Be Seen and Metering Strategy

Hondo Pope’s Road

AG Hondo Popes Road BV

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1.0 EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

On behalf of our Client “AG Hondo Popes Road BV”, HDR has undertaken a ‘Be Seen’ and Metering Strategy assessment of the proposed Hondo Pope’s Road Development in the London Borough of Lambeth.

This Strategy document is based on the GLA ‘Be Seen’ energy monitoring guidance adopted in September 2021. It details the approach taken to comply with the requirements of the newly added ‘Be Seen’ fourth step of the energy hierarchy (Be lean, Be Clean, Be Green, **Be seen**). It also details the approach taken to comply with the policy from the concept stage of design to full occupancy and operation in order to ensure that each responsible party is aware of their design, installation and reporting responsibilities at each reporting stage**.**

Development description:

The proposed development comprises the demolition of an existing building and erection of a part ground + 19 storey and part ground + 8 storey building, comprising flexible A1/A3/B1/D1/D2 uses at basement, ground and first floor, with restaurant (A3) use on Floor 8 and B1 accommodation on floors 2 to 19, with plant enclosures at roof level, and associated cycle parking, servicing and all necessary enabling works.

This Strategy addresses the retail, community space, restaurant, and office areas.

An analysis has been completed of the building using the CIBSE TM54 modelling methodology which, as recommended in the GLA ‘Be Seen’ guidance, uses an adapted Part L model for the estimates of regulated and unregulated loads, the tariff meter requirements associated with utility suppliers to the landlord's services and the metering provided to the lettable areas. This includes metering of supplies to the office, community centre and retail areas.

The ‘Be Seen’ output is to be reviewed at the Planning stage, As-built stage, and In-use stage. **This report is related to the Planning stage only**.

The purpose of the Be Seen approach is to reduce the energy and carbon performance gap between design and in-use operation.

The planning stage predicted energy and carbon end uses, as predicted using the CIBSE TM54 methodology, and which is to be uploaded to the public ‘Be Seen’ planning portal are:

Item	Performance indicator
Grid electricity (kWh)	4,427,782
Gas consumption (kWh)	-
Other fuels consumption (kWh)	-
Energy generation (kWh)	17,728
Carbon Emissions (tCO_2/m^2)	1,028
Carbon Shortfall (tCO_2/m^2)	213
Estimated carbon offset (£)	**607,854**

Table 1: summary the ‘Be Seen’

The metering strategy to allow the above ‘Be Seen’ Requirements to be monitored and reported at As-built and In-use stage are also described within this report. It is structured to meet the requirements as set out in Section 2.1.4 ‘Ensuring Data Accuracy’ of the London Plan Guidance document for ‘Be Seen Energy Monitoring Guidance’ (September 2021).

2.0 INTRODUCTION

INTRODUCTION

On behalf of and in conjunction with AG Hondo Popes Road BV, HDR have developed the 'Be Seen' and Metering Strategy assessment of the proposed Hondo Pope's Road Development in the London Borough of Lambeth.

This Strategy details the assessment process and estimated carbon emissions related to the proposed building based on CIBSE TM54 modelling, which as recommended in the GLA 'Be Seen' guidance, uses a adapted Part L model for the estimates of regulated and unregulated loads, tariff meter requirements associated with utility suppliers to the landlord's services, and the metering provided to the lettable areas.

This Strategy also describes the proposed metering and billing strategy for electricity, ventilation, Low Temperature Hot Water (LTHW) and DHW services for the Hondo Pope's Road Development.

Furthermore, this report sets out the methodology to be used for monitoring the energy consumption of the services within the building in accordance with the recommendations set out, for non-domestic buildings, in CIBSE TM39: 2009 Building Energy Metering, CIBSE TM63 Operational performance: Modelling for evaluation of energy in-use and BREEAM 2018 NC. This report demonstrates that all these requirements and those of AD Part L2A of Building Regulations will be considered as part of the design process in addition to the policies from the GLA "Be Seen" Energy Monitoring Guidance – September 2021

2.1 Reasons for Metering

The methodologies contained within CIBSE TM39 provides guidance to assist with the design and application of the metering strategy. the metering strategy applied to the Hondo Pope's Road development is to assist the building management in understanding the building performance characteristics and to provide an effective tool in managing energy usage.

There are various reasons for metering within a mixed-use development building:

- To truly achieve net zero-carbon buildings we need to have a better understanding of their actual operational energy performance. Although Part L calculations and Energy Performance Certificates (EPCs) give an indication of the theoretical performance of buildings, it is well established that there is a 'performance gap' between design theory and measured reality.
- The 'be seen' policy establishes post-construction monitoring as good practice, enabling developers and building owners to better understand their buildings and identify methods for improving energy performance from the project inception stage and throughout the building's lifetime.
- Ensuring that the actual energy and carbon performance of buildings is aligned with the estimated energy and carbon performance will also be a key factor in achieving a zero-carbon London.
- The energy performance data that will be collected will provide an evidence base which could help inform future industry-wide benchmarks or performance ratings for major building typologies based on in-use performance.
- Providing robust data to assist both the landlord team and commercial tenants in reducing their energy consumption and helping the Building Management Team to operate the building efficiently and effectively.
- Accurate measurement at the point of generation for onsite mechanical plant providing, heating, cooling and fresh air ventilation, as well as use of electricity and heat recovery provided by the usage of heat pumps to measure the added value of this innovative design.

2.2 Legislation

Landlords must be able to understand the energy consumption within their building and major energy-consuming areas within it. Tenants must be able to view their energy consumption and be shown that services being provided to them are at a competitive rate.

Specific legislation applies to commercial buildings:

- Gas and Electricity - approved tariff-based meters, meeting standards set out by the Office of Gas and Electricity Markets (OFGEM) are required for energy monitoring and billing purposes.
- Part L2A 2013– Building Regulations specific to non-domestic buildings.
- CIBSE TM 39 Building Energy Metering
- CIBSE TM63 Operational performance: Modelling for evaluation of energy in-use
- BREEAM 2018 – Ene 02 Energy Monitoring.
- CIBSE TM 22 - Energy assessment and reporting method.
- The European Measuring Instruments Directive (MID) 2004/22/EC, Measuring Instruments Directive.
- GLA "Be Seen" Energy Monitoring Guidance – September 2021

3.0 OPERATIONAL ENERGY

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3.1 CIBSE TM54

The CIBSE TM54 Energy Assessment Process is widely regarded as a best practice methodology for calculating the energy usage of building projects. This methodology is thorough, attempting to cover all aspects of the building energy use, however the results reported should not be solely relied upon as an accurate prediction. Rather, it is intended as a more detailed estimate that helps to identify and explain the factors that affect the operational energy use.

