UCL Wilkins Building

Replacement of Mechanical Services – Domestic Hot and Cold Water Services and Electrical Services

UCL

30 May 2022

Notice

This document and its contents have been prepared and are intended solely as information for UCL and use in relation to obtaining planning approval to allow for strip out and replacement of domestic hot and cold water services and electrical services.

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This document has 20 pages including the cover.

Document history

Revision	Purpose description	Originated	Checked	Reviewed	Authorised	Date
Rev P1	Planning application	Marcin Nazarewicz / Chaudhry Akhtar	Marcin Nazarewicz / Chaudhry Akhtar	Martin Whitchurch / Munish Nanwani	Stephen MacLoughlin	17/06/2019
Rev P2	Planning application	Marcin Nazarewicz	Martin Whitchurch	Ian Munro	Jeroen Rooseman	30/05/2022

Client signoff

Client	UCL
Project	UCL Wilkins Building
Job number	5187806
Client signature / date	

Contents

Introduction

The purpose of issuing the P2 revision of this document is to present changes to the design of the new domestic hot and cold water services and electrical services in the UCL Wilkins Building, for which works Planning Approval and Listed Building Consent was obtained in 2019.

Proposed changes are the effect of the feasibility check of the original pipe route during on-site construction works, which commenced at the beginning of the 2022 year. Proposed changes will be less disruptive to the building fabric than the originally approved route.

List of changes in P02 revision:

- Updated drawing 5187806-ATK-LG-DR-PH-101 Revision P02 (Revision P01 is also included for the record within this submission)
- New sketches: 5187806-ATK-SK-001 to 005 showing required openings to the building fabric to allow installation of the pipework

This document provides an overview of the systems, and proposed routes for the pipework and electrical services, and identifies the location of the associated equipment.

1. Introduction

1.1. Executive Summary

The Wilkins Building is a Grade 1 listed building and therefore all works to the building will be subject to Listed Building Consent. The building was completed in phases from 1827 to 1881, with substantial rebuilding following bomb damage during World War 2.

This report has been prepared to obtain a planning approval and Listed Building Consent for the proposed domestic water services and electrical services, including hot and cold water pipework, cold water storage tank, cold water booster pump set, hot water generation plant and associated equipment.

Atkins have surveyed the existing services within the building in order to understand the demand, best routes for new pipework and electrical services and the location for the new plant.

1.2. Planning consent

Listed building consent is required for all works of demolition, alteration or modifications that affect the character of the Wilkins Building as a building of special historic interest.

Section 7 of the Planning (Listed Building and Conservation Areas) Act 1990 (LBCA Act) provides that, subject to the following provisions of the Act, no person shall execute or cause to be executed any works for the demolition of a listed building or for its alteration or extension in any manner which would affect its character as a building of special architectural or historic interest, unless the works are authorised.

The works at Wilkins Building will therefore require plans and specifications approval for the proposed systems and associated equipment.

This report provides sufficient details, including plans, schematics and system description to allow the impact of the works on the building to be properly assessed.

2. Existing services

2.1. Public Health Services

The Wilkins Building has 4 cold water storage tanks, located on the roof – see *Figure 1*. Only 3 tanks are in use and but not at full capacity as some sections have been isolated. These tanks are fed from the mains water supply and provide cold water down service to the various outlets within the building and to the hot water generation plant located in the Lower ground floor plantroom B33. The tanks supply various areas within the building. These areas are highlighted in green on attached layouts. The tank supply survey carried on site by the LCS - UCL's contractor, shows possible cross connections between tank supplies.

As stated in reports and O&Ms provided by UCL and confirmed by Atkins, the overall capacity of stored cold water is 14m^3.

The current average daily water use can be estimated at 48m^3 – as per meter readings records provided by UCL.

