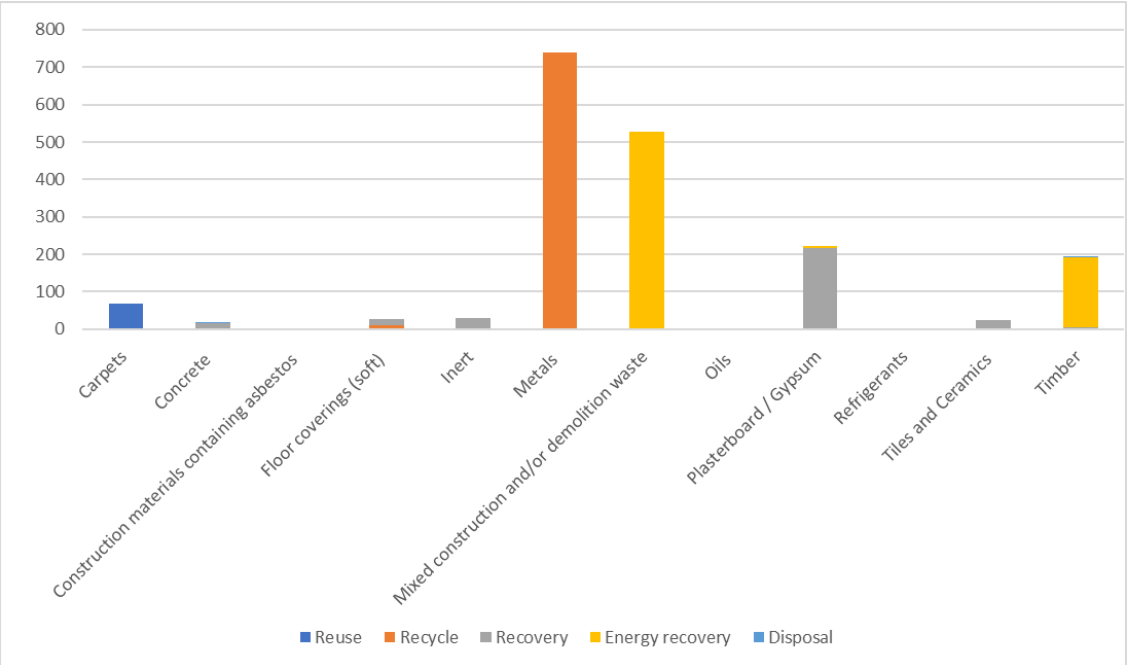


Figure 4: Strip Out Waste Results – waste management routes

	Reuse	Recycle	Recovery	Energy recovery	Disposal
Carpets	69.5				
Concrete			15		0.03
Construction materials containing asbestos					
Floor coverings (soft)		9.84	17.08		
Inert			30		
Metals		739.49			
Mixed construction and/or demolition waste				526.52	
Oils			1		
Plasterboard / Gypsum			216.64	5.56	
Refrigerants			0.371		
Tiles and Ceramics			23.82		
Timber			4.32	188.54	0.03
Grand Total	**69.5**	**749.33**	**308.23**	**720.62**	**0**

Table 3: Strip Out Results – Waste management routes (by tonnes)

Table 4 provides details of the waste destinations. Carpet was reused by community organisations (one abroad) via Globechain. Most of the waste was sent to waste transfer stations such as Westminster Waste, Suez and Powerday for either further sorting or recycling. Metals were sent directly to metal recycling sites. Concrete was also sent directly for recycling.

Waste type	Destinations
Carpets	CCORRN (Cambridgshire Community Reuse and Recycling Network) via Globechain Hawa Trust via Globechain
Concrete	Recycled Material Supplies Ltd - Sunshine Wharf
Construction materials containing asbestos	Cohart Asbestos Disposal Ltd
Floor coverings (soft)	European Metal Recycling – Willesdon Worcester Recycling Croydon Ltd
Inert	Recycled Material Supplies Ltd - Sunshine Wharf
Metals	European Metal Recycling – Wandsworth European Metal Recycling – Willesdon Southwark Metals Ltd Suez Recycling & Recovery South East Ltd Westminster Waste
Mixed construction and/or demolition waste	Powerday Plc Suez Recycling & Recovery South East Ltd Westminster Waste
Oils	MAG Properties Services Ltd
Plasterboard / Gypsum	Powerday Plc Suez Recycling & Recovery South East Ltd

	Westminster Waste
Refrigerants	MAG Properties Services Ltd
Tiles and Ceramics	MSK Waste Management & Recycling Ltd
Timber	Powerday Plc Suez Recycling & Recovery South East Ltd Westminster Waste

Table 4: Strip Out Results – Waste management destinations

5. Concrete

Concrete is the largest KDP identified, estimated to be approximately 36,981 tonnes from the full demolition as shown by Table 5 (equivalent to 3,865 tonnes of CO_2e). This is from a number of sources, the most from the concrete floor slabs (17,613 tonnes), the columns (4,355 tonnes), precast walls (9,488 tonnes) and beams (4,043 tonnes). Most of the concrete is unsuitable for reuse, as it is not in precast sections, though some of the walls are precast. There is also fire retardant spray (similar to grout) on the underside of around half of the floor slabs; this maybe difficult to remove.

Concrete is in theory 100% recyclable. It can be segregated and crushed for reuse as hard core, fill or in landscaping or used as recycled aggregate in new concrete. Although recycled and secondary aggregates can be used in some concrete applications, other lower grade end uses (e.g. in unbound materials as fill and hardcore) may sometimes be more resource efficient due to reduced processing demands and transportation. Often such waste does not even leave the demolition site, being used for the site's redevelopment, as shown by the NFDC figures with nearly half of inert waste (over 9 million tonnes) treated this way. Otherwise, it is used on other sites as fill to offset the need for primary raw materials. Very little concrete waste therefore tends to go to landfill.