SBEM (Simplified Building Energy Model) is a compliance tool to assess a building against Building Regulations Approved Document Part L2a. This approach does not account for all of the energy usage in a building so the CIBSE TM54 methodology is used to assess the building to close the performance gap between design intention and operational performance.

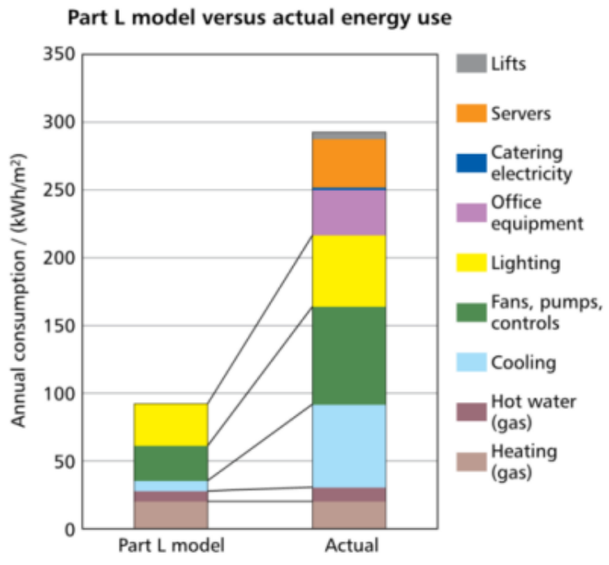

Figure 1: Comparison of Part L model and operational performance of a live building. (CIBSE TM54)

The calculations undertaken have included as many of the items of plant and equipment as possible identified at design stage, including lifts, all lighting, fans and pumps. It is important to note that with any modelling exercise the input data is based upon the information provided by HDR RIBA Stage 2 and in-operation activities of the building. Building usage is by its nature somewhat unpredictable and may change with time, therefore some deviation from actual usage would be expected. All results are based on the output from computer modelling software (IES Virtual Environment 7.0.13) and should be taken as an indication of the likely real-world situation.

3.1.1 System breakdown

In line with the approach used by TM54, the estimated energy use results are presented for all energy end-uses, which represent the whole building. These include the following energy end-uses:

- Space heating
- Hot Water
- Space Cooling
- Fans, pumps and controls
- Internal Lighting
- External Lighting
- Small power and equipment
- Lifts and escalators (regulated energy uses).

3.1.2 TM54 Modelling output

The calculations undertaken have included as many of the items of plant and equipment as possible identified at design stage, including lifts and all lighting as well as fans and pumps.

Item	Annual Energy Consumption (MWh/year)
Space Heating	46.24
Hot Water	93.43
Space Cooling	279.15
Fans, Pumps and Controls	623.36
Internal Lighting	727.52
Small Power and Equipment	2,154.92
Total	**3,924.62**

Table 2 TM54 Modelling output

3.1.3 Other Energy uses

The manual calculations summarised in the table below have been undertaken to establish additional unregulated energy consumption associated with various components in the building:

Item	Annual Energy Consumption (kWh/yr)	Normalised Annual Energy Consumption (kWh/m2/yr)	Annual Energy Production (kWh/yr)	Normalised Annual Energy Production (kWh/m2/yr)
Trace heating tape	446.4	0.016	-	-
ICT	79,821	2.8	-	-
Microwaves	15,926	0.57	-	-
BMS & Controls Parasitic	70,350	2.5	-	-
PH Pumping	30,868	1.1	-	-
Hand Dryers	5,673	0.20	-	-
CCTV Cameras	2550.9	0.091	-	-
Air Curtains	1,460	0.052	-	-
Coffee Makers	46,922	1.67	-	-
Zip Taps	20,177	0.72	-	-
Generators	2,208	0.1	192	0.01
Fridges	46,859	1.7	-	-
Lifts	173,959	6.2	-	-
External Lighting	5,951	0.21	-	-
Total	503,171	17.88	**192**	**0.01**
Net Total	503,171	17.87		

Table 3: Additional energy consumption

3.1.4 Results

The table below summarises the operational energy consumption for the proposed building.

Source of energy	Annual Energy Consumption (KWh/yr)
Electricity	4,427,781.78

Table 4: Operational energy consumption

Based on the above modelling and calculations the planning stage predicted energy and carbon end uses, as predicted using the CIBSE TM54 methodology, and which is to be uploaded to the public 'Be Seen' planning portal are:

Item	Performance indicator
Grid electricity (kWh)	4,427,782
Gas consumption (kWh)	-
Other fuels consumption (kWh)	-
Energy generation (kWh)	17,728
Carbon Emissions (tCO_2/m^2)	1,028
Carbon Shortfall (tCO_2/m^2)	213
Estimated carbon offset (£)	**607,854**

Table 5 summary of 'Be Seen'

3.2 Flexibility and Demand Side Response (DSR)

The National Grid and Distribution Network Operators (DNOs) aim to reduce peak demand since if the demand exceeds system capacities, then supplies may be interrupted.

Furthermore, providing power to meet high peak demands is very expensive as it means that some energy sources would only be needed for the intermittent peak demands, and would be idle for much of the year.

3.2.1 Energy Storage

Given the electrical demand and the area of PV panels included in the design, the generated electricity onsite will be directly used within the proposed development. Therefore, it is not proposed to incorporate battery storage with the design.

In terms of heat storage, the building's thermal load is met by Air source heat pump units. Thermal storage will be included within the main plant room located within the basement.

3.2.2 Peak energy demand

This section explains how the proposed development responds to the London Plan policies SI 2 and SI 3 in relation to 'minimising both annual and peak energy demand'.

For the proposed development, there will be no gas consumption onsite except for the restaurant cooking needs which are expected to be minimal. The building's thermal load will be met by a connection to the heat pumps system.

Therefore, key design decisions regarding Peak Energy Demand are use of high efficiency lighting to reduce electrical load. Analysis has shown that compared to a lighting provision of *31.20* W/m^2 and 10 W/m^2 (display lighting) as per NCM guidance has been used for the retail sales areas and 15W/m^2 for the restaurant and 10 W/m^2 display lighting has per CIBSE Guide A, the introduction of high efficiency lighting in these areas (20W/m^2 for the retails sales and 7.8W/m^2 for the restaurant), achieve a substantial reduction in peak demand.

The table below compares peak demand vs revised peak demand. It shows that the building achieves a 2.14% reduction for electricity, with only a slight rise in Peak Demand for heat (due to reduced heat gains resulting from efficient lighting and external shading).

Parameter	Electrical	Enabled Through
Estimate peak demand (MW)	3,924.61	This is based on standard lighting.
Available capacity (MW)	UKPN contacted by design team	
Flexibility potential (MW)	-	Flexibility measures are being considered but have not yet been confirmed.
Revised peak demand (MW)	3840.48	This is based upon introduction of high efficiency lighting that has to be confirmed.
Percentage flexibility predicted (%)	2.14%	Calculated % reduction from Peak Demand to Revised peak demand.

