**Landlord's Heating Systems**

Wall mounted electric panel heaters complete with integral time and temperature control shall be installed in staircases and plant areas to provide background heating and fabric protection as indicated on the drawings.

Ground floor front of house areas shall be provided with electric underfloor heating system supplied with local time and temperature control.

**Landlord's Cooling Systems**

There is no cooling proposed within the landlord areas apart from the UPS room.

Two stand-alone VRV systems (run and stand-by) shall provide cooling to the lower ground floor UPS room. Each system shall comprise an air-cooled condenser located within the external plant area at roof level and a wall mounted indoor units within the space.

Each condenser shall be connected to the indoor units via refrigerant pipework mounted on dedicated trays.

Condensate shall discharge by gravity over the gully within the adjacent tank room.

**Ventilation Systems** Gray's Inn Road

GENERAL

All systems and sections of systems shall comply with Building Regulations Part L 2013 with respect to specific fan power and air leakage. Systems operating at more than 1m³/s shall be air leakage tested to the requirements of DW 144 and in accordance with DW 143.

All penetrations through fire barriers or compartments shall incorporate fire/smoke dampers/brakes and adequate protection measures to maintain the compartment integrity. Details of the fire compartmentation are shown on the architect's drawings and within the Fire Strategy Report.

Ductwork shall be DW144 galvanised sheet steel within landlord's areas and flat plastic type within apartments.

All smoke ventilation ductwork shall be 2-hour fire rated for integrity, stability and insulation, unless stated otherwise in the Fire Strategy.

All plant/equipment shall be isolated from the building structure by appropriate means of anti-vibration mountings.

 

Crosstalk attenuators shall be provided where required in line with the acoustic consultant's requirements.

All fresh and exhaust air ductwork shall be insulated against heat loss and surface condensation.

All dampers shall be accessible for maintenance and testing.

APARTMENT VENTILATION

Each apartment shall be provided with its own dedicated mechanical ventilation heat recovery unit (MVHR) providing ventilation to the apartment in line with the requirements of Part F of the Building Regulations.

Fresh air to each apartment shall be taken at the façade via architectural 'glazed-in' louvres and routed in insulated flat plastic ductwork to the MVHR unit located in the services cupboard.

$NO_2/NO_x$ filter unit shall be provided on the air intake in line with the Air Quality report.

The heat recovered from the spent air, extracted from kitchens, bathrooms and services cupboards, shall be used to pre-heat the fresh air before being supplied to the living rooms and bedrooms via an integrated counter-flow heat exchanger element. Both fresh air and extract air shall be filtered before entering the heat exchanger.

Supply air duct shall be routed via the ceiling void and connect to the supply air grille/diffuser provided for the fan coil unit system, via flexible acoustic ductwork (500mm).

Ducted exhaust air from the unit shall be taken to the façade and terminate at the architectural 'glazed-in' louvres, similar to the fresh air. Both ducts shall be terminated at different façades or at least as far away from each other as practically possible.

Volume control dampers shall be provided within the ductwork to balance the supply and extract air volumes with final balancing via the supply and extract air grilles in the rooms. Commissioning shall be coordinated with the ceiling installation to ensure temporary access is available to the dampers when required for commissioning. Permanent access panels in the ceiling for VCDs will not be required.

The unit shall be supplied with an insulated condensate drip tray and 20mm drain connection.

Kitchens shall be provided with a recirculating extract system, specified by the architect. Allowance should be made for extract air duct and return air grille to suit final selection.

Purge ventilation shall be provided by openable windows.

All MVHR units shall be provided with integral controls to enable continuous operation at normal mode flow rates. The MVHR unit will vary its speed and so the ventilation rate to the boost mode, as it receives signals from the light switch in the bathroom, c/w 15min (adjustable) run on timer.

LANDLORD'S AREAS VENTILATION Gray's Inn Road

Reception and BOH Areas

A dedicated ceiling mounted heat recovery unit located within the bin store at ground floor level shall provide supply and extract ventilation to the front and back of house areas the ground and lower ground floors.

The unit shall be provided with plate heat exchanger, fans and filters and duct mounted electric heater battery heating the air to a temperature of 20°C.

The unit shall be provided with AV mounts and attenuators on both the room side and atmospheric side of the supply and extract fans as necessary to meet the noise requirements.

