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Frankham Consultancy Group Building Services Engineering Services Strategy Report for 41 Russell Square

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1.0 Introduction

This Report has been prepared on behalf of the British Museum in support of the Planning and Listed Building Application for the proposed refurbishment of 41 Russell Square London WC1.

The building comprises of lower ground, ground, first, second and third floors with a pitch roof (roof void).

The Report provides an overview of the proposed mechanical and electrical services strategy and also the energy and sustainability strategy.

The property is a Grade II listed building and the proposed mechanical and electrical services shall be designed and installed with sensitivity taking into account the heritage significance of the property.

The existing service routes and risers have been surveyed and reviewed and the proposed mechanical and electrical design has taken into account such existing service routes so as to minimise the impact on the existing structure.

2.0 Existing Services Installation

The building has been used as offices for many years and the existing mechanical and electrical installations reflect that use.

The existing services installations have been added to and extended in a rather ad-hoc manner and the result is a mixture of surface and recessed services and mixture of equipment, luminaires, lamps, wiring accessories etc. In various areas of the building there are surface run cables, cable trunking, pipe work etc.

The existing mechanical and electrical installations are also not in compliance with current standards and codes of practice and energy efficiency standards.

The proposed new mechanical and electrical services installations will take into account the existing service risers and lateral routes, which have been surveyed and assessed for suitability. The design strategy is to minimise the impact of the cable and pipe work routes so as to minimise any impact on the historic fabric.

3.0 Installation Methodology Overview

The detailed design has been developed in conjunction with the Architects the services are being designed and proposed so as to coordinate with:

- Existing service risers
- Existing notches and holes in flooring joists
- The existing building fabric and finishes

The approach to the new installations has been to:

- Reduce services where possible.
- Re use existing service routes.
- Rationalise external plant.
- Conceal services with appropriately designed architectural bulkheads and bespoke joinery.
- Install plant in less sensitive areas.
- Design service cross overs and plant locations in areas where drop ceilings are being installed.
- Improve internal environment of lower ground floor to provide better building protection.
- Install services in ceiling from the floor above to avoid intervention of ceiling finishes.
- Use of flexible conduit in lathe and plaster walls.
- Use galvanised conduit in masonry walls that require chasing.
- Provide floor standing up lighters to avoid the need for ceiling mounted fittings.
- Perimeter electrical sockets to be served from floor void to limit vertical runs.
- Install aspirated smoke sampling system to rooms with a sensitive ceiling finish.
- Sounders and beacons to be discretely located on walls rather than ceiling.
- Vaulted areas will be dry lined to allow services to run between rather than chase into existing fabric.
- Wireless systems will be employed where practical to reduce services runs.

4.0 Utilities

4.1 Gas Service

The existing gas supply enters the front vault to supply the existing boilers located within the boiler room adjacent the vaults. The existing supply shall be retained and re-used to serve the new boiler.

A new gas safety system and solenoid shut off valve shall be installed. The system shall monitor carbon dioxide levels within the plant space.

A check meter shall be installed and have a pulsed output connected to and monitored by the site BMS. The meter shall be used by the landlord to monitor the total gas consumption in accordance with the Building Regulations Part L2.

The vault containing the gas meter is naturally ventilated, via louvered doors, to the statutory requirements. The gas supply shall be routed through the gas meter room to serve the gas boiler, located within the boiler room.

In addition to the above a BMS or local standalone monitoring panel shall also monitor plant room air quality in compliance with IGM11.

4.2 Electrical Supply

The existing electrical supply enters the building at the front via the under pavement vault at lower ground floor level.

The capacity of the existing electrical supply is limited and the supply will need to be replaced to accommodate the change from gas as a major heating energy to heat pumps. The heat pumps have the advantage of high coefficients of performance and reducing the local emissions.

4.3 Mains Water

The existing water supply which enters the front vault to supply the building shall be retained and re-used.

The whole cold water services installation shall conform to the measures outlined in the 'Health & Safety Executives Legionnaires Disease – The Control of Legionella Bacteria in Water Systems' Approved Code of Practice L8, HSG274 and CIBSE TM13.

The Main Cold Water Services shall comply with all relevant current British Standards and Health and Safety Executive Regulations.

4.4 Boosted Cold Water Services

The existing incoming mains cold water supply shall be routed to the plantroom containing the new break tank and booster set, including controls and expansion vessel as shown on the drawings.