Table 6 Summary of site-wide peak demand, capacity and flexibility potential

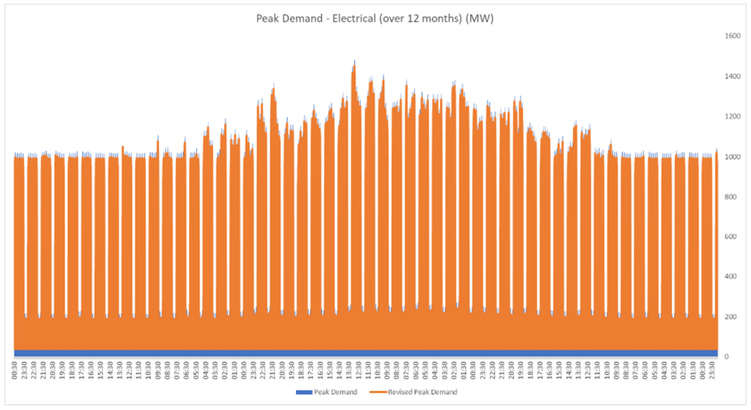

Figure 2 Peak Demand on monthly basis (ELECTRICITY)

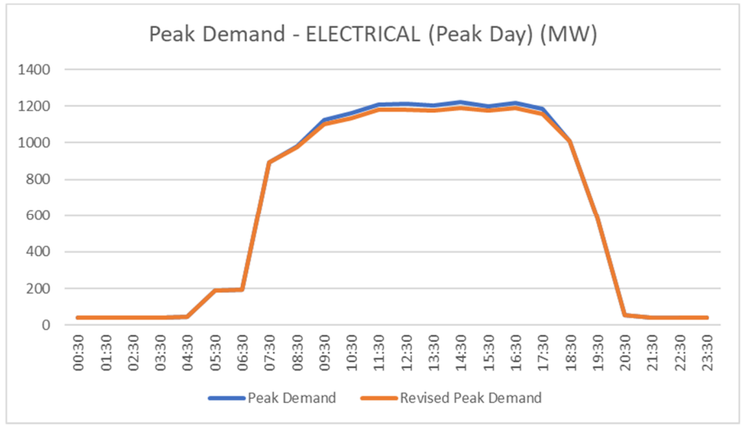

Figure 3 Peak Demand on daily basis (ELECTRICITY)

4.0 METERING METHODOLOGY AND ENERGY MANAGEMENT SYSTEMS (EMS)

4.0 METERING METHODOLOGY AND ENERGY MANAGEMENT SYSTEMS (EMS)

4.1 Metering Methodology

The CIBSE Technical Memorandum TM39: 2009 promotes best practice in the design of energy metering and submetering in non-domestic buildings. This has been used to develop a cost-effective and practical approach to the design of the energy metering systems. The metering strategy for the Hondo Pope's Road development is aligned with current regulations and guidance for new buildings.

The metering methodology is provided to address the following considerations:

- Building benchmarking to comply with CIBSE TM 54 for Evaluating Operational Energy Performance of Buildings at the Design Stage, CIBSE TM 46 and advanced modelling requirements set by Better Buildings Partnership BBP.
- Landlord technical energy analysis by use (i.e. type of plant or equipment)
- Billing of each individual tenant in offices and retail units.

Description		Responsible Team Member	Actions /Progress	Level of Compliance
Step 1	Select the boundary within which TM39 will be applied	HDR	Clear boundary provided within the EMS system	✔
Step 2	List all energy that is imported and exported across this boundary including all the main supplies and Renewables energy and LZC technologies	HDR	Meters are installed to measure the heat recovery opportunities from the heat pumps. Also energy generation by PV panels is metered.	✔
Step 3	List all items within the boundary that will be supplied. These could be end-uses, technologies, tenancies or other activity areas	HDR	Has been developed as part of the design progress and is included in RIBA Stage 2 Schematics	Work in progress
Step 4	Decide which of these items should be metered or sub-metered. Consider how the energy data collected within the boundary might need to be or could best be used		in RIBA Stage 2 Schematics	
Step 5	Select the appropriate meters or method for each item to be metered or sub-metered.	HDR	Will be developed as part of RIBA Stage 2 design	Work in progress
Step 6	Determine where to locate the meters. Mark the plan to show, within the boundary, which meter is located where.	HDR	Will be developed as part of RIBA Stage 2 -3 design	Work in progress
Step 7	Decide how the meters are to be read. For automatically read meters, ensure that readings can be gathered for analysis, particularly if there is an existing EMS system.	BMS team& Client	Client to advise regarding the level integration between the EMS / BMS and the strategy to be adopted	Work to be completed at RIBA Stage 3
Step 8	Review metering strategy for appropriateness, complexity and cost - effectiveness. Go back to step 4 if revisions are required.	MEP/EDS/BMS team Appointed contractors		Work to be completed at RIBA Stage 3
Step 9	Specify, implement and commission the metering and submetering decided in step 8	Client & MEP/ESD/BMS teams Appointed contractors	Additional review and optimisation work should be scheduled as part of the five years Post Occupancy Evaluation (POE)	Work to be completed from RIBA Stage 4
Step 10	Ensure a copy of the updated metering strategy is included in the building logbook.	Client & MEP/ESD/BMS teams Appointed contractors	The documentation and reporting templates should be agreed in advance as part of RIBA Stage 3 specification to comply with the latest industry guidance	Work to be completed at RIBA Stage 3

Table 7: Compliance with CIBSE TM39 and responsibility table

4.1.1 Metering Dashboard

The following charts represent suggested reporting templates to demonstrate achievement of the targets listed above in Table 1.