It is recommended that the concrete should be segregated either onsite (space is limited on site) or at a waste facility and crushed to produce recycled concrete aggregate (RCA)[1] in accordance with the WRAP Quality Protocol for aggregates[2] from inert waste. Ideally, this should be used back in concrete, possibly into precast elements to be used in the further development. It can also be used for lower value applications such as for piling mats and temporary/ permanent fill (infilling). If reprocessed, stored and/or used onsite then appropriate permits[3] or exemptions will be required for these operations. RCA is of a higher quality than recycled aggregate (RA) due to the limit of masonry in the aggregate (maximum of 5%). The performance characteristics of RCA are better than RA and therefore there are fewer restrictions on the use of RCA in concrete. The use of RCA in concrete is given in BS 8500-2[4].

Various options are available to utilise RCA as listed below.

Recycled concrete aggregates can be used in:

[1] Recycled concrete aggregate is aggregate resulting from the processing of inorganic material previously used in construction and principally comprising crushed concrete [BS 8500-1: 2002].

[2] https://www.gov.uk/government/publications/quality-protocol-production-of-aggregates-from-inert-waste

[3] https://www.gov.uk/guidance/waste-environmental-permits

[4] https://shop.bsigroup.com/products/concrete-complementary-british-standard-to-bs-en-206-specification-for-constituent-materials-and-concrete/standard

1. Bitumen bound materials – Recycled concrete aggregate can be used may be used in a variety of base course and binder course mixtures.

2. Concrete – Recycled concrete aggregate is permitted for use in certain grades of concrete. It is generally acknowledged that RCA can be used to replace 20% of the coarse aggregate in concrete up to Grade 50.

3. Pipe bedding – suitably graded recycled concrete aggregate is used in pipe bedding.

4. Hydraulically bound mixtures (HBM) for subbase and base – recycled concrete aggregate can be suitable for use in HBMs. These can be used in the construction of car parks, estate/minor roads and hard standing.

5. Unbound mixtures for subbase – suitably graded recycled concrete aggregate is used as subbase.

6. Capping – Recycled concrete aggregate is suitable for capping applications.

Best practice

There is an opportunity to reuse the concrete paving stones used on the lower ground roof with the majority (at least 75%) which appear to be of good quality. There is an example of reuse of precast panels through a new EU Project: Recreate and the SuperLocal project Superlocal . There are also examples of higher value recycling technology where the constituents of concrete are separated, also producing a cementitious product that can reduce the need for new cement Smartcrusher (note not in the UK as yet).

Inert waste can also be used for making bricks e.g. the K-Briq (in Scotland) https://kenoteq.com/ and StoneCycle https://www.stonecycling.com/ .

Examples of structural concrete that have been used as RCA include the London Olympics 2012 London 2012 sustainable aggregates and Building B16 at BRE; BRE's Environmental Building

Otherwise, concrete waste can also be used for blocks and paving. For example, Blocks (Aircrete) can be up to 70%; other blocks average 24%; Aggregates in concrete blocks; but can vary considerably e.g. 74%; Sheehan Concrete blocks.

Further testing and investigation

It is recommended that further sampling and testing is carried out to enable high quality recycling of all the concrete removed. This includes:

- Testing of the 'groutlike' substance on the underside of numerous concrete floor slabs to determine the composition and likely impact as a contaminant in the recycling applications listed above.
- Testing of the concrete (removal of small samples) in each of the key areas – floor slab, columns and walls to determine composition of the concrete and possible contaminants, such as elevated levels of chlorides and sulphates.
- Further testing of the concrete, as required, to meet the specifications of potential high value end uses, such as precast concrete elements, concrete blocks etc
- Discussions with the providers of the SmartCrusher equipment on the viability of using this system in the UK.

Local waste management companies

Local waste management companies that could manage the concrete waste include:

- Powerday, https://www.powerday.co.uk/ T: 020 3858 0504
- Norris Skips, https://norriskips.co.uk/skip-hire/ T: 020 8698 8000
- RTS Waste, www.rtswaste.co.uk T: 020 7232 1711
- Days Group, http://www.daygroup.co.uk/. T: 0845 065 4655

Alternatively, licensed waste management contractors or demolition contractors should be able to reprocess concrete waste into aggregates.

Item	Area m^2	Volume (m^3)	Tonnes	Tonnes of CO_2e
Concrete floor slab	20,391.37	5,063.69	12,152.85	1,251.74
Columns	3,148.52	1,814.66	4,355.18	448.58
Concrete beams	5,691.15	1,680.88	4,034.12	415.51
Precast walls - 300mm	5,391.76	1,596.03	3,830.48	394.54
Ribbed slab - ribs	7,466.00	1,445.42	3,469.00	357.31
Precast walls - 200mm	7,110.34	1,407.89	3,378.94	348.03
Precast walls - 380mm	2,045.28	773.13	1,855.51	191.12
Ribbed slab - intermediate areas	11,172.17	541.85	1,300.44	133.95
Precast concrete staircase	34.80	477.46	1,145.89	118.03
Lower ground roof deck	2,304.00	345.60	691.20	71.19
Precast walls - 100mm	1,780.59	176.28	423.07	43.58
Block: Concrete: Lightweight	1,808.66	168.93	236.50	61.49
Mortar	4214.870843	52.90	100.51	20.10
Paving slabs lower roof	62.00	3.10	7.44	0.77
Total	**72,621.52**	**15,547.81**	**36,981.12**	**3,855.94**

Table 5: Estimated concrete arisings from demolition

6. Steel

Steel accounts for 1,942 tonnes (250m^3) of materials arising from the demolition as shown by Table 6 (equivalent to 3,938 tonnes of CO_2e). This comes from a variety of sources, but the majority is as reinforcement in the structure at 1,871 tonnes from the demolition. There is likely to be limited opportunity to reuse this steel as the majority is embedded within the structure. Smaller items such as the joists on the internal staircase, handrails and balustrades could potentially be reused, as could the steel supports on the secondary glazing structure.

Where structural steel is available and suitable for reuse, then the SCI has produced a protocol for its reuse[5] including how to test for recertification. This describes the following process:

- A building is offered for salvage of the steelwork for reuse. Considerations include the acceptability of the source material, the demountability of the structure, the increased cost of careful demolition, etc.