Figure 1 – Cold water storage tanks located on the roof

Visual inspections carried out by Atkins discovered unnecessarily complicated piped connections on lower ground floor level, with multiple branch connections added over the years – see Figure 2. Some of these branch connections as well as main pipe runs are labelled incorrectly – making the understanding of the system more complicated. In various areas the pipework is inaccessible or embedded in walls.

Some parts of the cold water system are not compliant with the current water Regulations. Refer to the UCL water risk assessment for more details.

During site investigations Atkins have noted a number of dead legs on the cold water system. These will be replaced with the new system, compliant with the current water Regulations.

Figure 2 – Examples of complicated piped connections on lower ground level. The picture on the left shows 2 sets of 3 pipe runs (cold, hot flow and return) supplying the same area. The picture on the right shows an example of a numerous branch connections being added over years.

The majority of the pipework is in galvanised steel, however some of the pipework are in plastic and copper. Lead pipework was observed in Provost's toilet as shown on *Figure **3*** below. This will be removed and replaced.

Figure 3 - Lead pipework in Provost's bathroom

Hot water generation plant for the majority of the building except new Refectory, is within the lower ground level plantroom B33. Hot water is generated from the district heating (MTHW) via s set of plate heat exchangers - MTHW to LTHW and LTHW to domestic hot water storage vessels. Hot water flow and return system pipework extend from the plantroom B33 to various areas of the building in underground ducts or at high level on the lower ground.

The Refectory has its own hot water generating system located in the sub-basement, consisting of hot water storage vessels and plate heat exchangers taking the heat from the district heating.

The majority of the hot water pipework is in galvanised steel with exception of newly refurbished toilets where copper material are used.

Figure 4 – Hot Water storage vessels in B33

Pipework connections in the Plantroom B33 are complicated. It is recommended to simplify them.

Some parts of the hot water system are not compliant with the current water Regulations. Refer to the UCL water risk assessment for more details of known risks that should be addressed.

During site investigations Atkins have noted a number of dead legs on the hot water system. These will be replaced with the new system, compliant with the current water Regulations.

2.2. Electrical Services

All new and modified public health equipment as part of this package of works will be supplied from existing distribution boards.

On Lower Ground Floor level, a one 3-phase spare way on existing distribution board ‘DB/MECH/IH’ within ‘Plant Room B33’ will be utilised.

Cables will be contained within steel conduits installed at high level. See electrical services drawings for proposed cable routes.

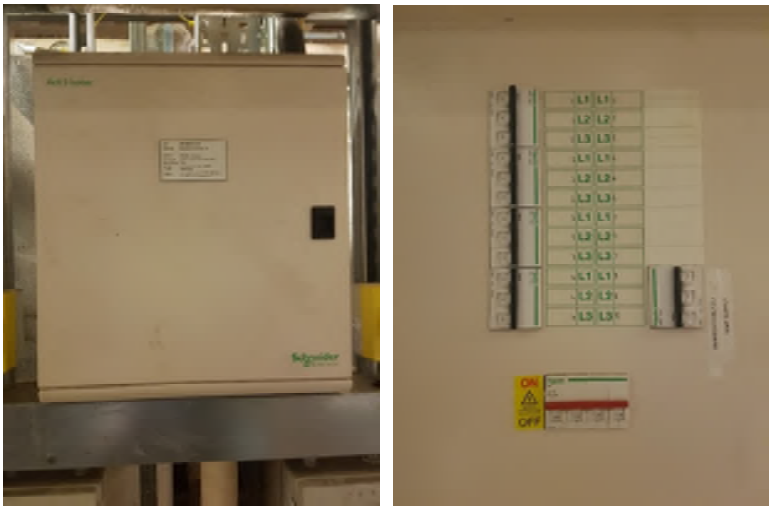

Figure 5 - Distribution board ‘DB/MECH/IH’ within ‘Plant Room B33

On the third floor the existing distribution board ‘MB3PR’ located within Plant Room-386 and shown in *Figure **6*** will be used.