The AHU shall be provided with a bipolar ionisers located within the intake and supply air sections. Each bipolar ioniser shall be supplied via the AHU electrical supply and will operate only when the AHU is operational.

Protected Lobbies

A dedicated smoke extract system shall be provided to the protected lobbies within the core. The extract system shall also provide environmental ventilation to avoid overheating within lobbies. The system shall typically operate every day based on temperature levels within the lift lobbies.

The system shall comprise the following:

- A single vertical shaft of fire rated construction with a minimum 0.6m$^2$ free area from basement to roof level
- Two duty and standby fans with automatic changeover rated to operate at 300°C for 2 hours
- An automatic damper (drop back flap type) at all levels from basement to 5$^{th}$ floor into the shaft
- An automatic damper with decorative grilles on each side above the stair door
- Controls
- A stairwell ventilator with a geometric area of 1m$^2$ located at the head of the fire-fighting stairs

The fans shall be installed within roof plant enclosure and provided with AV mounts and attenuation on both sides of the system. Room side attenuator shall be located vertically within the shaft.

In a day-to-day scenario the system shall run if the temperature within lobbies rises above a pre-set temperature. The air shall be drawn from outside through the stair AOV and above the door damper into the shaft, utilising the smoke extract back flap damper. The fans will typically run at 20% of their full speed.

In the event of fire, the system shall open the stairwell ventilator and the damper on the fire floor and start the extract fan. If the pressure in the lobby on the fire floor drops the fan slows on inverter control. All day-to-day dampers shall close.

A fireman's override switch shall be installed at the base of the stairs, or other location agreed with the Fire Authority.

A central control panel shall provide full automatic operation and fire service override and status indication facilities, linked to a separate fan starter panel, complete with auto-changeover. This shall be linked to the smoke detection and local fire override switches within the stair at each level and to differential pressure sensors in the stair to modulate airflow.

The fire door between the lobby and the accommodation is required to be smoke sealed.

The system shall be designed in line with the recommendations within the Fire Strategy Report.

Refuse Store

A dedicated ceiling mounted extract fan serving both bin stores at ground floor shall be located at high level within the residential bin store lobby and shall extract air direct to outside through a set of weather louvres on the ground floor façade, as indicated on the drawings. The unit shall be provided with AV mounts and room and atmospheric side attenuators.

The fan will be controlled via a programmable time-clock.

Air shall be extracted from the bin stores via duct mounted grilles.

Make-up air shall be provided from the BOH ventilation units via duct mounted grilles. Non return dampers shall be provided on the branch serving the bin stores.

**Smoke Ventilation**

Permanently open ventilation (0.2m$^2$ free area) shall be provided to the bin store lobbies at ground floor level, in line with the fire strategy. Each system shall comprise ceiling mounted grille, fire rated duct and façade connection via exhaust air louvre.

**PANTHER HOUSE AND BRAIN YARD**

**Office VRV System**

All office areas, hub space and reception shall be heated and cooled using a high COP (Coefficient of Performance) heat recovery variable refrigerant volume (VRV) system. The system is capable of simultaneously heating and cooling individual spaces as required.

FUTURE TENANTS COMMS ROOMS

Dedicated plant space shall be provided within roof plant area for the future tenants' comms rooms cooling plant installation (one condenser per tenant). A dedicated trays within the main pipework risers shall be provided to allow the tenant to fit out their pipework.

**Ventilation Systems** Panther House and Brain Yard

GENERAL

All systems and sections of systems shall comply with Building Regulations Part L 2013 with respect to specific fan power and air leakage. Systems operating at more than 1m³/s shall be air leakage tested to the requirements of DW 144 and in accordance with DW 143.

All penetrations through fire barriers or compartments shall incorporate fire/smoke dampers and adequate protection measures to maintain the compartment integrity. Details of the fire compartmentation are shown on the architect's drawings and within the Fire Strategy Report.

Ductwork shall be DW144 galvanised sheet steel unless otherwise specified.

All smoke ventilation ductwork shall be 2-hour fire rated for integrity, stability and insulation, unless stated otherwise in the Fire Strategy.

All plant/equipment shall be isolated from the building structure by appropriate means of anti-vibration mountings.

Crosstalk attenuators shall be provided where required in line with the acoustic consultant's requirements.

All intake and exhaust air ductwork shall be insulated against heat loss and surface condensation.

All dampers shall be accessible for maintenance and testing.