[5] https://steel-sci.com/assets/downloads/steel-reuse-protocol-v06.pdf

- A business case is established between the holder of stock and the company responsible for demolition.
- Important details of the anticipated salvaged steel are recorded as described in the document
- Salvaged steelwork is received by the stockholder, grouped and listed as described in the document. The necessary grouping has an important impact on the extent of testing required.
- Members are inspected and tested in accordance with the guidance with the information appended to the stock data. The testing regime involves a combination of non-destructive and optional destructive testing, with the opportunity to make conservative assumptions about certain material characteristics. Testing may be completed at any convenient time, but the seller of the stock is responsible for declaring the necessary characteristics as the material is sold.
- Material is sold, with an accompanying declaration of the material characteristics by the holder of salvaged stock.
- Structural design and member verification is completed with certain modifications, as described in the document.

For recycling, steel should be segregated on site. It is common practice for demolition contractors to reduce their contract value by allowing for the income from the recycling of metals during demolition. Standard skip hire companies are likely to charge for haulage costs only and may give back a small rebate on the metals. Once segregated, it is usually sent to a metal scrap merchants (recyclers). At these, the metals will be sorted, sheared (cutting large pieces), shredded, graded, and baled. The steel will be then sent to smelters to be re-melted as ingots (which are usually downcycles material), and then sent to steel furnaces. Much of this maybe abroad - depending on the price per tonnes the scrap merchant can obtain (currently it is around £350/tonne). The UK does not use all the scrap metal it produces with around 80% exported to countries such as China and Turkey.

Best practice

Best practice for steel is for it to be reused; recycling is the business as usual model. Cesla Steel (are introducing a scheme where steel can be bought by them and recycled in their furnace and a voucher provided for new high recycled content steel (around 98%) (mainly rebar). They are looking for companies to pilot this with.

Further testing and investigation

As indicated, there is limited reuse options for steel, with only a small quantity of structural steelwork available (as part of the internal staircase on level 34/35). Should this be suitable for reuse than further testing may be required to determine chemical composition, Charpy impact test (fracturing) and yield/tensile strength. This could also be useful if considering reuse opportunities for the secondary glazing support struts.

Local waste management companies

Local waste management contractors include:

- Capital Metal Recycling, http://capitalmetalrecycling.co.uk/ T: 0208 964 2120
- London Scrap Metal Recycling, http://www.londonscrapmetalrecycling.com T: 0208 809 1019
- EMR Group http://www.emrgroup.com/

Item	Area m^2	Volume (m^3)	Tonnes	Tonnes of CO_2e
Columns	3,148.52	80.62	624.74	1,270.75
Ribbed slab - steel rebar	17,875.48	55.24	429.45	854.61
Concrete floor slab - steel rebar	20,391.37	34.16	265.56	528.46
Concrete beams - steel rebar	5,691.15	26.46	205.76	409.46
Precast walls - 300mm - steel rebar	6,111.76	24.37	189.46	377.02
Precast walls - 200mm - steel rebar	7,110.34	14.18	110.23	219.37
Precast walls - 380mm - steel rebar	2,045.28	4.08	31.69	63.07
Steel deck	2,304.00	3.46	26.87	66.10
Secondary glazing support	146.00	2.13	16.55	45.69
Precast walls - 100mm - steel rebar	1,780.59	1.78	13.84	27.55
Metal ballustrade	1,319.50	1.32	10.26	28.01
Metal handrail	204.75	1.02	7.96	21.73
Metal studwork - joists	387.21	0.77	5.42	14.96
Metal studwork - top/base channels	69.52	0.28	1.95	5.37
Steel Staircase (internal)	6.32	1.14	1.17	3.23
Precast concrete staircase - steel rebar	34.80	0.14	1.08	2.15
Total	**68,626.58**	**251.14**	**1,942.00**	**3,937.53**

Table 6: Estimated steel arisings from demolition

7. Brick

Brick is estimated at 388 tonnes from the internal walls from the demolition, with an assumption of 4" thick. This is equivalent to 229m^3 and 138 tonnes of embodied carbon. They are thought to be a mix of brick types. However due to the age of the buildings it is likely that cement mortar has been used, making it much harder to reuse the bricks. Bricks can potentially be recovered and reused, but most often they are crushed and recycled into fill materials or recycled aggregate. Although there is a market for recovered clay bricks, it is not always done, commonly due to the inability to remove mortar from the bricks. Traditional lime-based mortars are generally weaker than cement-based mortars and hence easier to remove. The more recent use of strong mortars with a high cement content can increase the time and effort required to remove the mortar and/ or lead to subsequent damage to the bricks. These mortars may be chosen to improve longevity in use and reduce maintenance requirements from repointing for instance.

It is recommended that bricks that are unable to be reused are segregated either onsite or at a waste facility and crushed to produce recycled aggregate (RA). This RA can be used as fill materials or added (up to 20%) to a crush mix with concrete for end use applications such as Type 1 aggregates for road sub-base. Considering the size of the site, it is likely that this will be offsite. Finished recycled aggregates should not contain more than 1% by weight of clay, soil, metals, wood, plastic, rubber and gypsum plaster, in line with the limits set within the aggregates standards. It is

recommended that they are processed where possible into recycled aggregates (RA) following the Quality Protocol for inert materials (Quality Protocol for Aggregates from Inert Waste)

Best practice

There could be possibility of using the recycled aggregate to make new bricks and blocks, for example the K- Brick is a new product made from construction and demolition waste (https://kenoteq.com/).

In terms of reuse techniques not tried out in a commercial setting in the UK, there are a couple of areas to consider.

Firstly, is the brick panel cutting process, as deployed in the Resource Rows project in Copenhagen. Here, 1 metre square brick panels from a Carlsberg brewery demolition were incorporated vertically and horizontally in the façade of new housing (Resource Rows).

Secondly, recent R&D into the potential to laser cut brickwork adhered with cement mortar could be of interest for separating the bricks for further use. This was carried out as part of the REBUILD project (Rebuild).