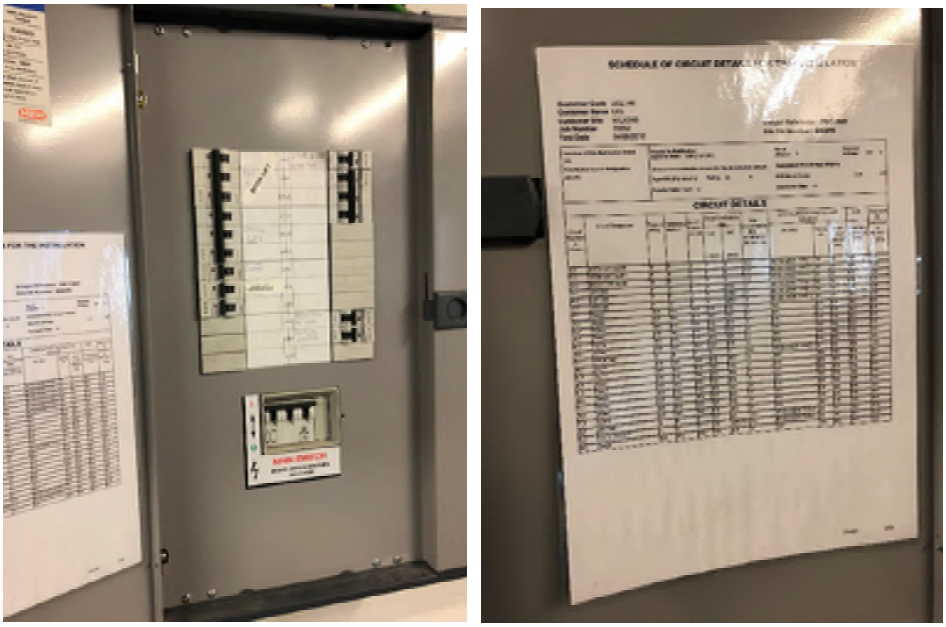

Figure 6 - Distribution board ‘MB3PR’ within ‘Plant Room 386

3. Proposed services

3.1. Domestic Water Services

3.1.1. Introduction

This section of the report describes the proposed Domestic Water Services for the Wilkins Building. It should be read in conjunction with the associated drawings contained within the appendices.

3.1.2. Overview

The Public Health services will comprise of the following elements:

- Domestic cold water system together with associated plant such as tanks, pumps
- Domestic hot water system together with associated plant such as hot water storage provision
- Central hot water generation system
- Local hot water generation system

3.1.3. Design Criteria

The public health services design criteria will be based on but not limited to the codes and standards listed in the table below. Items note as “M” are mandatory and items noted as “G” are guidance only.

Table 1 – Standards and guidelines pertaining to Public Health Services

Publication Reference	Description
Approved document	Building Regulations Part G – Sanitation, hot water safety and water efficiency (M)
Approved document	Building Regulations Part L – Conservation of fuel and power (M)
Statutory document	Water Supply (Water Fittings) Regulations 1999 (M)
Statutory document	Water Industry Act (M)
Health and Safety Executive	HSG 274 Part 2: The control of legionella bacteria in hot and cold water systems (G)
Health and Safety Executive	HSE Approved Code of Practice and Guidance L8. Legionnaires' disease - The Control of Legionella Bacteria in Water Systems (G)
Health and Safety Executive	The Health and Safety at Work Act (M)
Health and Safety Executive	Pressure Equipment Regulations and Pressure Equipment Directive (M)
Health and Safety Executive	The Construction (Design and Management) Regulations (M)
European and British Standards	BS EN 806 - Specifications for installations inside buildings conveying water for human consumption – Parts 1-5 (G)
European and British Standards	BS EN 8558 - Guide to the design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages - complementary guidance to BS EN 806 (G)
British Standards	BS 6700+A1 - Design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages Specification - although withdrawn and no longer active is still cited in other current documents.
BSRIA	BSRIA Rules of Thumb – Guidelines for building services (G)
CIBSE	CIBSE TM13 Minimising the Risk of Legionella (G)
CIBSE	Guide G - Public Health and Plumbing Engineering (G)
IOP	Plumbing Engineering Services Design Guide (G)
UCL Engineering , Maintenance and Infrastructure	Design Guidance for Mechanical, Electrical & Public Health Services (G)
UCL Estates	Design Requirements for Connections to the UCL District Heating Network (G)
UCL Estates	Asbestos Management Plan (G)