The new booster set shall supply a Boosted Mains cold Water Service (BMWS) to the building via the mechanical services riser. The system shall be extended to serve all outlets and hot water appliances within the building.

Before the booster set, an approved electromagnetic water treatment device will be installed to reduce build-up of scaling within the supply systems.

The tank and booster set shall be sized to ensure that the full design flow rate can reach all mains water draw-off points to suit daily demand.

4.5 Hot Water Services

Hot water services shall be designed and installed to meet the requirements of the Camden Environmental Guidance contained in document CPG3.

The hot water services shall be generated by electric storage water heaters located close to the point of use. All hot water for showers shall be provided via electric thermostatic showers.

A cold water feed shall be connected to the water heaters. The water heaters will then supply the local domestic hot water pipework and outlets. Due to the expected pipework lengths the domestic hot water pipework shall be trace heated, to prevent legionnaire risk.

Each hot water system shall be a single pipe system with no recirculation.

It is expected that the local water heater shall be supplied with expansion vessels to maintain and manage the system pressure.

4.6 Heating Systems

The heating system shall be designed and installed to meet the requirements of the Camden Environmental Guidance contained in document CPG3.

A new heating system will be designed for the building by means of providing a Low Temperature Hot Water (LTHW) system, including a new modulating condensing boiler. The boiler shall be connected to the LTHW systems including circulating pumps and all necessary associated items. The system shall have weather compensated LTHW systems. The LTHW systems shall serve new radiators.

The radiators shall serve circulation areas and WC's only.

All distribution pipework and all pipework in the boiler room shall be thermally adequately insulated.

4.7 Comfort Cooling and Heating (Office Areas)

Comfort cooling and heating systems within the building shall be provided via a set of VRF/ VRV heat pump heat recovery systems.

The comfort cooling and heating shall be provided to office areas only.

The system shall be capable of providing simultaneous heating and cooling via branch selector boxes. There shall be a set of condensing units to serve the building. The condensing units shall be located externally to the building at ground floor level (rear garden) as shown on the drawings.

Refrigerant pipework shall run in the services zones to BC Controller boxes located in plant areas, risers or roof voids with the exact positions to be finalised on site. From the BC controller box individual flow and return refrigerant pipework shall run out to the individual Fan Coil Units in the spaces to be served. All refrigerant pipework shall be suitably insulated and run on suitable containment.

Within each space to be served, there shall be indoor units connected by flow and return refrigerant pipework to the BC controller box. The indoor units shall be the floor mounted concealed type units. Each space shall have a wall mounted controller.

The indoor units shall circulate air within the space to the desired room temperature.

4.8 VRF System

The installation shall provide an energy efficient R410A Variable Refrigerant Flow (VRF) comfort air conditioning system(s) to the designated areas/zone utilising a simultaneous heating and cooling with heat recovery. The system shall be installed in accordance with relevant codes of practice and regulations.

The system shall be a VRF 3-Pipe Heat Recovery Condenser and multiple indoor units to provide simultaneous heating and cooling to each zone within the building. The system shall use non-ozone depleting HFC refrigerant R410A and be able to run with a minimum indoor cooling demand.

4.9 Outdoor Units

Each separate system shall be capable of simultaneous heating and cooling.

The outdoor units located at the rear garden on the ground floor shall connect to the indoor heating/cooling units via a copper refrigerant pipework system distributing primarily via the building services risers and the ceiling voids.

Pipework in risers shall drop or rise on cable ladder/tray and then distribute at each floor level within the ceiling void again mounted on cable ladder/tray.

4.9.1 Indoor units

Space heating and cooling shall be provided to all offices spaces by VRF floor mounted fan coil units, to meet the internal environmental requirements. The Fan Coil Units shall be supplied with heating and cooling energy via the outdoor units.

Make up air to the indoor units shall be drawn directly from the room via an opening within the casing.

4.10 Controls and Monitoring

The outdoor units and distribution boxes shall be monitored by energy monitoring software.

Each space shall have a wall mounted controller, which in turn shall be linked to a central VRF system controller. The central controller shall be linked to the BMS `for monitoring and control.

Local controls of the VRV system shall be provided by a hard wired remote control units. The controller shall provide basic on/off control with set point adjustment, fault code diagnosis and time clock configured. The controller shall also be capable of being connected to remote temperature sensors to suit various interior design options.

A central intelligent touch controller shall also be provided. This controller shall be linked to each local controller and have the capacity to control each local unit. The system shall have capacity to allow floor-by-floor energy use metering.