Further testing and investigation

Sometimes, the cement mortar used in brickwork can be relatively weak and easy to separate. Therefore, it would be useful to test a sample of brickwork (taking down a section of wall) to determine the strength of the mortar bond to the brick. Should it be viable to clean the brick quickly and without damage then these bricks should be suitable for reuse. Typically, it is possible to gauge the condition of the bricks visually and use again in a brick as façade application. For use in further structural applications, it may be necessary to test for compressive strength and frost resistance.

If the mortar bond is very strong, the reuse options outlined above (create brick panels and/or laser cut walls to reclaim bricks) could be investigated in more depth for viability on this project.

Waste management companies

Local waste management companies that could manage the brick waste include:

- Brewsters Waste, https://brewsterswaste.co.uk/, T: 020 7474 3535
- Ohara Bros, http://oharabros.co.uk/services/aggregates-recycling, 020 8424 2220
- RTS Waste, www.rtswaste.co.uk T: 020 7232 1711
- Days Group, http://www.daygroup.co.uk/. T: 0845 065 4655

Alternatively, licensed waste management contractors/demolition contractors should be able to reprocess the brick waste into aggregates.

If any of the bricks are suitable for reclamation, then local reclamation companies that can be contacted with regard to reclaiming the bricks and the value in doing so include:

- London Reclaimed Brick Merchants, www.lrbm.com, T: 020 8452 1111
- Premier Reclaimed Bricks, http://www.premierreclaimedbricks.co.uk/, T: 020 8684 3537
- Contact Salvo, https://www.salvoweb.com/

8. Glass

Glass is estimated to be 378 tonnes (equivalent to 592 tonnes of CO_2e), the majority arising from the windows (façade) (169 tonnes) in the tower and the associated secondary glazing (161 tonnes) as shown by Table 7. For glass to be reused it needs to be collected on specialist steel A frame stillages, handled and stored carefully. There is potential for the newer facades on the lower floors to be reused and also some internal partitions, as these are relatively new and of good quality.

Glass can be collected in skips and containers for recycling. The quality of the glass in the skips will be dependent upon the awareness and training of those working on site and appropriate site management is required along with clear signage. They also need to be close to the workplace due health and safety risks from transporting glass.

A few glass manufacturers run their own cullet recycling scheme when they will collect cullet from processors or of older glass where they will be returned to the float line. The UK has three flat glass manufacturers, all operating float lines: Guardian Glass UK, Pilkington UK Ltd and Saint-Gobain Building Glass which are all based in the North of England. One of the limiting factors in the use of post-consumer flat glass as cullet back into the float glass manufacturing process is the availability of it in the right quality and chemical compatibility as the manufacturing process is sensitive to low levels of contamination. Most of post-consumer flat glass waste produced does not go back into glass and is will be used as aggregate or landfilled. For demolition, it is more likely to be crushed into aggregate with other inert waste.

There is a health and safety consideration for the workforce if it is to be segregated onsite. According to the NFDC, glass from facades may be available for recycling back into glass, as they are likely to be deconstructed and the glass less contaminated. As the cost of logistics is high, large volumes of waste are preferred when collecting. The quality of the glass waste is important with minimal contamination requiring the effective separation and segregation on site, which in turn requires education and training for those working on site. UKGBC have an example of glass being turned into new glass (UKGBC case study). Other markets include the use of glass in glass wool insulation, container glass and ballotini products (glass beads).

The glass recycling industry has developed grades of glass cullet:

- Class C – which is contaminated and not suitable for re-melting back into glass. Contamination can include ceramic frit, putty, lead beading and space bars. This will be used as aggregate and road paint.
- Class B – this is called 'mixed cullet' and may have some contamination such as laminated glass, which is suitable for glass wool insulation and container glass.
- Class A – clean clear glass cullet with no contamination which can be used back in the floating by re-melting. This is currently mostly from pre-consumer glass. Demand for this outstrips supply.

If glass waste is sent to landfill and not mixed with other types of non-inert waste, it will attract the lower rate of tax, currently at £3.10/tonne. There are economic opportunities with a market price of £50/tonne for recycled glass compared to €90/tonne for virgin material. For flat glass, one tonne of recycled material results in savings of 1200 kg of virgin material and 300kg of CO_2 emissions directly linked to the melting process[6].

[6] https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52014DC0445&from=EN

Further testing and investigation

In the event that there's a possibility to reuse the glass panels on the ground - 2nd floor, further investigation into the ease of removal without causing damage should be undertaken by a competent contractor, such as JF Hunt who are currently on site. This limited panel removal could also provide an opportunity to develop prototype elements for the subsequent development, should this be considered as an end use option.

As described above, there are closed loop recycling opportunities with the façade/window glass. However, the level of contamination will need to be kept to a minimum and the method of extracting the glass will be critical to achieving this. The façade glass is referred to as 'Armour clad colour 3.039' in the original drawings so is likely to have coatings that could be detrimental to the new glassmaking process. Therefore, it would be useful to obtain clear specifications from the glass manufacturers in terms of glass composition and acceptable quality/ segregation to match against the glazing available and the likely demolition method. This could require laboratory testing for unacceptable coatings and chemicals. Alternatively, if it is too difficult to reach these specifications, for example it impacts negatively on safety, programme or cost, the next option should be to supply into the glass wool manufacturers. Again, this should be matched against their specifications for quality of feedstock.

Glass recyclers

- RTS Waste (www.rtswaste.co.u k T: 020 7232 1711). Note they may require the glass to be removed and stacked as panels.
- Berryman Glass Recycling (www.berrymanglassrecycling.com E: info@berryman-uk.co.uk
- May Glass Recycling (http://www.mayglassrecycling.co.uk/) ; may only take new glass
- Viridor https://www.viridor.co.uk/siteassets/document-repository/brochures/glass-recycling-ukviridor-low-res.pdf.