3.1.4. Incoming Supply

The existing Ø42mm Mains Cold Water Supply (MCWS) from Gower street enters the lower ground floor level within room B16A. The Authority's water meter is located in the meter pit near the main gate to the campus. This supply will serve the new 12m^3 domestic water storage tank located in proposed location B15G.

Figure 7 – Existing Mains Water Supply from Gower street

3.1.5. Domestic Cold Water System

The new 12m^3 cold water storage tank will be located in the new plantroom space on lower ground level. The tank will be fed from a new supply from the existing Ø42mm mains cold water supply. The tank will be sectional and will provide cold water supply to the Wilkins Building – areas highlighted in green on attached drawings – see appendix A.

Proposed size of the tank covers 25% of daily water demand of 48m^3.

Figure 8 – Typical cold water storage tank

The incoming cold water supply will be sub-metered with a pulsed BMS water meter located in the new plantroom.

The system will be fitted with auto reverse rinsing filter on the incoming main to the break tank.

From the tank a potable cold water supply will be boosted by a variable speed pump and will be distributed around the development. The Boosted Cold Water Service (BCWS) will serve all outlets within the building, e.g. sinks, WCs, wash hand basins, showers etc. It will also provide cold water to the hot water system, and pressurisation units located in Plant Room B33.

Domestic cold water booster pump set will be a multi-stage variable speed in a duty / assist / standby configuration.

Figure 9 – Typical cold water booster pump set

To protect the build-up of scale within the water services pipe work system, it is proposed to use an electro-magnetic water conditioner, downstream of the multi-stage pump set.

To prevent the system from the bacteria, the disinfection of the water by the use of ultra violet light lamp will be provided.

Figure 10 – Typical electro-magnetic water conditioner (left) and UV lamp (right)

The BCWS will route within the building through the existing underground ducts or at high level on the lower ground floor. The aim of the design is to utilise existing routes and limit to the absolute minimum any cores through the structures. Where possible, connections between levels will be via existing service risers within the B26 store and within B23 room and via cores through the lower ground level ceiling to ground level locations.

Fire stopping between levels within the risers will be provided.

The information on some of the existing services routes is very limited, some of the pipe routes have not been recognised and therefore there is a risk of discrepancies against this report. Some interfaces with existing system shall be utilised, especially within the recently refurbished areas. This will be confirmed by the appointed contractor and dependent on the pipework condition.

Pressure reducing valves will be incorporated at the pipe branches on both cold and hot water and will regulate the pressure to approximately 3 bar in each area requiring potable water.

Pipework will be installed using copper tube with end-feed, solder ring fittings. Pipework in the underground duct will be installed using push fit fittings. All pipework will be insulated – see *Figure **11***. Where running in areas exposed to external air temperatures, the pipework will be insulated and trace heated to protect it from freezing.