OFFICE AREAS

Mechanical ventilation system shall be provided to each office floor using two centralised double stacked air handling units (AHU) complete with heat recovery. Both AHUs shall be located within the roof plant area.

Each air handling unit shall comprise of supply and extract sections, with a thermal wheel for heat recovery.

The supply section shall consist of motorised damper, panel and bag filter, thermal wheel, DX heating and cooling coil, electric heating coil for back up and supply fan. The extract section shall consist of pre-fitted panel filter, thermal wheel, extract fan, motorised discharge damper and weather louvre.

Both units shall connect to the louvered enclosure for intake and exhaust via dedicated plenum sized on the required free area through louvre.

Both units shall be fitted with AV mounts and attenuators on the room and atmospheric side of the systems as necessary to meet the noise requirements.

At the central plant, the air shall be heated to a temperature of 20°C and cooled to a temperature of 24°C.

The tempered air from the AHUs shall be distributed through the building via sheet metal ductwork in tenant's ductwork risers within the main core, with low level branch connections to each office floor. Each branch connection shall be equipped with a motorised fire damper, a motorised volume control damper and an access panel.

All supply air ducts shall terminate within the underfloor supply air plenum. Where the underfloor plenum is provided with fire separation, sufficient number of fire dampers shall be provided to suit the area served.

Supply air shall be introduced to the office space via floor mounted circular grilles distributed evenly throughout the office space.

Return air shall be extracted from the office floors via open ended bell mouth ductwork located near the core at high level. Each extract branch will have a fire damper, a motorised volume control damper and an access panel.

Extract air shall be ducted and routed via risers back to the roof AHUs where the heat shall be recovered from the exhaust air, and passed to the incoming fresh air, via the thermal wheel.

All supply and extract connections to the office floors shall be provided with motorised dampers to allow a purge function to be operated regularly out of hours, one floor at a time.

The air handling unit shall have an integral dedicated IP65 rated control panel. This control panel shall be pre-wired to all power and control components within the AHU and source power from the local landlord's distribution board.

Both units shall be provided with a bipolar ionisers located within the intake and supply air section. Each bipolar ioniser shall be supplied via the unit's electrical supply and shall operate only when the AHU is running.

AFFORDABLE OFFICE SPACE AND HUB/RECEPTION AREAS

A dedicated vertical floor standing AHUs shall be provided to serve:

1 - the affordable workspace area on the lower ground floor of Brain Yard and Gray's Inn Road and
2 - hub and receptions areas on ground floor.

The air handling units shall contain supply and extract fan sections, with a thermal wheel for heat recovery. Each AHU shall also include motorised dampers, panel and bag filter and duct mounted electric heater batteries.

Both units shall be provided with AV mounts and attenuators on both the room side and atmospheric side of the supply and extract fans as necessary to meet the noise requirements.

At the central plant, the air will be heated to a temperature of 20°C.

Each AHU shall be provided with a bipolar ioniser located within the intake and supply air section. Each bipolar ioniser shall be supplied via the AHU electrical supply and will operate only when the AHU is operational.

TOILET AND SHOWER ROOMS VENTILATION

A dedicated roof mounted twin extract fan shall be provided to serve the toilets and shower/changing areas. The unit shall be located within the roof top enclosure and fitted with AV mounts and attenuators in line with acoustic consultant's requirements.

The fan shall be powered from the landlord's distribution board by the electrical services contractor. The unit shall come complete with integral auto-changeover panel located within the casing and interface capability to the central BMS.

Spent air shall be extracted from the toilet and shower cubicles via purpose made plenum above an architectural ceiling shadow gap at the back of the cubicle. Each plenum connection shall be provided with a pull cord volume control damper.

Make up air to the toilets shall be provided from the adjacent office areas via air transfer system; make up air to the showers shall be provided to the locker's areas from the main AHU.

Make up air transfer system shall comprise:

- Office side duct mounted grille at high level
- A transfer duct within the ceiling zone
- Cross talk attenuator in the main transfer duct in accordance with the acoustic requirements
- Fire damper in the core wall
- Bipolar ionizer on the toilet side before the first branch

Make up air shall be introduced into the superloo cubicles and cleaner's cupboards via separate branches with ceiling mounted circular supply valves.

Make up air to the showers shall be provided via purpose made plenum above an architectural shadow gap above wash hand basins within each changing room area. Each plenum connection shall be provided with a pull cord volume control damper.