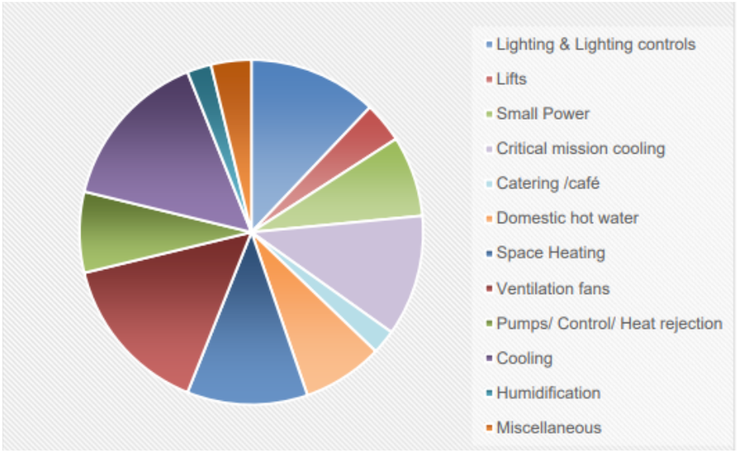

Figure 4. Example of Energy consumption of commercial areas broken down by energy end-usage

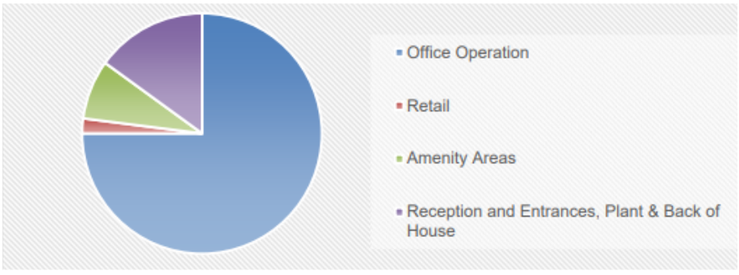

Figure 5. Example of Different energy consumption broken down by areas

4.2 GLA "Be Seen" Reporting process

The Mayor of London has declared a climate emergency and has set a target for London to be net zero-carbon by 2035. This means all new buildings must be net zero carbon. To truly achieve net zero-carbon

buildings, design team and client needs to have a better understanding of the building actual operational energy performance and work towards bridging the 'performance gap' between design theory and actual energy use.

To address this gap the London Plan Policy SI 2 'Minimising greenhouse gas emissions' introduces a fourth stage to the energy hierarchy; the 'be seen' stage, which requires monitoring and reporting of the actual operational energy performance of major developments for at least five years via the Mayor's 'be seen' monitoring portal.

The 'Be seen' energy monitoring guidance requires the reporting of energy performance data as a scheme is planned, built out and in use. The responsibility for providing the data at each reporting stage lies with the legal owner of the development at that particular reporting stage.

Figure 6 outlines the 'be seen' process through the reporting stages of a development, including who specifically is responsible for reporting at each stage.

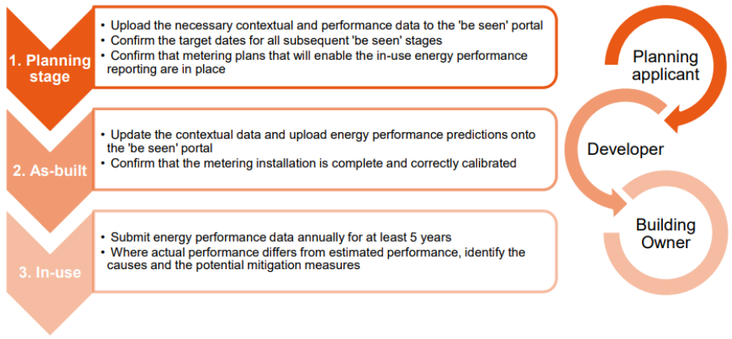

Figure 6 : Be seen' process and responsibilities

4.2.1 Building Tenure

Based on the Addendum Design And Access Statement submitted in September 2020 by Adjaye Associates, the Hondo Pope's Road development will comprise four different tenures, as shown in the following table:

Usage	Proposed Net Internal Area, NIA (m²)
Retail units	1,447
Office	18,412
Community Space	155
Restaurant	385

Table 8: Building area schedule

Whilst the metering of the main landlord services is generally similar, the metering and billing may differ between the different tenures (retail, office, restaurant and community space).

4.2.2 Landlord Metering Boundary

The site metering boundary line demonstrates the areas in which the metering methodology has been applied. The major plant areas which contain metering are located at the basement level of the building. The boundary lines are illustrated in red in Figures 4 to 12..