5.0 Ventilation

5.1 Mechanical Ventilation (Extract Only)

A series of new local mechanical extract ventilation systems in the building shall be utilised for the toilet areas, showers, cleaner cupboards and kitchenettes. Air shall be extracted via ceiling or wall mounted air grilles and ducted to atmosphere as shown on the drawings.

The extract ventilation rates shall comply with building regulations part F.

Make up air shall be provided by natural ventilation means from adjoining spaces via undercut doors.

5.1.1 Toilet Systems

All extract systems for toilet and cleaner's cupboard areas shall be via twin extract fan system. These systems shall operate on space occupancy only activated by PIR sensor located in each space. The systems when activated with operate for a prescribed time frame and shall also have an automatic changer over (run/standby) and run-on facility.

The system with makeup air from the adjacent spaces, shall allow the creation of a negative pressure regime to prevent the egress of smells and moisture to surrounding areas.

5.1.2 Kitchenette Systems

The extract fans shall be controlled via manual switching with a run-on timer to comply with Building Regulations.

The systems shall allow the creation of a negative pressure regime to prevent the egress of smells and moisture to surrounding areas.

5.2 Natural Ventilation

All windows to office areas shall be openable, with a limited and restricted opening amount, to provide natural ventilation to the building and make up air to the extract systems.

5.3 External Vaulted Areas

Frost protection shall be provided in vault containing the booster set and tank to prevent from freezing.

6.0 Above Ground Drainage

The new above ground drainage systems to suit the new architectural layouts and drainage positions shall comply with building regulations part H.

The above ground foul and waste drainage system shall connect to all sanitary appliances, showers, basins, sinks, floor gullies, and condensate drains.

The drainage system has been designed and installed to achieve the following:

- Prevent the transmission of foul air in to the building
- Minimise the frequency of blockages and provide adequate pipe access to enable the effective clearance of any blockages
- Minimise the risk of flooding to any part of a building, especially where the floor level is located below normal ground level
- Pipework has been kept as short as possible, with the fewest number of bends, and installed with an adequate gradient.

Air Admittance valves have been used within parts of the above ground drainage installation, but will need to be confirmed against the required ventilation regime for the below ground drainage system.

7.0 Lighting Installations

Lighting will be designed and installed to meet the requirements of the Camden Environmental Guidance contained in document CPG3, Chartered Institution of Building Services Engineers lighting guides and BCO lighting guide for offices, general building areas such as corridors, toilets, stairs, kitchens etc. and VDU/VDT environments i.e.

- Maximum installed lighting power for the specified illumination levels to comply with Building Regulations.
- Lighting controllability
- Users over ride facilities
- Light sources selected from the ETL list
- Luminiares selected from the ETL list
- Lighting controls compliant with the ETL criteria
- Lighting control zones compliant with the ETL criteria.

New luminaires will be of the high frequency DALI dimmable control gear type with low energy ballasts and drivers fitted with white 3500K LEDs. The LED lamp technology will be to the latest standards and provide a low energy and associated emissions strategy.

The new lighting installation will be provided throughout the buildings and specifically to the following areas:

- Office floors
- Common areas such as toilets, stairs, corridors etc.
- Plant spaces internal and external
- Externally to entrances and exits and for access.
- External Areas and Vaults.

Lighting to the ground and first floor heritage office areas will comprise decorative pendant LED and decorative wall mounted LED luminaires selected to enhance the interiors and be in keeping with the architectural finishes. The LED lamp colour is recommended at 3500K. Luminaires will be locally controlled via demand switches and absence, presence and daylight sensors to optimise energy use.

The DALI network will have at least 30% spare capacity upon completion of the works.

Lighting to common areas such as corridors, entrances, stairs, toilets, shower rooms, plant rooms, stores, will be of the low energy LED type and DALI controlled via PIRs, daylight sensing etc. LED light sources would be of Colour temperature 3500K.

All luminaires will be using DALI high frequency control gear. Lighting will be controlled in accordance with the switching and control requirements of Part L2 of the Building Regulations.

The complete lighting system will be fully commissioned and fully interfaced with the BMS and lighting control system.

8.0 Emergency Lighting Installations

New emergency lighting will be provided throughout the buildings designed in accordance with the British Standard Code of Practice BS5266.

Emergency lighting will be provided in all office, escape routes and other areas required by Building Regulations, BS5266 and as required by the Building Control Approved Inspector class NM3.