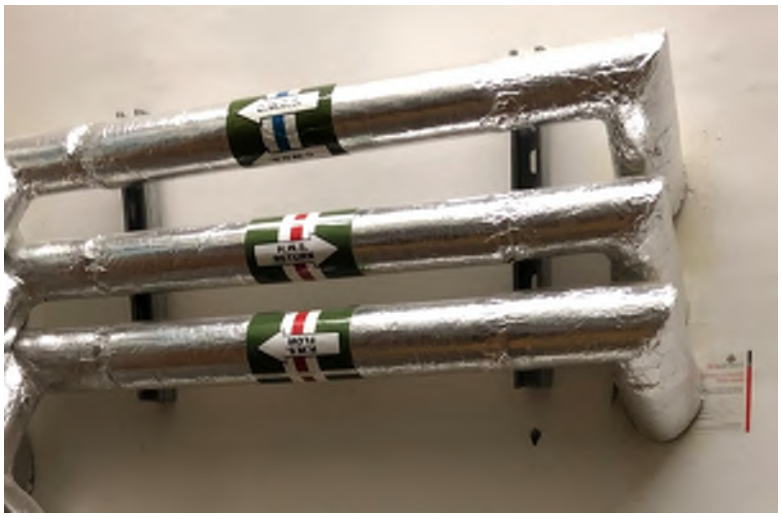

Figure 11 – Typical pipework arrangement with insulation currently installed in the Wilkins Building

3.1.6. Domestic Hot Water System

The new Domestic Hot Water Service (HWS) for lower ground floor and ground floor areas will be generated via plant located in the B33 plantroom. The plant will consist of storage vessels, plate heat exchangers and associated equipment. See *Figure 12* for clarification.

Figure 12 – Typical hot water storage vessel proposed for the B33 plantroom

Hot water flow and return system pipework will extend from the plantroom B33 to various areas of the building in underground ducts or at high level on the lower ground. The pipework will utilise existing routes where possible. Cores through the structures will be limited to the absolute minimum.

The HWS will be a fully recirculated system to insure that there are no delays in available hot water. The centralised hot water store will gradually replenish throughout the day.

The hot water system will generate hot water at 60°C. The system will be designed so that hot water reaches any fixture within thirty seconds to minimize water wastage.

Hot water will be distributed to wash hand basins and showers via thermostatically controlled mixing valves to provide safe operating temperatures at those hot water outlets. HWS to fittings requiring full temperature hot water, such as tea sinks, cleaner's sinks etc will not require thermostatically controlled mixing valves.

In order to save energy required to maintain the water temperature for remote locations, domestic hot water for first and second floor toilets will be generated by electric water heaters. This will allow additional savings on materials.

Electric water heaters are already installed in rooms 204, 218, 219, 220, 221, however not all heaters are in use at the moment. Therefore, plant replacement may be required, depending on the condition of heaters. New water heater serving second floor toilets 278 and 279 will be installed in room 276. New electric water heaters will be installed in first floor level toilets 125A and 125B.

These heaters will require new power supply. Refer to electrical section of this report for more details.

Figure 13 – Typical electric water heaters for first floor toilets 125A and 125B (left) and second floor toilets 278 and 279 (right)

All necessary safety devices will be provided on the water heaters, together with dedicated drain lines to collect discharges from the heater safety relief valves. Relief drain discharge points will be located in safe locations and shall discharge to the nearest local foul drainage stack via a HepVo type waterless trap.

3.2. Electrical Services

3.2.1. Design Criteria

The electrical services design criteria will be based on but not limited to the codes and standards listed in the table below.

Table 2 – List of Standards pertaining to Electrical Services

Title
Electricity at Work Regulations 1989
BS7671:2018 18th Edition.
Electricity Safety, Quality and Continuity Regulations, 2002
Health and Safety at Work Act 1974
Construction (Design & Management) Regulations 2015
Working at Height Regulations 2005
Control of Asbestos Regulations 2012
Regulatory Reform (Fire Safety) Order 2005
Management of Health and Safety at Work Regulations, 1999
EMC Regulations 2006
Distribution Code: Engineering Recommendation G12/4 (Requirements for the protective multiple earthing to low voltage networks)
Building Regulations