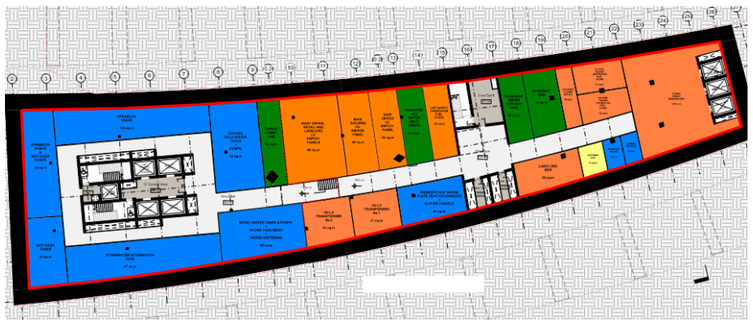

Figure 7. Metering boundary for Upper Basement level

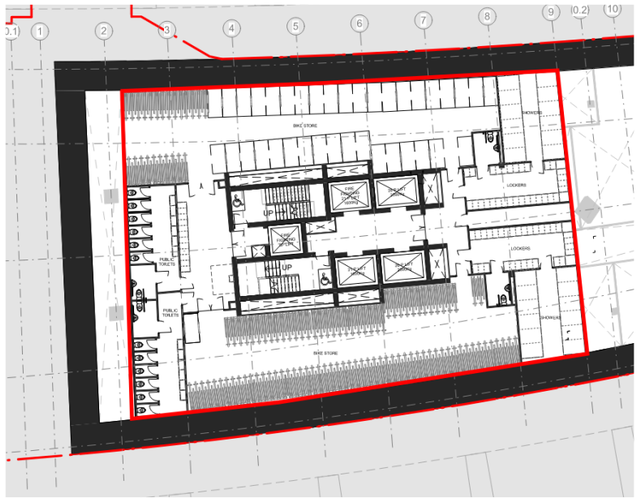

Figure 8 Metering boundary Lower Basement floor

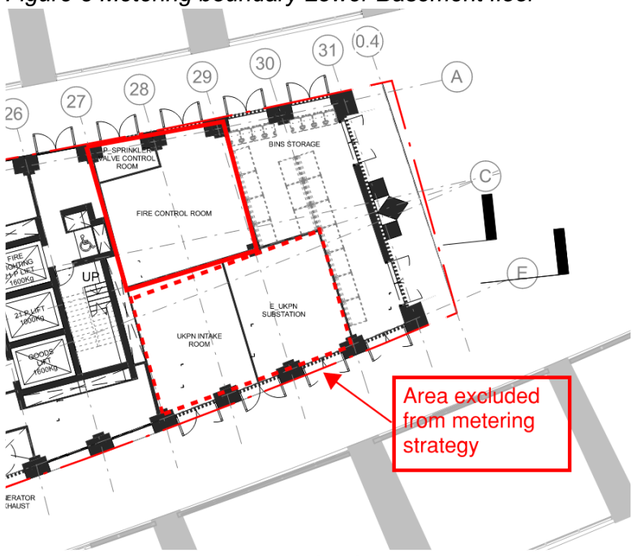

Figure 9. Metering boundary for Ground level

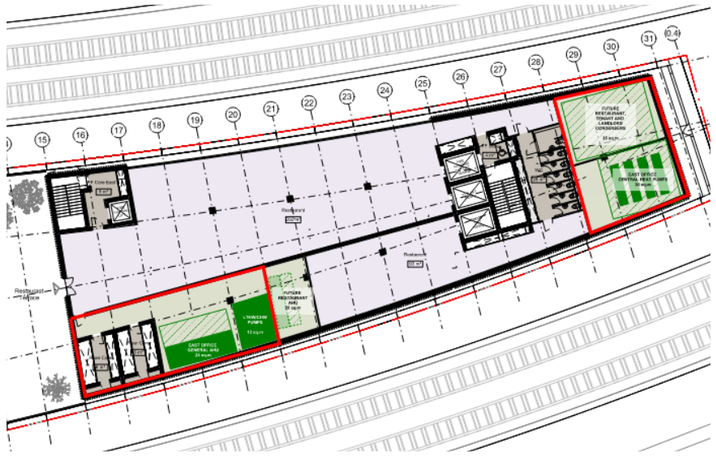

Figure 10 Metering boundary Eighth floor

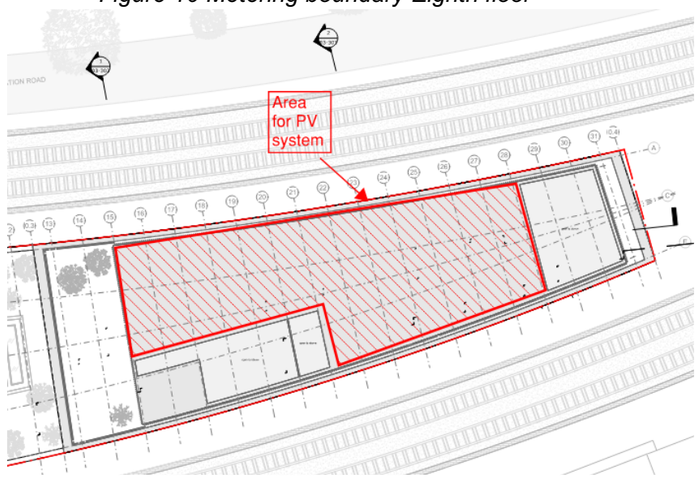

Figure 11 Metering boundary Ninth floor

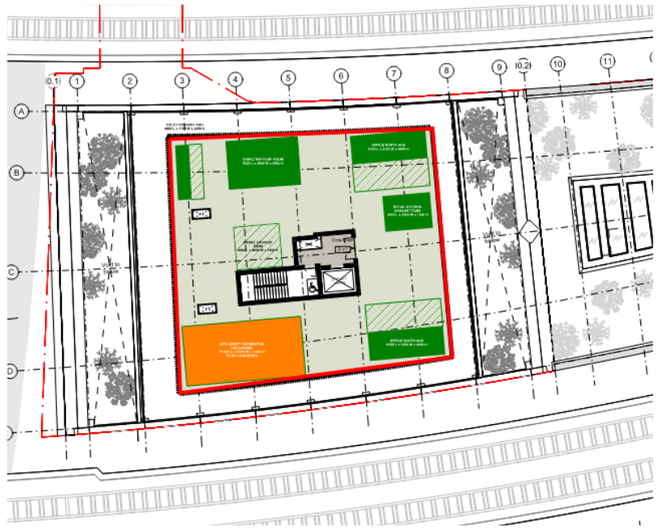

Figure 12 Metering boundary Roof Level

4.2.3 Commercial Metering Boundary

The figures below identify the metering boundary for the typical office floor and the retails, community space and restaurant as well as amenity space.

Figure 13 Metering boundary for retail tenant at Ground Level

The building is designed to allow independent operation of the retail units tenancies (split is highlighted in blue on the figure above), including the provision for sufficient monitoring to apportion energy use.

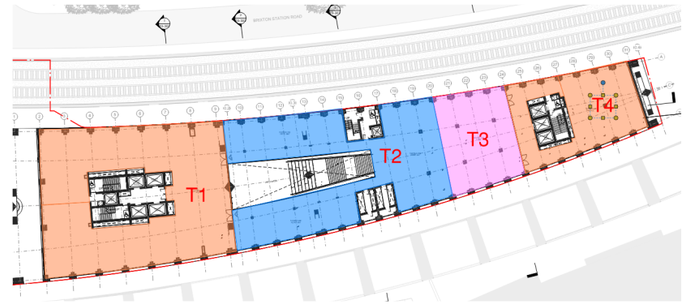

Figure 14 Metering boundary for Office, retail and community tenant at First Floor

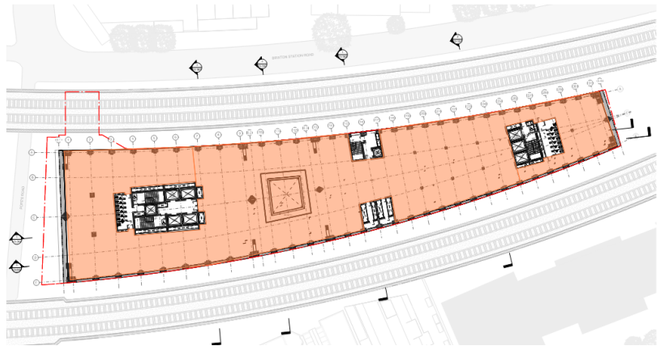

Figure 15 Metering boundary for Office, at Second to Fourth Floor

The figure above shows the metering strategy for the open floor plate. Should this space be sub-divided to allow additional tenants, each space will need to include additional meters.

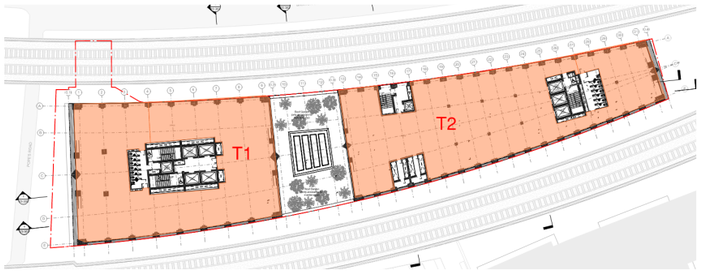

Figure 16 Metering boundary for Office, at Fifth to Seventh Floor

The figure above shows the metering strategy for the open floor plate. Should this space subdivided to allow additional tenants, each space will need to include additional meters.