Item	Area m^2	Volume (m^3)	Tonnes	Tonnes of CO_2e
Façade (tower)	10,639.00	67.78	169.46	244.02
Secondary glazing	8,890.00	64.28	160.69	267.23
Glass façade (lower floor)	466.56	7.00	17.50	29.22
Windows (ground and first floor)	598.91	5.99	14.97	25.00
Windows (second floor)	286.05	2.86	7.15	11.94
Atrium	175.20	1.75	4.38	7.31
Doors (second floor)	84.60	0.85	2.12	3.53
Blue panels (int. ground floor)	42.12	0.42	1.05	1.76
Crazy glass feature (int.ground floor)	19.60	0.20	0.49	0.82
Staircase (internal)	13.30	0.13	0.33	0.56
Clear panel (int. ground floor)	6.71	0.07	0.17	0.28
Clear panel door (int. ground floor)	1.60	0.02	0.04	0.07

Total	**21,223.65**	**151.34**	**378.34**	**591.73**

Table 7: Estimated glass arisings from demolition

9. Aluminium

There is an estimated 305 tonnes of aluminium, equivalent to 2,035 tonnes of CO_2e from the demolition as shown by Table 8. Most of the items are panellised and as such may be suitable for reuse though may need to be cut and cleaned. This includes the cladding and the canopy.

Aluminium is usually treated in a similar manner to steel, in that it will be sent to a scrap merchant, where it will be sorted, sheared (cutting large pieces), shredded, graded, and baled. There are 14 aluminium recyclers in the UK and the total recycled is 800,000 tonnes per year. The UK exported nearly 437,500 tonnes of scrap aluminium in 2020[7]. As it is non-ferrous it needs to be separated from the ferrous (steel) material) either on or offsite. Aluminium will be sent for smelting (only one plant in the UK), the actual furnace type will depend on the level of contamination of the aluminium. Secondary aluminium refiners will either convert most of the materials into foundry ingot to produce aluminium castings. Some secondary refiners produce deoxidiser for the steel industry, this material being in a variety of forms such as notched bars and granules. Some secondary refiners also produce hardeners or master alloys such as aluminium-manganese alloys for use by other sectors of the aluminium industry. These hardeners are used to adjust the composition of molten aluminium so that specified alloy compositions can be produced. The wrought remelters take good quality old and new scrap and convert this into extrusion billet or rolling slab, usually of the same alloy. Secondary aluminium refiners may be integrated into major aluminium companies or they may be independent companies. The UK is unusual in that the arising of aluminium scrap more than meets the needs of the UK foundry industry, as such much gets exported, particularly to China. The remelters are usually within the control of the integrated, global aluminium companies and most of the production of rolling slab and extrusion billet is used within their own supply chain. The current scrap price is around £1000/tonne.

Aluminium has high recycling rates, which can be between 92% and 98% for architectural aluminium and there is a highly established aluminium recycling market. Around 75% of all aluminium ever produced is still in productive use. Recycling uses only 5% of the original energy used to produce primary Aluminium and water. Some aluminium can be up to 75% recycled content (postconsumer); about half of the aluminium produced in Europe originates from recycled materials.

Best practice

Reuse of panels is best practice. The original drawings indicate the aluminium cladding and mullions are a form of anodised aluminium sheeting. This material is highly durable whilst being lightweight and easy to handle.

The Council for Aluminium in Building has recently launched a closed loop recycling scheme for its members CAB recycling .

Further testing and investigation

There is a large surface area of anodised aluminium sheeting that could be used again in applications requiring, or benefitting from a form of lightweight cladding/covering. It is not clear, as yet, whether

[7] https://www.statista.com/statistics/518633/uk-volume-of-exports-of-aluminum-waste-and-scrap/

the new development designs will provide such as opportunity. If so, the performance requirements of the potential application should be matched against the ability of the sheeting, which could involve a range of tests and prototyping to be undertaken.
In the event of this not being possible and for residual scrap, there could be advantages of using the CAB closed loop recycling scheme as opposed to normal recycling routes. Alternatively, the aluminium will typically be recycled back into new aluminium even in the 'business as usual' management route.

Local waste management companies

Local waste management contractors include (same as steel):

- Capital Metal Recycling, http://capitalmetalrecycling.co.uk/ T: 0208 964 2120
- London Scrap Metal Recycling, http://www.londonscrapmetalrecycling.com T: 0208 809 1019
- EMR Group http://www.emrgroup.com/

Item	Area m^2	Volume (m^3)	Tonnes	Tonnes of CO_2e
Anodised aluminium curtain walling	784.78	36.13	90.33	602.51
Aluminium panels (Ground and first floor)	219.53	32.93	86.94	579.90
Aluminium/ secondary glazing window frame		51.93	77.90	519.58
Mullions (Aluminium)	196.80	9.19	22.99	153.32
Canopy	585.60	5.86	15.81	105.46
Frames	372.15	4.45	11.17	74.47
Total	**2158.86**	**140.49**	**305.13**	**2035.23**

Table 8: Estimated aluminium arisings

10. PVC

There is an estimated 120 tonnes (16m^3) of plastic arising, from the uPVC windows used for secondary glazing on the tower floors, with an estimated 372 tonnes of CO_2e. The uPVC may be collected through the Recovinyl scheme for recycling: Axion recycling . It should be noted that there is likely to be more plastic arising than estimated from hidden components such as cabling. The management of the PVC should be done in conjunction with the glass recycling to maximise the amount and quality of recycled feedstock of both materials.

11. Gypsum

There is an estimated 105 tonnes (137m^3) of plaster and plasterboard arising from full demolition. See Table 9. Plaster skim is assumed to be used on the internal brick walls.

Plasterboard should be possible be segregated on site, or if room does not permit then well sorted and segregated at a waste transfer station. The plaster maybe difficult to remove from the brickwork/blockwork, and as such it can be treated with the bricks as Recycled Aggregates, if it is in low quantities. There are a number of companies within the London area that offer recycling services, as long as the plasterboard is relatively free from contamination. Some of the recycling routes can include being used in the plasterboard manufacturing process (although this tends to be mainly for new plasterboard offcuts rather than older plasterboard from demolition). The legal minimum, if sent to disposal, is to landfill in a monocell (landfilled separately from any degradable waste) to avoid the production of hydrogen sulphide gas.