 

All shower cubicles shall be provided with doors that are either non-full height or undercut.

Cross talk attenuators shall be provided in accordance with the acoustic requirements where required.

BOH AREAS

A dedicated extract system shall be provided to lower ground floor cycle store and plant rooms areas. The extract fan shall be located in the refuse store on the ground floor and discharge to outside via a set of weather louvres on the ground floor façade, same as the refuse store extract.

The extract fan shall be provided with AV mounts and room and atmospheric side attenuators. Each fan will be controlled via a programmable time-clock.

Air shall be extracted from all areas with exposed soffit via duct mounted grilles and via ceiling mounted grilles where suspended ceiling is provided.

Make-up air shall be drawn from the adjacent affordable office accommodation. The transfer system shall include:

- Office side duct mounted grille at high level
- A transfer duct within the ceiling zone
- Cross talk attenuator in the main transfer duct in accordance with the acoustic requirements
- Fire damper in the core wall
- Duct/ceiling mounted grilles at high level within the areas served

REFUSE STORE

A dedicated ceiling mounted extract fan shall be located at high level in the refuse store and shall extract air direct to outside through a set of weather louvres on the ground floor façade, as indicated on the drawings. The unit shall be provided with AV mounts and room and atmospheric side attenuators.

The fan shall be controlled via a programmable time-clock.

Air shall be extracted from the bin store via duct mounted grilles.

Make-up air shall be drawn from the office accommodation on the ground floor. The make-up air transfer system shall consist of:

- Office side duct mounted grille at high level
- A transfer duct within the ceiling zone
- Cross talk attenuator in the main transfer duct in accordance with the acoustic requirements
- Fire damper in the core wall

- Non-return damper
- Refuse store duct mounted grille at high level

**Smoke Ventilation**

Natural smoke ventilation system shall be provided to lower ground floor area and atrium via automatically openable windows. Refer to architectural information for details.

Permanently open ventilation (0.2m$^2$ free area) shall be provided to the bin store lobby at ground floor level, in line with the fire strategy. The system will comprise ceiling mounted grille, fire rated duct and façade connection via exhaust air louvre.

**INDOOR AIR QUALITY MONITORING**

Indoor air quality shall be monitored and controlled in all office areas.

Ceiling mounted internal indoor air quality (IAQ) sensors shall be provided within each tenancy, 1 per 325m$^2$ as well as external sensors.

The package shall include professional group provisioning, setup app, API including outdoor air quality data access as well as reports and web dashboard access.

The sensors shall include the following:

- PM Sensor (Laser): PM1; PM2.5; PM10
- 0 to 30 µg/m3, ±3µg/m3 I > 30µg/m3, ±10% reading
- CO2 Sensor (NDIR): 0 to 5000ppm I ± 50ppm or 5% of reading
- tVOC Sensor (MOX): Detects among others, Acetone, Ammonia, Ethanol, Formaldehyde, Toluene,
- Isobutylene Xylene. Validated against US EPA reference tVOC gas mix.
- Temperature & Relative Humidity sensors
- PIR sensor: Approx. motion detection 500sqft / 45m²

**RETAIL UNITS**

All retail units shall be provided with the following:

- Façade louvre typically within the shop front glazing for future installation of tenant's ventilation plant within their demise.
- Space provision for future retail tenants' cooling plant within each building's roof plant enclosure.
- Space provision for future refrigerant pipework tray within DX pipework riser and a route from each retail unit.

## B2.2 DESIGN CRITERIA

### GUIDES AND STANDARDS

The Mechanical Installation shall be designed in accordance with the current editions of the following documentation available at the date of issuing the report or specification:

- Relevant British, European and ISO Standards
- The Building Regulations Approved Documents and Second Tier Documents
- CIBSE Guides and Technical Memoranda and recommendations
- Society of Light and Lighting Codes and Guides
- BSRIA Guides
- British Council of Offices Guide to Specification
- British Council for Offices Guide to Fit Out
- Local Authority Requirements and Regulations Health and Safety at Work Regulations

### OFFICE

#### Key System Design Criteria

Population density - 1 person per 8 $m^2$

#### External Design Temperatures

| | |
|---|---|
| Summer | 30°C dry bulb, 20°C wet bulb |
| Winter | -4°C saturated |
| Heat Rejection | 35°C at full capacity, 40°C at reduced capacity |