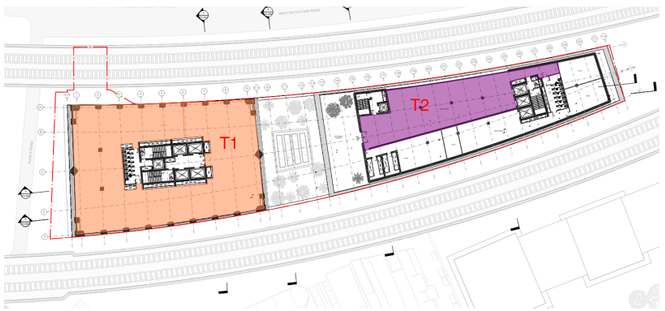

Figure 17 Metering boundary for Office and restaurant on Eighth Floor

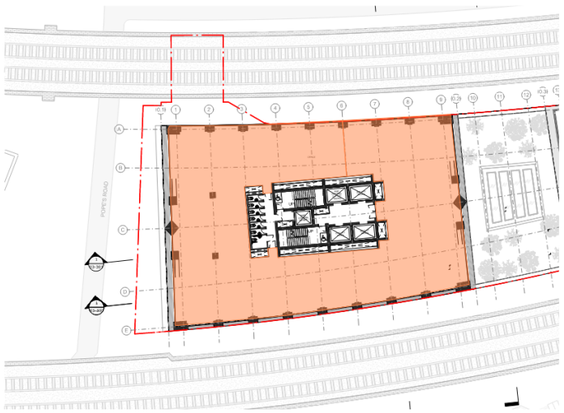

Figure 1185 Metering boundary for Office at Ninth to Thirteen Floors

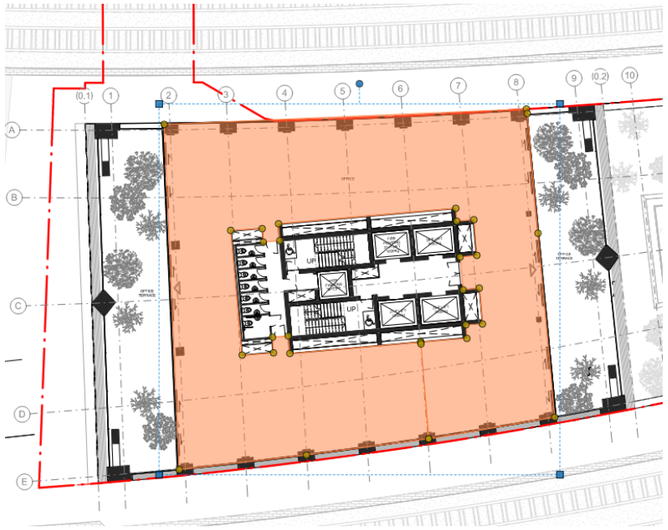

Figure 19 Metering boundary for Office at Fourteen to Nineteen Floors

4.3 Energy Management System (EMS)

In line with the 'Be Seen' guidance (GLA, Sept 2021) a cloud-based Energy Management Systems (EMS) will be provided, enabling automatic data collection, monitoring & targeting and tenant billing.

The EMS will collate, via the BMS, the consumption of data from water, electrical, LTHW and CHW meters. The EMS will automatically monitor, collect and bill energy usage throughout the development.

The EMS will analyse the collected data, in order that consumption charges are appropriately allocated to the correct end-user, by the Landlord.

The EMS and the service provider will be compliant with the General Data Protection Regulation (GDPR) and ISO27001. Metering and billing data will be securely stored in the cloud by the service provider.

Further details on the EMS will be included within the BMS Technical Specification which will be provided at a later design stage.

4.3.1 Meter Chains

Ensuring the correct operation of meters is crucial to the reliability and robustness of the metering strategy. In order to achieve optimum data collection, it is recommended that the creation of 'virtual' meters within the system architecture that constantly checks the summation of meters arranged in chains is implemented.

In order to avoid errors in metering and ensure that these errors are detected by the system and reported for investigation, a 'meter chain' should be devised and each chain clearly explained as to its contents.

4.3.2 Meter Consumption

The BMS will calculate and log the following consumption rates for all meters and display them:

- Half Hourly Consumption
- Daily Consumption
- Weekly Consumption
- Monthly Consumption
- Yearly Consumption
- Total Consumption

4.3.3 Revenue Collection

The revenue will be collected from tenants via a 3rd party accounting system, provided by the Landlord. The EMS will be capable of producing electronic invoices/bills addressed to each tenant and capable of producing electronic files containing billing data for direct import into the Landlord's chosen accounting system/revenue collection system.

5.0 COMMERCIAL SERVICES METERING STRATEGY

5.0 COMMERCIAL SERVICES METERING STRATEGY

The following services shall be metered within each tenant boundary:

- Potential gas consumption
- Electricity consumption (small power, lighting, FCUs and electric water heaters)
- Water consumption (domestic boosted cold water)
- CHW and LTHW consumption (space heating and space cooling)
- Apportioned central HVAC consumption associated with the ventilation system

5.1 Metering of Gas

A new gas services enter the building into the basement within the building envelope. From there the services is routed to the incoming gas room at basement level.

Figure 20 Incoming gas supply and gas room

A capped branch provided on the main incoming gas service. A pipe route will be coordinated to the retail areas that are sufficiently sized for kitchen/restaurant use and this will allow a gas connection to be provided for use by future retailers.

A dedicated incoming gas pipe will be provided along with a ventilated meter enclosure on the perimeter of the retail unit.

The ordering and installation of gas meters may need to be undertaken by the respective tenant as part of their fit-out works.

Tenants would also need to set up their own supply contract and be responsible for payment of their bills.

5.2 Metering of Electricity

5.2.1 Incoming Electrical Supply

A new HV incoming supply shall be provided by UKPN and terminated in a dedicated UPKN substation. Supplies from the UPKN Substation shall then be taken to the dedicated landlord and tenant LV switchrooms.

Figure 21 UKPN substation and intake room at ground floor level

The landlord electrical services are routed into the landlord electrical riser that provides a service to all floors and the plantrooms at basement and roof level.

Electrical supplies to each of the tenant floors shall be taken from the tenant electrical riser located on each of the commercial floors.

Each retail unit will be provided with its own dedicated metered supply.

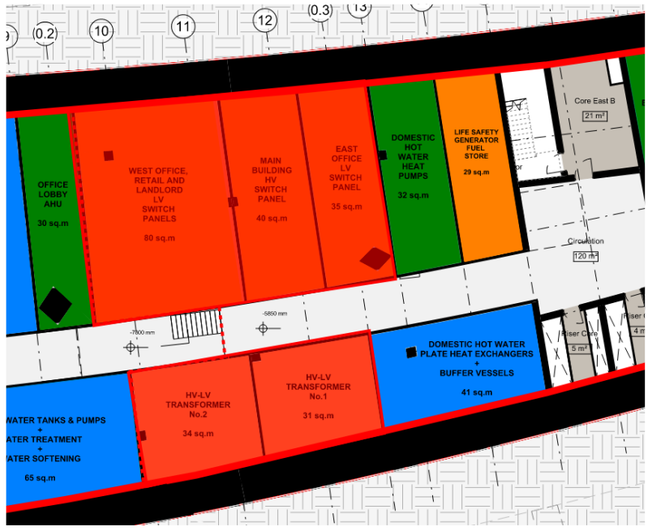

Figure 22 LV switch Panels and HV-LV Transformers rooms at Basement level

5.2.2 Retail Tenant Electricity Supplies

The retail units will be provided with a metered supply, derived from the tenant's switchboard. The capacity will be based on the area and intended use of the retail unit.