A recovery use previously existed in animal bedding but the risk to animals, humans or the environment from hydrogen sulphide generation through the mixing with biodegradable waste means that this is not an acceptable route currently. Paper from the plasterboard can also be recycled, for example, for wallpaper manufacture.

Further testing and investigation

For demolition plasterboard, the options for closed loop recycling back into new plasterboard are very limited, if at all. Therefore, recovery is principally as a soil conditioner as land treatment.

It is technically possible to recycle back into gypsum for plasterboard manufacture through demonstrating compliance with BSI PAS 109 Specification for the production of recycled gypsum from waste plasterboard (2008). This standard includes meeting certain threshold levels for particle size distribution, residual paper, purity levels and presence of soluble chloride, magnesium oxide and sodium oxide. However, the current position is that demolition waste is not accepted. It may be worthwhile making further enquiries to each of the three UK manufacturers to see if they can make exceptions where the composition has been tested and meets the quality criteria.

Local waste management companies

Local waste management options include:

- Powerday, https://www.powerday.co.uk/ T: 020 3858 0504
- Plasterboard Recycling Solutions http://www.plasterboardrecyclingsolutions.co.uk/ T: 0780 118 6380
- Hintons Waste, https://www.hintonswaste.co.uk/recycling-facilities/plasterboard-recycling/ T:020 3322 3476
- Hippo Waste (collect in bags), https://www.hippowaste.co.uk/blog/plasterboard-recycling-removal/ T: 0333 9990 999
- RTS Waste Management, https://www.rtswaste.co.uk/plasterboard-mobile-compaction-service/ T: 020 7232 1711

Item	Area m²	Volume (m³)	Tonnes	Tonnes of CO_2e
Plasterboard - walls	1,844.76	27.67	20.75	8.09
Plaster skim (modern) walls	1,363.52	4.09	3.48	0.45
Plasterboard (secondary glazing)	6,137.00	58.30	43.73	17.05
Plaster skim (modern) walls	7,044.67	21.13	17.96	2.34
Plasterboard - walls	1,729.46	25.94	19.46	7.59
Total	**18,119.40**	**137.14**	**105.38**	**35.52**

Table 9: Estimated plaster and plasterboard arisings

12. Softwood

As shown by Table 10, there is an estimated 34 tonnes (68m³) of timber arising from the demolition, equivalent to the storage of 44 tonnes of CO_2e. The largest source is from the framing system used in the secondary glazing system – as these are largely uniform they could be suitable for reuse/remanufacture. Other sources include the doors and riser cupboards.

It is recommended that a local wood recycling organization is contacted (Community Wood Recycling, www.communitywoodrecycling.org.uk) to see what timber items are suitable for reclamation and reuse. The nearest enterprise is Shaw Trust Wood Recycling (Croydon); T: 020 8300 9744, and Solo Wood Recycling; www.solowoodrecycling.co.uk There are also examples of the reuse of doors (FCRBE door reuse). If reuse is not viable, most of the solid timber can be recycled, usually into chipboard. Due to the age of the building, some of the timber maybe hazardous due to the coatings and preservatives used. Guidance has been issued for this[8]. Timber should be segregated on site if space permits, to improve level of reuse or recycling. If sent offsite to a licensed waste management contractor, this will typically result in recycling for chipboard (if well segregated) or as an energy feedstock (especially where mixed with other materials).

Further testing and investigation

For any significant amounts of timber that seem to be coated or treated prior to 2007 it is recommended to test for preservatives containing hazardous substances. In the event these occur over certain threshold limits the waste wood is classed as a hazardous waste.

Most of the visible timber (supporting the secondary glazing) seems to be of the type of timber used to construct stud walls and hence less likely to have been treated. This timber also seem to be highly reusable in any similar applications, such as partitioning, other internal joinery etc.. Depending on the application, further testing linked to performance requirements may be required.

Item	Area m²	Volume (m³)	Tonnes	Tonnes of CO_2e

[8] https://condemwaste.org/wp-content/uploads/2021/07/CIWM-CD-Waste-Wood-Guide-v1.0.pdf

Timber struts (secondary glazing)	480.88	52.18	26.09	-33.65
Fire Doors and Frames	211.20	8.45	4.22	-5.45
Riser Cupboards (full)	451.44	5.42	2.71	-3.49
Riser Cupboards (half)	158.40	1.90	0.95	-1.23
Riser Cupboards (frame)	68.64	0.69	0.34	-0.44
Total	**1370.56**	**68.68**	**34.34**	**-44.27**

Table 10: Estimated softwood arisings

13. Other materials

Ceramics

There is an estimated 16 tonnes (6.6m^3) of ceramic materials arisings covering 1320m^2; with an embodied energy of 12 tonnes CO_2e. This is estimated to be from the WCs on Floor 2 to 35, on the walls and the floor. It will be difficult to remove these tiles intact for reuse without damage and their monetary value is relatively low. There is a factsheet produced by the FCRBE project which discusses the requirements for reuse; see FCRBE ceramic reuse. However, for this project, it is recommended that these are either crushed with the inert waste on site or sent off site to produce recycled aggregate.

Chipboard

There is an estimated 12 tonnes of chipboard (17.5m^3) arising from the demolition; with 11 tonnes from the toilet cubicles and 1.6 tonnes from the sink carcasses. This equates to -14 tonnes of CO_2e if carbon sequestration is factored in. It is unlikely that this will be suitable for reuse as it is of low monetary value and of average quality. However, the panel sizes are consistent and could potentially be repurposed. It is also difficult to recycle due to the length of the fibres and the glues, so the most appropriate route is likely to be energy from waste.

Further testing and investigation

In the event that recycling is considered to be an important option to pursue, there has been R&D in the past to separate MDF back to particle form (and then used to make more timber based board products). This is now a commercial process, run by MDF Recovery. Other R&D revolved around composting with high organic matter substances for soil replacement. Either of these options could be investigated in more detail if of interest.