#### Internal Design Temperatures

| | |
|---|---|
| Office space | 20°C±2°C in heating mode/ 24°C±2°C in cooling mode |
| Reception | 20°C±2°C in heating mode/ 24°C±2°C in cooling mode |
| Toilets | 19°C minimum, no cooling |
| Showers/Changing rooms | 22°C minimum, no cooling |
| Circulation | 19°C minimum, no cooling |

#### Internal Cooling Loads

| | |
|---|---|
| Small power | 20W/$m^2$ diversified to 15W/$m^2$ over 1000$m^2$ |
| Lighting | 10W/$m^2$ |
| People | 80W/person sensible, 60W/person latent |

**Humidity Control** None provided

**Fresh Air Ventilation Rates**

| | |
|---|---|
| Office space | 12 l/s/person + 10% for densely populated areas/meeting rooms |
| Reception | infiltration only |
| Toilets | make-up from adjacent office space |
| Corridors/Staircases | none |
| Showers | 10 air changes per hour |
| Lockers | 8 air changes per hour |
| Refuse store | 8 air changes per hour |
| Cycle store | 3 air changes per hour |
| Storage areas | 3 air changes per hour |
| Plant areas | 3 air changes per hour |

**Extract Ventilation Rates**

| | |
|---|---|
| Office space | 90% of the fresh air after deducting the toilet extract volume |
| Reception | None |
| Toilets | 12 air changes per hour |
| Corridors/Staircases | none |
| Showers | 12 air changes per hour |
| Locker rooms | 10 air changes per hour |
| Refuse store | 10 air changes per hour |
| Cycle store | 3 air changes per hour |
| Storage areas | 3 air changes per hour |
| Plant areas | 3 air changes per hour |

**Smoke Extract Ventilation**

| | |
|---|---|
| Basement | natural ventilation |
| On floor smoke extract | natural ventilation |

**Noise Levels**

| | |
|---|---|
| Open Plan Office | NR 38 |
| Executive Offices | NR 35 |
| Toilets | NR 45 |
| Staircases | NR 40 |
| Reception Area | NR 40 |
| Plant areas | NR 55 |

External Noise Criteria — As detailed in the acoustic report.

Noise levels shall be measured at 1.2m above finished floor levels and no closer than 1.0m from any wall.

 

**Considerations For Dynamic Simulation Thermal Modelling**

1. Heating days: 5 days/week.
2. Heating profile and sizing for dynamic heat loss calculations: Periodic. Setback temperature applied during non-occupied hours.
3. Cooling days: 5 days/week.
4. Cooling profile and sizing for dynamic heat gain calculations: Periodic.
5. Air permeability: Refer to the energy section/report for the value.
6. Infiltration: Rates in ACH are best matched, extrapolated or derived from the representations in Tables 4.13 to 4.21 of CIBSE Guide A, based on the concurrent air permeability values.
7. Internal blinds: Excluded from the simulations unless they are motorised.
8. Diversities for heating and cooling loads: For emitter sizing, apply positive 10% diversity to the sensible calculations. For central plant, apply a generic negative 10% diversity.

**RESIDENTIAL**

**Internal Design Temperatures**

| | |
|---|---|
| Living room | 22°C±2°C in heating mode/ 24°C±2°C in cooling mode |
| Bedroom | 20°C±2°C in heating mode/ 24°C±2°C in cooling mode |
| Bathroom | 22°C minimum, no cooling |
| Toilet | 19°C minimum, no cooling |
| Hall | 19°C minimum, no cooling |
| Stairs/lobbies/ corridors | 16°C minimum, no cooling |
| Reception | 20°C±2°C in heating mode/ 24°C±2°C in cooling mode |

Winter and Summer conditions for reception areas shall depend on the type of external doors and the frequency of the doors being opened.

Specific heating below the reception desk is recommended for localised comfort heating of reception staff.