5.2.3 Meter Provision – Landlord and Retail Areas

Retail areas that are separately rented shall include a dedicated metered electrical supply from the local substation. The capacity of all supplies shall be based on the size and use of the space.

The ordering and installation of electricity meters will need to be undertaken by the respective tenant as part of their fit-out works.

Tenants would also need to set up their own supply contract and be responsible for payment of their bills.

The incoming electrical supply to the switchgear is provided with utility tariff meters.

Further meters are provided on the landlord LV switchboards to monitor electrical energy consumption to key areas of the building.

Meters will be provided with a high-level communications interface for connection to the Landlord BMS network. Meters shall not be provided with volt-free pulsed outputs. Where required, further signal outputs shall be provided for direct contract utility billing.

The BMS will monitor the following points as a minimum; Active Power Per Phase (kW), Voltage Per Phase (V), Current Per Phase (A), Power Factor, Total Energy Usage (kWh) Electrical interfaces within retail units are provided as part of the base build with landlord meters. These will be fully integrated with the Landlords BMS for direct contract billing between the landlord and the retail tenant.

Electricity meters will be MID approved and certified. Where meters serve commercial/retail areas, they shall be compliant with MID 2004/22/EC, Annex MI-003, Commercial/retail Light Industrial Class B.

Locations of main electrical meters are summarised below (table to be completed at later stage of design):

Location	Meter Ref	Type	Utility Ref	Supply Rating	Location
UKPN HV switch (ground floor)	TBC	Utility Tariff Meter	TBC	TBC	Landlord Electrical Consumption
Basement LV switch room – Tenant LV switch board	TBC (one meter per unit)	MID approved Meter	TBC	TBC	Retail Units Electrical Consumption

Table 9: Electrical meter locations

TBC = to be confirmed at later design stage

5.2.4 Metering Provision for Office Floors

The landlord will provide tenant meters incorporated within the lighting, LTHW and CHW loops, and distribution boards serving each Tenant demise as part of the CAT A fit out works. Tenants will also provide their own metering for small power distribution boards (provided by tenant connected to base build tap off) on each floor.

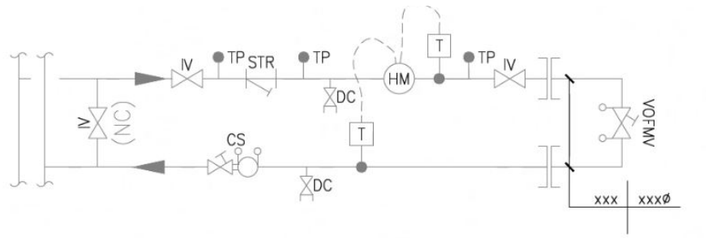

Figure 23 typical riser valve arrangement for CHW and LTHW loops

A rising main busbar system installed for supplies to the Category 'A' floors incorporates space provision in each riser cupboard on each floor for the provision of tenant's small power distribution boards/electricity check meters (provided by tenants). Each check meter will be connected to the Landlords BMS via a high-level interface.

5.2.5 Metering of Renewable Technology

As per BREEAM NC 2018 Ene 02 requirements, the PV panels on the roof has been provided with a separate MID meter to determine the amount of net energy generated.

The Heat Pump used to supply space heating, cooling and domestic hot water generation also has been provided with metering to measure the electrical energy consumption.

5.3 Metering of Water

An incoming water supply is connected to the building from the existing Thames Water infrastructure.

5.3.1 Incoming Water Supply

The mains water supply is connected to the Thames Water incoming mains.

Mains water will be stored in fluid Category 1, Category 2 and Category 5 tanks, from where water will be pumped through booster sets and distributed to all floors throughout the building via dedicated risers. Water will be also provided to landlord areas for building maintenance, cleaning and other uses.

5.3.2 Retail Tenant and Community Space Water Supply

Only retail units with kitchen, the restaurant and the community space will be fitted with water supply. Each of these tenants will be allocated a separate connection from the Thames Water main suitable for a shop, café or -sized restaurant. The service will be provided with a provision for a Thames Water revenue meter, to be installed by the tenant, and will be terminated within the retail unit. Each Thames Water revenue meter would be located in the basement. A pipework route to each retail unit will be coordinated into the base build design.

This will provide each retail unit with a separately metered water service which is independent from the landlord supply.

5.3.3 Meter Provision – Landlord and office areas

The incoming main water supply to the building will be provided with a Thames Water revenue meter. A separate BREEAM water leak detection system complying with BREEAM WAT02 and WAT03, shall be installed on the incoming mains water supply with a connection to the BMS.

Office tenants would sub-meter their supplies via the Landlord water meters connected to the BMS.

Water meters shall be compliant with MID 2004/22/EC, Annex MI-001, Rated Operated Conditions 1,2 and 3.

Meter accuracy shall be determined by the MID classification of the meter. Water meters that are installed within the fluid 1 & 2 category water network shall be WRAS approved and shall comply with

Statutory Instrument S.I.1999 No. 1148 – The Water Supply (Water Fittings) Regulations 1999.

Water meters shall be the ultrasonic type having no moving parts to prevent mechanical wear and removal for maintenance. Clamp-on meters shall not be used.

Devices shall be provided with local displays allowing the operator to routinely check that logged data matches actual readings.

Meters shall be provided with a high-level communications interface for connection to the Landlords BMS network. Meters shall not be provided with volt-free pulsed outputs. Where required, further signal outputs shall be provided for direct contract utility billing.

Location	Meter Ref	Type	Utility Ref	Line Size	Measuring
Basement water meter room	TBC	Thames Water Revenue Meter	Mains Cold Water	TBC	Landlord & Commercial Water Consumption
Basement water meter room	TBC	Bulk Water Meters	Mains Cold Water	TBC	Landlord Monitoring & Leak Detection
Basement (location TBC)	TBC	Bulk Water Meters	CAT2 BCWS	TBC	Landlord Shower Monitoring
Landlord risers	TBC	Bulk Water Meters	CAT2 BCWS	TBC	Landlord Toilet Monitoring
Tenant risers	TBC	Bulk Water Meters	CAT1 BCWS	TBC	Landlord Tenant sub-metering
Basement	TBC	Thames Water Revenue Meter	Mains Cold Water	TBC	Retail Unit Water Consumption

Table 10: Water meters location

5.4 Chilled Water and Low Temperature Hot Water Metering

CHW and LTHW circuits to AHUs, domestic hot water calorifiers and fan coil units will be provided with energy meters for overall energy usage.