The emergency lighting will operate in conjunction with escape signage to provide illuminated escape routes from all areas.

9.0 Fire Alarm Installations

The fire alarm installations will be designed in accordance with BS5839 Part 1 and use will be made of 'Radio' systems to avoid the need for extensive site wiring. The buildings have been surveyed for suitability and the use of radio technology has been confirmed.

The classification of fire alarm cover will be L1, this is coverage of all parts of the building.

Sounders, incorporated into the bases of the smoke and heat detectors, will be installed to maintain the sound pressure level required in BS 5839 Part 1.

The fire alarm system will comprise a fully automatic analogue addressable system with a central panel in each building, interlinked, so as to provide a coordinate fire detection and alarm system utilising the latest design of detection.

Facilities will be provided to meet the requirements of the DDA Act in respect of alerting persons that have a hearing deficiency, by means of xenon flashers also incorporated into detectors as appropriate.

10.0 Electrical Mains and Distribution Switchgear and Cabling Strategy

The incoming electrical supply will feed into main panel boards, one per building, incorporating the latest MCCB (moulded case circuit breaker) technology. From these MCCB board multicore riser cables will be installed to local MCB (miniature Circuit Breaker) Located at each floor level.

A review of having centralised distribution boards versus local boards showed that the installation of cabling and riser sizes was optimised by having local boards.

From the local MCB distribution boards Ring power and radial power feeds to final circuits serving socket outlets and switch fused connection units will be installed using LSF sheathed twin and earth cabling installed in the floor voids.

Also from the local MCB board will be installed the supplies to the lighting circuits again using LSF sheathed twin and earth cabling installed in the floor and ceiling voids and within the existing walls connecting to switches.

The cabling will be installed using existing risers and holes in flooring joists where at all possible.

11.0 Lightning Protection

The Lightning protection requirement has been reviewed and found not to be required for the building. However surge protection will be provided to the electrical distribution.

12.0 As Fitted Drawings and Maintenance Manuals and Building Log Book and Building User Guide

The existing buildings do not have extensive as fitted drawings, operation and maintenance manuals or Building Log Books.

As part of the mechanical and electrical services strategy as fitted drawings and O&Ms will be provide together with Building Log Books in principle will be as follows:

During the progress of the works it will be required to maintain on site, a set of drawings indicating the progress of works and detailing tray, cable routes, etc.

The drawings will then be used as the basis of the 'As Fitted' drawings together with the manufacturer's drawings to produce a comprehensive set of 'As Installed' drawings on completion of the works.

The Operating and Maintenance manuals will be based on the BSRIA Code of Practice for Operating and Maintenance Manuals and include the following (all documentation written in English):

(a) Catalogue details of all equipment used within the installation.
(b) Complete operations instructions for all equipment and services installed.
(c) All routine daily, weekly, monthly and yearly maintenance instructions for all of the equipment.
(d) Copies of 'As Fitted' drawings, names, addresses and telephone numbers of manufacturers together with reference numbers for all items of equipment which may be used as spares for the 9installation.
(e) A recommended schedule of spares and consumables.
(f) Copies of all test certificates, test schedules and commissioning.
(g) The above would be provided in lever arch ring binders and shall be provided with properly printed front labelling identifying the name of the project, the contents of the manual and the name and address of the contractor together with masters and copies of current Test Certificates.

The M&E contractors will co-operate to produce Building Log Books in accordance with Building Regulations Part L2 and using the CIBSE model.

13.0 Data/Voice Installation

Data and Voice installations are to be provided as a requirement of any modern office environment.

The electrical contractor will install a network of containment up the proposed services risers and then install data/voice cabling linking back from every outlet to distribution frame in the designated Comms room.

The existing risers have been utilised to accommodate the cable trays and existing holes through floor joists will be utilised as practicable.

The contractor will supply and install a complete network of UTP CAT 5E cabling on a radial basis from the Comms rack in the basement terminating into data outlets in a similar manner as for the wiring of the 13A socket outlets.

14.0 Renewable Energy

Due to the constraints of the site the introduction of renewable technologies has not been possible. However the design of the new mechanical and electrical services strategy has been based upon the optimisation of energy efficiency and emissions in accordance with the guidance in the Camden Environmental Sustainability guidance document CPG3.

The buildings existing mechanical and electrical services has been upgraded to reflect modern office standards, with energy efficient plant and intelligent lighting that comply with building regulations Part L guidelines whilst minimising the services impact on listed buildings.