Fibreboard

Fibreboard in the form of a wool wood board (assumed) is apparent on Floor 34, above the internal windows, covering an area of 95m^2, estimated to be 7 tonnes (10m^3) and 7 tonnes of CO_2e. The board is of low quality and low monetary value, making reuse difficult. It is unlikely to be recycled due to its composite nature. The most likely recovery route is energy from waste.

Aggregate

There is loose aggregate on the lower floor roof, covering around 800m^{2,} with a volume of 4m^3 and a tonnage of 6.5. The embodied carbon of this material is estimated to be 0.05 tonnes. The aggregate

is loose and not fixed to the substrate and of reasonable condition. As such it should be suitable for reuse on another similar project, donated or used for landscaping elements.

Insulation

There is an estimated 4.5 tonnes (89m^3) of insulation arisings from the demolition, covering an area of 1789 m^2; this equates to 5.7 tonnes CO_2e. This insulation is assumed to be mineral wool and present in the internal stud walls that are to be removed. From a visual inspection it is difficult to ascertain the type of insulation used and the extent of it. There may be more present within the external walls. No insulation has been included which has been used for pipes. Recovery of insulation material is unlikely to be possible if it is bonded to the substrate. Insulation is usually disposed of to landfill via a licensed waste management contractor or could be sent for energy recovery if foam-based insulants can be successfully segregated. There is a pilot project looking at the recycling of insulation including from Knauf: (Knauf recycling) and Rockwool offer a recycling scheme: Rockwool recycling. Care should be taken to ensure that insulation that may contain ozone-depleting substances are removed and handled carefully.

Further testing and investigation

It could be useful to test samples of the insulation to determine the composition and check for problematic substances or fibres.

Vinyl

There is an estimated 1.3 tonnes (0.99m^3) of vinyl covering approximately 495m^2 of the toilet areas from Floors 2 to 35. This is equivalent to 9 tonnes of CO_2e. The condition is thought to be average (note, not all floors were observed). The best route for this vinyl is either recycling or energy recovery. Schemes exist to recycle old vinyl flooring, depending on the quality and amount of screed attached. This can either be dropped off at specific locations or collected. See Recofloor and Recofloor specifications for more details. Tarkett also has a program, called ReStart program, where old vinyl flooring can be reused in new flooring: Tarkett flooring. If the product does not meet the specification for recycling, then it is likely to be sent for energy recovery.

Further testing and investigation

As described above, there are recycling schemes that could be relevant to this waste stream. However, conditions in terms of quantities and flooring type are attached so it would be necessary to investigate further with each option, and carry out any tests (if needed) to determine polymer type, presence of unwanted substances etc..

14. Maximising Reuse and Best Practice

It is advised that a long lead-in time as possible and maximum exposure are required to enable the reuse of products and components. The best chances for reuse, with the associated environmental and economic benefits, are as near to site as possible:

- Used by the same client locally
- Sold or given away locally

Table 11 shows the items that maybe suitable for reuse. The following recommendations may assist in maximising the reclamation potential of the items identified:

- Consult the client on the findings of this report and consider any options for closed-loop re-use in a similar project (or within the further development)
- Consider setting aside storage on site for segregation of salvaged items.

There are a few organisations that may be able to assist with the reuse of items, which are listed below in London:

- Reyooz: http://www.reyooz.com/about/clients. Offer a service to collect surplus and distribute to charities, schools and small businesses.
- Globechain: https://globechain.com/; a reuse marketplace that donates to charities, schools and small businesses
- Reuse Network: https://reuse-network.org.uk/donate-items/#/
- Collecteco: https://www.collecteco.co.uk/; donation of furniture and equipment to charities, schools and small businesses.
- London Reuse Network - http://lcrn.org.uk/projects-services/london-re-use-network/
- Scrapstores: https://www.workandplayscrapstore.org.uk/ and Reuseful UK https://www.reusefuluk.org/

There is also an interactive map available from the Supply Chain Sustainability School, which shows geographically the different platforms available for material exchange. https://www.supplychainschool.co.uk/school-launches-new-mep-mapping-tool/

For items that may have some architectural salvage value, specific salvage items can be advertised for free on www.salvo.co.uk or low value materials on www.salvomie.co.uk. Salvo also operate a demolition/refurbishment alert service on their website which serves to bring forthcoming demolition products to the attention of potential buyers or users. Local architectural salvage merchants about specific items can also be contacted. Salvo publishes a directory on their website. Ensure that salvaged items are removed and stored in such a way that all components remain together, e.g. doors in their frames.

Table 11 summarises the products that are likely to be more suitable for reuse. This amounts to 3176 tonnes (174m^3) and 1,516 tonnes of CO_2e.

Item	Area m^2	Volume (m^3)	Tonnes	Tonnes of CO_2e
Anodised aluminium curtain walling	784.78	36.13	90.33	602.51
Aluminium panels (Ground and first floor)	219.53	32.93	86.94	579.90
Timber struts (secondary glazing)	480.88	52.18	26.09	-33.65
Mullions (Aluminium)	196.80	9.19	22.99	153.32
Glass façade (lower floor)	466.56	7.00	17.50	29.22
Secondary glazing support (Steel)	146.00	2.13	16.55	45.69
Canopy	585.60	5.86	15.81	105.46
Paving slabs (lower roof)	62.00	3.10	7.44	0.77
Loose aggregate	800.00	4.00	6.48	0.05
Metal ballustrade	819.00	0.82	6.37	17.38
Metal handrail	120.75	0.60	4.69	12.82
Glass atrium panels	175.20	1.75	4.38	7.31
Fire Doors and Frames	211.20	8.45	4.22	-5.45
Riser Cupboards (full)	451.44	5.42	2.71	-3.49
Steel Staircase (joists)	6.32	1.14	1.17	3.23
Blue panels (int. ground floor)	42.12	0.42	1.05	1.76

Riser Cupboards (half)	158.40	1.90	0.95	-1.23
Crazy glass feature (int.ground floor)	19.60	0.20	0.49	0.82
Riser Cupboards (frame)	68.64	0.69	0.34	-0.44
Clear glass panels (int. ground floor)	6.71	0.07	0.17	0.28
Total	**5821.53**	**173.98**	**316.67**	**1516.25**

Table 11: Products that are potentially suitable for reuse/repurposing/remanufacture

Table 12 summarises the standard and best practice opportunities for each of the KPDs identified on this project.