5.4.1 CHW and LTHW Supply

LTHW is generated by air source heat pumps installed at roof levels. LTHW is then distributed to serve AHUs, FCUs and calorifiers as required. Each circuit is individually metered with meters also provided on the on floor pipework loops.

CHW is generated by air sourced heat pump units and/or cooling only air sourced heat pumps (located on the roof). Pumps distribute CHW and LTHW to landlord areas and office units throughout the building via dedicated service risers. Each area (landlord and tenants) are served by a separate CHW and LTHW circuit, which is served from the primary circuit via a low loss header.

5.4.2 Meter Provision for Landlord Areas

The LTHW and CHW services to major energy consuming areas are provided with an energy meters installed by the landlord. This includes areas such as the main office AHUs, reception area. Meter will be provided with connection to the BMS/EMS system.

Heat meters shall be MID approved and certified.

Heat meter integrators shall have a dedicated permanently wired electrical supply, battery backup (min. 45 days) and a permanent memory to ensure there is no loss of the energy and operational data. Devices shall be provided with local displays allowing the operator to routinely check that logged data matches actual readings.

Where meters serve commercial areas, they shall be compliant with MID 2004/22/EC, Annex MI-004, Commercial Light Industrial Class 2.

The flow sensor shall be provided with test points for routine calibration. Heat meter installation shall comply with all parts of BS EN 1434.

Following commissioning, the meters shall be provided with tamper seals protecting meter settings and reset functions, providing protection against fraud.

Meters shall be provided with a high-level communications interface for connection to the Landlord BMS network. Meters shall not be provided with volt-free pulsed outputs.

Locations of LTHW and CHW meters are summarised below.

Location	Meter Ref	Type	Utility Ref	Line Size	Measuring
Basement LTHW plantroom	TBC	Utility Tariff Meter	TBC	TBC	Landlord LTHW Consumption
Basement CHW plantroom	TBC	Utility Tariff Mete	TBC	TBC	Landlord CHW Consumption
Roof LTHW plantroom	TBC	Utility Tariff Mete	TBC	TBC	Landlord LTHW Consumption
Roof CHW plantroom	TBC	Utility Tariff Mete	TBC	TBC	Landlord CHW Consumption

Table 11: LTHW and CHW meters location

5.4.3 Meter Provision – Office Floors

The CHW & LTHW branch to each office floor an energy meter networked to the BMS via the M-BUS protocol. The heat meter is provided on the supply pipework as indicated in Figure 21 to allow measurement of the chilled water and LTHW flow rates and energy consumption, which can then be charged to each tenant.

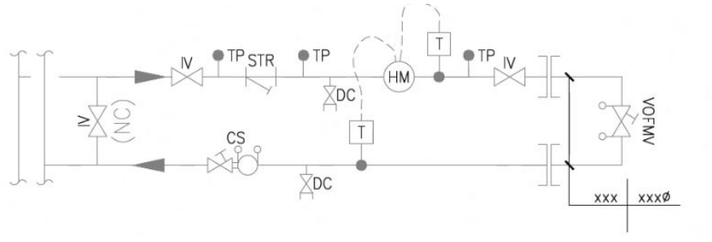

Figure 24 typical riser valve arrangement for CHW and LTHW loops

5.5 Ventilation metering

The ventilation supply to the office tenants will be fitted with CAV boxes with volume feedback. The LTHW, CHW and electricity supply to the main ventilation plant serving the office floors shall be metered as described in sections 5.2 and 5.4 of this report.

The total energy consumption at the office supply ventilation plant shall be apportioned to each office tenant based on the air volume measured at the associated tenant supply CAV box.

6.0 BILLING STRATEGY

6.0 BILLING STRATEGY

This section outlines the billing strategy for direct utility services and shared landlord services, as well as details on how energy consumption charges are to be allocated to the end users

6.1 Electrical services

6.1.1 Main incoming Electrical Services

The main incoming electrical supply serving the building will be provided with an electricity meter, supplied and installed by the energy provider. The meter is provided for direct contract billing between the landlord and the energy provider, the meter will not be connected to the BMS/EMS. In order to provide monitoring, billing and verification a check-meter connected to the landlord BMS/EMS will be installed downstream of the supply authority electricity meter.

6.1.2 Office Tenant Electricity Services

Electricity meters serving the office tenants will be required to directly be connected to the BMS/EMS. These will be used for direct contract billing between the individual tenant and the landlord.

6.1.3 Retail Tenant Electricity Services

Electricity meters serving the retail tenants, will be required to directly be connected to the BMS/EMS. These will be used for direct contract billing between the individual tenant and the landlord.

6.2 Water services

6.2.1 Main incoming Water Services

The main incoming water supply serving the building will be provided with a water meter, supplied and installed by the water authority (Thames Water). The meters are provided for direct contract billing between the landlord and the water authority, the meter shall not connect to the BMS/EMS. In order to provide monitoring, billing and verification a check-meter connected to the landlord BMS/EMS will be installed downstream of the supply authority water meter

6.2.2 Office Tenant Water Services

Water supply serving the office tenants shall not be provided with a water meter. The water supply to the office tenants shall be billed by the landlord on a service charge basis.

6.2.3 Retail Tenant Water Services

The incoming water supply serving the retail units and the restaurant requiring water supply will be provided with a water meter, supplied and installed by the water authority (Thames Water). The meters are provided for direct contract billing between the retail tenant and the water authority, the meters shall not connect to the BMS/EMS.

6.3 LTHW and CHW Services

6.3.1 Office Tenant LTHW and CHW Services

LTHW and CHW heat meters, serving the office tenants, will be required to directly connect to the BMS/EMS, for direct contract billing between the individual tenant and the landlord.

6.3.2 Retail Tenant LTHW and CHW Services

No LTHW or CHW supply is provided to the Retail tenant. Retail tenant will be required to provide their own Heating, Cooling and Ventilation systems.

6.4 Ventilation Services

6.4.1 Office Tenant ventilation Services

The ventilation supply to the office tenants will be fitted with CAV boxes with volume feedback. The LTHW, CHW and electricity supply to the main ventilation plant serving the office floors will be metered.

The total energy consumption at the office supply ventilation plant will be apportioned to each office tenant based on the air volume measured at the associated tenant supply CAV box.

The office tenant will be billed directly by the landlord as per the apportioned energy consumption for the respective tenant demise.

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