**Ventilation Rates**

1. Background ventilation for all habitable rooms, kitchens, utility rooms and bathrooms shall comply with Section 5 for new dwellings of Building Regulations Approved Document Part F, 2010
2. Extract ventilation provided in all wet rooms (e.g. kitchen, utility and bathrooms) shall comply with Section 5 for new dwellings of Building Regulations Approved Document Part F 2010
3. Purge ventilation provided in all habitable rooms and wet rooms shall comply with Section 5 for new dwellings, Building Regulations Approved Document Part F, 2010
4. Ventilation system provided for the dwelling shall meet the requirements of Section 5 for new dwellings of Building Regulations Part F in full

**Supply Ventilation Rates**

| | |
|---|---|
| Apartments | to match total extract volume |
| Stairs/lobbies/corridors | No ventilation provided |
| Refuse store | 8 air changes per hour |
| Cycle store | 3 air changes per hour |
| Storage areas | 3 air changes per hour |
| Plant areas | 3 air changes per hour |

**Extract Ventilation Rates**

| | |
|---|---|
| Apartments | Extract rate to comply requirements of Part F of the Building Regulations |

Purge ventilation shall be provided by openable windows.

| | |
|---|---|
| Stairs/lobbies/ corridors | No ventilation provided |
| Refuse store | 10 air changes per hour |
| Cycle store | 3 air changes per hour |
| Storage areas | 3 air changes per hour |
| Plant areas | 3 air changes per hour |

**Noise Levels**

| | |
|---|---|
| Living room | NR30 |
| Bedroom | NR25 |
| En-suite bathrooms | NR35 |
| Plant room | NR 55 |
| External Noise Criteria | As per Acoustic Consultant's recommendations |

Refer to the acoustician's report for details of acoustic treatment required to plant.

Noise levels shall be measured at 1.2m above finished floor levels and no closer than 1.0m from any wall.

**Humidity Control**

None provided.

**Considerations For Dynamic Simulation Thermal Modelling**

1. Heating days: 7 days/week.
2. Heating profile and sizing for dynamic heat loss calculations: Periodic to allow occupant control. Setback temperature applied during non-occupied hours.

3. Cooling days: 7 days/week.
4. Cooling profile and sizing for dynamic heat gain calculations: Periodic to allow occupant control.
5. Air permeability: Refer to the energy section/report for the value.
6. Infiltration: Rates in ACH are best matched, extrapolated or derived from the representations in Tables 4.13 to 4.21 of CIBSE Guide A, based on the concurrent air permeability values.
7. Internal blinds: Excluded from the simulations unless they are motorised.
8. Diversities for heating and cooling loads: For emitter sizing, apply positive 10% diversity to the sensible calculations. For central plant, apply a generic negative 10% diversity.

## B6.0 CONTROLS

The controls subcontractor shall provide all detailed design, labour, equipment and materials, plant, tools, off-loading, taxes, engineering, off-site and on-site testing, supervision and all other works necessary to provide the controls installation. The controls subcontractor shall provide a complete controls system installation for the development suitable for the purpose of controlling and monitoring the operation of mechanical and electrical plant throughout the site.

A fully automatic BMS shall be provided comprising intelligent addressable controllers for all plant. A central head end monitoring and control system shall be located at the office reception desk. At the head end, a graphics page shall be provided for each item of plant. An alarm panel shall be provided at the concierge.

No MCCs shall be provided. Each item of mechanical plant to be controlled by the BMS shall be provided with a power supply from a local distribution board by the electrical subcontractor.

The controls subcontractor shall install all controls outstations containing all DDC controllers and other hardware necessary to monitor and control the M&E plant and systems as described within this specification. Each Controls outstation shall be interconnected via a communication bus and the entire system shall be accessible from the head end.

The automatic control system, including all hardware, software and associated wiring shall be designed, manufactured, supplied and installed by the same controls subcontractor. The whole system shall be checked and put into operation by the controls subcontractor upon completion of the installation. The controls subcontractor shall:

- Supply and install all controls and control equipment
- Supply and install all head end equipment
- Supply and install all interface devices and network controllers to interface the DDC controls on the different items of plant with the head end equipment
- Supply and install all control devices detailed in this specification. Sensor pockets and valves shall be free issued to the mechanical subcontractor for installation
- Provide all necessary software and network software for the correct operation of the plant and the control system network
- Supply, off-load, position and install all equipment for which he is responsible
- Supply and install all controls wiring, including that necessary to operate all packaged plant controls supplied and installed by others
- Provide the control wiring containment systems for the control system for the control system wiring installation
- Provide all necessary earth bonding and associated with the installation
- Provide the complete BMS communication wiring installation
- Provide the complete BMS communication wiring containment system
- Supply and install all metering equipment