	Opportunities	
	Standard practice	**Best practice**
Concrete	Crushed as RA for fill on/offsite	Crushed for RCA back into concrete
Steel	Recycled as scrap on the global market	Reuse (structural); closed loop recycling as scrap
Brick	Recycled as RA for fill on/offsite	Reuse; recycle into higher value products
Glass	Crushed and used for RA for fill on/offsite	Reuse; closed loop recycling
Aluminium	Recycled as scrap on the global market	Reuse; closed loop recycling as scrap
PVC	Sent for energy recovery/landfill	Closed loop recycling as scrap
Gypsum	Sent to cement kilns; or spread on land	Closed loop recycling
Softwood	Sent for energy recovery	Reuse; recycled into panelboard and animal bedding
Ceramic	Recycled as RA for fill on/offsite	Higher value recycling e.g into tiles
Chipboard	Sent for energy recovery	Sent for energy recovery (opportunities limited)
Fibreboard	Sent for energy recovery	Sent for energy recovery/landfill (opportunities limited)
Aggregate (loose)	Reuse as RA as fill etc	Reuse as aggregate
Insulation	Sent for energy recovery/ landfill	Closed loop recycling
Vinyl	Sent for energy recovery/ landfill	Closed loop recycling

Table 12: Standard and best practice opportunities for the KPDs

15. Targets

It is highly recommended that to maximise the reuse and recycling of the KDPs that the following materials are segregated on site:

- concrete
- glass
- brick
- steel
- aluminium
- timber (softwood)
- plasterboard
- any hazardous waste

Potential targets for materials are shown in Table 13. Overall, an estimated 98% could be diverted from landfill.

	Reuse	Recycling	Diversion from landfill
Concrete	0%	98%	98%
Steel	1%	99%	100%
Brick	0%	98%	2%
Glass	6%	90%	96%
Aluminium	30%	70%	100%
PVC	0%	50%	75%
Gypsum	0%	50%	75%
Softwood	50%	20%	100%
Ceramic	0%	98%	98%
Chipboard	0%	0%	90%
Fibreboard	0%	0%	90%
Aggregate (loose)	95%	5%	100%
Insulation	0%	25%	50%
Vinyl	0%	50%	75%

Table 13: Recommended targets per material

During the demolition, details of the actual materials arisings and the waste management methods used should be recorded to compare actual with forecast and to assess performance against the targets set. Following completion of the project, any barriers to achieving the targets should be reviewed to ensure that in future projects these barriers can be overcome.

Appendix A

Sources of embodied carbon figures

The embodied carbon figures have been taken from the freely available ICE Inventory of Carbon and Energy V3 -10th November 2019. This can be downloaded at: https://circularecology.com/embodied-carbon-footprint-database.html. It should be noted that as the original material is not known in detail (in terms of its composition, source etc), then the figures used for CO_2e must be treated with some caution).

Material	Kg/CO2e	Assumption
Aggregate	0.007	Aggregates and sand, general UK, mixture of land won, marine, secondary and recycled, bulk, loose
Aluminium	6.670	Aluminium General, European Mix, Inc Imports
Block: Concrete: Lightweight	0.093	Concrete block, medium density solid, average strength, per kg
Bricks	0.354	Clay: all data collected
Ceramic	0.780	General
Chipboard	-1.120	Chipboard - including carbon storage
Concrete	0.103	General
Glass	1.663	Glass glazing (double)
Mineral wool insulation	1.280	Mineral wool
Mortar	0.200	Mortar (1:3 cement:sand mix)
Plaster	0.130	General, gypsum
Plasterboard	0.390	Plasterboard
PVC	3.100	PVC General
Softwood	-1.290	Softwood - including carbon storage
Steel (rebar)	1.990	Steel Rebar
Steel (plate)	2.460	Steel Plate
Steel (hot galavanised)	2.760	Steel hot galvanised)
Steel, finished cold-rolled coil	2.730	Steel, finished cold-rolled coil
Woodwool board	0.980	CO2 Only
Vinyl	3.190	Vinyl

Appendix B

Report Authors

Gilli Hobbs is working with Reusefully Ltd and is based in France & UK and has provided technical & expert input to sustainability related projects in the built environment for over 25 years. Until 2021, this was at BRE, where she was Director in the Strategic Advisory team, working across low carbon buildings and building products, circular & lean construction, renewable energy technologies and sustainable communities, in the UK and overseas. During the last year, Gilli has focussed on working with the World Green Building Council, an expert technical assistance to FCO project in India, and a Rapid Evidence Assessment for Defra. She is also an advisor to London Borough of Enfield on the Meridian Water regeneration project and member of various standards committees including CEN TC 350 SC1 Circular Economy (Chair of UK mirror committee), BS 8895 Material efficiency, B/558 Sustainability of Construction Works and CB/101 Service Life Planning.

Dr Katherine Adams has worked in the area of construction resource efficiency for nearly 20 years, mostly at BRE, where she has been instrumental in shaping the construction industry to achieve high levels of diversion of waste from landfill and reducing waste. She has much experience of Pre-refurbishment and demolition audits, having undertaken and reviewed many for various clients, which has involved the development of a robust methodology. She has been responsible for developing waste reporting, including the online system Smartwaste. She enjoys working closely with many elements of the industry, at both a sector and project level. She has recently finished a PhD at Loughborough University looking how circular economy can be embedded in the building sector. She has recently set up a consultancy, Reusefully Ltd, providing advice on circular economy and waste, to the building sectors. She continues to assist BRE and other organisations such as the Alliance of Sustainable Building Products (ASBP).

Euston
Tower

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