Table 3 – List of Statutory Requirements pertaining to Electrical Services

Reference	Title
The Grey Guide v 1.2	M & E Engineering
BSI BS EN 61386-1: 2008	Conduit systems for cable management - Part 1: General requirements
BS EN 50085-1: 2005+A1: 2013	Cable trunking systems and cable ducting systems for electrical installations — Part 1: General requirements
BS 6004: 2012	Electric Cables, PVC Insulated, Non-Armoured Cables for Voltages up to & including 450/750V for Electric Power, Lighting & Internal Wiring
BS 7430: +A1:2015	Code of Practice for Protective Earthing of Electrical Installations.
BS 7671:2018	Requirements for electrical installations. IET Wiring Regulations. Eighteenth edition.
BS 951: 2009	Electrical earthing. Clamps for earthing and bonding. Specification.
BS EN 62444: 2013	Cable glands for electrical installations
BS EN 50525	Electric cables – Low voltage energy cables of rated voltages up to and including 450/750V
BS EN 61439: 2011	Low Voltage Switchgear & Control Gear Assemblies
BS EN 60529:1992 + A2:2013	Specification for degrees of protection provided by enclosures (IP code)
BS 7375:2010	Distribution of electricity on construction and demolition sites - Code of practice
BS 5839-1	Fire detection and fire alarm system for buildings. Code of practice for design, installation and commissioning and maintenance of systems in non-domestic premises

3.2.2. Lower Ground Floor Services

New cold-water booster pump located within B15F will be fed from DB/MECH/IH within plant room.

New cable will be connected to the existing distribution board and routed on high level within the cable tray. Within B16 and B16A, cable will be contained within steel conduit, clipped to the wall at high level.

Figure 14 - Location of proposed route for high level cable conduit within B16A

The contractor shall ensure that the lighting level within the new plant room B15 shall meet the minimum requirements as recommended by SLL lighting guides. The contractor shall also ensure that the design,

installation, commissioning and operation of fire detection and alarm system is in compliance with the list of standards and statutory requirements mentioned in Fig 14 and Fig 15.

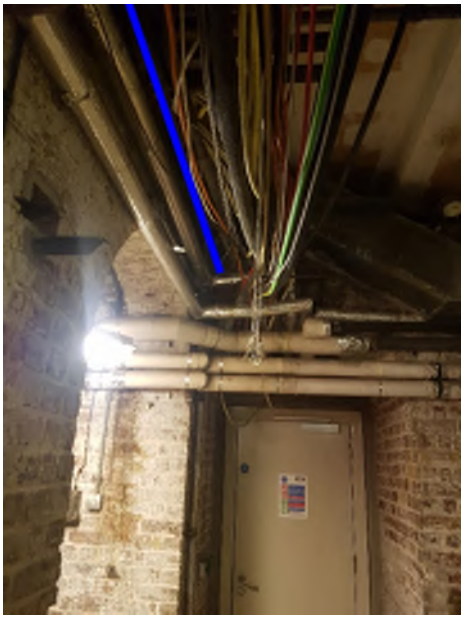

Figure 15 - Location of proposed route for high level cable conduit within B33

3.2.3. First & Second Floor Services

It is proposed to use the spare ways on distribution board 'MB3PR' to serve the electric water heaters in rooms 125A and 125B on first floor and room 276 on second floor. Indicative cable route has been illustrated in the drawings.

4. Strip-out works

The redundant pipework and equipment will be stripped out by the contractor. The Client, UCL Estates, will arrange for the asbestos Refurbishment and Demolition Survey and any asbestos removal before the commencement of the strip-out works.

The contractor will be the Principal Contractor under the CDM Regulations 2015. As such the contractor shall comply with their duties under the regulations, including (but not limited to) having regard to the Pre-Construction Information compiled by the Principal Designer and the preparation of the Construction Phase Health and Safety Plan.

The contractor shall undertake their own surveys to verify the redundant services before strip-out work commences. The strip out drawings and report do not take into account the sequence of strip-out works.

When an item is identified for strip-out, it shall include pipework, supports, valves, insulation and all associated ancillary items.

Works shall be carried out carefully with no damage to the historic fabric of the building. Any damage shall be reported to the UCL Estates. All strip-out items are to be removed from site.